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Comparative Studies on Vehicular Emission caused by Conventional Automobiles

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Abstract - As we know that the use of automobiles are increasing with a very large rate. With this increase, the fuel consumption is also increasing. Due to increased vehicular emission, the pollution due to the automobile is also increasing at a very rapid rate. This article shows various by-products suspended by the burning of conventional fuel in the automobile and their effects on the environment. These by-products cause various environmental problems like global warming, acid rain, climate change etc. This paper also shows the comparative analysis of the different fuels used in automobiles and their effect on the automobile performance, speed and emissions etc.

Keywords - Vehicular Emission, Pollution, Fuel Combustion, Conventional Fuel Drawbacks, EPA, DPM.

1. Introduction

Pollution may be defined as the addition of any unwanted material in the environment which has an adverse effect on it. The unwanted particles added to the environment are called as pollutants. A pollutant may be natural particle or a synthetic or by-product of human activities like waste from industries, vehicular emission etc. Pollution is categorized in a number of categories listed as ^[1]:

Air pollution: It is the suspension of chemicals and particles into the atmosphere. Common air pollutants are carbon monoxide, chlorofluorocarbons (CFC), sulfur dioxide etc which are caused by industries and vehicles

Noise pollution: Any voice which is causes disturbance to human hearing is the example of noise pollution. Industrial noise, Automobile noise, aircraft noise and high intensity sonar are all responsible for noise pollution.

Soil Pollution or Soil Contamination is the process of addition of various harmful chemicals and products in the soil measure due to waste disposed and spills. Industrial waste, Pesticides, Detergents etc are some of the common soil pollutants.

Radioactive contamination, which was caused due to the testing of radioactive bombs like atom bomb etc. The harmful radioactive rays are emitted to the environment.

Water pollution: It is the disposal of various types of harmful chemicals and products like detergents, soap, industrial wastes etc into the water bodies. These pollutants are affecting ground water in the ponds, lakes and rivers etc and also ground water. The aquatic life is also affected by this pollution

Plastic pollution: It is accumulation of plastic products like plastic bags, wrappers etc in various places. As we know the plastic is non-biodegradable, it remains intact forever and causes various problems. It affects wildlife, animal habitat and even humans.

As we know that the pollution on the earth is increasing at a very tremendous rate. There are various sources of this pollution ranging from industries, mining and above of all, automobiles. About half of the total pollution in the world is caused by the automobiles only. Automobiles include burning of fuel in an internal combustion engine for generation power to propel vehicle. The major fuels used in automobiles are petrol, diesel, compressed natural gas (CNG) etc. Petrol and diesel on burning gives by-products like hydrocarbons, carbon monoxide etc which are harmful for every living being on earth.

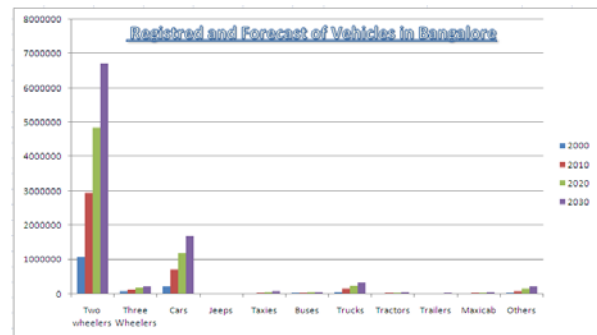


Figure 1: Registration and Forecast of vehicles in Bangalore ^[1]

Automobiles were developed to ease the human effort in transportation, but we have overly utilized automobiles for our pleasure and as a symbol of wisdom which ultimately have an adverse effect on our environment. The use of automobiles is increasing at a very high rate. The figure 1 shows the increase in the registration of automobile in past years in Bangalore city with a forecast if the use of automobiles keeps growing at the running rate.

2. Discussion

In this article we are going to discuss about the different fuels used in automobiles and the by – products exhausted by the vehicles due to the burning of these fuels in the combustion chamber and their effect ^[3] ^[4] on the environment.

Let us consider various fuels of the automobiles in details:

2.1 Petroleum ^[5]:

It is a naturally occurring, yellowish to blackish liquid found beneath the Earth's surface. It contains hydrocarbons of different molecular weights and other organic compounds, which are refined into various types of fuels. The name petroleum covers both the natural crude oil and product obtained by refining of these crude oils. Petroleum is a fossil fuel as it was formed large quantities of dead organisms mainly aquatic like zooplanktons and algae were buried under the earth. Due to large pressure and temperature, these fossils turned into petroleum by decomposition.

The various petroleum products are separated by refineries on the basis of the number of carbon atoms present in the alkanes. Some major fuels refined from petroleum are given below:

Table 1: Alkanes of various petroleum products

Refined Product	Alkane
Petroleum Gas	Alkanes with 4 or less than 4 Carbon Atoms
Gasoline	Pentane (C ₅ H ₁₂) to Octane (C ₈ H ₁₈)
Diesel, Kerosene and Jet Fuel	Nonane (C ₉ H ₂₀) to Hexadecane (C ₁₆ H ₃₄)
Lubricating Oil	Alkanes with more than 16 Carbon Atoms
Paraffin Wax	Alkanes with about 25 Carbon Atoms

Asphalt	Alkanes with about 35 Carbon Atoms
---------	------------------------------------

2.1.1 Petrol:

Petrol is a refined product of petroleum. It is the lightest product in the distillation process of petroleum. It is used in Petrol engines working on Otto Cycle. These engines include mixing of petrol with air in a carburetor and then supplied to combustion chamber which after compression is burned with a spark plug which expands the fuel in form of hot gases and then exhausted from the cylinder to the environment. The burning of the petrol gives out various harmful products which are shown in the table below:

Table 2: Emissions of petrol engine

Non-toxic Emissions	
Nitrogen gas (N ₂)	Air is 79% nitrogen gas, most of which passes straight through the engine
Water vapour (H ₂ O)	Produced during combustion when the hydrogen in the fuel combines with oxygen in the air
Carbon Dioxide (CO ₂)	Produced during combustion when carbon in the fuel combines with oxygen in the air (a greenhouse gas which is the major contributor to global warming)
Harmful Emissions	
Carbon Monoxide (CO)	Produced during combustion, this is a poisonous gas that is colourless and odourless
Volatile Organic Compounds (VOC's)	Consisting of unburned hydrocarbons and products of combustion reactions, these can further react to form ground level Ozone (O ₃), a major component of smog.
Nitrogen Oxides (NOX)	NO and NO ₂ contribute to smog and acid rain, and also cause irritation to human mucus membranes.

2.1.2 Diesel:

The chemical energy which is stored in the diesel fuel is converted into the mechanical energy by a diesel engine. In diesel engine, combustion occurs when diesel fuel is injected into the engine cylinder having compressed hot air under pressure. The combustion of the diesel fuel contains various harmful pollutants which are harmful for animals and humans. These harmful gases are exhausted into the environment in the form of exhaust.

2.1.2.1 Carbon Monoxide (CO), Hydrocarbons (HC):

As we know that the diesel fuel is mainly consists of hydrocarbons as it is a product of petroleum, if some of the unburned fuel escapes out as exhaust, these hydrocarbons are released in the environment along with the fuel. When oxygen supply is not sufficient the fuel in not burned completely. As the result of this incomplete combustion, carbon content in fuel produces carbon monoxide rather than carbon dioxide. Carbon monoxide is

a toxic gas. These particles are environment are very harmful for humans as it cause many problems like irritation in eyes, dizziness, headache, skin allergy, lungs problems etc.

2.1.2.2 Nitrogen oxides (NO_x):

Oxides of nitrogen are produced by reaction between nitrogen and oxygen under high pressure and high temperature as found in engine cylinder. Nitrogen oxides mainly consist of nitrogen oxide and some fractions of nitrogen dioxide. Nitrogen dioxide is toxic in nature and very harmful for both human beings and environment. NO_x emissions are very harmful for environment as it causes smog formation.

2.1.2.3 Sulfur dioxide (SO₂):

It is generated from the sulfur present in diesel fuel. Sulfur is a toxic colorless gas with an irritating smell. The concentration of SO₂ in the exhaust gas depends on the sulfur content of the fuel. These days fuels with less sulfur contents are used. When sulfur dioxide is further oxidized it produces sulfur trioxide, which is responsible for production of sulfuric acid. This acid in the environment is very harmful as it causes acid rain.

2.1.2.4 Diesel particulate matter (DPM):

DPM is basically a complex mixture of solid and liquid particles. These are caused due to presence of carbon particles in the diesel fuel. When fuel is burned at high pressure and temperature and pressure, the carbon particles decomposes to into particle called DPM. The DPM are categorized in three states:

- **Solid Particles** - dry carbon particles, commonly known as soot,
- **Soluble Organic Fraction** - heavy hydrocarbons which are adsorbed and condensed on the carbon particles, called Soluble Organic Fraction,
- **Sulfate Particles** - sulfate fraction, hydrated sulfuric acid.

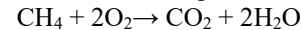
2.2 Compressed Natural Gas (CNG):

CNG or Compressed Natural Gas is a natural occurring gas. It mainly consists of methane, CH₄. The natural gas is found in petroleum deposits beneath the earth. It is safer than other fuels in case of spills as it is lighter than air. The natural gas is compressed to the 1% of the volume it is present in atmospheric air.

The automobiles running on diesel or LPG are modified to run on CNG. However, the use of CNG causes some effects to the environment, which are:

2.2.1 Green House:

As discussed, natural gas is mainly composed of methane. When this is suspended in the environment through the exhaust it decomposes gradually by the radicals. The chemical equation of methane is given as:



The methane gas keeps on decomposing until whole of the methane is finished. It produces only carbon dioxide and water, but it causes more global warming than that of carbon dioxide due to its power to entrap radiations. However its life is very short, having half life if 7 years, than the carbon dioxide, it still causes 84 times more global warming that carbon dioxide.

2.2.2 CO₂ emissions

Natural gas is known as the cleanest fuel as it has very few pollutants than other fuels used today. The CNG produces about half the carbon dioxide than petrol and diesel. However small, but still it produces carbon dioxide emission which is responsible for global warning.

2.2.3 Other pollutants

Compressed Natural gas produces very less pollutants as discussed but still it have some contents of nitrogen oxides and sulfur particles. The pollutants caused by burning of the CNG are listed below:

- Carbon monoxide
- Particulates
- Sulfur dioxide
- Nitrogen oxide

2.2.4 Nano-Carbons:

Now recent studies have shown that the so called clean fuel exhausts the nano sized carbon particles which are harmful for animals and humans. These nano-carbon particles cause cancer and other harmful problems.

3. Comparison

Among the three discussed type of fuels, CNG is considered to be good followed by the Petrol and lastly Diesel.

But latest studies showed that even CNG suspend nano-carbon particles in environment, which causes cancer in human beings. This makes the Petrol the best among these three. Diesel has large number of harmful by-products like lead, carbon-particles which makes it a very harmful fuel.

Talking about the performance, each fuel has its own advantages and disadvantages. Some attributes of the three fuels is given in table 2. [6]

Table 2: Comparison of Different Fuels

Attribute	Petrol	Diesel	CNG
Speed	Very Fast	Slower than Petrol	Very Slow
Maintenance	Low	High	Very High, as risk of leakage.
Durability	High	Low	Moderate
Emission	CO ₂ NO _x CO Volatile Particles	CO ₂ NO _x CO Volatile Particles Carbon Particles Lead	CO ₂ NO _x CO Volatile Particles Nano-Carbons

4. Conclusions

The conclusion is that these non-renewable fuels causes various harmful pollutants like carbon-dioxide, carbon-monoxide, nitrogen oxides etc to the environment which causes various types of pollutions discussed above. Government have taken many steps like odd-even scheme and banning old diesel engine cars, to decrease the automobile usage, but none of them is seem to be working. These are not the permanent and effective solution for the problem but in turn it is creating new problem.

Proper steps should be taken for control of pollution due to the automobiles. Proper guidelines and pollution check should be done for each vehicle sold. Other alternative fuels like pneumatic energy, hydraulic energy and solar energy should be used. Electricity Powered Motors are a very good substitute for automobiles as it is very much efficient and totally non polluting.

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References

- [1] Anubha Kaushik and CP Kaushik; "Environmental Studies"; ISBN: 978-81-224-3625-9; printed by New Age International Publishers in Delhi.
- [2] Mahadevappa Harish; "A Study on Air Pollution by Automobiles in Bangalore City"; Management Research and Practice; September 2012; ISSN: 2067-2462; Volume 4, Issue 3; Page 25-36.
- [3] K. Aparna Seetharam; "Automobile Exhaust Pollution"; October 2014; ISSN: 0974-2115; Journal of Chemical and Pharmaceutical Sciences, Special Issue 3, Page 73-74
- [4] T Subramani; "Study of Air Pollution due to vehicle Emission in Tourism Centre"; May-June 2012; ISSN: 2248-9622; International Journal of Engineering Research and Applications Vol. 2, Issue 3; Page 1753-1763.
- [5] R.K. Rajput; "A Textbook of AUTOMOBILE ENGINEERING"; ISBN: 81-7008-991-3; Printed by Laxmi Publications (P) Ltd.
- [6] Dr. Kirpal Singh; "Automobile Engineering"; ISBN: 81-804-119-5; Printed by Standard Publishers Distributors.

Review on scheduling of PV Generation for economic/environmental dispatch

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Abstract - This paper on review on scheduling of PV Generation for economic/environmental dispatch using different optimization techniques. This multi-objective consider the minimization of fuel cost and emissions of thermal generating units with scheduling for sharing of different photo-voltaic generating units to fulfill the load demand in such a way to minimize the total generating cost and satisfying equality and inequality constraints using optimization technique. Now a days it is challenge to achieve reliable and inexpensive electricity in mature energy market. Exhaustion of fossil fuels reserves and rapid intensification of fuel price and increasing emission having environmental concerns has compelled to assimilate the renewable energy sources in the energy market.

Keywords - Economic load dispatch (ELD), Combined Economic Emission Dispatch (CEED), Renewable Energy Sources, Photo-Voltaic (PV) generating units, Particle swarm optimization (PSO).

1. Introduction

Electric energy carries a great significance in the energy ranking because of its numerous application for the domestic purposes, agricultural usage, and industrial applications and even for transportation [1]. Electricity is one of the forms of energy which cannot be stored but can be carried from one place (probably the generating station) to the other place (area of its application) instantaneously. It can easily be controlled making it an enchanting form of energy. The index for standard of living of people in a particular country depends on the per capita electric energy consumption [2, 3].

Now a day the generation of electricity is too expensive in terms of reliability. To make reliable and inexpensive energy market, this paper presents analysis of scheduling of photo-voltaic generating units such as the commitment of photo-voltaic generating unit to meet

maximum generation at particular hours for economic/environmental dispatch. In recent days, only minimization of fuel cost of thermal generating units is not enough as due to increasing pollution [1], [2]. The rapid depletion of fuel energy reserves and environmental concerns has compelled us to incorporate the renewable energy resources in energy mix. The main objective of such system is to achieve the convenience of minimum production cost, maximum reliability and better operating conditions.

Economic dispatch is an optimization problem that allocates power to each committed generating units so as to minimize the total operational cost, subject to constraints. In modern system only minimization of fuel cost is not enough but also the energy crux must be minimized by integrating renewable energy generation system in present power system scenario [5]. This multi-objective function includes minimization of fuel cost of thermal generating units with emission and minimization of solar cost with different scheduling at constant load [3].

2. Analysis of Various Techniques used for optimization

2.1 Classical Techniques

Classical method is totally dependent on the parameter selection i.e. the step size with which the number of iteration vary. Newton- rapson method can be applied to obtain the solution of non-linear equation in which the problem of change in the control variables can be fulfilled by using Taylor series expansion using hessian matrix [3]. All such mathematical programming based algorithms such as lambda iterative method, Lagrange relaxation; gradient based method does not manifest to be applicable for non-linear or non-convex cost functions [4]. Such techniques involve a derivative approach which does not converge. This difficulty of constraint handling can be overcome by following dynamic programming (DP)

approach [6]. Thus, these classical methods do not provide solution in extensive optimization problem.

2.2 Random Search Techniques

The second category of methods for solving optimization type of problems includes stochastic searching algorithms. It includes genetic algorithm (GA), particle swarm optimization (PSO), artificial immune system (AIS), evolutionary programming (EP). Above optimization techniques are different approach which is flexible and efficient than traditional methods because of their propensity to traverse new solution with suitable satisfaction of constraints. Genetic algorithm is one of the global optimization technique based on the principles of biological evolution in which exactness can be improved by increasing the string length. But the problem with GA is that it works with binary operators which require sufficient time and space to convert into required form. Vanaja *et al.* [07] have proposed AIS based ELD with valve point effect. T. Kumano presented functional optimization to solve dynamic ELD with ramp rate of power output of thermal units [08]. Orike *et al.* [09] have presented improved evolutionary algorithms for ELD.

2.3 Hybrid Techniques

Ultimate aim of any optimization technique is to converge the given problem within certain limited time cycle. Hybrid approach is one such method which involves hybridization of two independent optimization algorithms. By using hybrid structured search, quality of solution gets improved and computational time also. Kumar *et al.* [10] have proposed a hybrid multi-agent based PSO algorithm in which hybridization of the deterministic search, multiagent system, PSO and bee decision making process combine result more accurately and prove to be robust in finding global optimum for ELD. Cai *et al.* [11] have proposed hybridization of fuzzy system and chaotic swarm optimization known as a fuzzy adaptive chaotic ant swarm optimization algorithm used for solving ELD problem. Coelho *et al.* [12] have proposed a DE based on truncated lévy-type flights and population diversity in which hybridization lead to avoiding premature convergence effectively and capable of achieving higher efficiency and better solution for solving ELD. Zhang Zhisheng presented hybridization of electromagnetism-like mechanism algorithm (EMA) and chaos theory known as chaotic electromagnetism-like mechanism algorithm (CEMA) used for solving ELD problem of power system [13]. Hybridization lead to

increase the searching spaces and to avoid particle trapped into local optimum [14]. Ling *et al.* [15] have presented a hybridization of particle swarm optimization and wavelet theory based mutation operation use to solve ELD. A wavelet theory used to enrich PSO in exploration of spaces more effectively for better results. Ahmed Y *et al.* [16] presented hybridization of bacterial foraging technique and PSO biased evolution for solving ELD. De *et al.* [17] presented a hybridization of biogeography-based optimization and predator-prey approach used to solve ELD. Wang *et al.* [18] have presented a modified mutative scale chaotic optimization algorithm applied to ELD. Lai *et al.* [19] presented intelligent optimization with fuzzy control; a technique called iteration windows introduced which provide the self-terminating ability used to solve ELD. Rathi *et al.* [20] presented hybrid technique based on biogeography based optimization for solution of ELD problems in this technique searches for the global solution throughout the mutation and migration. Das *et al.* [21] presented hybridization of differential evolution and invasive weed operation for solving ELD. Nejad *et al.* [22] presented hybridization of clonal selection algorithm and PSO for solving valve- point ELD.

3. Environmental Concern

Several contaminants are released in atmosphere due to the burning of fossil fuels which include sulphur oxides, carbon dioxide and nitrogen oxides etc and other green house gases that may adversely affect the environment [23]. But generation of power from these fossil fuels result in release of various gases in the atmosphere. Main concern out of these gases is regarding the green house gases like NO_x , SO_x , CO_2 that causes pollution in the environment [24]. The emission of these pollutants causes global warming that affect not only humans but also affect other forms of living beings like plants and animals. Thus it is required to produce electricity at minimum possible cost as well as at minimum level of pollution [25].

But optimal generation dispatch deal with minimizing the total generation cost of system. Thus such methods are not preferable. Increased concern over environmental regulations in the recent years (clean air act 1990) enforced the consideration of emission as important factor to be considered with generation [26]. It can be concluded from the above discussion that ELD problem not only deals with minimizing the cost ensuring all constraints but at the same time limit the emission as well [27]. The conventional ELD problem deals with the allocation of

power in such a way so as to carry out generation economically with all constraints ensured. Ultimately it follows an increase in level of emission of gaseous pollutants from these fossil fuels. In concern environmental awareness, electrical utilities are required to reduce their emission level well below preset standards [28]. So far the only criterion of economic load dispatch is to dispatch electric power economically only and now minimization while considered emission as constraint is also important for all generation utilities. Ramanathan has presented emission constrained economic load dispatch (ECELD) [4]. Arya *et al.* [5] have presented emission constrained secure economic dispatch. Abou *et al.* [29] have presented DE algorithm for emission constrained economic power dispatch problem.

3. Conclusions

In this paper, different optimization technique is used for scheduling of renewable generating unit for economic emission dispatch problem. The purpose of using multi-objective combined economic emission dispatch problem including solar and thermal generating units at different hours on constant load is to fulfill the increasing demand with satisfying the condition of exhaustion of fossil fuels with minimization of emissions. These different methods are applied with environmental and economical conditions simultaneously using maximum photo-voltaic generating units at different hours with scheduling for obtaining maximum power generation. The better results in terms of minimum emission and minimum total cost for CEED problem with less computational time and more accurate global best solution.

References

- [1] [Brodsky, Steven F.J.](#); [Hahn, Robert W.](#), "Assessing the influence of power pools on emission constrained economic dispatch," *IEEE transactions on power systems*, Vol. 1, No. 1, pp. 57-62, 1986.
- [2] Wood, A.J.; Wollenberg, B., "Power generation, operation and control," 2nd edition, *John Wiley, New York*, 1996.
- [3] Kothari, D.P.; Dhillon, J.S., "Power system optimization," 2nd edition, *PHI learning private limited*, 2011.
- [4] [Ramanathan, R.](#), "Emission constrained economic dispatch," *IEEE Transactions on Power Systems*, Vol. 9, No. 4, pp. 1994 - 2000, Nov 1994.
- [5] Arya, L.D.; Choubale, S.C.; Kothari, D.P., "Emission constrained secure economic dispatch," *International journal of electrical power & energy systems*, Vol. 19, No. 5, pp. 279-285, June 1997.
- [6] Liang, Zi-xiong; Duncan Glover, J., "A zoom feature for a dynamic programming solution to economic dispatch including transmission losses," *IEEE transaction on power systems*, Vol. 7, No. 2, pp. 544-550, 1992.
- [7] Vanaja, B.; Hemamadini, S.; Sishaj P., "Artificial immune based economic load with value point effect," [IEEE conference on TENCON 2008](#), pp. 1-8, 2008.
- [8] Kumano, T., "A functional optimization based dynamic economic load dispatch considering ramping rate of thermal units output," *IEEE conference and exposition on power systems*, pp. 1-8, 2011.
- [9] Orike; Corne, S.; D.W., "Improved evolutionary algorithms for economic load dispatch optimization problems," *IEEE conference on computational intelligence*, pp. 1-8, 2012.
- [10] Kumar, Rajesh.; Sharma, Devendra.; Sadu, Abhinav., "A hybrid multi-agent based particle swarm optimization algorithm for economic power dispatch," *International journal of electrical power & energy systems*, Vol. 33, No. 1, pp. 115-123, Jan 2011.
- [11] Cai, Jiejun.; Li, Qiong.; Li, Lixiang.; Peng, Haipeng.; Yang, Yixian., "A fuzzy adaptive chaotic ant swarm optimization for economic dispatch," *International journal of electrical power & energy systems*, Vol. 34, No. 1, pp. 154-160, Jan 2012.
- [12] Coelho, L.D.S.; Bora, T.C.; Mariani, V.C., "Differential evolution based on truncated levy-type flights and population diversity measure to solve economic load dispatch problems," *International journal of electrical power & energy systems*, Vol. 57, pp. 178-188, May 2014.
- [13] Hosseinneshad, Vahid.; Babaei, Ebrahim., "Economic load dispatch using θ -PSO," *International journal of electrical power & energy systems*, Vol. 49, pp. 160-169, July 2013.
- [14] Chaturvedi, K.T.; Pandit, Manjaree.; Srivastava, Laxmi., "Particle swarm optimization with time varying acceleration coefficient for non-convex economic power dispatch," *International journal of electrical power & energy systems*, Vol. 31, No. 6, pp. 249-257, July 2009.
- [15] Ling, S.H.; Iu, H.H.C.; Chan, K.Y.; Ki, S.K., "Economic load dispatch: A new hybrid particle swarm optimization approach," [Power engineering conference on AUPEC 2007](#), pp. 1-8, 2007.

- [16] J. Kennedy, J.; Eberhart, R.C., "Particle swarm optimization," *In Proc. IEEE conference on Neural Networks*, pp. 1942–1948, Nov. 1995.
- [17] [De Athayde Costa e Silva, M.](#); [Dos Santos Coelho, L.](#), "Biogeography based optimization combined with predator-prey approach applied to economic load dispatch," *IEEE symposium on Neural Networks*, pp. 164 – 169, 2010.
- [18] Wang, Jun.; Zhou, Jianxin.; Si, Fengqui.; Xu, Zhigao., "A modified mutative scale chaotic optimization algorithm for economic load dispatch," *International conference on Remote sensing, environment and transportation engineering (RSETE)*, pp. 3768 – 3771, 2011.
- [19] Lai, J.C.Y.; Leung, F.H.F.; Ling, S.H.; Shi, E.C., "Economic load dispatch using intelligent optimization with fuzzy control," *IEEE conference on Fuzzy systems*, pp. 2219–2224, 2011.
- [20] Rathi, A.; Agarwal, A.; Sharma, A.; Jain, P., "A new hybrid technique for solution of economic load dispatch problems based on biogeography based optimization," *IEEE conference on TENCON*, pp. 19-24, 2011.
- [21] Das, A.K.; Majumdar; Krishnanand, R.; Panigrahi, K.R.; B.K., "Economic load dispatch using hybridized differential evolution and invasive weed operation," *International conference on energy, automation and signal*, pp. 1-5, 2011.
- [22] Nejad, S.B.; Elyas, S.H.; Khamsch, A.; I.N., Moghaddam and M. Karrari, "Hybrid clonal [selection algorithm with PSO for valve-point economic load Dispatch.](#)" *IEEE conference on MELECON*, pp. 1147–1150, 2012.
- [23] [Lamont, J.W.](#); [Obessis, E.V.](#), "Emission dispatch models and algorithms for the 1990's," *IEEE transactions on power systems*, Vol. 10, No. 2, pp. 941-947, 1995.
- [24] [Gent, M.R.](#); [Lamont, J.Wm.](#), "Minimum-emission dispatch," *IEEE transactions on power apparatus and systems*, Vol. PAS-90, No. 6, pp. 2650-2660, 1971.
- [25] [Delson, Jerome K.](#), "Controlled emission dispatch," *IEEE transactions on power apparatus and systems*, Vol. PAS-93, No. 5, pp. 1359-1366.
- [26] J.H Talaq, Ferial and M.E. El-Hawary, "Minimum emission power flow," *IEEE Transactions on power systems*, Vol. 9, No. 1, pp. 429 - 435, Feb 1994.
- [27] William, Y.Spens.; Fred, N.Lee., "Interactive search approach to emission constrained dispatch," *IEEE transactions on power systems*, Vol. 12, No. 2, pp. 811-817, 1997.
- [28] El-Keib, A. A.; Ma, H.; Hart, J. L., "Economic dispatch in view of the clean air act of 1990," *IEEE*

Transactions on Power Systems, Vol. 9, No. 2, pp. 156-175, May 1994.

[29] Abou, A.A.; Elaa, El; Abidob, M.A.; Speaa, S.R., "Differential evolution algorithm for emission constrained economic power dispatch problem," *Electric power Systems research*, Vol. 80, No. 10, pp. 1286-1292, Oct 2010.

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Improving Network Stability of Sink Mobility Using Immunity Algorithm in Wireless Sensor Networks (WSNs)

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Abstract- In this paper, we tend to propose the quality of a sink in improved energy economical adaptive immunity formula to advance the network lifespan of Wireless sensing element Networks (WSNs). The multi-head chain, multi-chain construct and therefore the sink quality affects the highly part in enhancing the network lifespan of wireless sensors. Thus, we tend to suggest Mobile sink improved energy-efficient adaptive immunity model having a sink quality, to realize skillful energy utilization of wireless sensors. Because the motorized movement of mobile sink is steered by CHS. Their paths thus there's a necessity to confine this movement inside boundaries and therefore the flight of mobile sink ought to be mounted. In our technique, the mobile sink moves on its flight and stays for a sojourn time at sojourn location to ensure complete knowledge assortment. We tend to develop Associate in formula for flight of mobile sink. We tend to ultimately implement the formula to assess the performance of the projected technique. The results reveal that the projected solution is almost optimum and conjointly higher than previous in terms of network lifespan.

Keywords: *Sojourn tour, Sojourn time, Network Lifetime, Power-Efficient Gathering in Sensor Information Systems.*

1. Introduction

WSN square measure accustomed sense numerous attributes of setting by mistreatment wireless sensors. Wireless Routing Protocols attempt to make sure economical information transmission in WSN. Because the adept energy utilization is incredibly necessary acquisition in WSN, it's attainable by mistreatment sink quality in WSNs. On one hand, a mobile sink will minimize the energy utilization of detector nodes by grouping info at their place, whereas on the opposite finish it lessens the delay in information delivery for all the nodes in chain. It causes the worldwide load equalization within the entire network of wireless sensors therefore, the amendments in chain-based protocols square measure necessary to take advantage of their blessings. Planned algorithmic program presents the notion of chain formation among sensors so conveys the information to base station. The leader node

collects information of all alternative chain nodes and sends it to the sink. It is a challenge to attain well-organized energy utilization of the leader node of chain however it is defeated by sink quality and multi-head chains. The multi-chain construct at one hand, decreases the network overhead attributable to fewer numbers of nodes enchain, whereas on the opposite hand shrinks the space between the connected nodes attributable to their uniform random distribution. The rest of paper is organized as follows. In Section 2, we tend to gift connected work to our planned theme whereas Section 3 depicts assumptions for our novelty and describes the network operations of planned work which has multi-chain construction, information transmission and sink quality involving suggested algorithmic program. Section 4 investigates the simulation of distinction between our technique and said proposals. The last section concludes the paper expressing its stability required.

2. Background

In wireless device network knowledge transmission is extremely high-priced in terms of energy consumption, whereas processing consumes considerably less [1]. The energy value of transmission one little bit of info is around constant as that required for process cardinal operations in typical device node [2]. The communication system has a lot of higher energy consumption than the computation system. It is been shown that transmission one bit could consume the maximum amount as corporal punishment some thousand instruction. On the opposite hand the nodes in an exceedingly device network might not be charged once their energy drained that the life of the network depends crucially on the energy of the nodes. Thus life of network depends on acceptable routing protocol. Most of the sooner works on energy economical routing in wireless device network uses the minimum total energy (MTE) routing for knowledge transmission approach during this work to reduce the energy consumption to succeed in the

destination was by causing the traffic to same path however if all the traffic follows constant path then all the nodes of that path can depleted their energy quickly [3]. Instead of making an attempt to reduce the consumed energy the most objective is to maximize the life of the system [4]. As in [4] the utmost life drawback could be an applied mathematics drawback and resolvable in polynomial time. During this works Chang and Tassiulas planned energy economical routing algorithms like flow redirection and most residual energy path routing. During this work considers the only destination version of the matter.

3. Network Operation of proposed model:

In this paper we make assumptions reckoning the environment where the network will operate. Some assumptions are detailed here:

The sensing element nodes area unit stationary such that the nodes cannot move from one location to another on their own. Nodes will be captive by external forces, like animals, attackers or sturdy winds. Any node movement are taken under consideration whenever the network reclusters. Communication links area unit radially symmetrical. If a node u will hear another node v , then node v will hear node u . The algorithms use the local neighborhood connectivity and layout so as to elect cluster heads. So it is mandatory that all nodes in the neighborhood are aware of the connections. Nodes area unit not location aware. The nodes area unit not equipped with GPS receivers and do not understand their location among the lined space. Nodes do not know in which direction other nodes are located, nor do they understand that alternative nodes will communicate with one another. Every sensing element is aware of its native neighborhood. Nodes communicate with one another exploitation wireless communication to construct a connected network. Every node is aware of that alternative nodes it's ready to communicate with and it is aware of the standard of this affiliation.

3.1 Network Model:

We consider a 100m x 100m space for WSN. In our state of affairs, a hundred nodes are deployed within which twenty five, twenty five nodes are additional divided arbitrarily in equally spaced space exploitation uniform random distribution. We have a tendency to assume sink quality because the sink moves through the centre of equally spaced regions and complete its full flight in one entire spherical. We have a tendency to use 1st order radio

model to calculate energy consumption in information transmission by sensors. According to 1st order radio model, $E_{elec} =$ fifty nJ/bit is consumed by the radio to run the transmitter or receiver electronic equipment and $E_{amp} =$ a hundred pJ/bit/m² is needed for transmitter electronic equipment, wherever k are range of bits and d is distance. Transmitter electronic equipment additionally consumes $E_{DA} =$ fifty nJ/bit to mixture the info received by the child nodes.

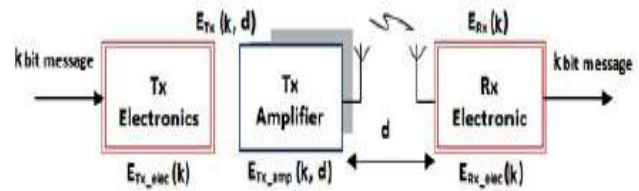


Fig1. Network Model [1]

3.2 Multi-chain construction:

The procedure of chain building is same as of PEGASIS. In our work, there are four chains in our proposal thus chain formation happens in following method. Sink sends howdy packet to any or all the nodes to induce data of all the nodes. Sink finds the farthest node by examination the distances of all the nodes from itself in initial region. The chain formation starts from the farthest node i additionally referred to as finish nodes. The tip node finds the closest node from itself. Within the chain, every node i receiving knowledge from the node j , acts as a parent to node j , whereas node j acts as a baby to node i .

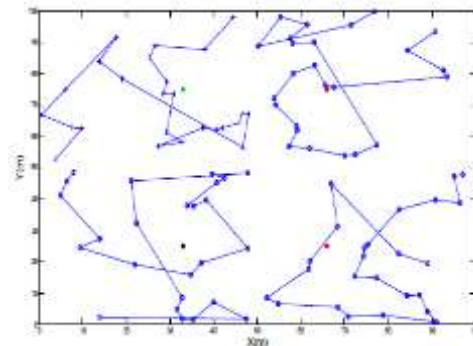


Fig.2 Chain formation

3.2. Chain Selection:

In this section leader is selected on the idea of weight alphabetic character allotted to every node. Every node computes its weight alphabetic character by dividing its residual energy with its distance from the bottom station. The network compares the weights of all the nodes in

chain. The network computes the node having highest weight and judges it as primary chain leader of the chain. once the chain formation, every node i computes its distance dp with the parent node and so, compares it with the gap dfs to the sink. If the later distance is a smaller amount ($dp \geq dfs$), the node i acts as a secondary chain head and sends the collected information to the sink, rather than transferring it to parent node

$$Q_i = E_i / D_i \quad (1)$$

where E_i - the residual energy of sensing element D_i indicates the gap between sensing element node i and sink.

3.3 Sink mobility :

Sojourn time is that time of measure where sink stays at specific position and gets knowledge from the chain leaders. Sojourn location is that the location wherever the sink quickly stays for knowledge assortment. We advise a ascendable algorithmic program for the gap forced mobile sink to modify the higher than mentioned issues. It consists of following 3 stages. The sojourn time profile at every sojourn location is calculated 1st. supported the sojourn time profiles, it then starts sojourn tour for the mobile sink .The sink computes the overall sojourn time of all four sojourn locations in one spherical as follows :

3.4.1 Startup phase:

During this section, the sink initializes the network by process the quantity of nodes (N), the information packet size (k), the management packet size (kCP), the scale of detector field (M×P) and therefore the parameters of the radio model. Then the sink divides the detector field into R equal size regions.

3.4.2 Stand-up phase:

After initialization, the mobile sink goes to center of r the region ($r = \text{one}, 2, \dots, R$) and uses AIA to seek out its sojourn location and locations of the optimum CHs supported the received messages from the sink, every CH in r th region creates the TDMA schedule by distribution slots to its member nodes and informs these nodes by the schedule. the small print of the planned protocol and the way AIA is employed to seek out the locations of the optimum CHs and placement of the mobile sink in every region as follows: The mobile sink finds the sensors nodes that have residual energy equal or larger than the common energy of all live nodes in an exceedingly region r by constructing the sensors set. The most issue we want to

attenuate is that the dissipation energy. Therefore, AIA is employed to see the mobile sink location and therefore the best range of clusters and their locations. The wheel choice is used in immune based mostly algorithms for antibodies replica choice. Replication operation is applied to pick out higher ($pr \times ps$) CHs antibodies by sorting them in line with their objective perform values ($Fr (Xr)$) in ascending order. The mutation operator is applied to every sequence of AN protein with a chance of mutation. To preserve sensible antibodies those have minimum $Fr (Xr)$, the initial population pool (parents) and offsprings antibodies that generated in previous step square measure sorted in ascending order supported the values of $Fr (Xr)$. The stopping criterion achieves once objective function (Xr) doesn't amendment for a definite number of generations or once the quantity of generations exceeds the utmost generations (Maxgen)

3.4.3 Steady state phase:

This method is recurrent till the sink visits all R regions within the detector field to ensure complete knowledge assortment.

4. Simulation and results:

4.1 Network Lifetime and Stability Period:

As shown in fig.3 this simulation shows the results of the proposed protocol on the lifetime of network and the stability period of proposed protocols. The AIA parameters are set as $ps=25$, $pr=0.5$, $pc=0.35$, $ph=0.7$, $w=0.7$ and $Maxgen=100$.

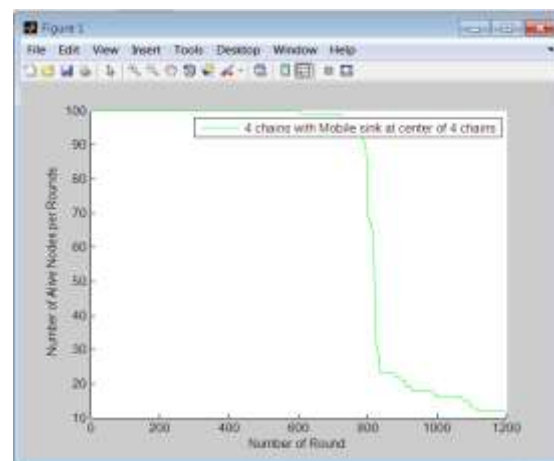


Fig.3. Network lifetime of proposed work

4.2 No. of dead nodes:

Fig.4. Shows the no. of dead nodes found after certain rounds.

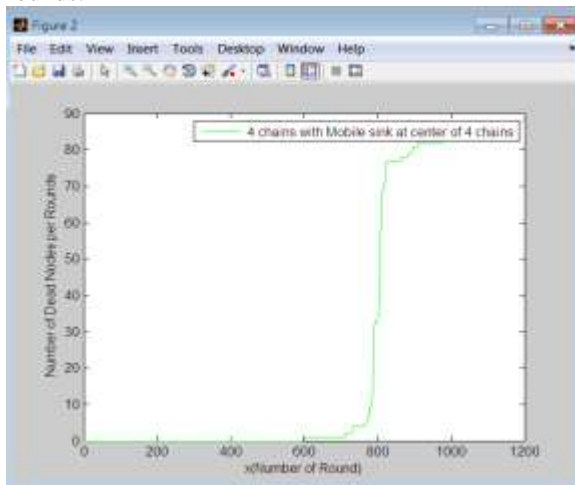


Fig.4. No. of dead nodes

4.3 Residual Energy of Nodes:

Furthermore, the residual energy of every node in the considered network for the given proposed patterns slows more slowly than other protocols as shown in Fig. 5.

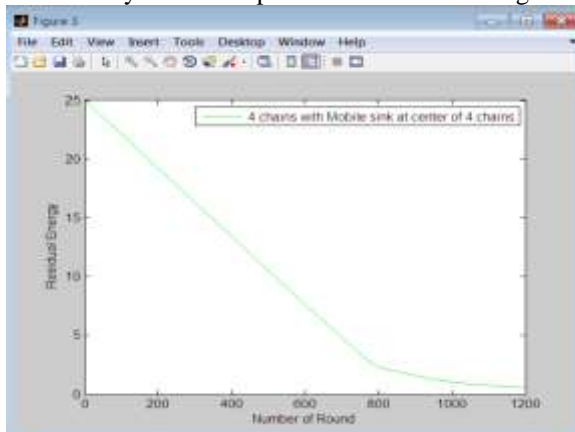


Fig.5 Residual energy

5. Conclusion:

In this paper, we've enforced an intensive algorithmic rule as a knowledge gathering theme that exploit sink mobility to get rid of the matter of energy-hole and thereby rising network lifetimes and its stability. During this paper, a replacement rule known as Energy-Efficient Mobile Sink primarily based adaptative immunity has been bestowed to eliminate the energy hole downside and Simulation results showed that the projected protocol lot of reliable and energy economical as compared to alternative protocols; specifically LEACH, LEACH-GA, A-LEACH,

rendezvous and MIEEPB protocols. Moreover, it outperforms the previous protocols in terms of the period of time, and is the most effective energy economical rule for the mobile sink.

References

- [1] M. Abo-Zahhad, S. M. Ahmed, N. Sabor, and S. Sasaki, "Mobile Sink-Based Adaptive Immune Energy-Efficient Clustering Protocol for Improving the Lifetime and Stability Period of Wireless Sensor Networks," IEEE sensors networks received December 24, 2014; accepted April 14, 2015; date of publication April 17, 2015; date of current version June 23, 2015.
- [2] E. B. Hamida and G. Chelius, "Strategies for data dissemination to mobile sinks in wireless sensor networks," IEEE Wireless Commun., vol. 15, no. 6, pp. 31–37, Dec. 2008.
- [3] W. Liang, J. Luo, and X. Xu, "Prolonging network lifetime via a controlled mobile sink in wireless sensor networks," in IEEE GLOBECOM, Miami, FL, USA, pp. 1–6 Dec.2010.
- [4] B. Nazir and H. Hasbullah, "Mobile sink based routing protocol (MSRP)for prolonging network lifetime in clustered wireless sensor network,"in Proc. ICCAIE, Kuala Lumpur, Malaysia, pp. 624–629 Dec. 2010.
- [5] B. Behdani, Y. S. Yun, J. C. Smith and Y. Xia, "Decomposition algorithms for maximizing the lifetime of wireless sensor networks with mobile sinks," Computers & Operations Research Volume 39, Issue 5, Pages 1054–1061 May 2012.
- [6] M. R. Jafri, N. Javaid, A. Javaid, and Z. A. Khan, "Maximizing the lifetime of multi-chain PEGASIS using sink mobility," World Appl. Sci. J., vol. 21, no. 9, pp. 1283–1289, Mar. 2013.
- [7] S. Mottaghi and M. R. Zahabi, "Optimizing LEACH clustering algorithm with mobile sink and rendezvous nodes," AEU-Int. J. Electron. Commun., vol. 69, no. 2, pp. 507–514, Feb. 2014.
- [8] C. Zhu, S. Wu, G. H. Shu And H. Wu, "A Tree-Cluster-Based Data-Gathering Algorithm for Industrial WSNs With a Mobile Sink," IEEE sensor networks. Received March 30, 2015, accepted April 5, 2015, date of publication April 22, 2015, date of current version May 5, 2015.

Analysis of Load Frequency Control in an Interconnected Power Systems

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Abstract -Variations in load the speed of the generator is varied and also the frequency is changing which may be highly undesirable. Because change in frequency causes change in speed of the consumers, affecting plant production processes, line tripping and blackout can occurs. The frequency variation must be reduced to the smallest possible value by using automatic generation control (AGC) which is a combination of two sections viz load frequency control (LFC) along with automatic voltage regulation (AVR). In this paper, different control areas models are building in SIMULINK and then simulation evaluation is done to know about the principle behind the load frequency control (LFC) including the challenges. Here, in addition with the single area system and two area system, three area systems are also being taken into consideration. Several important parameters of ALFC like integral controller gains (K_{Ii}), governor speed regulation (R_i) as well as frequency bias (B_i) are being optimized. Simultaneous optimization of the parameters like K_{Ii} , R_i and B_i has been done, so that the best dynamic response for the power system is produced It is also permits us to use quiet larger values of R_i than put into practice. This will help the industries related to power for simpler as well as cheaper realization of the governor.

Keywords - Load Frequency Control (LFC), Automatic Generation Control (AGC), Single Area, Two Area, Three Area

1. Introduction

Power systems are very large and complex electrical networks consisting of generation networks, transmission networks and distribution networks along with loads which are being distributed throughout the network over a large geographical area. In the power system, the system load keeps changing from time to time according to the needs of the consumers. So properly designed controllers are required for the regulation of the system variations in order to maintain the stability of the power system as well as guarantee its reliable operation. The rapid growth of the industries has further lead to the increased complexity of the power system. Frequency is greatly depends on active power and the voltage greatly depends on the reactive power. So the power system control may be divided into two parts. One is related to the control of the active power along with the frequency whereas the other is related to

the reactive power along with the regulation of voltage. The active power control and the frequency control are generally known as the Automatic Load Frequency Control (ALFC).

Basically the Automatic Load Frequency Control (ALFC) deals with the regulation of the real power output of the generator and its frequency (speed). The primary loop is relatively fast where changes occur in one to several seconds. The primary control loop reacts to frequency changes through the speed governor and the steam (or hydro) flow is managed accordingly to counterpart the real power generation to relatively fast load variations. The secondary loop is slower as compared with the primary loop. The secondary loop maintain the excellent regulation of the frequency, furthermore maintains appropriate real power exchange among the rest of the pool members. This loop is being insensitive to quick changes in load as well as frequency, although it focuses on swift changes which occur over period of minutes.

Load disturbance due to the occurrence of continuous and frequent variation of loads having smaller values always creates problem for ALFC. Because of the change in the active power demand/load in an area, tie-line power flows from the interconnected areas and the frequency of the system changes and thus the system becomes unstable. So we need ALFC to keep up the stability at the time of the load deviations. This is done by minimizing transient deviations of frequency in addition to tie-line power exchange and also making the steady state error to zero. If the frequency is not maintained within the scheduled values then it may lead on the way to tripping of the lines, system collapse as well as blackouts.

2. Design model for various systems

2.1 Single Area System

The frequency which changes with load is contrasted with reference speed setting. The frequency can be adjusted to the desired value by making generation and load demand equal with the help of controller of the steam valve to regulate it and increases power output from generators. It serves the primary/basic purpose of balancing the real

power by regulating turbine output (ΔP_m) according to the variation in load demand (ΔP_0). Here, the transfer function of the power system is given as $\frac{1}{2Hs+D}$ i.e. $\left[\frac{1}{2Hs+D} = \frac{K_p}{1+sT_p} \right]$

where $K_p = \frac{1}{D}$ and $T_p = \frac{H}{D}$.

Due to change in load there is change in the steady state frequency ($\Delta\omega$) so we need another loop apart from primary loop to convey the frequency to the initial value, before the load disturbance occurs. The integral controller which gives zero steady state error is put in the secondary loop.

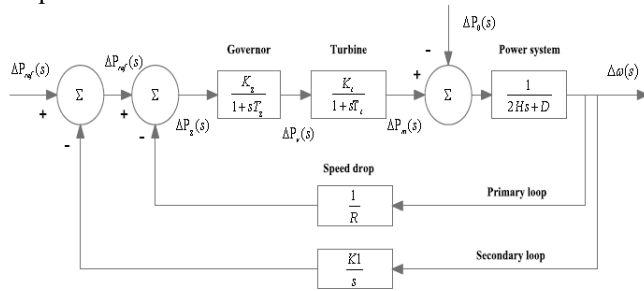


Fig.1: Model of single area ALFC by using secondary control

Therefore, the signal from $\Delta\omega(s)$ is being fed back all the way through an integrator block (1/s) to regulate ΔP_{ref} to get the frequency value to steady state. Thus, $\Delta\omega(s) = 0$. Thus, integral action is responsible for automatic adjustment of ΔP_{ref} making $\Delta\omega = 0$. So this act is known as Automatic Load Frequency Control transfer function with integral group is shown below by representing in the form of equations.

$$\omega = \frac{1}{D + \frac{1}{K_I}} [\Delta P_{ref} - \Delta P_0] \quad (1)$$

2.2 Two Area System

Now, we have an interconnected system divided into two areas each having one generator. The two areas are interconnected by single transmission line. The flow of power over the transmission line will appear as a positive load to one control area and an equal but negative load to other or vice versa depending upon the direction of flow. Tie line power flow was defined as going from area 1 to area 2; therefore, the power flow appear as a load to area 1 and power source (negative load) to area 2.

Regulate the frequency to the initial value, before the load disturbance occurs. The integral controller which is responsible in making the frequency deviation zero is put in the secondary loop. Three area interconnected system

For change in area 1 load by ΔP_{01} , we have,

$$\Delta\omega = \frac{-\Delta P_{01}}{\left(\frac{1}{H_1} + D_1\right)\left(\frac{1}{H_2} + D_2\right)} = \frac{-\Delta P_{01}}{\beta_1 + \beta_2} \quad (2)$$

$$\Delta P_{12} = \frac{-\Delta P_{01} \left(\frac{1}{H_1} + D_1\right)}{\left(\frac{1}{H_1} + D_1\right)\left(\frac{1}{H_2} + D_2\right)} = \frac{-\Delta P_{01} \beta_2}{\beta_1 + \beta_2} \quad (3)$$

Where β_1 and β_2 are the composite characteristics of area 1 and 2 respectively.

An increase in load of area 1 by ΔP_{01} result in frequency reduction in both areas and a tie line flow ΔP_{12} . A negative ΔP_{12} is indicative of flow from area 2 to area 1. The tie line flow deviation gives the contribution of the regulation characteristics $\left(\frac{1}{H} + D\right)$ of one area to another.

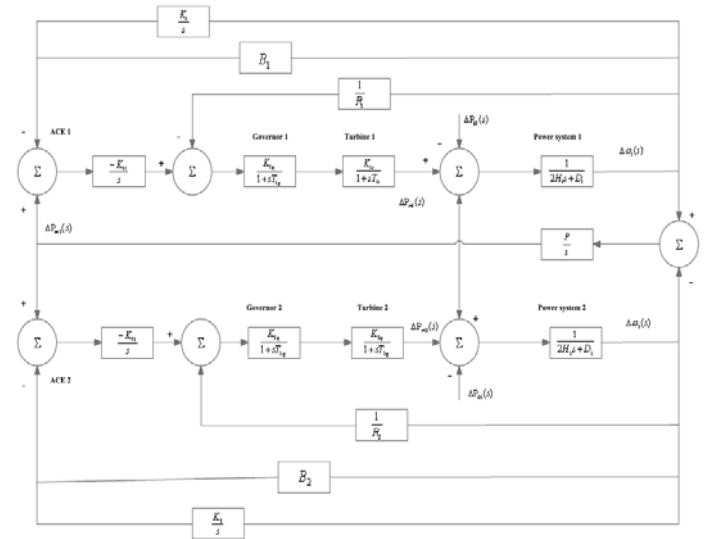


Fig.2: Model of Two areas ALFC by using secondary Control

2.3 Three Area System

The integral control loop which is used in the single area power system and two area power system can also be related to the three area power systems. Due to variation in load demand there is change in the steady state frequency ($\Delta\omega$) so we need another loop apart from primary loop to

consists of three interconnected control areas. The tie line power is flowing as per the variation in the load demand due to the interconnection between the control areas. Thus the overall stability of the system is maintained at a

balanced in spite of the constant variations in the load.
The tie-line power flow among three areas is as below:

$$\Delta P_{12}(s) = \frac{2\pi f T}{s} [\Delta f_1(s) - \Delta f_2(s)] \quad (4)$$

$$\Delta P_{13}(s) = \frac{2\pi f T}{s} [\Delta f_1(s) - \Delta f_3(s)] \quad (5)$$

$$\Delta P_{23}(s) = \frac{2\pi f T}{s} [\Delta f_2(s) - \Delta f_3(s)] \quad (6)$$

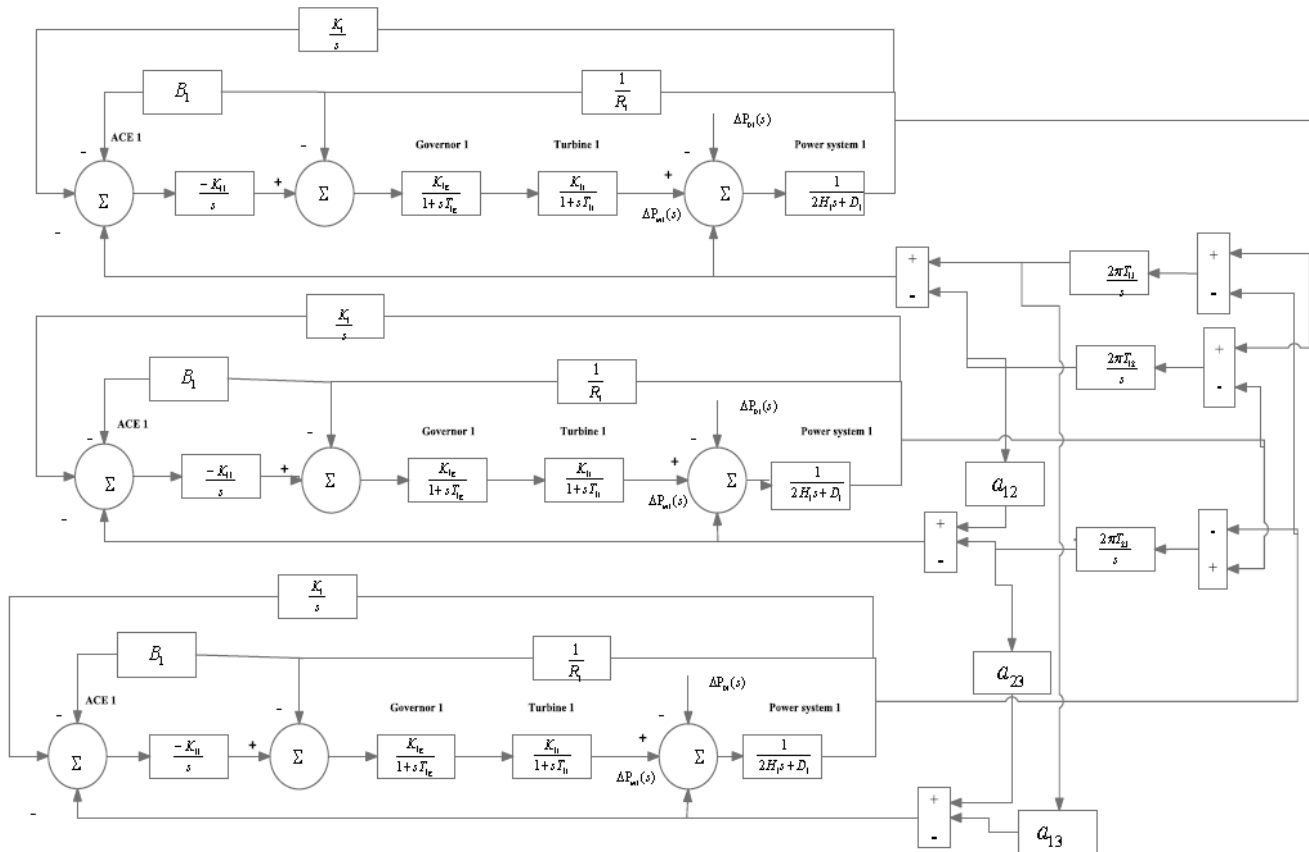


Fig.3: Model of Three areas ALFC by using secondary Control

3.0 Simulation Results of ALFC

3.1 Single Area System without Using Secondary Loop

The plot which is obtained by simulating the model shows that the variation in load demand causes alteration in speed and that causes drift in frequency.

From the plot we are able to see that the frequency oscillations will gradually stay down to a limited value.

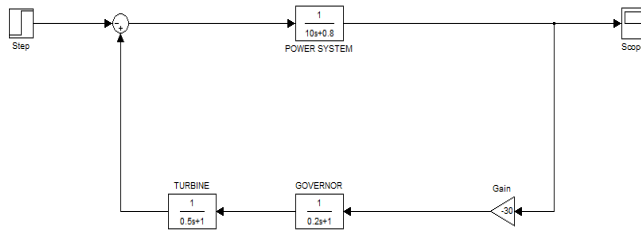


Fig.4: Simulink Model of single area system without using secondary loop

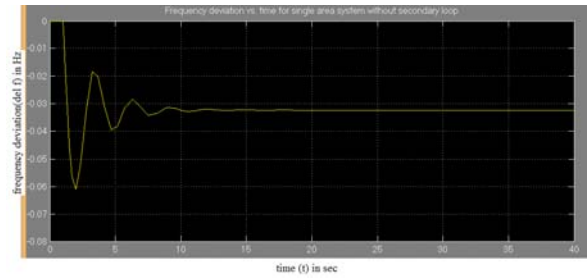


Fig.5: Frequency deviation vs. time for single area system without secondary loop

3.2 Single Area System by using Secondary Loop

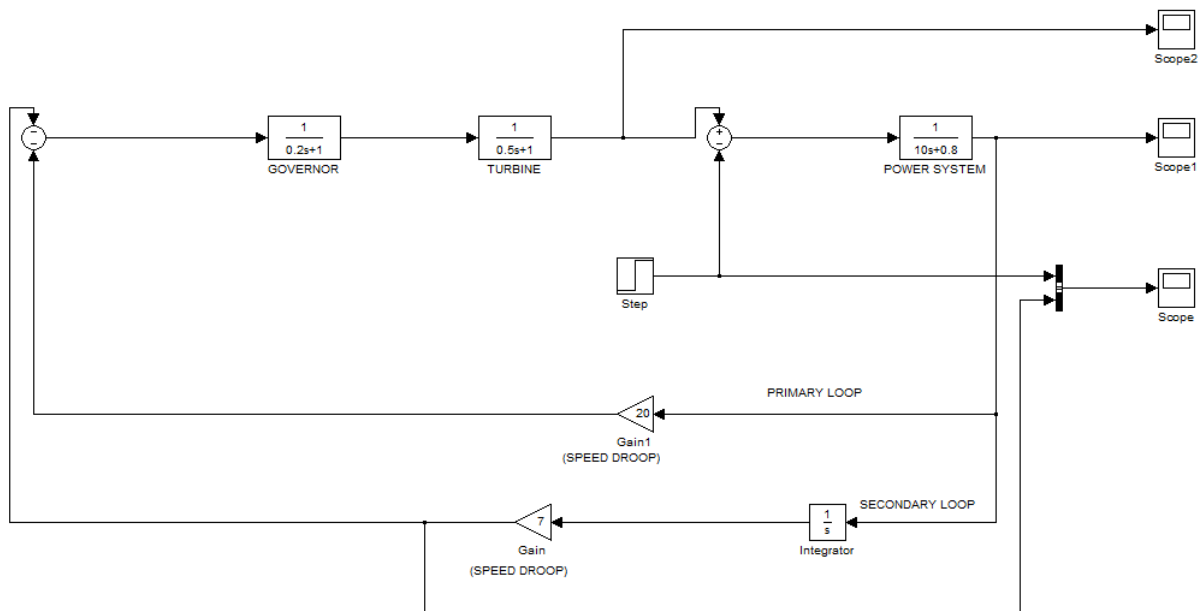


Fig.6: Simulink Model of single area system by using secondary loop

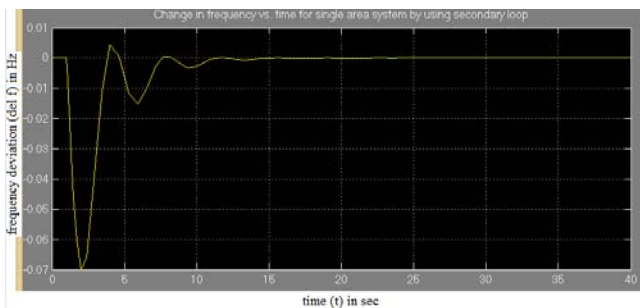


Fig.7: Change in frequency vs. time for single area system by using secondary loop

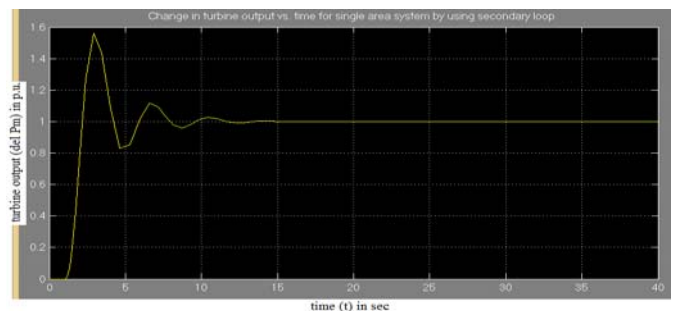


Fig.8: Change in turbine output vs. time for single area system by using secondary loop

3.3 Two Area System without using secondary loop

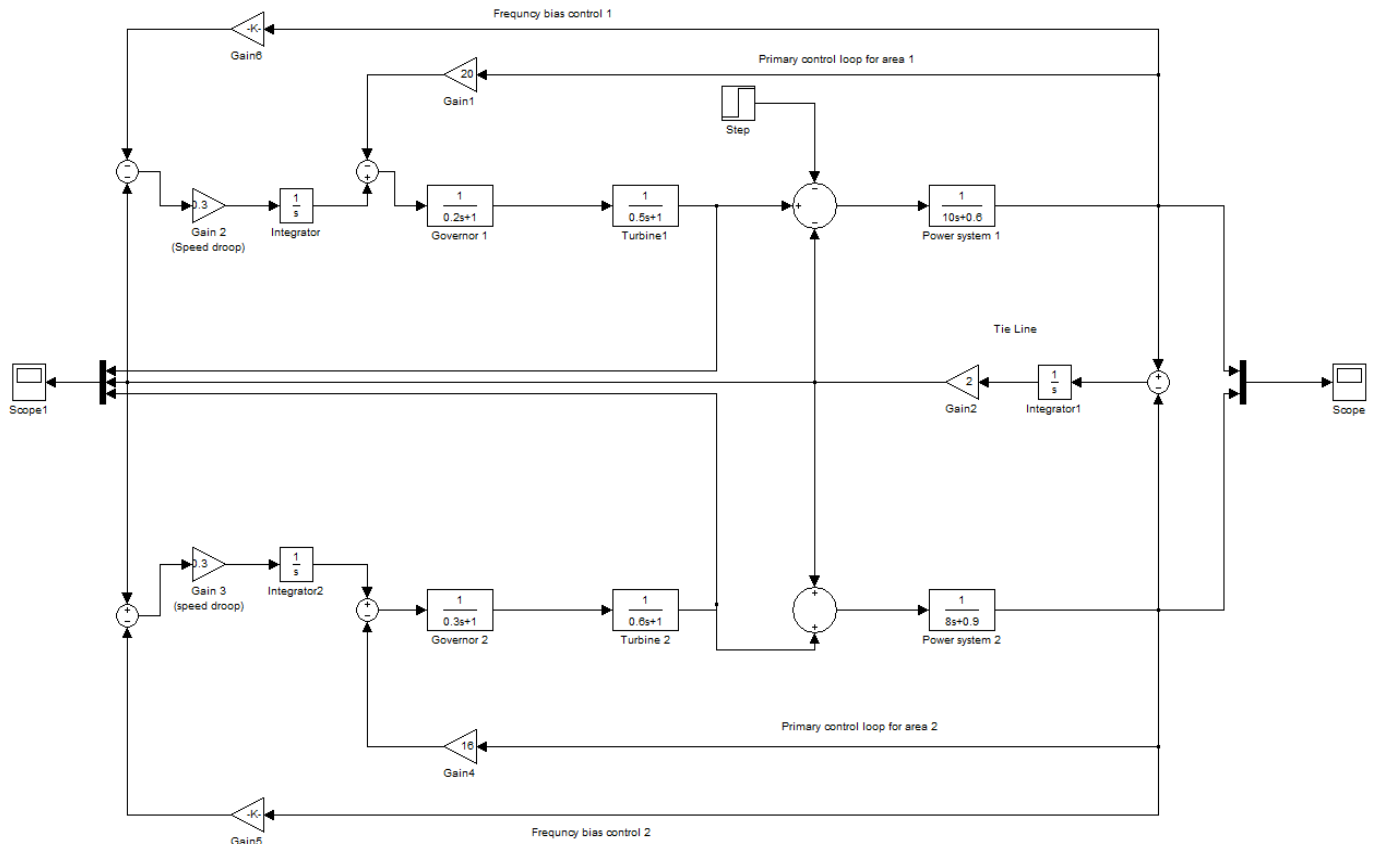


Fig.9: Simulink Model of Two Area System without using Secondary Loop

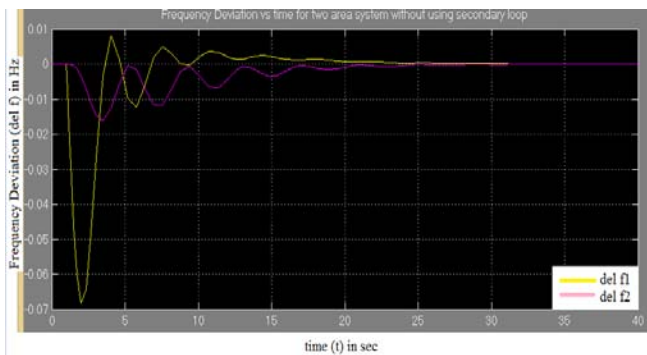


Fig.10: Frequency deviation vs. Time for two area system without using secondary loop

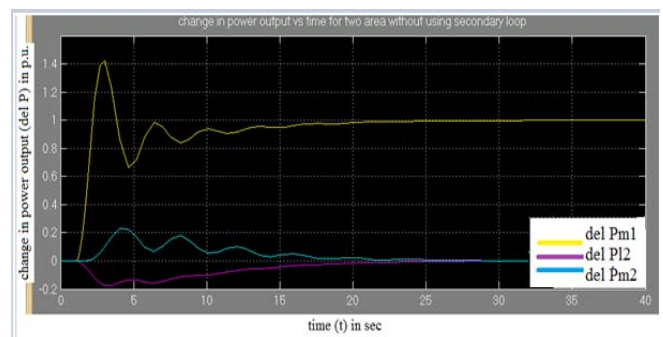


Fig.11: Change in power output vs. Time for two area system without using secondary loop

3.4. Two Area System by using secondary loop

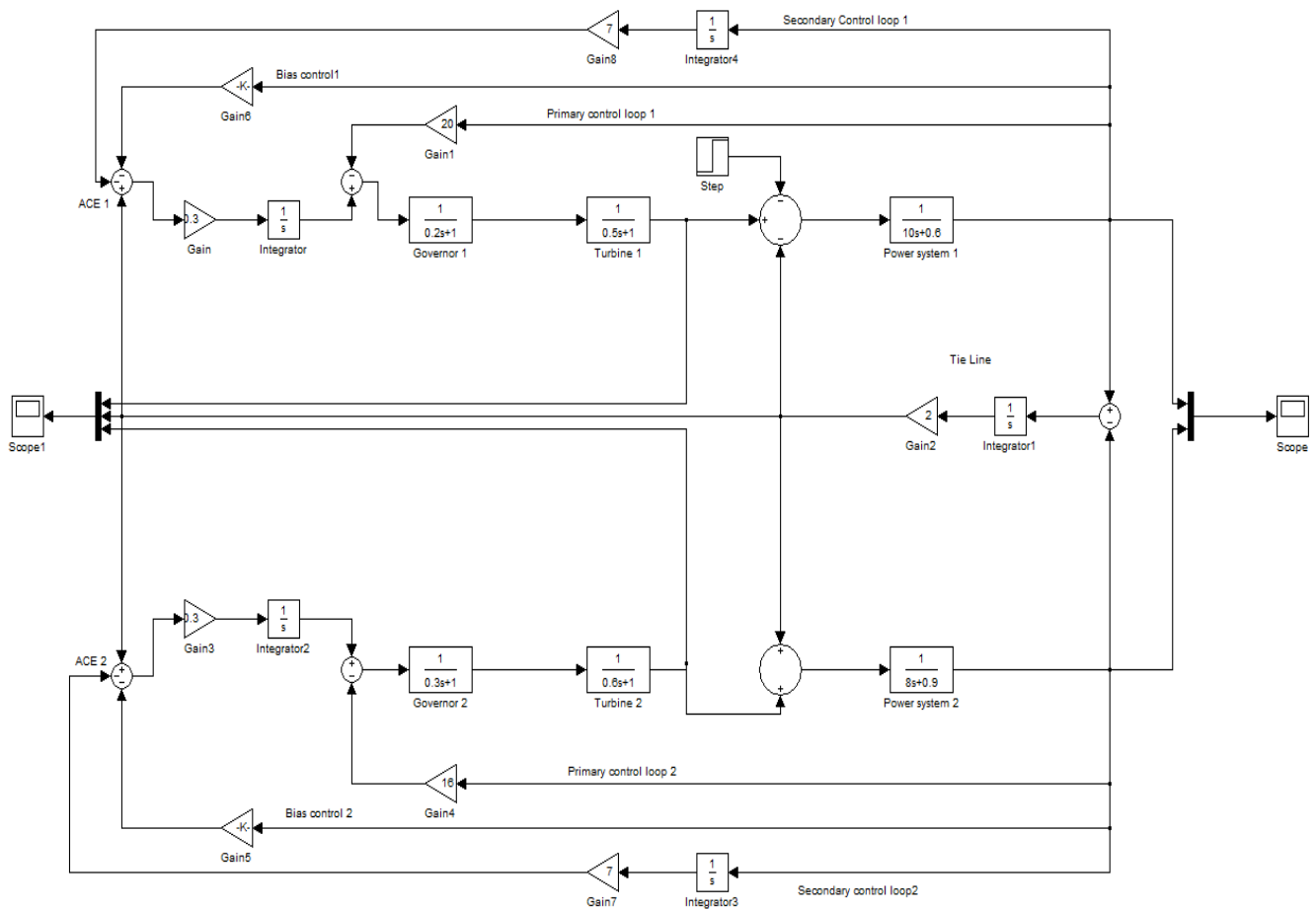


Fig.12: Simulink Model for Two Area System using Secondary Loop

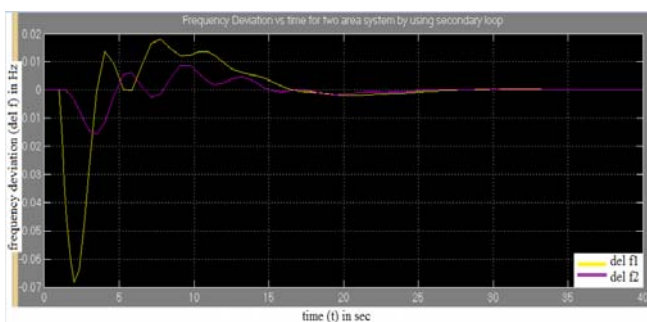


Fig.13: Frequency deviation vs. time for two areas by using Secondary loop

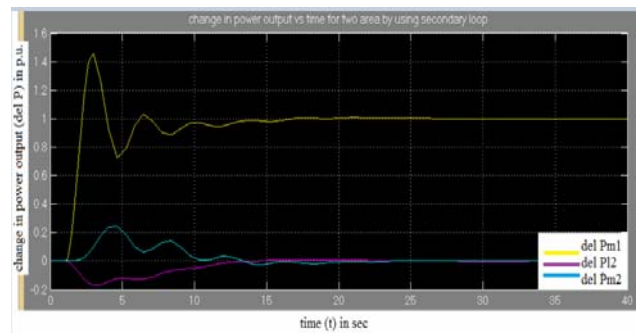


Fig.14: Change in power output vs. time for two area by using secondary loop

3.5 Three Area System by using secondary loop

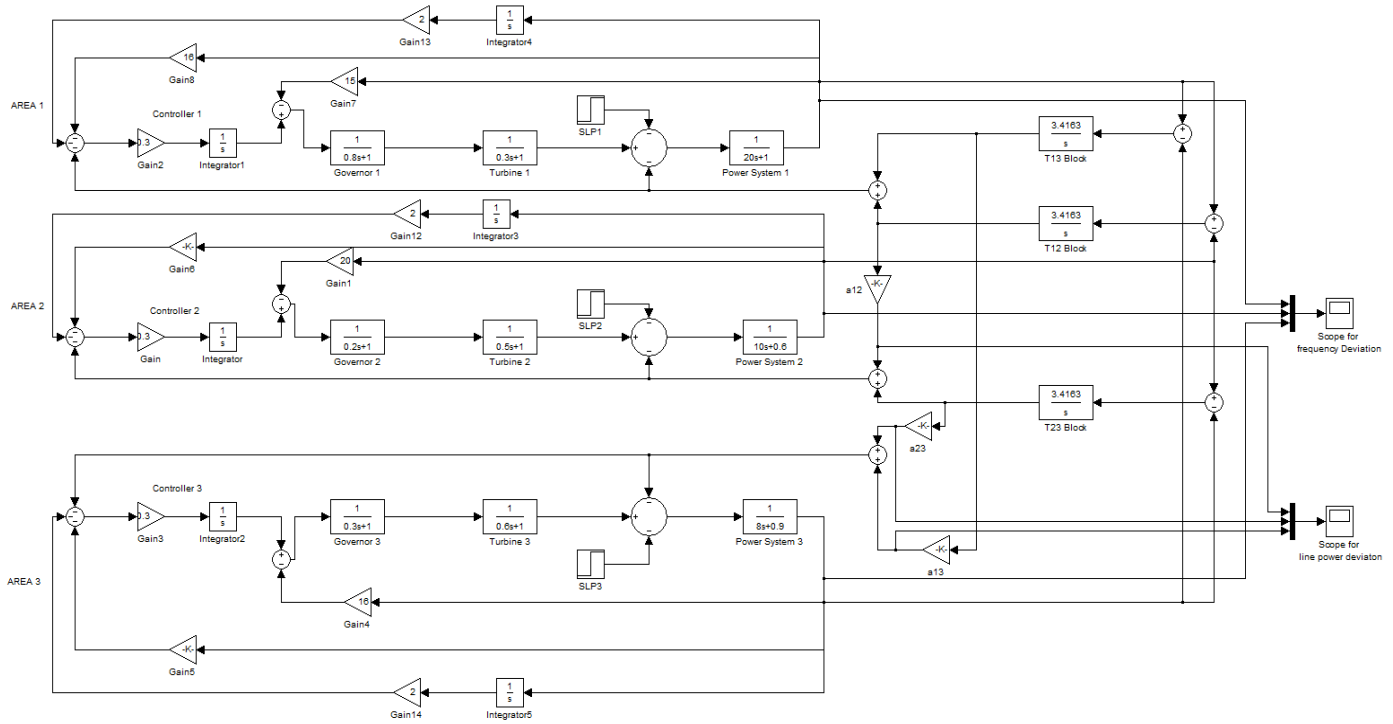


Fig.15: Simulink Model of Two Area system without secondary loop

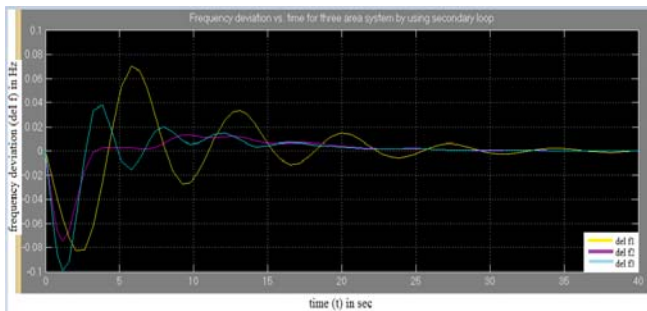


Fig.16: Frequency Deviation vs. time for three area system by using secondary loop

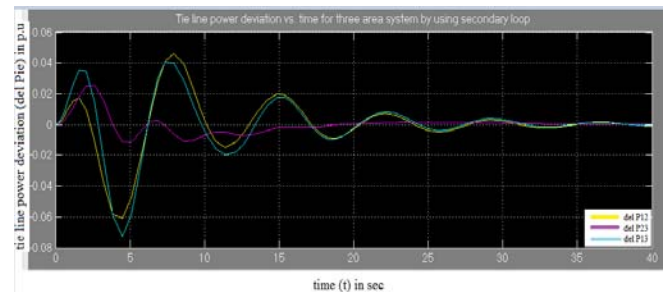


Fig.17: The line power deviation vs. time for three area system by using secondary loop

4.0 Conclusion

A simulation study of single, two and three area system with automatic generation and control is carried out with models developed in SIMULINK and results are analyzed. In this paper we study the frequency change as well as change in the tie line power due to the change in the load and also the techniques that may be used for obtaining the optimized values of various parameters for minimizing the changes. The operation of single area and two area power systems with and without secondary loops are representing through simulation models.

Firstly, for minimizing the deviation in frequency a secondary control is being used in addition with the primary control. This is usually essential in case of a single area power system or an isolated system as the secondary control loop i.e. an integral controller gives zero steady state error and reducing the changes in the frequency deviations. So, it maintains the system stability. Therefore, without the presence of secondary loop the power system loses its stability. Secondly introduction of interconnection of two or more systems

to deal with changes in load through tie line power exchange. Two or more areas interconnection ensures the sharing of the power across the systems during the times of load changes which may occur in any area at any time. Therefore controllers burden to minimize the variation in the frequency is reduced as a result of the rise in the power demand can be fulfilled by drawing power from the neighboring areas and thus maintains the stability of the power system. Thus we understood the advantage of interconnection and see that the dynamic response of the power system is improved by means of the secondary loop. The SIMULINK evaluation has been done for single area system, two area systems and three area systems and the result is being given accordingly.

Appendix

Data for interconnected system:

$R1 = 0.05$ $R2 = 0.0625$ $R3 = 0.0588$

$B1 = 20.6$ $B2 = 16.9$ $B3 = 16$

$H1 = 5$ $H2 = 4$ $H3 = 10$

$D1 = 0.6$ $D2 = 0.9$ $D3 = 1.0$

$Tg1 = 0.2$ $Tg2 = 0.3$ $Tg3 = 0.8$

$Tt1 = 0.5$ $Tt2 = 0.6$ $Tt3 = 0.30$

References

- [1] Yao Zang, "Load Frequency Control Of Multiple-Area Power Systems" Tsinghua University July, 2007 Master of science in Electrical Engineering.
- [2] I. J Nagrath and D. P Kothari, "Modern power system analysis"- TMH 1993.
- [3] Elgerd Ol. Electric energy systems theory- an introduction, 2nd ed. Tata McGrawHill:2000
- [4] Elgerd Ol. Fosha C, "Optimal megawatt frequency control of multi area electric energy systems", IEEE Trans Electric Power Apparatus System, vol.PAS-89, pp.556-63, 1970
- [5] Adil Usman BP Divakar "Simulation study of load frequency control of single and two area systems". IEEE Global Humanitarian Technology Conference, pp.214-219, 2012
- [6] H.Bevrani, Y.Mitani and K.Tsuji, "Robust decentralised load frequency control using an iterative linear matrix inequalities algorithm", IEE Pro. Gener. Transm. Distrib., vol.151, no.3, pp.347-354, 2004.
- [7] Wen Tan, "Unified tuning of PID load frequency controller for power systems via IMC", IEEE Transactions on Power Systems, vol.25, no.1, pp.341-350, 2010.
- [8] LC Saikia "Automatic Generation Control of a combined cycle gas turbine plant with classical controllers using firefly algorithm", International Journal of Electrical Power and Energy Systems, vol.53, pp. 27-33, 2013
- [9] U.K.Rout, R.K.Sahu, S.Panda, "Design and analysis of differential evolution algorithm based automatic generation control for interconnected power system", Ain Shams Engineering Journal, vol. 4, No. 3, pp. 409, 2013
- [10] DG Padhan S Majhi, "A new control scheme for PID load frequency controller of single area and multi area power systems", ISA Transactions, vol.52, pp.242-251, 2013.

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Li-Fi Technology: Future Wireless Communication System

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Abstract – As we all are familiar of already existing Wi-Fi technology which utilizes RF waves for wireless communication and for high-speed internet facility. A new advancement has been made in this technology which use visible portion of electromagnetic waves for the communication and networking purpose. This technology is called Light Fidelity or Li-Fi. In future Li-Fi will be used for transmitting data in laptops, tablets, LED and smartphones. In this article various aspects like construction, working and application of Li-Fi technology is discussed. The advantages and disadvantages of the Li-Fi and a comparison of the Li-Fi and Wi-Fi is also mentioned.

Keywords- Li-Fi, VLC, LED, Wi-Fi.

1. Introduction

The full form of Li-Fi is Light Fidelity. With increasing demand of communication system, the most emerging part of everyone's life is through sharing information through wired and wireless devices. At present, the wireless devices used for the communication system are of lower speed because of the multiple users making use of that wireless device due to the increased load on one particular device such as Wi-Fi modem. But in case of Li-Fi devices such increase of load does not affect rate of speed of data transmission from various devices. Thus, in future, Li-Fi will play a major contribution in relieving large burden that present wireless systems face. The term of Li-Fi was coined by German Physicist Harald Hass from University of Edinburgh in the UK in the TED Global Talk on VLC (Visible Light Communication) on July 12, 2011. Wi-Fi makes use of radio frequency of electromagnetic spectrum whereas Li-Fi technology makes use of visible light of electromagnetic spectrum to transmit data at high rate. Wi-Fi transmits light in megabits but Li-Fi transmits data in Gigabits. Li-Fi is more secure as compared to Wi-Fi because in Li-Fi there is no need of encryption or password for security purpose as the range is within the limited area of illumination emerging from the LED. Li-Fi uses common household LEDs to transfer data and boosting speed up to 1-3.5 Gigabits/second. Thus, Li-Fi is transmission of data through light and increases speed of data transmission beyond our expectations.



Fig 1. Li-Fi bulb

2. Construction of Li-Fi System

Li-Fi is faster and cheaper illuminant version of Wi-Fi technology. It uses fast pulses of light to transmit information wirelessly. It is based on VLC. VLC utilizes visible light in range of 780 nm and 375 nm as data communication medium. We can say that this range of light is used as carrier for data transmission and lightening illumination.

The main components involved in the Li-Fi system are as follows:

- a) LED
- b) Silicon Photodiode



Fig.2 Pin Photodiode

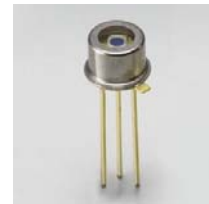


Fig.3 Avalanche Photodiode

Here, LED is used for high brightness which acts like a transmitting source for transmission purpose. And silicon photodiode is used due to its good response to visible light as a receiving element on the receiver side.

Communication rate larger than 100 megabits is done with the highest speed LEDs using various multiplexing

techniques. The LEDs can be used as parallel arrays to transmit data with a higher speed in different data streams. The Li-fi system has following sub-assemblies:

- a) LED Bulb
- b) Radio frequency power amplifier circuit
- c) Printed circuit board (PCB)
- d) Enclosure

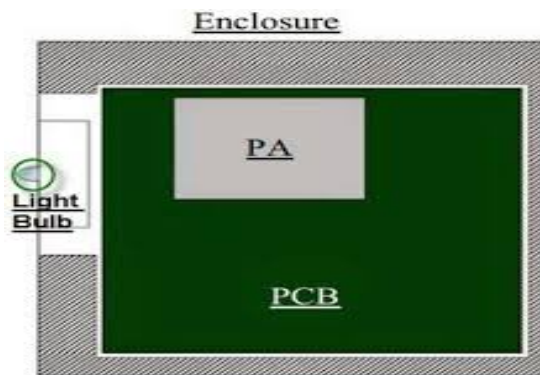


Fig.4. Block Diagram of Li-Fi sub-assembly

2.1 Bulb

The concentrated energy in electric field vaporizes the content of bulb into plasma state on the bulb's center. The highly control plasma state generate the high intense beam of light. The bulb has a dielectric material in it as shown in the fig. 5. The dielectric material is helpful in two purposes as follows:

- a) As a waveguide for the RF energy transmitted by the power amplifier.
- b) As an electric field concentrator is very helpful for focusing energy in the bulb. This energy from electric field readily heats up the material of bulb into plasma state which emits light of higher intensity.

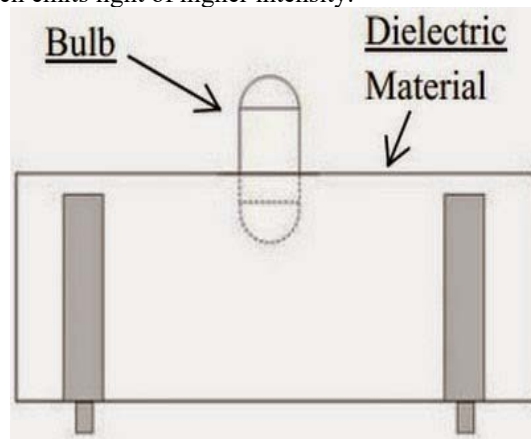


Fig.5. Bulb sub-assembly

2.2 Radio frequency power amplifier circuit

Solid state power amplifier generates the RF signal and these RF signals are then passed with an electric field in the bulb.

2.3 Printed Circuit Board

The Printed Circuit Board (PCB) takes care of all the electrical input and output in LED bulb and it also have the microcontroller used to manage different lamp functions.

2.4 Enclosure

Bulb, Power Amplifier, PCB are enclosed in aluminium enclosure. The bulb in Li-Fi emitter is basically the heart in the system. It is sealed which is enclosed in a dielectric material.

3. Working

To an LED light bulb, a constant current is provided from the current source i.e. from the power supply. A visible light emitted from the bulb as constant stream of photon. A receiving dongle on receiver side makes the little changes in amplitude in the form of electrical signal, which is then afterward converted back into data stream and transmitted to a computer or any other device. Here, output intense light dims up and down with the slow variation of current in the input current source.

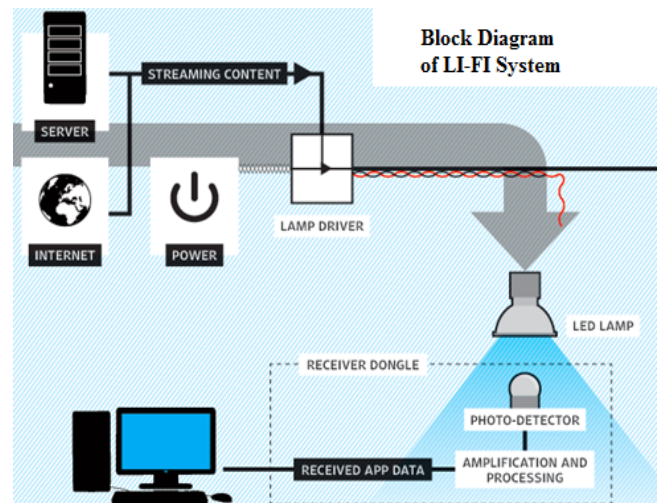


Fig.6 Block Diagram of Li-Fi Technology

The basic working principle of Li-Fi technology is dependent on the Light Emitting Diode i.e. LED. During

the ON time of the LED, the digital bit 1 is transmitted and on the other side, on the OFF time of the LED, 0 is transmitted. In this way, LED is switched ON and OFF in a quick manner which is very helpful in the transferring data at a higher speed. The encoding of data is done on the transmitter portion of the LED bulb in the Li-Fi system which is dependent on the flickering of the LEDs. The data transmission in parallel form is used through an array of LEDs for the further enhancement of the technology. We can also use the mixture of colored LEDs such as red, green, blue etc. to change light frequency of different data channels with each frequency encoding scheme. As an LED light bulb is a semiconductor device, and is capable of modulating optically illuminated output at extremely high speed. The modulated optical signal is then demodulated on the receiver side by detecting through the photo-detector. After that it is converted back to electrical current. This intensity modulation is not perceptible through the human being's eye and is as invisible as RF signals. Thus, great speed data transmission is possible from an LED bulb. A theoretically predicted speed is about 10 GB/s which is possible with these advancements. With such a high speed of data transmission, it is possible to download a full High-Definition film in just a few seconds.

4. Features of Li-Fi

4.1 Data Density

The density of data transmission can be 1000 times larger as compared to the Wi-Fi. This is because of the higher illumination caused because of the larger bandwidth of the data transmission. The transmission of data in through RF waves in Wi-Fi usually spread in the outward surroundings, which causes a huge interference.

4.2 Speed

As the presence of high illumination area in the form of visible light becomes larger, the speed of data transmission is greatly enhanced, although this highly enhanced tight illumination offers low interference because of higher bandwidth.

4.3 Bandwidth

The radio frequency spectrum is about 10,000 times smaller as compared to visible light of electromagnetic spectrum.

So, the bandwidth of visible spectrum of light is very much larger for transmission of data in Li-Fi.

4.4 Lower cost

As the visible light in electromagnetic spectrum is free of cost and although it is not licensed but is utilized in Li-Fi technology. Also the installation of Li-Fi technology requires a very few components as compared to the radio technology implementation.

4.4 Required Energy

The operation of LED on transmitter edge and photo detector on the receiving edge requires a very small amount of power which is considered as negligible.

4.6 Safety

As visible light in electromagnetic spectrum is not harmful to living beings, thus, there is no health concern. So, there is not any safety problem there in Li-Fi.

4.7 Security Control

As the Li-Fi signals are confined within a close illuminated area so, it will never travel from the walls. In this way, we can have secure transmission without any need of the pairing as in case of the RF signals in Bluetooth technology.

5. Applications of Li-Fi

5.1 Hospitals

In hospital, Wi-Fi usage is not permitted because of the interference from computers and cell phones can cause blocking of signals for medical monitoring of various devices, for example, ECG. So, here we can make use Li-Fi technology, which causes no interference with any of the signals in the medical equipment like MRI scanner.

5.2 Underwater Communications

The acoustic underwater communications are not efficient through Wi-Fi technology. The usage of Li-Fi makes a transmission efficient and also the distortion is very lesser. In navy, the underwater communication can be efficiently done which is required in high security. The submarine communications are enhanced by using of Li-Fi technology.

5.3 Road Accidents Avoidance

The Li-Fi technologies can be utilized in cars to communicate from one care to the other cares through the LED lights which is very helpful to send the signals and thus avoid the road accidents.

5.4 Airlines

The Wi-Fi communication is prohibited in aircrafts. But as we know the light is already present in the aircrafts, so here we can make use of the light system to transmit data for various purposes.

5.4 Connectivity

As in case of Wi-Fi, Li-Fi is also used for various devices to communicate from device to device such as Laptops, tablets, smartphones and others devices.

6. Limitations

6.1 Line of Sight Required

Li-Fi system can transmit data when there is a line of sight between bulb and photo detector. But can be sorted out hopefully in the upcoming days.

6.1 Inability of transmitting data through obstacles

Li-Fi technology seems like replacement to Wi-Fi but this high speed data transferring technology also has the limitation that is the inability to pass light through obstacle.

7. Conclusion and Scope in Future

Li-Fi technology was pioneered by Harald Haas. It can become one of the major technologies in the upcoming days if this technology is improved and become efficient in the future we might soon have something like Wi-Fi hot spots in which a light bulb will be available. It will be the most clean and green technology and the future of human beings and all the living creatures will be safe. As the available radio frequency band width is limed and air waves are becoming clogged leading the huge difficulty in reliable and high speed of data signals. Thus, this problem of speed can be improved in the Li-Fi technology. Although, this technology of Li-Fi will surely allow using internet facility at places like: operation theater and air craft's where internet access is usually prohibited. Thus, the future of li-fi is Gi-Fi. Gi-Fi or gigabyte wireless is a wireless transmission of communication system which

transmit data at more than 1 billion bits (gigabyte) in 1 second the researcher of the university of Melbourne demonstrated one of the transceiver integrated chip which operates nearly at 60 Gigahertz on the CMOS process that will allow audio and video transfer of data up to 5 gigabyte per second, 10 times of the present maximum data rate, at just 1/10th of the cost.

8. Comparison between Li-Fi and Wi-Fi

Table 1: Comparison

No	Parameters	Wireless Technologies	
		Li-Fi	Wi-Fi
1.	Speed for data transfer	Faster transfer speed(>1 Gigabits per second)	Data transfer speed(150 Mbps)
2.	Medium through which data transfer occurs	Used visible light as a carrier.	Used radio spectrum as carrier.
3.	Spectrum range	Visible light spectrum has 10,000 times broad spectrum in comparison to radio frequency.	Radio frequency spectrum range is smaller than visible spectrum.
4.	Cost	Cheapest as compared to Wi-Fi because free band doesn't need license and it uses light emerging from LED	More expensive as compared to Li-Fi because it uses radio-spectrum.
5.	Network topology	From one point to other point	From one point to other point
6.	Operating frequency	Hundreds of Tera Hertz	2.4 GHz range

References

- [1] Anurag Sarkaar, B Shalabh Aggarwal, and Asoke Nath, "Li-Fi Technology: Data Transmission through Visible Light," Volume 3, Issue 6, June 2015

- [2] Subarna Panda, Md Soyaib, Dr. A. Jeyasekar “Li-Fi Technology – Next Gen Data Transmission through Visible Light Communication”, *Volume 4, Special Issue 11, September 2015*
- [3] C.Periasamy, K.Vimal, D.Surender, “LED Lamp Based Visible Light Communication in Underwater Vehicles,” *Volume 13 Number 3 – Jul 2014*
- [4] Ekta, Ranjeet Kaur Light “Fidelity (LI-FI)-A Comprehensive Study” *International Journal of Computer Science and Mobile Computing Vol. 3, Issue. 4, April 2014, pg.475 – 481*
- [5] <http://www.slideshare.net/tapeshchalisgaonkar1/gi-fi-technology-finl-ppt>
- [6] http://purelifi.com/what_is_li-fi/how-does-vlc-wor

Review on 4 G Technology

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Abstract - After 3G, the latest development in wireless technology is the fourth generation (4G) mobile network. This article consists of the development of the 4G technology is discussed. The various features of the technology like speed, enhanced GPS, scalability, security etc are discussed. The basic technologies, working frequencies, bandwidths of 4G are also discussed in this article. A comparison of the 4G technology with its predecessors like 3G, 2G etc are also given in the article.

Keywords - 4G, Mobile Network, OFDMA, MIMO, and Software Define Radio, GPS.

1. Introduction

In 1981, the first cellular communication system was set up at Norway. It was followed by similar projects in United Kingdom and United State. The 1st generation system used analog modulation. Thus, this system provided voice transmission by using frequency around 900MHz. Low band digital data signaling technology were used in the second generation (2G) mobile communication. The 2G wireless mobile network is also called Global Systems for mobile communication (GSM). The first global system for mobile communication (GSM) systems had 25MHz frequency spectrum in the 900MHz band. 3G systems were introduced in 1980s. Initially it focused on multimedia applications like conferencing for mobile phone video communication. 3G had introduced internet user demanded more and more wireless application and services. Instead of fixed telephones personal wireless handsets becomes more common. So, it is clear that the wireless internet access will follow and users want broadband internet access. To further enhance experience the objectives of the 3G were set to develop some new protocols and new technologies. In contrast the 4G framework established is trying to accomplish new level of user experiences and multi-service capacity by integrating all the mobile technologies that exist that is global system for Mobile Communication System (GSM), International Mobile Communication Service (IMT -2000),

Packet Radio Service, wireless fidelity (Wi-Fi), Bluetooth etc. The main objective of 4G network is stated as follow in the form of properties:

In order to achieve the proposed goals a very flexible network that would combine different radio access technologies, must be developed. For higher mobility users, the network must provide larger bandwidth from 50-100Mbps, 1 Gbps for lower mobility users and technologies that permit fast response and efficient delivery of services.

4G wireless is the term used to describe the fourth generation of wireless mobile services thus 4G is step up from 3G which is currently the most commonly used and high speed is provided for wireless service. 4G network is only available in limited area today for example sprint uses Wi Max technologies 4G technology network while long term evolution (LTE) technology was utilized in Verizon Technology of wireless. It doesn't matter, what kind of technology is behind thus system, 4G is designed to deliver a very large speed. On an average 4G wireless is spread to be 4 to 10 times faster than 3G network sprint says that 4G Wi Max network can offer with speed that top out at 10 mbps. Verizon LTE network can deliver speed within the range of about 5 mbps to 12 mbps.

2. Evolution in 4G Network

The mobile service n from 1G (1st generation) to 4G (4th generation) are discuss in this section. In 1970, the processes designs that are known as first generation 1G, many fundamental problems are solved by these early systems were based on basic analogous technology and simple cellular structure of mobile communication. The 2G (2nd generation) system that was designed in the 1980s were still used for voice applications but those systems were based on modern digital technology having the digital signal processing techniques. The low speed circuit switched data communicational services were provided in the 2G system.

The implementation of digital systems led to a various number of incompatible and different standards for example PDC (personal digital cellular) is used in Japan; GSM (global system mobile), mainly in Europe; TDMA (time division multiple access) which is used in the US; and code division multiple access (CDMA) which is IS95 is used in another US system. However, the data rates for users in these systems are very limited, these systems operates internationally or nationwide and are today's main system. In 1990s two organizations worked together for next generation 3G mobile system which would eliminate previously accounted incompatibilities and become a truly global system. The 3G system had greater quality voice channels, and also good broadband data capabilities, up to 2 mbps. The 2 groups would not connect their differences, and there were introduction of two mobile standards for 3G. A mean way is being taken in between 2G and 3G, the 2.5G. This is basically the improvement of 2G to introduce high output for data service at about 384 kbps and also provides increase capacity on 2G radio frequency (RF). One of the features of 2.5G was that data channels were modified for packet data connections which introduce internet access from cellular devices, whether telephone, laptop or PDA (personal digital assistant). Due to the high demand of higher access speed for multimedia communication in today's society, which is totally depended on computer communication in digital format is seemingly unlimited. Due to historical revolution, occurring once a decade, today's scenario appears to be correct time for the 4G communication system implementation.

The 4G (fourth generation) mobile communication system have solved all the problems which were there in 3G (third generation system). It can provide a large variety of services from very high quality voice of higher definition video to high data rate of different wireless communication channels 4G system can also be explained in terms of MAGIC- Mobile multimedia, anytime anywhere, Global support for mobility, Integrated solution for wireless communication, and Customization of Personal services. The 4G will support the fixed wireless communication network and it will only run on next generation cellular devices. This paper represents an overall version of the 4G features, framework and advantages and disadvantages.

Table 1

Generation	Requirements	Comments
1G	Officially no requirements analogous Technology	Deployed in 1980s

2G	Officially no requirements Digital Technology	First digital system. Deployed in 1990s Primary technologies include IS-95 CDMA and GSM. New services such as SMS and low-rate data.
3G	ITU having IMT-2000 require 144Kbps mobile, 384Kbps pedestrians speed and 2 Mbps indoor.	2000 1X/EV-DO and UMTS-HSPA. Wi-MAX now & official 3G technology
4G	ITU's IMT-Advance requirements include ability operate up-to 40MHz radio channels and with very high spectral efficiency.	No Technologies meets requirements today. IEEE 802.16m and LTE-Advanced being designed to fulfill requirements.

3. Advance Features of 4G Technology

3.1 High performance

Expertise officials say that users of 3G technology will not be able to take advantages of this multimedia content. In contrast to this 4G features a very high quality video i.e. comparable to HD (high definition) television. Speed of 3G is 100 mbps which is improved 50 times in 4G system.

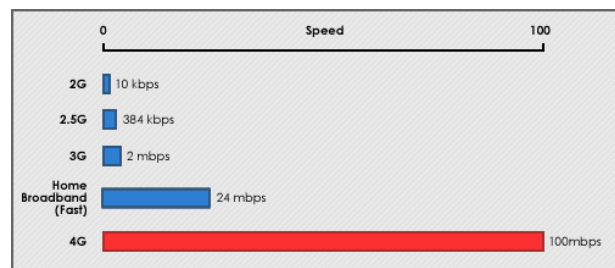


Figure 1: Comparison of speed

3.2 Easy Roaming and Interoperability

In 3G we have multiple standards, that makes it difficult to interoperated and roam across various networks. Whereas, on the other hand, 4G provides a global standard that provides mobility over a global area. Various wireless networks which normally differ in terms of data rate latency, coverage and rate loss therefore; all are practically design for different sets of specific services and devices.

3.3 Fully Converged Services

For accessing the network from various platforms: cell phones, laptops, PDAs. Everyone is free to do that in 4G which deliver a good connectivity intelligently and flexible in such a manner that it supports video streaming, VoIP telephony, moving images, still images, email, web browsing , e-commerce, location based services in wide varieties of devices which simply means providing freedom for customers.

3.4 Lower Cost

The 4G system is cheaper than 3G, as they can also launched on existing network antennas and also it would not require the operator to completely retool and would not required different carrier for transmission by purchasing costly extra spectrum. Along with cost efficiency 4G networks are spectrally efficient, so carriers can do more with less.

3.5 Better GPS services

In 4G network, the version of GPS technology is so developed that it might be able to let the user to present in the place virtually.

3.6 Scalability

Most challenging expect of mobile networks are scalability. It is basically the ability increasing no of users in services. As the IP layer of 4G system is scalable, and suitable for this channel.

3.7 Management of Crisis

When natural disasters affect the communication infrastructure, restoring communication quickly is very essential in such a situation wideband wireless

communication internet and video services could be setup within hours instead of days or even weeks required of restoration of wire line communications.

4. Technologies of 4G

4.1 OFDMA

It stands for Orthogonal Frequency Division Multiplexing which is a structure for improving layer 2 performances by proposing an additional degree of free domain. It provides advantage for physical layer performance. With OFDM, frequency domain, time domain, code domain and space domain can modify to modify radio channel usage. It is compatible with other enhanced technologies like smart antennas and MIMO. When OFDM modulation integrated as a multiple access technology then each of OFDM symbol is able to transmit information to or from various users using a number of sub channels. An OFDM transmitter receives data from an IP network, it is able to convert and encode the data prior to its modulation. An inverse fast Fourier Transform (IFFT) is a device which can transform OFDM signal into IF analog signal, next it can send to the RF trans-receiver. The circuit of receiver reconstructs all data by receiving the whole process. Many types of fading and multipath delays of the wireless transmission techniques, the ODFM provides good link and better communication quality. Orthogonal FDM's spreads various spectrum techniques the data of the carrier which are spaced a part at resize frequencies. The space occurring in the "orthogonality" which prevent the receivers /demodulators from scene frequencies other than their own one. OFDM is beneficial for high spectrum efficiency and also the multipath distortion is reduced, but in OFDM we get high resiliency to RF interferences. Various different versions of the signal interference with one another are known as inter-symbol interference.

4.2 Multiple-Input and Multiple- Output (MIMO)

In order to improve performance of communication between sender and receiver, the multiple number of antennas on both the receiver and the transmitter side are used. On one side, m antennas are used for transmission of the signal and n antennas are used for the reception of the signal on the receiving terminals. Enhancing the received signal processing may result in significant improvement in performance like range, received signal quality and efficiency of spectrum.

4.3 Software Define Radio

It is communication system used as software on the personal computers and embedded devices. It search the network and reconfigure itself for selected network after downloading the software required to that particular selected network SDR has several advantages like: flexibility in network expansion which means that its operator may expand its network by adding infrastructure like modem that connect to the base station trans-receiver system it will benefit for both the users and service provider. The current SDR technology used, is not capable for multiple networks thus it should be enhanced to support multiple networks.

4.4 IPv6.0

IPv6.0 allows implementation of large number of address as compare to IPv4. So, 4G wireless technology uses IPv6. Each devices have their own IP addresses in the IPv6 technology and a use can also change when they changes their access point.

4.5 Smart Antenna

Generally there are two major types to antennas which are used in 4G. These are adaptive array smart antennas and switched beams smart antennas. A beam can be transmitted in any required direction by adaptive arrays while simultaneously overcoming the interfering signals by nulling them. While switched beam system provides fixed beam pattern that helps in decision making as which beam should access at any point of time according to the requirement of the system.

5. Challenges

5.1 Security and Privacy

With the development of 4G network measures are required for safety data transmission. 4G addresses mobility security and QoS through reuse of various mechanisms available. Although work is on the way for handover and some mobility issues so it becomes necessary for the organization to develop various tools which supports 4G security for protecting data that is transmitted from transmitter and receives at the receiver by the hackers. Multiple levels of security is required as the 4G network is very prone to attacks, These security measures includes increased requirement for proper authentication which is necessary to protect data and transmitted information

across the networks. Encryption and description methods which were used in 3G networks are not adequate for 3G system because of new devices and services that are introduced 1st time for the 4G networks. The foremost task is to modify the existing securities, so that they will be useable to 4G networks.

5.2. Service Quality

Due to the quality of the network, many telecommunication provider promises of enhanced connectivity, and the quality of data which is transmitted through the network is of the highest possible quality. About 10 times higher data rate as compare to today's broadband mobile networks is possible in 4G networks. Customers can always be connected on the movement so it is important for providers to develop 4G network in an effective manner to enhance quality ,provide effective measure for security and also insures that the users have the provision for extensive alternatives for downloading videos, music and picture files without any delay or negligible delay. The major challenge which the 4G networks are facing is about the integration of non IP based and IP based devices.

6. Conclusion

As in India 4G is a latest network technology, it is quiet better than its predecessors as per their speed, security, reliability etc. It introduced many new features like enhanced GPS system, crisis management system etc. as discussed in the paper. As we know that the speed of internet has become a basic need of the current generation, the 4G technology is fulfilling this need by providing a speed of up to 100 Mbps, while its predecessors can only reach up to 2 Mbps.

References

- [1] Priya Gautam, Savneet Kaur, Ramandeep Kaur, Sumeet Kaur, Harish Kundra; "Review Paper on 4G Wireless Technology"; International Journal of Advances in Science and Technology (IJAST); March 2014; ISSN: 2348-5426; Vol. 2 Issue ; page 15-19.
- [2] Afaq H. Khan, Mohammed A. Qadeer, Juned A. Ansari, Sariya Waheed; "4G as a Next Generation Wireless Network" International Cnference on Future Computer and Communication 2009; ISBN: 978-0-7695-3; page 334-338.
- [3] S. B. Akintone; "Wireless Mobile Communication – A Study of 4G Technology"; Kuwait Chapter of Arabian Journal of Business and Management Review, May 2013; Vol. 2, No.9, page 42-52.
- [4] Rahul Dayal; "Optimizing Access Network of 4G Wireless Communication System.; International Journal of Latest

- Research in Science and Technology' September-October 2012; ISSN: 2278-5299; Vol. 1, Issue 3, Page 272-275.
- [5] K. Kumaravel; "Comparative Study of 3G and 4G in Mobile Technology" IJCSI International Journal of Computer Science, September 2011; ISSN: 1694-0814; Vol. 8, Issue 5, No 3, Page 252-263.
- [6] B. Vasari, Mounika Marepalli, Leepika Gudur; "Evolution of 4G- Research Directions Towards Fourth Generation Wireless Communication"; (IJCSIT) International Journal of Computer Science and Technologies, 2011; ISSN: 0975-9646; Vol. 2 (3), page 1087-1095.
- [7] Shivani Harnal, "Analysis on 4G Technology"; International Journal of Advanced Research in Computer science and Software Engineering' March 2013; ISSN: 2277-128X; Volume 3, Issue 3, Page 624-628.

Microwave Attenuation of Co-Al substituted M-type Ba-Sr Hexagonal Ferrite

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Abstract - In this investigation, we have reported microwave attenuation characteristics of M-type Ba_{0.5}Sr_{0.5}Co_xAl_xFe_(12-2x)O₁₉ hexagonal ferrite (x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0). The microwave parameters have been measured using network analyzer. The substitution of Co²⁺ and Al³⁺ ions causes increase in attenuation and composition x=0.4 exhibits large attenuation with 55.84 dB at 11.98 GHz.

Keywords - Ferrites; Microwave attenuation.

1. Introduction

The exponential growth in information technology, associated with devices operating in GHz and high frequency region, has lead to the emergence of electromagnetic pollution. This effect produces electromagnetic interference (EMI) which causes malfunctioning of electronic devices. M-type hexagonal ferrites are incorporated as electromagnetic attenuators or absorbers owing to natural ferromagnetic resonance (NFMR), enhanced dielectric and magnetic losses [1-2].

2. Experimental

The M-type Ba_{0.5}Sr_{0.5}Co_xAl_xFe_(12-2x)O₁₉ hexagonal ferrite compositions were synthesized using standard ceramic method (x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0). The attenuation (α) of compositions was calculated from the measurement of complex permittivity ($\epsilon' - j\epsilon''$) and complex permeability ($\mu' - j\mu''$) (where ϵ' , ϵ'' , μ' and μ'' permittivity, dielectric loss, permeability and magnetic loss respectively) at X-band (8.2-12.4 GHz): these complex parameters were derived from S-parameters which were measured using vector network analyzer, Agilent model N5225A. Before carrying out measurements, calibration of network analyzer was performed in air to check permittivity and permeability of air.

3. Results and Discussion

The attenuation was calculated using following formula:

$$\alpha = 2\pi/\lambda_0 \{ \epsilon'' \mu'' - \epsilon' \mu' + [(\epsilon' \mu')^2 + (\epsilon'' \mu'')^2 + (\epsilon' \mu'')^2 + (\mu' \epsilon'')^2]^{1/2} \}^{1/2} \quad (1)$$

Where λ_0 is the microwave wavelength in free.

Figure 1 depicts variation of attenuation with frequency for different substitution of Co²⁺ and Al³⁺ ions in Ba_{0.5}Sr_{0.5}Co_xY_tFe_(12-2x)O₁₉ ferrite (x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0). The attenuation increases with frequency in all compositions and x=0.0, 0.2 and 1.0 observe large dispersion with frequency. The undoped composition x=0.0 remain at low α among all compositions throughout the entire investigated frequency region. Composition x=0.4 stays at highest α with 55.84 dB at 11.98 GHz and lowest α in x=0.0 with 38.63 dB at 8.20 GHz.

Composition x=0.6 and 0.8 owe not much increment with frequency in comparison to other compositions. Composition x=0.2 displays two peaks in low and high frequency region: 43.64 dB at 8.70 GHz and 46.11 dB at 11.14 GHz. The substitution of Co²⁺ and Al³⁺ ions causes increase in attenuation. In doped compositions, it increases from x=0.2 to 0.4 followed by diminution with further substitution from x=0.6 to 1.0: x=0.4 and x=0.6 have nearly same value from 9.04 to 9.46 GHz.

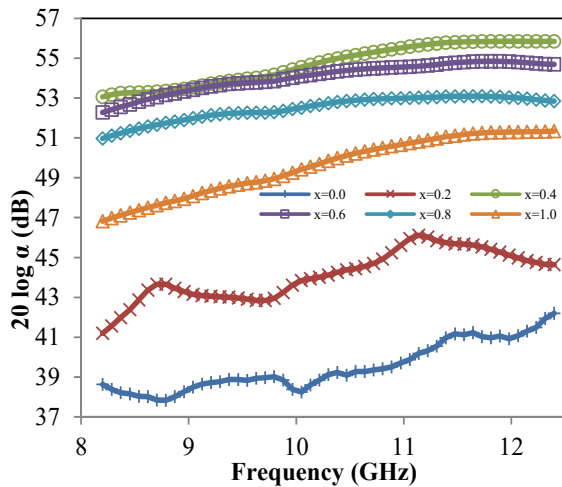


Figure 1. Attenuation (α) Vs. frequency variation of $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_x\text{Al}_x\text{Fe}_{(12-2x)}\text{O}_{19}$ ferrite for substitution of Co^{2+} and Al^{3+} ions ($x=0.0, 0.2, 0.4, 0.6, 0.8$ and 1.0).

4. Conclusions

The microwave attenuation increases with substitution of Co^{2+} and Al^{3+} ions in $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_x\text{Al}_x\text{Fe}_{(12-2x)}\text{O}_{19}$ ferrite. It also observes considerable increase with frequency in $x=0.0, 0.2$ and 1.0 . The investigated compositions have scope for microwave absorber applications.

References

- [1]. P. Meng, K. Xiong, L. Wang, S. Li, Y. Cheng, G. Xu, Tunable complex permeability and enhanced microwave absorption properties of $\text{BaNi}_x\text{Co}_{1-x}\text{TiFe}_{10}\text{O}_{19}$, *J. Alloys Compd.* 628 (2015) 75–80.
- [2]. R. S. Alam, M. Moradi, H. Nikmanesh, J. Ventura, M. Rostami, Magnetic and microwave absorption properties of $\text{BaMg}_{x/2}\text{Mn}_{x/2}\text{Co}_x\text{Ti}_2\text{Fe}_{12-4x}\text{O}_{19}$ hexaferrite nanoparticles, *J. Magn. Magn. Mater.* 402 (2016) 20–27.

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Microwave Attenuation of M-type Ba_{0.5}Sr_{0.5}Co_xYt_xFe_(12-2x)O₁₉ Hexagonal Ferrite (x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0)

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Abstract - In this investigation, microwave attenuation characteristics, of M-type Ba_{0.5}Sr_{0.5}Co_xYt_xFe_(12-2x)O₁₉ hexagonal ferrite (x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0), have been reported. Network analyzer has been used to measure microwave parameters. The substitution of Co²⁺ and Yt³⁺ ions enhances microwave attenuation and composition x=0.6 infers highest attenuation of 52.7 dB at 12.4 GHz

Keywords - Ferrites; Microwave attenuation.

1. Introduction

Electromagnetic pollution is the hazardous outcome of technological applications associated with the advent of high speed devices, navigation systems, radar systems etc. This results in electromagnetic interference (EMI) accompanied by high frequency spurious signal. The researchers are working on novel materials which can attenuate or absorb these spurious signals, thereby reducing EMI. M-type hexagonal ferrites have been engineered for microwave absorber or attenuation applications due to high resistivity, large dielectric and magnetic losses [1-2].

2. Experimental

The M-type Ba_{0.5}Sr_{0.5}Co_xYt_xFe_(12-2x)O₁₉ hexagonal ferrite compositions were synthesized using standard ceramic method (x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0). The attenuation (α) of different compositions was calculated from the measurement of complex permittivity ($\epsilon' - j\epsilon''$) and complex permeability ($\mu' - j\mu''$) (where ϵ' , ϵ'' , μ' and μ'' represent permittivity, dielectric loss, permeability and magnetic loss respectively) at X-band (8.2-12.4 GHz): these complex parameters were derived from S-parameters which were measured using vector network analyzer, Agilent model N5225A. Before carrying out measurements, calibration of network analyzer was

performed in air to check permittivity and permeability of air.

3. Results and Discussion

The attenuation was calculated using following formula:

$$\alpha = \sqrt{2\pi/\lambda_0} \{ \epsilon'' \mu'' - \epsilon' \mu' + [(\epsilon' \mu')^2 + (\epsilon'' \mu'')^2 + (\epsilon' \mu'')^2 + (\mu' \epsilon'')^2]^{1/2} \} \quad (1)$$

where λ_0 is the microwave wavelength in free.

Figure 1 shows plots of attenuation vs. frequency for substitution of Co²⁺ and Yt³⁺ ions in M-type Ba_{0.5}Sr_{0.5}Co_xYt_xFe_(12-2x)O₁₉ (x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0). The attenuation increases with frequency in all compositions and large dispersion is observed in x=0.0, 0.2, 0.8 and 1.0. However it does not vary much with frequency in x=0.4. The two peaks are observed in x=0.6 in low and high frequency region: 49.47 dB at 8.36 GHz and 49.70 dB at 11.89 GHz. The observed peak in x=0.6 keeps it at large value among all compositions from 8.36 to 8.45 GHz and α remains nearly independent of frequency from 8.87 to 11.05 GHz.

Composition x=1.0 remains at highest α among all compositions from 10.13 to 12.40 GHz: it owes 52.7 dB at 12.4 GHz, while x=0.4 owes highest α from 8.20 to 10.04 GHz except 8.36 to 8.45 GHz.

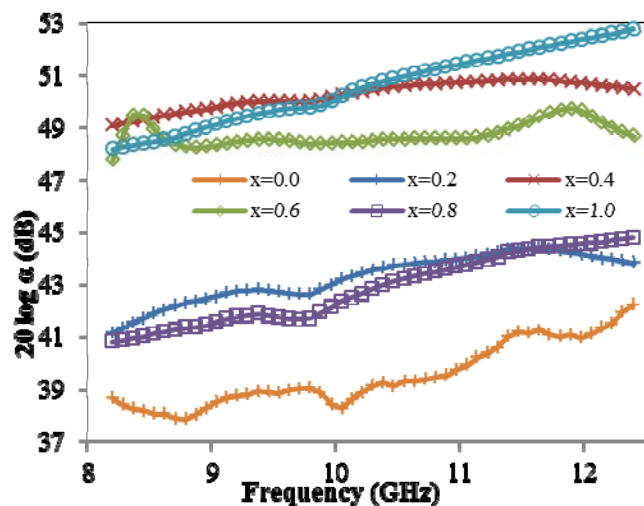


Figure 1. Attenuation (α) Vs. frequency variation of $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_x\text{Yt}_{(12-2x)}\text{O}_{19}$ ferrite for substitution of Co^{2+} and Yt^{3+} ions ($x=0.0, 0.2, 0.4, 0.6, 0.8$ and 1.0).

The attenuation increases non-linearly with the substitution of Co^{2+} and Yt^{3+} ions. It remains minimum in undoped composition $x=0.0$ among all compositions and increases non-linearly with substitution of Co^{2+} and Yt^{3+} ions. In doped compositions, $x=1.0$ and 0.4 remains at large values among all compositions at most of the frequencies.

4. Conclusions

The substitution of Co^{2+} and Yt^{3+} ions causes increase in microwave attenuation in $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_x\text{Yt}_{(12-2x)}\text{O}_{19}$ ferrite. The attenuation also increases with frequency in all compositions. The investigated compositions have scope for microwave absorber applications.

References

- [1]. S. Salman, S. Afghahi, M. Jafarian, Y. Atassi, Microstructural and magnetic studies on $\text{BaMg}_x\text{Zn}_x\text{X}_2\text{Fe}_{12-4x}\text{O}_{19}$ ($X=\text{Zr,Ce,Sn}$) prepared via mechanical activation method to act as a microwave absorber in X-band, *J. Magn. Magn. Mater.* 406 (2016) 184–191.
- [2]. H. Bayrakdar, Fabrication, magnetic and microwave absorbing properties of $\text{Ba}_2\text{Co}_2\text{Cr}_2\text{Fe}_{12}\text{O}_{22}$ hexagonal ferrites, *J. Alloys Compd.* 675 (2016) 185–188.

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Automation of Industrial Machines using PLC, HMI and Drives

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Abstract -. The main focus of this paper is on automated working of various machines and plants. Automation reduces the time required for completion of product. PLC, HMI and drives (VFDs) are used for automating the machine. PLC generates alarm in case of any faults. Drives are used to control the speed of various motors present in machine. Automation used in industrial machines is to reduce labor, time and saving energy. In this paper automation of different machines is discussed.

Keywords - Programmable logic controller (PLC), Human machine interface (HMI), Variable frequency drives (VFDs).

1. Introduction

Automation done with microcontrollers relays and timers that were actually wired in hardware system posed many problems if any change is required to be done. Moreover such hardware systems were to o bulky and faced many problems during modification. Another difficulty faced was to locate the any fault and faulty equipment had to be replaced. In present research work, these difficulties can be eliminated. These difficulties can be resolved using PLC, Drives and HMI. Most important industrial cost includes electricity. Labor cost and raw material cost[2].Electricity or energy is one factor, which if managed can lead to reduction of operating cost. Along with this reduction in labor cost can also reduce some percentage of operating cost. Cost of electricity or energy is increasing day by day so, reduction in energy should be given first priority. Therefore PLC is a digital computer used for automation in many industries and machines. PLC is designed for multiple inputs and outputs arrangements, extended temperature ranges, immunity to electrical noise and resistance to vibrations. Program to control machine are typically stored in battery backed or non volatile memory. Drives generally used are VFD [6]. These drives control the speed of various motors in industrial machines. Motors generally used are three phase induction motors. These induction motors are mostly used in industries. Input to these motors is controlled by drives to control the speed of Motors. These drives are generally used in industries. Drives used are variable frequency drives.

2. PLC

PLC is specialized computer which controls machines and processes using a programmable memory to store instructions and specific functions such as ON/OFF control, arithmetic, counting, sequencing, timing and data handling. It is special form of microcontroller processor based controller which is designed to be operated by engineers with perhaps a limited knowledge of computers and computing languages. It is not designed in a way that only computer programmers can set up a program or change it. Therefore PLC has been reprogrammed by designers so that the control program can be entered using simple form of languages.

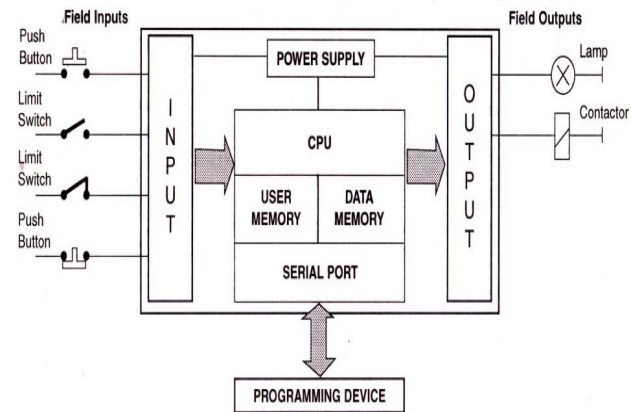


Fig. 1. Block diagram of PLC.

3. HMI

HMI includes the electronic system that is required for signalling and controlling the state of industrial automation equipment. The interface products can vary from basic LED status indicator to a 20-inch TFT panel with touch screen interface. HMI applications require mechanical robustness and resistance to water, dust, moisture, a wide range of temperatures and sometimes also secure communication.

4. Drives

Drives are used to system where motion control or speed control is required. Example- transport system, fans, robots, pumps, machine tools, motors etc. Prime movers are required to provide movement or energy such as diesel engines, petrol engines, hydraulic motors, electric motors etc. Drives use electric motor as prime mover are electrical drives.

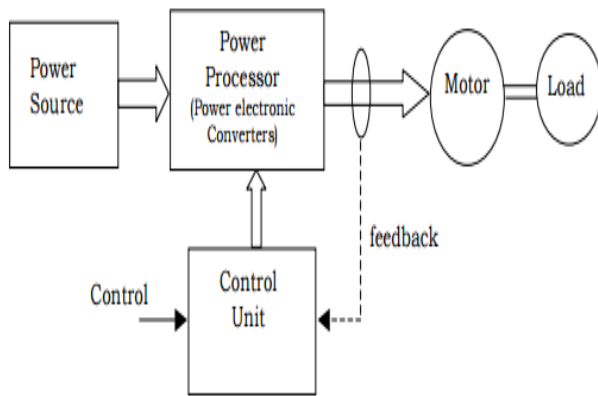


Fig 2. Block diagram of drive.

5. Automation of machines using PLC

5.1 Labelling machine-

PLC and some sensor are used to synchronize the AC motor feeder of the system with some stepper motor who will stick the label. Labelling machine has a conveyor driven by AC motor and one axis for labelling driven by stepping drive and stepping motor. There are two sensors for product/label sensor. First command is given to the inverter to start the conveyor for feeding the products. When the product reaches the sensor then the product sensor sends signal to plc. As PLC receives the signal PLC gives pulses to stepper drive and stamps the label on the product. Then as label sensor gives signal PLC output specifies the number of pulses and stops. Then again when Product sensor senses the product, this process starts again.

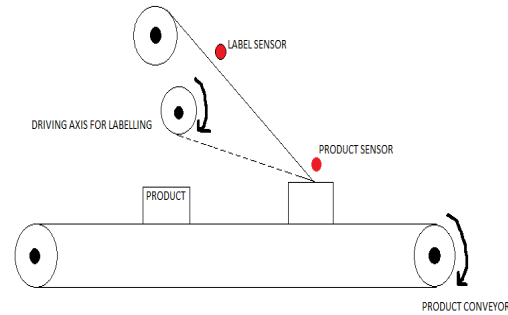


Fig 3. Labelling machine.

5.2 Bottle filling:

Tank 1 and 2 consists of two different colors. There are two valves 1 and 2. Time for opening of valves is given by user in the PLC program. These valves will work according to program entered into the PLC. Start and stop buttons are used to start and stop the process respectively. Proximity sensor is used to sense the presence of bottle below valve 3. If proximity sensor senses the presence of bottle, then valve 3 is on till bottle is filled. Time for which valve 3 is on is the time required to fill the bottle. This time is specified by programmer [3].

This bottle filling technique is used in many industries which reduce labor and increase the production. Industries producing and filling cold drink in bottles use this technique of PLC for automation. Mixing of two colors or two liquids can also be automated by PC in this described manner with little variation.

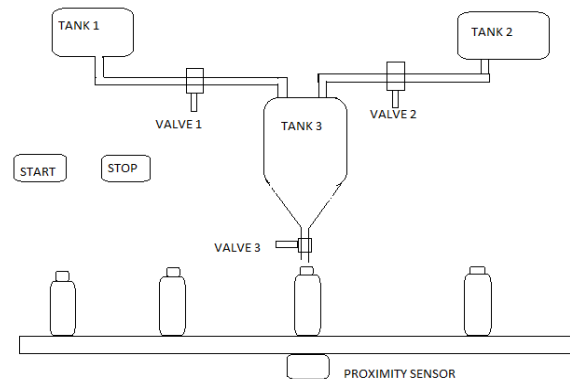


Fig. 4 Bottle mixing

5.3 Planar machine-

In this machine, the work piece or the job placed on the table moves to and fro by rack and pinion arrangement mounted on the shaft of the squirrel cage motor. Here the

cutting tool is fixed while the job placed on the table is worked upon by the movement of table. Movement of the table is controlled between two limits left and right by switches 1LS and 2LS. When the table moves left to right, tool works on the job while it remains ideal during right to left motion of the table. At the end of right to left motion, tool gets feed for the next cut on the job. The motor is started manually by pressing start push-button. Once the motor starts it reverses automatically at the end of right or left stroke by limit switches 2LS and 1LS. If the machine table is lying in between extreme position, machine will fail to start. Selection of initial direction of travel is possible through right and left push buttons PBR and PBL.

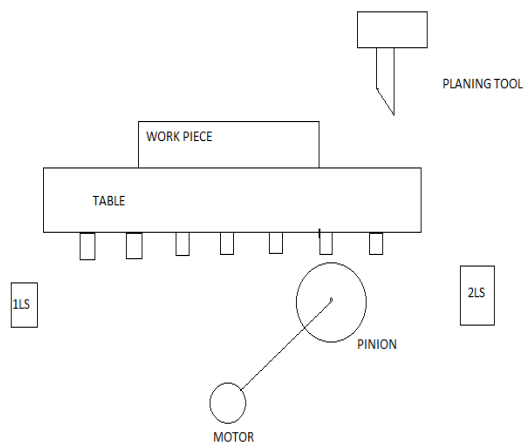


Fig. 5 Planar machine

5.4 Boiler:

PLC and SCADA are interfaced through communication cables. SCADA is used to monitor the boiler temperature, pressure and water level using different sensors and the corresponding output is given to the PLC which controls the boiler temperature, pressure and water level. block diagram of boiler Automation consists of PLC, SCADA and sensors to monitor and control the entire operation of boiler. Here Resistive Temperature detector Pt 100 (RTD PT 100) is used to measure the temperature, RT pressure switch is used to measure the pressure inside the boiler and float switches are used to detect the feed water level inside the boiler.

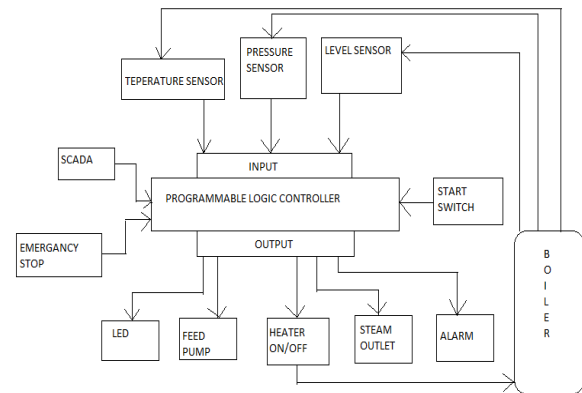


Fig.6. Boiler block diagram

6. Conclusion

Hence various machines can be easily controlled using PLC automation. Labour cost is reduced as less number of labourers are required. Human errors have been reduced as human intervention is reduced through automation. Along with this time required for completion of finished product is reduced. This further reduces the energy usage in form of electricity. Moreover, using HMI control of machine is easy. Even a supervisor with less technical knowledge can operate the machine. SCADA can be used to control the machine from distant point. There is no need of presence of human near machine, as it was done in conventional methods. Over load faults and many other faults which can damage the machine are detected by PLC by giving alarm. In this way machine is saved from severe damage.

References

- [1] Maria G. Ioannides, "Design and implementation of PLC based monitoring control system for induction motor". IEEE transactions on energy conversion, vol. 19, no, 3, September 2004
- [2] A. R. ALAE, M. M. Negm , M. Kassas. "A PLC Based Power Factor Controller for a 3-Phase Induction Motor
- [3] Mehdi Yahyaei, Ashraf W Labib, "Increasing the flexibility and intelligence of material handelling through factory by integrated fuzzy logic controller with programmable logic controller". The 2005 IEEE International Conference on Fuzzy Systems
- [4] Patrick Rock, Terry Bauman, Bill Granzin, "PLC based turbine governor system". Conference Record of the 2006 IEEE IAS Pulp and Paper Conference.
- [5] Pei Ruilin, Zhang Lei, Wang Li," Real-time monitoring and integrated automation control in steel rolling plant".
- [6] Coia Ferrater-Simón, Lluís Molas-Balada, Oriol Gomis-Bellmunt, "A remote laboratory platform for electrical drive

control using programmable logic controllers". IEEE transactions on education, vol. 52, no. 3, august 2009.

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Grid Interconnected Solar Plant with HVDC Transmission in MATLAB

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Abstract - Huge amount of power is generated through conventional energy resources like coal, gas etc. but due to bad environmental conditions like global warming, depleting of fossil fuels, it is necessary to upgrade our technology. Now the power is generated through renewable energy resources like solar, hydro and wind. Renewable sources are abundant and are free of cost. These are used to generate power during peak demand hours. Their integration through grid is beneficial for large distances. HVDC is used for integration of plants with AC grids because it has lower losses, more reliable transmission system. In this paper integration of plants through HVDC is presented.

Keywords - HVDC, AC, HVAC, PV

1. Introduction

Non renewable energy resources are depleting day by day. Now a day there has been increasing interest in generation of electricity from renewable energy sources.

The main reason behind it is fuel saving and environmental considerations. Sun is the primary non conventional resource. PV technology is the recent method to generate electric energy from sun.

PV Module: multiple solar cells are connected in series or parallel to generate required level of voltage and power.

PV Array: It is a structure that consists of number of PV modules.



Fig 1 Solar Array

2. Background

The power blackout caused by the power demand was a warning to the government on the future problem, if nothing is done. According to Integrated Resource Plan 2010, more than 41346 MW of new capacity are required to meet demand in 2030. The renewable energies of 3725 MW are included in new capacity for carbon dioxide emission.

Table No. 1 Target for grid interactive RE power for 2011-2017

Sr. No.	Year	Solar Power Target(MW)
1	2011-2012	300
2	2012-2013	800
3	2013-2014	400
4	2014-2015	400
5	2015-2016	1000
6	2016-2017	1100
7	Total Target	4000

3. Literature Survey

3.1 Suprava et. al [2014] described that commonly Grid connected PV plants firstly generates DC power and then inverters converted it into AC power. This paper described the different PV technologies connected to HVDC grid. DC-DC bypass converter is taken into account and its operation with mathematical equations is presented step by step in matlab/simulink software [1].

3.2 Rupak and Md. Rifat [2014] described how HVDC transmission system could be implemented in Bangladesh power network. He

represented HVDC system with LCC technology with thyristors and VSC technology with IGBT. Solution for smart Grid with HVDC in Bangladesh, interconnection link through HVDC is also presented. Paper showed the different Cost graphs will be plotted with transmission distances [2].

3.3 W. Breuer et. al [2006] discussed the present and future HVDC applications. Cost comparison between AC and DC long transmission is represented. Integration of HVDC into AC, load flow, technical and economic advantages of interconnection is showed. Off shore wind generation and examples of implemented projects are presented [3].

4 Problem Formulation

With thermal power plants, the environment gets polluted day by day. Hence era of renewable energy is ongoing. In India sun is available 300 days of a year. Hence power is generated from solar, wind and hydro sources. They are cost free and clean sources.

Mathematically

$$1. \text{ Min } C_{a_2} \text{ emission} = \text{Min } \sum \text{Emission from Fossil Fuels}$$

$$\text{Min } \sum E_{\text{thermal}} + E_{\text{fossil}} + E_{\text{gas}} \quad (1)$$

Subject to Electricity generation

$$2. \text{ Max efficiency} =$$

$$\text{Max } \left(\frac{\text{Energy output from solar cell}}{\text{Input energy from sun}} \right) \quad (2)$$

Subject to Solar Equipment

Solar plant has no emission and efficiency of solar plant is more than thermal plants. Hence solar power is the good solution of power demand.

5 HVDC Transmission

With modernizations, the electrical energy took advantage on steam energy. With the increased in worlds economy, the demand of electricity is increased. The transmission of power over large distance using HVAC system was insufficient due to line losses. Hence HVDC is sufficient for power transmission in recent years.

HVDC is suitable for large distances above 700 km. The initial cost of HVDC is more than HVAC but above 700 km, the cost of HVDC is reasonable than HVAC.

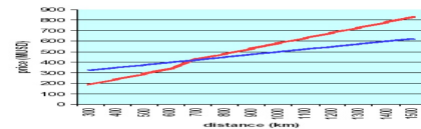


Fig 2 Cost comparison

6 HVDC system components

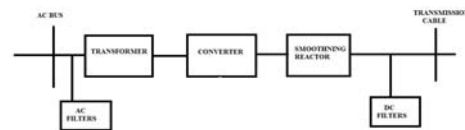


Fig 3 HVDC block diagram

- AC Filters:** Converter generates harmonics on both sides. These harmonics overheat the generators and hence disturb the communication system. Ac filters are used to eliminate these types of harmonics.
- Smoothing reactor and DC filters:** It is used to reduce DC ripple current to avoid discontinuation at low power. Smoothing reactor makes integral component with DC filters to limit the current flow into the converter.
- Converter transformer:** It is used to make the suitable voltage level of AC bus voltage to the converter.

7 Advantages of HVDC

1. HVDC has 30-50 % less losses than HVAC.
2. More energy transmission is possible in HVDC than HVAC.
3. HVDC has lesser corona loss and radio interference than HVAC.
4. Skin effect and proximity effect is completely eliminated.
5. Fast change of energy flow.
6. Control over harmonics.
7. DC lines and cables are cheaper than AC lines and cables.

8 Solar power

Due to government support and less cost of solar power, it is viable in economic terms. Sun is available 300 days in India. Sun rays hit the PV solar array and power is generated and converted into DC by converter in String monitoring box. The DC power is passing to inverter for conversion of DC power into AC power. AC power is then transmitted to consumers by grids.

9 Methodology

MATLAB software is used to plot curves of solar cell. MATLAB programming is shown below:

```
%PV MODEL
clear all;
K = 1.38065e-23; %Boltzman Constant
q = 1.602e-19; %charge of electron
Iscn = 8.21; %Nominal SC current
Vocn = 32.9; % Nominal OC voltage
Kv = -0.123; %temperature voltage constant
Ki = 0.0032; %temperature current constant
Ns = 54; %No. of series connected cells
T = 35+273; %operating temperature
Tn = 25+273; %nominal temperature
```

```
Gn = 1000; %nominal irradiance
a = 1.3; %diode ideality constant
Eg = 1.12; %band gap of silicon at 25 degree celcius
G = 1000; %Actual irradiation
Rs = 0.221;
Rp = 415.405;
Vtn = K*Tn/q;
Ion = Iscn/((exp(Vocn/(a*Vtn)))-1)
Io = Ion*((Tn/T)^3)*exp(((q*Eg/(a*K))*((1/Tn)-(1/T))));
Ipvn = Iscn;
Ipv = (Ipvn + Ki*(T-Tn))*(G/Gn)
Vt = Ns*(K*T/q);
I = zeros(330,1);
i=1;
I(1,1)=0;
for V=0:0.1:32.9
I_part = Io*(exp((V+(I(i,1)*Rs))/(Vt*a))-1) +
((V+(Rs*I(i,1)))/Rp);
I(i+1) = Ipv - I_part;
V1(i)=V;
P(i)=V*I(i);
i=i+1;
end
V1(i)=V1(i-1);
P(i) = P(i-1);
V1=transpose(V1);
%subplot(3,1,1);
plot(V1,I);
xlabel('V');
ylabel('I');
%subplot(3,1,2);
plot(V1,P);
xlabel('V');
ylabel('P');
```

10 Results



Fig 4 I-V Curve of solar cell

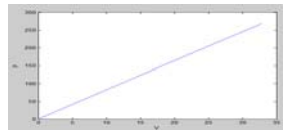


Fig 5 P-V Curve of solar cell

11 Grid interconnection

Grid interconnection is the basic need of today's worlds to meet the consumers demand. Now hydro, solar, wind plants are connected to nearby grids. With industrialization, the power demand is rising. It is difficult to meet power demand only by thermal plants. Hence small solar plants are built up to fulfill the power need.

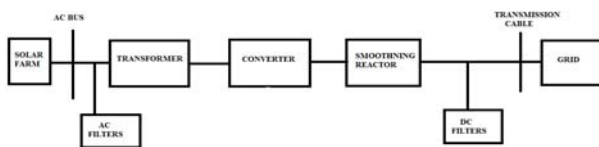


Fig 4 Block Diagram of Grid Interconnection

Solar plant is connected grid with mono polar HVDC transmission system. DC voltage from solar panel is converted into AC voltage by solar inverter. Then the harmonics in voltage can be reduced by AC filters and stepped up to required voltage level by the transformer.

12 Benefits of grid interconnection

1. Improving reliability.
2. Reduced investment in generation capacity.
3. Environmental dispatch.
4. Coordination of maintenance schedule.

13 Scope of research

HVDC will be the backbone for future power system HVDC applications for independent power provider are useful for interconnecting plants to AC grids through HVDC technologies. It makes the system reliable.

Acknowledgement

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References

- [1] "HVDC application for different solar PV technology combinations in India", Indonesian journal of electrical engineering, Vol. 12, December 2012.
- [2] Rupak Kanti Dhar, Md. Rifat Hazari "Analysis of patentability of HVDC in future power system in Bangladesh", IJSR, Vol. 3, Issue 1, Jan 2014.
- [3] W. Breuer, D. Povh, D. Retzmann, E. Teltsch, "Trends for future HVDC applications", CEPSI Conference, 2006.
- [4] Multi-Dimensional Issues in International Electric Power Grid Interconnections.

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Ultra Wideband Antenna using Corner Truncated Open Slot Technique

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Abstract - This paper consists of design of an ultra wide-band antenna using open slot technique having rectangular patch with truncated corners. This antenna is designed to enhance the bandwidth for wide-band applications. The proposed antenna provides a wide usable bandwidth of 8.10GHz (2.75-12.10GHz) for a 10dB return loss. This antenna is designed on standard FR4 substrate. Ultra wide-band antenna is simulated using Ansoft High frequency structure simulator (HFSS).

Keywords – Antenna, Ultra wideband antenna, slot antenna, bandwidth enhancement.

1. Introduction

Antenna is an important element in wireless communication. Slot antennas are popularly used because they can be cut on whatever surface they are to be mounted on and have good radiation pattern. Due to a rapid development in ultra wide-band (UWB) wireless communication technology, UWB antenna designing has become an important concept to seek attention. The design of antenna which can operate at a wide frequency range has become important for use in a high data rate system to expand the range of wireless communication [1] [2].

Slot antennas are attractive candidates for ultra wide-band (UWB) and microwave applications due to their low profile, design simplicity, robustness, wide range of bandwidth, compact size, reasonable cost and simple fabrication technology [2].

A large number of wideband and ultra wideband antennas have been studied and reported in the literatures [1-10]. Slot antennas fed by microstrip-line were investigated for wideband and ultra-wideband applications [1, 3, and 4]. To increase the bandwidth by using a dual band-notched slot antenna [5] or using hexagonal slot antenna [1] and parasitic central patch [4] or dual polarized patch antenna [6], dielectric resonator antenna [7]. This slot antenna can achieve good bandwidth characteristics. But the sizes in

[3, 4, 6] are very large and the bandwidths in [3, 6, 7] are not suited for ultra wideband requirement. L-shaped DRA

[8] And antenna with four capacitively coupled feeds [9] have been studied due to their wide bandwidth, omnidirectional radiation pattern for UWB applications. However, they are not suitable because they are not having planar structures. Therefore a microstrip-fed antenna is suitable due to its attractive features such as low profile, low cost, and light weight.

In this paper a rectangular slot in patch scheme is described, by truncating two corners from the rectangular patch, the bandwidth enhancement of the proposed antenna is achieved well over a wider frequency range of 8.10GHz (2.75-12.10GHz) for a 10dB return loss. From the simulation results it is shown that this scheme is an effective approach to enhance impedance bandwidth for ultra wide-band applications.

2. Antenna design

Figure 1 shows the configuration of the proposed UWB antenna which consist of rectangular patch fabricated on the FR4 substrate with relatively permittivity (4.4) and thickness 1.5mm. A non-symmetric open inverted L-slot on the ground was used [2] for producing a wide Operating bandwidth. To obtain a bandwidth for UWB applications, corners of the rectangular patch are truncated. As shown in figure 1, the Rectangular patch fed by microstrip-line has been cut with two corners. The truncated corners are investigated to understand their effect on operation bandwidth.

The proposed antenna has compact dimension of 35mm×30mm (W×L). The width of the microstrip feed line is 1.53 mm. On the front surface of the substrate, a rectangular patch with size of 9mm ×6mm is printed.

A good impedance match over the ultra wide-band frequency range can be achieved. Dimension of corner A is 3.5mm and corner B is 2.75mm.



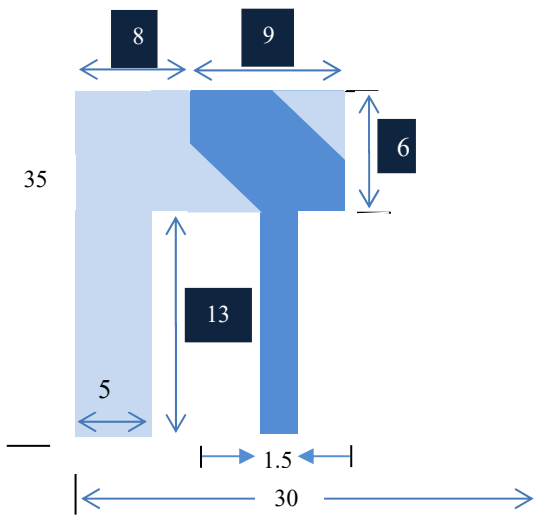


Fig. 1 Geometry and dimension of ultra wide band antenna with a corner truncated rectangular patch (units: mm)

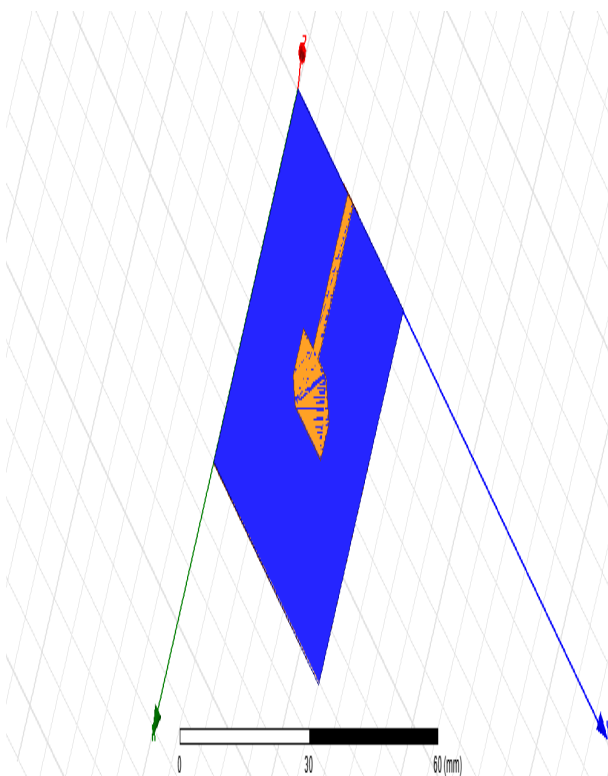


Fig. 2 Top view of the 3-D model of UWB antenna

The microstrip-fed UWB antenna was constructed and studied to demonstrate the proposed bandwidth-enhancement technique. The simulated results are obtained using the Ansoft simulation software high-frequency structure simulator (HFSS). Top view of the 3-D model of the UWB antenna is shown in figure 2 simulated return loss curves for proposed antenna is shown in figure 3. The simulated impedance bandwidth of the antenna, defined by 10dB return loss, can reach an operating bandwidth of 8.10GHz (2.75-12.10GHz) with center frequency operating at 7.5GHz, which is adequate for ultra wide-band application.

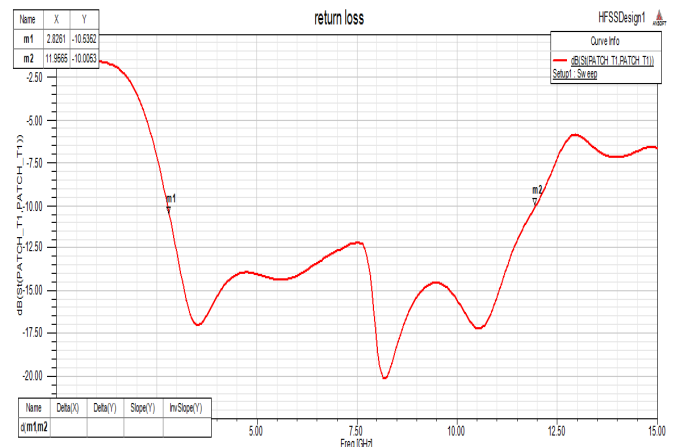


Fig. 3 Return loss of the UWB antenna

In addition, simulated far field radiation pattern of the proposed antenna at three different frequencies 6, 8, 10GHz are shown in figure 4.

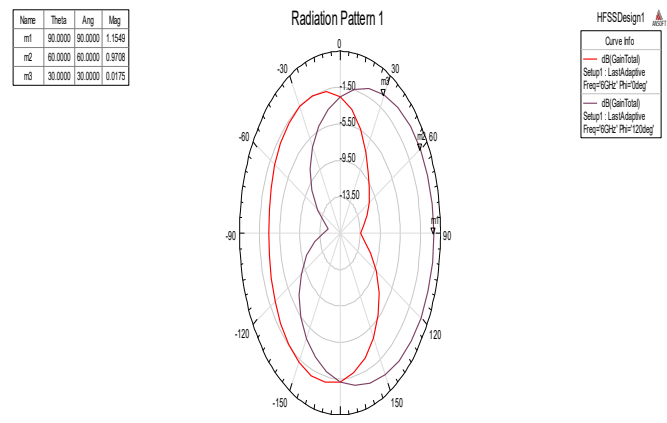


Fig 4.1 Radiation pattern at 6GHz

3. Experimental results and discussion

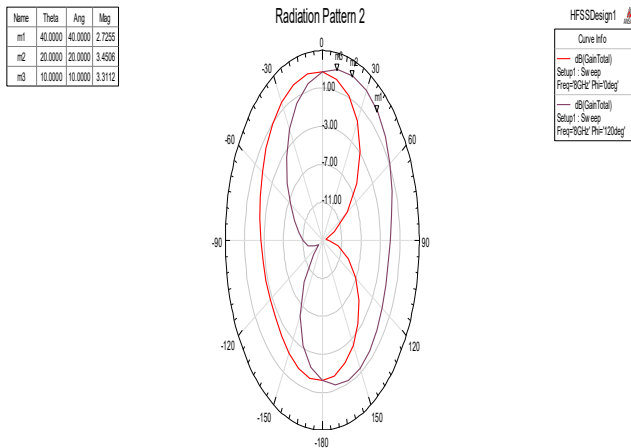


Fig 4.2 Radiation pattern at 8 GHz

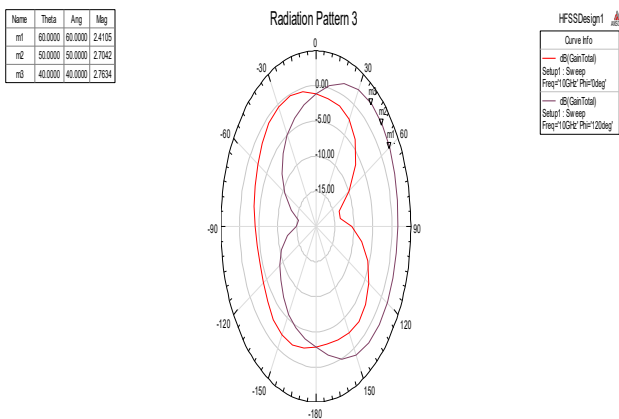


Fig 4.3 Radiation pattern at 10GHz

4. Conclusion

An UWB antenna using corner truncated open slot technique has been proposed for bandwidth enhancement. From the results, it is found that proposed patch scheme is an excellent approach, which makes a strong effect on the antenna's impedance bandwidth enhancement for ultra-wideband application. A study is done to understand the effect of truncated corner and to optimize the performance of designed antenna. Based on results, UWB antennas can be designed and used for many wideband and ultra wideband wireless communication systems.

References

[1] Mohammad Reza Ghaderi, and Farzad Mohajeri, "A Compact Hexagonal Wide-Slot Antenna With Microstrip-Fed Monopole for UWB Application", IEEE Antennas and Wireless Propagation Letters, Vol. 10, No.15, 2005, pp.682-685

[2] Kun Song, Ying-zeng Yin, Huan-huan Xie, Shao-li Zuo, and Dan Xi, "A corner-truncated patch scheme of bandwidth enhancement for open slot antenna", Proceedings of International Symposium on Signals, Systems and Electronics (ISSSE), Vol. 15, No. 10, 2010, pp. 616-618.

[3] Y. Sung, "A Printed Wide-Slot Antenna with a Modified L-Shaped Microstrip Line for Wideband Applications", IEEE Transactions on Antennas and Propagation, Vol. 59, No. 10, 2011, pp. 3918-3922.

[4] Y. Sung, "Bandwidth Enhancement of a Microstrip Line-Fed Printed Wide-Slot Antenna With a Parasitic Center Patch", IEEE Transactions On Antennas And Propagation, Vol. 60, No. 4, 2012, pp.1712-1716.

[5] Nasser Ojaroudi and Mohammad Ojaroudi, "Novel Design of Dual Band-Notched Monopole Antenna with Bandwidth Enhancement for UWB Applications", IEEE Antennas and Wireless Propagation Letters, Vol. 12, No. 8, 2013, pp.698-701.

[6] Fuguo Zhu, Steven Gao, Anthony T. S. Ho, Raed A. Abd-Alhameed, Senior Member, IEEE, Chan H. See, Tim W. C. Brown, Jianzhou Li, Gao Wei, and Jiadong Xu, "Ultra-Wideband Dual-Polarized Patch Antenna With Four Capacitively Coupled Feeds", IEEE Transactions On Antennas And Propagation, Vol. 62, No. 5, 2014, pp. 2440-2447.

[7] Xian-Ling Liang, Tayeb A. Denidni, and Li-Na Zhang, "Wideband L-Shaped Dielectric Resonator Antenna with a Conformal Inverted-Trapezoidal Patch Feed, IEEE Transactions on Antennas and Propagation", Vol. 57, No. 1, 2009, pp. 271-274.

[8] Jihak Jung, Wooyoung Choi, and Jaehoon Choi, "A Small Wideband Microstrip-fed Monopole Antenna", IEEE Microwave And Wireless Components Letters, Vol. 15, No. 10, 2005, pp. 703-705.

[9] A. A. Abdelaziz, "Bandwidth Enhancement Of Microstrip Antenna", Progress In Electromagnetics Research, PIER 63, Vol. 63, NO. 4, 2006, pp. 311-317.

[10] Huda A. Majid, Mohamad K. A. Rahim, Mohamad R. Hamid, and Muhammad F. Ismail, "Frequency Reconfigurable Microstrip Patch-Slot Antenna with Directional Radiation Pattern", Progress In Electromagnetics Research, Vol. 144, No. 9, 2014, pp. 319-328.

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Scope of Small Hydro Power Plant in Future (H.P)

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Abstract - While hydropower plays a main role in the energy and growth strategy of India, such natural resource projects are naturally demanding. The small hydro power generates the power and face up to improve consistency value and diminish cost. The paper aim to future of small hydro power plant analysis and development (SHP) which presently operation .The result shall help the project to determine the strength and weakness. Future European hydro power savings will mainly be made in efficiency events and improvement at accessible hydro power plant and new hydro power technology .Although new technology such as wave, tidal, osmotic and power have great potential *they are still under development. Their importance in future energy system is hard to predict.

For that reason, fossils fuels are considered as non renewable; that is, they are not replaced as soon we use them .Moreover flaming of fossiel fuels lead to pollution and many environmental impact [1].

Hydro sources are one of the most usable renewable energy properties for the generation of energy in the form of electricity.

Keywords - Small hydro power plant, generator, turbine, penstock

1. Introduction [2, 3, 4]

Small hydro is the development of hydroelectric power on a scale helping a small society or developed plant .The definition of a small hydro project varies, but a generating Capacity of 1to20 megawatt (mw) generally accepted, which align to the concept of distributed generation. To combot this shortage, the CEA and the Ministry of New and Renewable Energy are focusing on efforts in the production of electricity from SHO plants (Apple yard, 2013).Over 40% percent of the country people most living in the rural area do not have contact to electricity and on third of Indian businesses cite costly and unreliable power as one of their main business constraint. Power shortage and disturbance prevent farmer from civilizing their undeveloped incomes, deprive children of opportunity to study. The main advantages of small hydro power: Cost effectiveness, like clean energy manufacture. SHP projects can play a dangerous role in improving the overall energy scenario of the country and in particular for remote and unreachable area. Most of the potential is in Himalaya state on irrigation canal. However these plant also impact on the surrounding natural environment. In India the

improvement of micro, mini and small hydro power projects started in the year 1897.one of the first hydro power stations in India was specially made at Galogi in 1907 and is being operated by UJNL. In uttarakhand the probable capacity of small hydro power projects is about 1500MW out of total probable capacity of 20'363. . The involvement of small hydropower (SHP) hydropower installed capacity is about 5% with 34,000MW. In Indian a potential of 15,000MW has been probable in small hydro.Already 611 small hydro schemes with a total installed capacity of nearby 2,045mw are under operation and 225 schemes with another 669MW are under various stages of execution (MNRE2008) [2, 3, 4].

Finally, nuclear energy created roughly 2 percent of electricity during the same year, while geothermal and other renewable sources accounted for approximately 2 percent. [5]

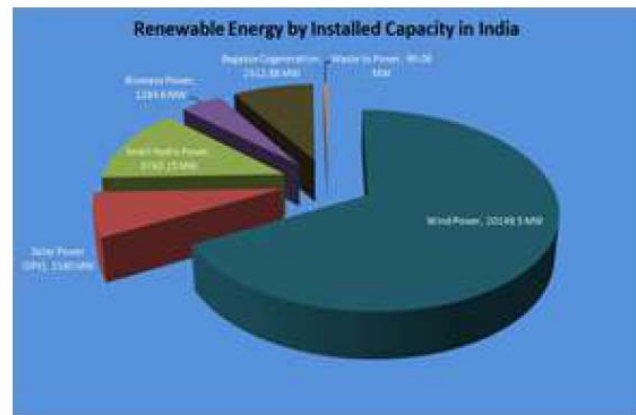


Figure 1: Electricity generation by type in India

The standard generally adopted to define the type of hydropower plant is based installed capacity as follows

- 1 Micro hydropower plants: up to 100KW
- 2 Mini hydropower plants: 101 to 2,000KW
- 3 Small hydropower plants: 2,001kw to 2,500KW
- 4 large hydropower plants :> 25,000KW

2. Methodology [6]

Hydro energy is basically energy that is taken from water and converted to electricity. Hydro energy can be used by

with many methods of capture. The most general method of using energy from water is a hydro electric dam, where water coming down throughout an area causes turbines to rotate and the energy is captured to run a generator. Many needs to use hydro energy is that it is cheaper than using other methods to convert energy to electricity. It is also dependable and can be used almost immediately when turned on to meet the demand for electricity. Therefore, one must weigh the pros and cons before deciding to use hydro energy to supply their demands for electricity.

3. Historical Background of Small Hydro Power Plant

Hydropower in development with the made of wood water wheel .Water Wheel of various types had been in use of many parts of Europe and Asia for some 2,000 years, normally milling grain. Improved engineering skills during the 19th century, collective with the need to develop less important and higher speed device to generate electrical energy, led to the extension of modern day turbines possibly the first hydro turbine was designed. In France in the 1820s by Benoit four heyron who called his invention a hydraulic motor. Small hydro power plant may be connected to expected electrical allocation network as a source of low cost renewable energy. Since small hydro projects usually minimum reservoirs and civil construct work, they are seen as having a relatively low ecological impact compared to large hydro.

4. Hydro Electric Potential of India

4.1 First Survey (1953-59) –

The first organized and inclusive study to evaluate the hydro electric property in the country was undertaken during the period 1953-1959 by the power sing of the previous central water and power expenses on the basis of established technology of hydro manufacture and the constraint imposed by topographical and hydrological kindness etc. These studies placed the economical utilizable hydro power potential of the country at 41200mw at 60% load factor (corresponding to an annual energy generation of 221 billion units).

4.2 Installed Capacity

The Total Installed Capacity India is 36878MW.

S.N O	STATES	CENTRAL SECTOR		STATE SECTOR		PRIVATE SECTOR		TOTAL	
		N O	MW	N O	MW	N O	MW	N O	MW
1.	HIMACHAL PRADESH	2	816	7	892	6	749	15	2457
2.	JAMMU&KAS HMIR	4	2450	4	1473	0	0	8	3923
3.	UTRAKHAND	12	4374	7	1655	5	829	24	6858
4.	PUNJAB	0	0	1	168	1	72	2	243
5.	MADHYAPRA DESH	3	166	0	0	0	0	3	166
6.	ANDHRAPRA DESH	0	0	3	1560	0	0	3	1560
7.	KERLA	0	0	6	373	0	0	6	373
8.	KARNATKA	0	0	2	400	0	0	2	400
9.	WESTBENGAL	1	120	2	66	0	0	3	186
10.	SIKKIM	1	320	0	0	10	1933	11	2453
11.	ARUNACHAL PRADESH	3	1610	0	0	23	79694	26	9579
12.	ASSAM	0	0	1	130	0	0	1	130
13.	MANIPUR	2	1566	0	0	0	0	2	1566
14.	TAMIL NADU	0	0	1	500	0	0	1	500
15.	MEGHALAYA	0	0	1	54	1	450	2	504
	TOTAL	28	1162	3	7291	46	12007	10	3092
			2	5				9	0

4.3 Basin/rivers Probable Installed Capacity (MW)

Indus basin 33,832
Ganja basin 20,711
Central Indian River system 4,512
Western flowing rivers of southern 9,430
Eastern Flowing Rivers of southern India 14511

In addition, 56 number of pumped storage projects have also been recognized with feasible installed capacity of 94000 mw. In addition to this, hydro impending from small, mini & micro schemes has been estimated as 6782 mw from 1512 sites. Thus in totality India is endowed with hydro potential of about 250000mw

5. Present Status of SHP in Himachal Pradesh [4]

Himachal Pradesh is particularly rich in its hydroelectricity resources. The state is having about twenty five percent of the national probable in this aspect .It has been estimated that about 27,436mw of hydel power can be generated in the state by the construction of various hydel projects on the five returning rivers basins no matter they are major ,medium or small . out of total hydel potential of the state 3934.74MW is harnessed so far ,out of which only 7.6% is under the control Himachal Pradesh government has been giving the highest main concern for its development ,since hydel generation can meet the increasing need of power for industry ,agriculture and rural electrification . Himachal has enough resources to generate excess power but, sometimes this is a misconstruction as in control scarcity overshoots ten lakh

units preclay due to less flow of in rivers and at the same time increase in lightning and heating load. Only 20 percent of the total available potential of the hydro power in the state has been harnessed up to now, with another 7060MW projects under various stages of implementation .By 2012,only 55% of the potential would be utilize.

6. Himachal Pradesh Hydro Power Sources [7]

Himachal is particularly rich in hydel resources. The state has about 25% of the national potential in the respect. it has been estimated that about 20,300MW of hydel power can be generated in the state by constructing various major, medium, small, mini/micro hydel projects on the five

river basins. The state government has been giving the highest priority for its development, as hydel generation can not only meet the increasing need of power for industry, agriculture and rural electrification, but can also be the biggest source of income to the state by way of sale of electricity to the neighbouring states. The private sector is seen as an important driver for hydropower progress in the future is best witnessed in the states where a bulk of the hydro power potential exists: Arunachal Pradesh (34% of the total potential in India), Himachal Pradesh (13%), Uttarakhand (12%). A significant share of new hydropower states are to be developed through the private sector. The most important and major project on river Sutlej in the state is the Nathpaikhal (1500MW). Bhaba Augmentation scheme, Ghanvi hydro project (22.5MW), large Hydel project (126MW) and Khauli Hydro projects for private sector involvement. Hydro electric project (70MW). Out of total hydel potential of the state 3934.74MW is harnessed far, out of which 7.6% is under the control Himachal Pradesh government while the rest is being exploited by the central government.

7. How to Work Small Hydro Power Plant

Hydropower converts the normal flow of water into power to light our homes and power our industry. The energy is created by the fall of water rotating the blades of a turbine. The turbine is connected to generator that converts the energy into electricity. A hydropower putting in place can produce depends on the amount of water passing through a turbine (the volume of water flow) or on the height from which the water falls (the amount of head). The greater flow and the head the more electrical energy produced. Some hydro power services include dam to increase the head of a waterfall or to control the flow of water, and reservoirs to store the water for future energy use (storage dam), will other create power by (run of rivers). energy use (storage dam), will other produce electrical energy by (run of rivers). Some hydro power plants also use pumped storage systems, which store the water for reuse in the manufacture of electricity during period of high demand.

7.1 Small hydro plant mainly used for:

- Run of river (ROR) Schemes without bondage,
- Run of river schemes with Pumped
- Storage schemes, pumped storage schemes.

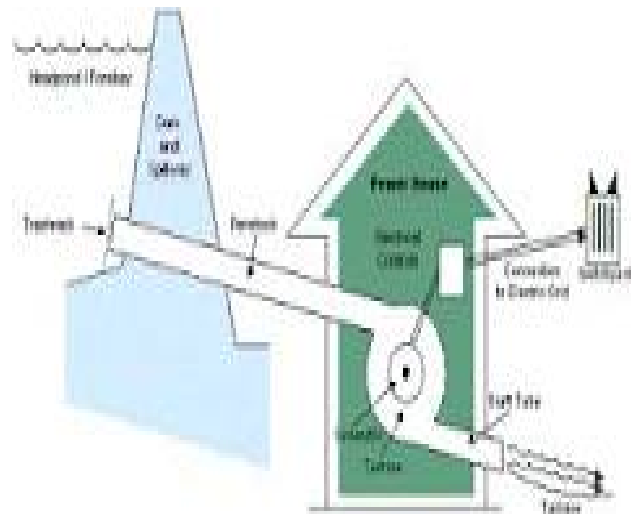


Figure-Small Hydro Power Plant

8. Impendent / Problems in Operating the SHP

1. The small hydro power stations are prone to natural calamities such as flash floods due to make unclear bursting, land sliding & long shut downs.
2. The power stations are situated in hilly areas where even road linkage are not available
3. Road blockages & severe climate conditions causing difficulty in construction, operation & maintenance.
4. Many times the telephone lines remain broken up that create lack of statement, especially during monsoon.
5. Small hydro power stations are normally connected through service lines or weak grid relatives, therefore incidence of disruptions are mainly, causing low generation.
6. Long transmission lines are horizontal to normal damages

9. Future of Small Hydro Power Plant Development

1. We can make small hydro power plant at home a large part of water is wasted in household work like washing, cleaning.
We can collect the waste part of water after its use in household work.
2. Canals also help us to established small hydro power plant.
3. As the wasting of the water is increased day by day the shortage of water become big issue .we can also established power plant on renewable resources like biogas, wind energy ,biomass.
4. Small hydro power plant mainly used for run off river.

10. Small Hydro Development Programmers in Himachal Pradesh

10.1 Private sector participation

The State Government has taken several initiatives to encourage private sector participation in small hydro power development. Himachal Pradesh is among few states , which has streamlined and is continuously refining the various procedures refining the various procedures /processes to minimize the bottlenecks.

Since then, the allotment of project sites has been a continuous processes till 30th November ,2011, 468 small hydro electric projects(up to 5MW) with an aggregate capacity of 1176MW have been allotted .A goal of 500 MW through small hydel projects by the end of 2014 has been fixed.

10.2 Demand and supply in Himachal Pradesh state

Himachal Pradesh, being generally a hilly area and located in the far north end of the country, considerably away from the coal fields, has little view of having thermal projects. Having considerable hydropower potential, which is generally found to be more economical for development than thermal power, power generation in the future for himachal Pradesh has to be essentially from hydro power sources.This demand was prospected to increase to 2536GWh in 1994-95. Similarly the peak load constraint for 1990-91 was 325 MW, which was expected to increase 541MW IN 1994-95.

11. Future of Environmental Impact of Making Hydro Power Plants [8]

Himachal Pradesh has five rivers basin i.e, satluj, Yamuna, Beas, Ravi & Chenab and identified potential of hydropower is 20463.5MW out of this only 6066.00MW

has been broken till now. Major of these hydro power projects are located in the satluj basin of kinnaur district which accounts for 9728.25 MW hydro powers potential.

From their study I got heart flouting data that, to give a way to the projects in Kinnaur districts like Shimla, Kullu, Sirmaur and Bilaspur are also precious as 1, 19,292 trees have been out to assemble these power lines. Apple is the most important cash crops of district during the district people attribute the decrease in precipitation and lack of moisture in the soil due to organization of hydro projects. Hydropower plants are the big adversary of kinnaur. Kinnaur is known of its normal beauty and cool and pleasant temperature. The main reason after its greenhouse gases that are unconfined into the atmosphere from air pollution. Hydropower project can become disaster for kinnaur and other hilly areas in near future. So before making the type of project government has to make some preplan like analysis and resettlement. Government needs to be use less critical technology and adequate damages that take care of damage and so on.

Conculsion

Small hydro power is a class in itself and is involved in the progress of remote areas of the state .The future of development of small hydro projects in Himachal Pradesh is bright and many power stations shall come up in future. Which make easy the development of rural areas of the state and make available superiority power to the people of area? Although hydro power does here a few environmental problems the natural technical, financial and environmental benefits of hydropower electric power make it an important contributor of the future world energy mix. A Hydroelectric plant uses water to make electricity water flow of the water .The power in the spinning wheels is channeled to give people electricity. Hydro power, besides being production free and renewable has the above operating benefits that provide improved value to the electric system in the form of efficiency, security and most important reliability.

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8. References

- [1] MNRE, 2008, Annual report 2007-08, New Delhi, Government of India, Ministry of New and Renewable Energy.
- [2] CEA, 1982, Guidelines for Development of small hydro – Electric schemes, New Delhi: Government of India.
- [3] BIS ,1991, Guildlines for the selection of hydraulic turbine ,preliminary Dimensioning and layout of surface Hydro Electric power houses (small ,mini,and microhydro Electric power house ,BIS 12800(PART 3),New Delhi Bureau of Indian standards
- [4] Nigam, P.S, 1995, Handbook of Hydro –Electric Engineering, Roorkee India: Nem Chand and brothers.
- Footnotes should be typed in singled-line spacing at the bottom of the page and column where it is cited. Footnotes should be rare
- [5] www.eai.in/ref/ae/hyd.html potential and future of hydro energy.
- [6] <http://www.greenenergyhelpfiles.com/hydroenergy.htm>
- [7] Choudhary, N. (2013b) development of hydropower in india:between global Norms and local Action Thesies,technischeunivesitatBerlin,http://opus4.knobv.de/opus4-turbline/front_door/index/index_dociid/3663
- [8] Environmental impact of making hydro powerplant www.scind.org/...../enviromental_impact_of_making_hydropower_project Feb19, 2014 and 16/4/16

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Review on Multi-Objective Emission and Economic Load Dispatch Problems

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Abstract - Economic load dispatch (ELD) is the phenomenon of allocating the demand of load between the available generation units such that the cost function of operation is reduced. The burgeoning of fuel cost and generation of power require the improvements in optimization methodologies for economic load dispatch (ELD) problems. The practical ELD problem is considered as a non-convex objective function with both equality and inequality constraints. With the increasing concern of environmental pollution such as SOX, NOX and COX caused by thermal power plants, reduced emission have to be considered along with the load dispatch, called a emission dispatch (ED) problem. The dual-objective of economic emission dispatch (EED) problem is dealing with the environmental impacts that are accrued from fossil-fuelled power plants. This paper delineates the techniques used to clarify ELD and CEED problems. Outcomes procured from various techniques are compared with other optimization algorithms and best algorithm is applied for solution of ELD and CEED problems. The purpose of CEED is to minimize both the operating fuel cost and emission level simultaneously while satisfying load demand and operational constraints.

Keywords-Economic Load Dispatch, Emission Dispatch Combined Economic Emission Dispatch,

1. Introduction

Economic Dispatch(ED) problem is very complicated to solve because of non-convex objective function and lots of constraints. ED deals with the determination of optimal generation schedule of available generators so that total generation cost is reduced within system constraints. The well known long established methods like gradient method [1], lambda iteration method [2, 3], linear programming [4], quadratic programming [5], Lagrangian multiplier method [6] and classical methods based on co-ordination equations are applied to solve ELD problems. These conventional methods cannot adequately solve such

problems because they are susceptible to initial estimates and computational complexity.

During last researches and methods had handled with ELD problems. Fuzzy Logic Control (FLC) is capable in control applications by performing the actions in terms of linguistic rules drawn from human behavior of human operator rather than an algorithm incorporate from model of the system [7, 8]. Further method like Artificial Neural Network (ANN) has its own merits and demerits. The main problem of ANN is long training time, the selecting number of layers and the number of neurons in each layer [9, 10].

Another approach is to applied to Evolutionary Algorithm (EA), which is believed to be very effective to pact with ELD problem. Among EA techniques, Genetic Algorithm (GA)[11,12] is brought but it requires long run time depending upon the size of system so it gives rise to same suboptimal solutions frequently. Further in accordance with these techniques Simulated Annealing (SA)[13,14] is introduced ,but this might fail by getting trapped in local optimal. Evolutionary Programming (EP)[15] is popularized, however it has slow convergence rate for large problem. Later improved Tabu Search(TS) [16] is explored, though the efficiency of the algorithm get deduce by using highly epistatic objective functions and the large number of parameters to be optimized, also the time consuming method. Ant swarm optimization (ASO)[17] is presented but its theoretical analysis is challenging and probability distribution changes with iteration. Particle Swarm Optimization (PSO)[18-20] lags behind in partial optimism. Moreover, it cannot achieve the problems of scattering and optimization. Gravitational Search Algorithm (GSA)[21], gives poor performance due to lack of agents' diversity in GSA. Artificial bee Colony (ABC)[22] is introduced but it gives slow convergence and contradiction between exploration and exploitation these should be well balanced for attaining optimization. On the other hand, Flower Pollination Algorithm (FPA)[23] uses key parameter p (switch probability) which makes it easy to implement and fast convergence. Moreover, this technique guarantee escaping from local minimum solution

2. Problem Formulation of ELD

The ELD problem can be defined as examining the least cost power generation schedule from a set of online generating units to meet the load demand at given point of time. Although the objective of problem is to minimize operating cost meeting the load demand, various physical and operational constraints make ED highly nonlinear, especially for large system.

2.1 Objective function of ELD

For thermal generating units, fuel cost per unit power output varies accordingly with the output power of the unit. Fuel costs are modeled as a quadratic function. Mathematically, the problem can be modeled as:

$$\min f = \sum_{i=1}^N F_i(P_{Gi}) \quad (1)$$

Where $F_i P_i$ is the total generation cost for generator unit i , which is defined by following equation:

$$F_i(P_{Gi}) = a_i P_{Gi}^2 + b_i P_{Gi} + c_i \text{Rs/hr} \quad (2)$$

Where a_i, b_i and c_i are coefficients of generator i .

2.2 Equality and Inequality Constraints

(i) Power balance

Considering the transmission losses in system, Equation can be modeled as:

$$\sum_{i=1}^N P_{Gi} = P_D + P_L$$

Where P_D the load is demand and P_L is total transmission losses of system. To derive losses, the B-coefficient method is commonly used, the losses are expressed as quadratic function:

$$P_L = \sum_{i=1}^N \sum_{j=1}^N P_{Gi} B_{ij} P_{Gj} + \sum_{i=1}^N B_{0i} P_{Gi} + B_{00} \quad (3)$$

Where B_{ij}, B_{0i} and B_{00} are dependent on impedance of transmission lines of power system.

(ii) Power limits

Under practical conditions, limits restrain the operating range of all online units for setting generator operation between two operating time. The generation may ascend or descend with corresponding upper and lower limits. Hence, units is restricted due to limits as below.

If power generation increase, we have

$$P_{Gi(\min)} \leq P_{Gi} \leq P_{Gi(\max)} \quad i = 1, 2, \dots, N \quad (4)$$

Where $P_{Gi(\min)}$ the lower limit of generated power is. $P_{Gi(\max)}$ is the upper limit of generated power.

3. Problem formulation of emission dispatch (ED)

With the increasing concern of environmental pollution such as SO_x, NO_x and CO_x caused by thermal power plants, reduced emission have to be considered along with the load dispatch, called a emission dispatch (ED) problem. The ED intent to schedule optimal power outputs of all generators in system so as to reduce the emission of various gasses.

3.1 Objective function of ED

The ED is a complex and non-convex problem. The objective function can be represented by following equation

$$\min E = \sum_{i=1}^N E_i(P_{Gi}) \quad (5)$$

The emission function for generator is given by

$$E_i = \alpha_i P_{Gi} + \beta_i P_{Gi}^2 + \gamma_i P_{Gi}^3 \quad (6)$$

Where, α_i, β_i and γ_i are constants evolved from the emission property of the generator.

4. Problem Formulation with Combined Economic Emission Dispatch (CEED)

The combined form of economic load dispatch and emission dispatch, generally termed as CEED become a complex non-linear function. It is aimed that scheduling of generators should operate with both minimum fuel costs and emission levels, together, while satisfying the load demand and operational constraints.

4.1 CEED

Optimization of generation cost is formulated based on classical ELD with emission and flow constraints. The objective function can be expressed as follows [26]:

$$\text{Minimize } F = \sum_{i=1}^N [F_i(P_{Gi}), E_i(P_{Gi})] \quad (7)$$

Both the emission and economic dispatch is formulated as a multi-objective problem by considering fuel cost and emission objectives of generating units.

Conversion techniques for multi-objective problem into scalar optimization:

The bi-objective optimization problem is converted into a scalar function using various techniques as such as

(i) Weighting Method:

The weighting method [30, 31], also known as the parametric approach, has been known method used for solving multiobjective problems. Multiobjective problem is transformed into scalar optimization as follows:

$$\text{Minimizes } \sum_{i=1}^N w_i F_i(P_{Gi}) \quad (8.1)$$

Subject to



$$x \in X \quad (8.2)$$

$$\sum_{i=1}^n w_i = 1, w_i \geq 0 \quad (i = 1, 2, \dots, n) \quad (8.3)$$

Where w_i are the weighting coefficients the approach yields best results for decision making only if solved many times for different values of w_i ($i=1,2,\dots,n$). though some known values of weighting coefficients, the decision maker still chooses them, presumably on the basis of point of view. The weighting coefficients do not follow proportionally the relative importance of the objectives but are only factors which, when varied, locate points in the non-inferior set.

Decision Making

Assuming the imprecise nature of decision maker's judgement, it is natural to consider that the decision maker may have fuzzy or imprecise goals for each objective functions. The fuzzy sets are defined by equations known membership functions; these functions represent the degree of membership in some fuzzy sets applying values from 0 to 1. The membership value 0, and point out incompatibility with the sets, while 1 means full compatibility. By taking account of minimum and maximum values of each objective function together with rate of increase of membership satisfaction, decision maker must detect membership function $\mu(F_i)$ in a subjective manner. Here it is supposed that $\mu(F_i)$ is strictly monotonic descending and continuous function defined as

$$\mu(F_i) = \begin{cases} 1 & \text{if } F_i \leq F_i^{\min} \\ \frac{F_i^{\max} - F_i}{F_i^{\max} - F_i^{\min}} & \text{if } F_i^{\min} < F_i < F_i^{\max} \\ 0 & \text{if } F_i \geq F_i^{\max} \end{cases} \quad (i = 1, 2, \dots, N)$$

The value of membership function suggests how far (in the scale from 0 to 1) a non-inferior solution satisfied the F_i objective. The sum of membership function values $\mu(F_i)$ ($i=1, 2, \dots, N$) for all objective calculated in order to measure the accomplished of each solution in satisfying the objectives. The accomplishment of each non-inferior solution can be rated w.r.t all the K non-inferior solutions by normalizing its accomplishment over the addition of the accomplishments of K non-inferior solution as below:

$$\mu_D = \frac{\sum_{i=1}^N \mu(F_i)}{\sum_{i=1}^K \sum_{j=1}^N \mu(F_j^i)}$$

The function μ_D in above equation can treated as membership function for non-inferior solutions, in a fuzzy set and represented as a fuzzy cardinal priority ranking of non-inferior solutions. The solution that attains the maximum membership μ_D , in the fuzzy set so procured can be chosen as the 'Best' solution or having the highest cardinal priority ranking.

$$\text{Max } \{\mu_D; K = 1, 2, \dots, K\}$$

(ii) Price Penalty Factor:

Price Penalty Factor is represented as following [27]:

$$\text{Minimize } F = F_i + h \times E_i$$

the price penalty factor h , which is ratio between the maximum fuel cost and maximum emission of corresponding generator in Rs/Kg[28,29], gives the emission along with fuel cost, then F is the total operating cost in Rs.

$$h_i = \frac{F_i(F_i^{\max})}{E_i(F_i^{\max})}, \quad i=1, 2, \dots, n$$

The below given steps are used to find price penalty factor for a particular load demand:

1. Find the ratio between maximum fuel cost with maximum emission of each generator.
2. Arrange the values of price penalty factor in increasing order.
3. Sum up the maximum capacity of each unit (P_i^{\max}) one at a time, proceeding from the smallest h_i , until $\sum P_i^{\max} \geq P_D$.
4. At this point, h_i which is related with the last unit in this process is near about the price penalty factor value (h) for the given load.

Hence, the correct value for the particular load demand is provided by a modified price penalty factor (h) by interpolating value of (h), corresponding to their load demand values.

5. Conclusion

A main objective for the Thermal power generation is to minimize fuel cost by allocating optimal power generation to each unit (Economic Dispatch) and to keep emissions within the environmental license limits (Emission Dispatch) subject to equality and inequality constraints, because to conflicting nature of emission and economy objectives, problem becomes multiobjective in natural world. In this paper, various optimization techniques are explained which is used to solve the CEED problem, but these techniques are not much capable up to some extend because these techniques do not provide ecofriendly environment satisfactory.

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References

- [1] J.C. Dodu, P. Martin, A. Merlin, J. Pouget, An optimal formulation and solution of short-range operating problems for a power system with flow constraints, Proc. IEEE 60 (1) (1972) 54–63.
- [2] C.L.Chen, S.C.Wang, Branch and bound scheduling for thermal generating units, IEEE Trans. Energy Convers. 8 (2) (1993) 184–189.
- [3] P.Aravindhababu, K.R. Nayar, Economic dispatch based on optimal lambda using radial basis function network, Int. J. Electr. Power Energy Syst. 24 (7) (2002) 551–556.
- [4] J. Parikh, D. Chattopadhyay, A multi-area linear programming approach for analysis of economic operation of the Indian power system, IEEE Trans. Power Syst. 11 (1) (1996) 52–58.
- [5] J.Y. Fan, L. Zhang, Real-time economic dispatch with line flow and emission constraints using quadratic programming, IEEE Trans. Power Syst. 13 (2) (1998) 320–325.
- [6] J. Nanda, L. Hari, M.L. Kothari, Economic emission dispatch with line flow constraints using a classical technique, IEE Proc. Gener. Trans. Distrib. 141 (1) (1994) 1–10.
- [7] Y.S. Brar, J.S. Dhillon, D.P. Kothari, Multiobjective load dispatch by fuzzy logic searching weightage pattern, Electr. Power Syst. Res. 63 (2002) 149–160.
- [8] L. Singh, J.S. Dhillon, Fuzzy satisfying multiobjective thermal power dispatch based on surrogate worth trade-off method, Electr. Power Components Syst. 36 (1) (2008) 93–108.
- [9] A.Y. Abdelaziz, S.F. Mekhamer, M.A.L. Badr, M.Z. Kamh, Economic dispatch using an enhanced Hopfield neural network, Electr. Power Components Syst. 36 (7) (2008) 719–732.
- [10] P. Surekha, S. Sumathi, A self-adaptive fuzzy means based radial basis function network to solve economic load dispatch problems, Int. J. Comput. Appl. 25(4) (2011) 50–59.
- [11] M.A. Abido, A novel multiobjective evolutionary algorithm for environmental economic power dispatch, Electr. Power Syst. Res. 65 (1) (2003) 71–81.
- [12] H. Bouzeboudja, A. Chaker, A. Alali, B. Naama, Economic dispatch solution using a real coded genetic algorithm, Acta Electrotechnica Informatica 5 (4) (2005) 1–5.
- [13] K.P. Wong, Y.W. Wong, Genetic and genetic/simulated – annealing approaches to economic dispatch, IEE Proc. Gener. Transm. Distrib. 141 (5) (1994) 507–513.
- [14] K.P. Wong, C.C. Fong, Simulated annealing based economic dispatch algorithm, IEE Proc. C (Gener. Transm. Distrib.) 140 (6) (1993) 509–515.
- [15] N. Sinha, R. Chakrabarti, P.K. Chattopadhyay, Evolutionary programming techniques for economic load dispatch, IEEE Trans. Evol. Comput. 7 (1) (2003) 83–94.
- [16] W.M. Lin, F.S. Cheng, M.T. Tsay, An improved Tabu search for economic dispatch with multiple minima, IEEE Trans. Power Syst. 17 (1) (2002) 108–112.
- [17] J. Cai, X. Ma, L. Li, Y. Yang, H. Peng, X. Wang, Chaotic ant swarm optimization to economic dispatch, Electr. Power Syst. Res. 77 (10) (2007) 1373–1380.
- [18] J.B. Park, K. Lee, J. Shin, K.Y. Lee, A particle swarm optimization for economic dispatch with non-smooth cost functions, IEEE Trans. Power Syst. 20 (1) (2005) 34–42.
- [19] M.R. Alrashidi, M.E. El-Hawary, A survey of particle swarm optimization applications in power system operations, Electr. Power Components Syst. 34 (12) (2006) 1349–1357.
- [20] D.C. Secui, I. Felea, S. Dzitac, L. Popper, A swarm intelligence approach to the power dispatch problem, Int. J. Comput. Commun. Contr. 5 (3) (2010) 375–384.
- [21] A.Y. Abdelaziz, E.S. Ali, S.M. Abd Elazim, Flower pollination algorithm to solve combined economic and emission dispatch problems, doi:10.1016/j.jestech.2015.11.005.
- [22] J.G. Vlachogiannis, On the profitability of load dispatch in power systems, Int. Rev. Electr. Eng. 8 (2) (2013) 810–819.
- [23] G. Aydin, The modeling of coal related CO₂ emissions and projection into future planning, Energy Sources Part A Recovery Util. Environ. Eff. 36 (2) (2014) 191–201.
- [24] G. Aydin, The development and validation of regression models to predict energy-related CO₂ emissions in Turkey, Energy Sources Part B Econ. Plann. Policy 10 (2) (2015) 176–182.
- [25] M.A. Abido, Environmental/economic power dispatch using multiobjective evolutionary algorithms, IEEE Trans. Power Syst. 18 (4) (2003) 1529–1537.
- [26] A.L. Devi, O.V. Krishna, Combined economic and emission dispatch using evolutionary algorithms – a case study, ARPN J. Eng. Appl. Sci. 3 (6) (2008) 28–35.
- [27] P. Venkatesh, R. Gnanadass, N.P. Padhy, Comparison and application of evolutionary programming techniques to combined economic emission dispatch with line flow constraints, IEEE Trans. Power Syst. 18 (2) (2003) 688–697.
- [28] D.G. Prasad, D.H. Mohan, P. Manjree, B.K. Panigrahi, Economic load dispatch using artificial bee colony optimization, Int. J. Adv. Electron. Eng. 1 (1) (2011) 119–124.
- [29] K. Senthil, K. Manikandan, Economic thermal power dispatch with emission constraint and valve point effect loading using improved Tabu search algorithm, Int. J. Comput. Appl. 3 (9) (2010) 6–11.
- [30] D.P. Kothari, J.S. Dhillon, Power System Optimization, 2nd



ed., PHILearning Pvt. Ltd, New Delhi, 2006.

[31] Harinderpal singh, Yadwinder Singh Brar, D.P.Kothari,
Multiobjective Load Dispatch using
PSO,IEEE,DOI:10.1109/ICIEA.2013.6566379.

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Investigation of Biogas as a Fuel

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Abstract - Biogas is produced from organic wastes. It is a clean fuel and can replace the petroleum based fuels up to some extent. This resource is very widely available. With the appropriate technology in resolving the problem of sustainable energy supply Integration of renewable energy systems plays a pivotal role. From regionally available raw material such as recycled waste biogas can be produced. It is established from the research the world has enough clean and renewable energy resources. The environment is polluted by fossil fuels. Nuclear energy requires careful handling of both raw as well as waste materials. Now, the focus is shifting to more and more in the direction of the renewable sources of energy, which are nonpolluting. In India, the main sources of renewable energy are biogas, biomass, hydro power, solar and wind.

Keywords - Biogas, Raw materials, pollution, renewable energy resources.

1. Introduction

In environment air pollution and global warming are the major concern arises. Biogas contains methane, with a warming effect a potent greenhouse gas is 21 times greater than that produced by carbon dioxide [1]. Biogas can be manufactured by anaerobic digestion with anaerobic organisms, which absorb material inside a closed system [2]. In 2014-15, Biogas is manufactured in India about 20,700lakh cubic meters which are equivalent to 5% of the total LPG consumed in the India [3]. Biogas is mixture of methane 50–75% (CH₄) and carbon dioxide 25–50 % (CO₂) hydrogen and small amounts of hydrogen sulfide. The gases methane, hydrogen, and carbon monoxide (CO) can be oxidized with oxygen. This energy release allows biogas to be used as a fuel; it can be used for any heating purpose, such as cooking. Biogas can be used to produce electricity and heat in a gas engine.^[4] Biogas can be compressed; as such natural gas is compressed to CNG, which is used to power vehicles. Biogas potential in the UK is estimated to replace around 17% of fuel vehicle. Biogas is reducing CO₂. Biomass naturally decays releasing methane and also other gasses into the atmosphere, if the biomass is collected and methane is produced in controlled way and after being methane produced and reduce the green house effect. Biogas is an

energy source with this we can minimize our dependency on fossils such as coal, oil and natural gas. Biogas reduce the risk of pollution when this material is applied (compared with raw manure), since it is whole decomposed the nutrients are available (80%) to plants and bacteria. Biogases a plant reduces the risk of widely spread seeds of weed.

1.1 Feed Stocks

Following may be the Feed stocks (raw material) of biogas:

- Feedstock based on community
 - Sewage sludge
 - Clippings of grass
 - Food remains of starch
 - Institutional wastes
- Feedstock of Agriculture
 - Animal manure
 - Energy crops
 - Algal biomass
 - Crop residues
- Feedstock of industry
 - Food processing
 - Dairy
 - Industry of Starch
 - Industry of sugar
 - Industry of biochemical
 - Pulp and paper industry
 - Industry of cosmetics
 - Pharmaceutical industry

2. Uses of Biogass

Biogas can be used:

1. for heating and cooking.
2. for domestic and street lighting.

3. for running tube well and water pump.
4. for running Conventional internal combustion engines, diesel and petroleum engine.
5. for the compressed natural gases.

3. Literature review

P. Venkata et al. [6] Has worked on the topic of the performance and emission characteristics of 4 stroke petrol engine fueled with biogas /L.P.G blends. In this experiment it was clear that the performance of engine is found to be very considerable at 50% blending of biogas. At full load of 50% blending the specific fuel consumption and brake thermal efficiency are high when these are compared to the petrol and LPG. The mechanical efficiency is also high for the 50% blending with compared to the Petrol and L.P.G. The emission values of CO, HC and NOx are minimum for the biogas when these are compared to the petrol and L.P.G.

Debabrata and Murugan [7] have made contribution on Application of Biogas and the Production of area as a Gaseous Fuel for Internal Combustion Engines. Their opinion from this experiment was that Biogas is a renewable fuel, obtained from the anaerobic digestion of anaerobic organism wastes or crops of biomass. From tackling and transport climate change it can contribute to decreasing carbon emissions. Biogas as a renewable fuel helps to reduce dependence on conventional fossil fuels.

Vinaya C. Mathad et al.[8] has worked on emission and fuel economy of an automotive spark mechanism igniting the fuel in an engine vehicle which was fuelled with methane biogas and CNG using chassis dynamometer. The emissions such as CO, HC and NOx are marginally higher with the improved quality of biogas than supporting part of CNG. But, this experiment indicates with the enriched biogas the vehicle's emission fuel meets to the BS IV Emission Norms. In fuel economy of the vehicle there is no specific change with the improved quality of biogas (24.11 km/kg) as compared to supporting part of CNG (24.38 km/kg).The transient emission characteristics (CO, HC and NOx) for fuels are very higher with urban cycle (low speed) than extra urban cycle. (High speed) As the methane improved quality of biogas gives similar performance like fossil CNG, the improved quality of biogas could be used as an auto fuel for spark mechanism igniting the fuel in an engine vehicle.

P. R. Swain et al. [9] has worked on the topic of evaluation performance characteristics of biogas fueled C.I engine. In this paper using biogas and diesel the effect on performance of engine dual fuel operation is presented and also find the level of mixing ratio of diesel and biogas to effective run the C.I engine. The experiments were conducted by varying RPM and volume of Biogas and diesel over wide ranges. Comparatively of performance characteristics of C.I engine evaluation using diesel and biogas, with a step of 50 rpm, engine speed is changed from 1400 rpm to 1600 rpm. Engine efficiency is 20% increased by using dual fuel arrangement. The Brake Thermal Efficiency is reduced as the percentage of biogas become greater in size as compared to pure conventional diesel fuel. This is caused by lower energy contents in diesel fuel with biogas. The biogas was compared along with diesel for the properties obtained from the shown in Table 1.

Table 1: comparison

Property	Diesel	Biogas
Heating Value(MJ/Kg)	45.91	24.50
Cetane number	50	-
Specific gravity @15 °c	0.830	0.001
Sulphur content (%wt.)	0.037	0.12
Viscosity @ 40°c (cSt)	3.34	-

K.C.K Vijay Kumar et al. [9] has work as Alternate Fuel using Bio Gas and Bio Diesel to find the Performance of Vibration, Emission and Noise Characteristics of C.I Engine .This experiment concluded that brake thermal efficiency of the engine is slightly decreased with bio-diesel blends and B20. The emission like CO, CO₂, HC, smoke are slightly enhanced and HC, NO_x are slightly decreased when compared to diesel. The vibration and noise are reduced in bio-diesel, diesel blends but slightly increases in B20-biogas mode as compared to diesel.

Conclusion

Biogas is available in India at low cost and quality.

The emissions like CO, CO₂ smoke are slightly larger for diesel bio-gas blends and bio-diesel compared to base diesel.

After removal of H₂S and CO₂ by use of scrubbing, biogas is enriched in methane (CH₄).biogas becomes equivalent to natural gas but production rate is very low.

The performance of the engine is not reduced 20% as used in bio-diesel.

In biogas presence of carbon dioxide up to 30% which improves the engine performance.

Efficiency of the engine is increased by 20% by using dual fuel arrangement.

References

- [1]www.tusk.org/effect of global warming.pdf.
- [2] National Non-Food Crops Centre,"NNFCC Renewable Fuels and Energy Factsheet: Anaerobic Digestion", Retrieved on 2011-02-16.
- [3] By Surya Abhisek on June 19, 2015 LPG subsidy, stories.
- [4] "Engines & Biogas ", wwwclarke-energy.com Retrieved 21 November 2011.
- [5] Calverton Energy Conference Bath, UK" Bio methane fueled vehicles the carbon neutral option" 24 October 2009.
- [6] Venkata Ramesh Mamilla, V. Gopinath, Dr.G.Lakshmi Narayana Rao, C.V.Subba Rao," emission characteristics and performance of 4 stroke petrol engine fueled with l.p.g/biogas blends" International Journal of Advanced Engineering Technology E-ISSN 0976-3945.
- [7] S.Murugan Production, Debabrata Barik "As a Gaseous Fuel,Application of Biogas for Internal Combustion Engines" International, Journal of Engineering Research & Technology (IJERT) Vol. 1 Issue 7, September – 2012.
- [8] K.A. Subramanian ,P.M.V. Subba Rao, Vinaya C. Mathad,V.K. Vijay "using chassis dynamometer Comparative evaluation of fuel economy of an automotive spark ignition vehicle and emission fuelled with methane enriched biogas and CNG" journal homepage:www.elsevier.com/locate/apenergy Applied Energy 105 (2013) 17–29.
- [9] N.H.S.Ray, P.R.Swain,and M.K.Mohanty,"An Investigation on Performance Characteristics of C.I engine using diesel and biogas in dual fuel mode" International Journal of Engineering Research & Technology (IJERT) Volume 3, Issue 6, June 2014.
- [10] M. Ravi, K.C.K Vijaya Kumar and Dr.A. Murugesan, International Journal of PharmTech Research CODEN (USA): IJPRIF, ISSN: 0974-4304 Vol.8, No.1, pp 11-19, 2015.

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A Green and Efficient Transportation System “Sky Bus Technology”

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Abstract-Transportation is the life blood of Indian economy. Our national transportation system also binds us together. The contribution in this infrastructure today is staggering. Large population and mass transportation is one of the major barrier still, Transport in India has experienced major growth and expansion in recent years. In metro cities, traffic jams in denser areas causes air as well as noise pollution with huge massive snarl ups. As a major contributor of global climate change due to greenhouse gas emissions, transportation is a prime target for obtaining sustainable environment leads to green transportation. The paper presents a review on Sky bus Technologies in which Sky bus is one of the green and efficient transportation system making public transport a more attractive option.

Keywords: Green transportation, Sky bogies, Sky way.

1. Introduction

Sky bus is a unique mass transit system which can be put up in any congested and crowded city within two years for ease and safe transportation. Passenger vehicles are major pollution contributors, producing significant amount of nitrogen oxides, carbon monoxide and other pollution. The health risks of air pollution as well as noise pollution are extremely serious. To maintain the air quality standards we should adopt green transportation system. Clean vehicle and fuel technology provide us with an affordable, available means of transportation related pollution and climate change emissions. These include fuel efficient vehicles that use less oil, cleaner fuels that produce less emissions and electric cars. Urban transportation in most of the cities has become a state of crisis. Present technologies like subways, elevators, underground rail system cannot follow road alignments. The most of the latest technologies such as monorail, Bus Rapid Transit System, Metro railway adopted as public mass transportation by the nation. One of such latest technology in transportation to overcome the barriers is Sky bus Metro which should be adopted in most of the metro cities in the nation.

2. About The Technology

Sky bus metro is a prototype suspended worldwide system invented by Indian Technologist Mr. B. Raja Ram. The system have as an essential feature with an innovative track with the buses suspended below the track similar to the H-Bahn systems in Germany. The system is tested by the Konkan Railway Corporation as eco-friendly and economical metro system. The sky bus uses pre - fabricated latest construction technologies, which save time and money resulting ease in the execution of the project in busy metro regions. All these structural engineering methods are well - proven. Sky bus is an urban transportation solution which has modified the existing patterns of the massive road traffic patterns. It comes under tramway category art 360(20) which is excluded from Indian railways. The fixed concrete box kind structure at the height of approx. 8m runs with a 3 phase electric motor. The total length of approximate 19m train looks aesthetically good and provides a comfortable and luxurious experience to the passengers with unique system different to an ordinary bus or a train as shown in Fig.1.



Fig.1

2.1 Principles of Sky Bus

- Railway tracks over-head carry wheels and driving bogie with coach below.

- Sky bus stations are decorous with confined size with ease in approach to roads and almost no land is needed with beautiful skyline.
- Sky bus is eco-friendly and merges with local environment. It has same capacity as heavy metro rail but with no tears of displacement.
- The bus can fly over water bodies, roads and even long span covering buildings.
- The mechanism to transfer a sky bus from one track to another is Transverse working principle.

3. Construction of Sky Bus Technology

The structure is constructed at the divider space between road lanes without disturbing the traffic. Sky bus follow the existing routes. The noise free and pollution free rail carries the passengers in air conditioned comfort. Heavy 52/60 kilograms /metres rails placed at standard gauge floating in elastic medium and damped by inertia of measured mass held in a 8metres X 2metres box enclosure, supported over a 1m diameter. columns spaced at 15metres and located at 15metres distance from each other .It has no signaling and no points of crossing.[1,2,3,4]

3.1 Components of Sky Bus

The major components of the sky bus are as follows:

- a) Sky way
- b) Sky bogie
- c) Sky coaches
- d) Sky station
- e) Track switching arrangements



3.1. a) Sky Way

The pile foundations supports 1m diameter piers at the divider space between road routes with the height of approximate 8-10m. The column series is spaced at 15m from pier to pier along with the route line. The two rails

fixed with appropriate fastening within the concrete box guide and support the sky bogies. There are no crossings and signals.

3.1. b) Sky Bogie

Standard two axles bogies used in metro runs at the speed of 100kmph and can exceed up to 160kmph. Linear Induction motor technology is incorporated with 4th rail driving, which is above the bogie and 3 phase AC motors with regenerative power capability are used. 3rd railing is used for current location. Regenerative and emergency mechanical braking is adopted.

3.1. c) Sky Coaches

Double walled light shells with wide larger windows are suspended below the railings. The air-conditioned coaches with 4m wide automatic doors and audio visual information to assist passengers carry 300 passengers on each parallel side. The coach with the dimensions 9.25m X 3.2m consists of 2 coaches with total length of 18.5m.

3.1. d) Sky Station

Stations are available at every 1 km. It is a natural footbridge across the road. From up line to down line the station provides natural access, which is easy. Unlike other large platforms in railways and rapid transit systems, it needs a small area about 50m. It provides the service at every 2-3 minutes to reduce the waiting time of passengers. Stations are completely automated by access control of passengers by swipe/prepaid cards. The platform is constructed at the height of 5.5m above the road level.

3.1. e) Track Switching Arrangements

The traverse is the system which automatically shifts the sky bus units for balancing the loads/changing routes too as well as shift units to depot lines etc whether it has no crossings and signals.

4. Sky Bus A Green Mode Of Transportation

Why Sky Bus saves 50% to 75% in costs!

- Conventional railway provides for heavy steel coaches to protect people from derailments and capsizing. So carry more steel and dead weight instead of people.
- With total weight of 48T, a railway can carry only 70 persons in 20 m length
- Sky Bus has no such problem; no derailment hence uses very light weight coaches and carries more people using much less dead weight
- Sky Bus with the same weight & length carries 300 persons comfortably

4.1 Advantages

- Fast transportation
- No land acquisition problem
- Comfort to passengers
- No demolition
- No vandalism
- No capsizing Tourism
- Low capital and running cost Flyover Luxury
- No deaths due to trespassing
- Low maintenance cost
- No interference with normal traffic
- Can be built on existing flyover
- No pollution

4.2 Sky Bus In Near Future

After the successful test run of the skybus on its track built in Goa (Margaon).The Indian railways has recognized its work efficiency and found it as future Mass transit system in the urban areas. The skybus is proposed by Indian railways in India in following cities Hyderabad, Pune, Mumbai, Bangalore ,Chennai , Delhi, etc.

5. Conclusion

Ultimately life is more precious than any other thing hence we need to give safer transportation facility, the Sky bus is the technological breakthrough that India has achieved. Sky bus is an improved railway technology, eliminating the problems of existing metro rail systems, like - derailment collisions and capsizing crushing people - which have been suffered by country for decades.

• Sky bus is an improved railway technology, it eliminates the problem of city suffering from heavy traffic. Financially Sky bus metro makes urban transport dream - come true for administrators and people. The sky bus metro is one single technology which can- change the face of our cities

• Pollution free & Noise free transportation. If we take out almost 10 million road vehicles in the cities and make the cities live able, improving quality of life and generate new opportunity's to generate wealth.

References

- [1] Bhaveshkumar M.Katarial Dr. Neeraj kumar D.Sharma2 Bhavin K. Kashiyani3, A Review on "Sky Bus Technology: A Mass Transportation System" 1M. E. Student(Construction Management) 2Head & Associate professor 3Assistant professor 1, 2, 3Civil Engineering Department 1, 2, 3 S.N.P.I.T. & R.C, Umrakh, Bardoli, Gujarat, India
- [2] Dr. B. Rajaram "Rail International -Brussels", A New Theory of Rail Wheel Interaction, April 1984
- [3] Balamurali Arumugam Department of Civil Engineering, Latha Mathavan Polytechnic College, India, Sky Bus Metro Rail Linking Cities in Himalaya Region .
- [4] Rajaram.B.Engr; Inventor ACD/SKYBUS

Low Cost Earthquake Resistant Construction In Indian Perspective

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Abstract - Earthquakes had been highly disastrous to mankind and its development. The sudden and unexpected nature of the earthquakes makes the situation beyond tolerance on psychological front as it shakes the moral of the residents. The problem of devastation by earthquakes is more critical in developing and underdeveloped countries because of unplanned and unstructured construction by using the inferior quality building materials. The concept of Earthquake Resistant Buildings and Designs is coming up these days to counter this problem. This paper assesses this issue, especially with regards to the developing and poor countries like India and presents some solutions to the problem in Indian perspective.

Keywords - Author Guide, Article, Camera-Ready Format, Paper Specifications, Paper Submission.

1. Introduction

In order to make the human environment safe from an earthquake disasters, our predecessors studied the earthquake events exhaustively with extreme care and investigated the possible causes and solutions [1]. Counter measures have been developed against thousands of experiences to mankind from earthquake disasters. This has led to the emergency Earthquake Engineering. It is entirely based on the past experiences and hence it is not theoretically consistent sometimes. Although the earthquake engineering has addressed a number of problems, there remains a lot to be improved to protect human life from future earthquake disasters. Disasters are unexpected events which have adversely affected humans since the dawn of our existence. The sudden and unexpected nature of the earthquake event makes it even worse on psychological level and shakes the moral of the people.

Reliable statistics about damaged and undamaged buildings are important to develop the strategies for disaster reduction in the times to come. Some comprehensive statistics have been documents after the major earthquakes like; 1985 Mexico Earthquake, 1990

Luzon (Philippines) Earthquake, 1992 Erzincan (Turkey) Earthquake, 1995 Hyogoken Nanbu (Kobe) Earthquake etc.[2,3,4,5]. An earthquake of 7.0 M magnitude struck Haiti on January 10, 2010 and more than 230,000 people died and at least 300,000 injured. Around 1.5 million people became homeless as a result of this disaster. Similarly, at least 20,085 people killed and 166,836 injured in the earthquake that struck the Bhuj area of Gujarat. Approximately 339,000 houses were destroyed and 783,000 damaged in this earthquake. Many bridges and roads were also damaged during this disaster. This event was felt in southern Pakistan, throughout the northern India, Bangladesh and western Nepal, killing at least 18 people and injuring a number of others. However, in October of 1989, the same magnitude of earthquake struck in San Francisco and killed only 62 people and 3757 people were injured. Why did countries like India, Pakistan, Haiti etc. suffer so much devastation and lost so many of their innocent citizens?

One of the major reasons for such a loss of life and property is due to inappropriate construction, which lacked earthquake proof designs [6]. Most of the buildings in these countries are constructed with whatever materials are available locally, and as the ground shook the unreinforced masonry and insufficiently constructed frame structures result in collapse of buildings leading to unimaginable casualties and loss of property. With the advancements in this field, we now have a number of reliable techniques like: ground isolation, damping of the seismic forces, retro-fittings and seismic resistant construction with active controls. Unfortunately, constructing earthquake-proof building by these techniques is a challenging task for developing and poor countries as these require highly technical and skilled workforce and good quality building materials that are generally expensive. Therefore, these countries can not take full advantage of these reliable technologies due to financial constraints. The selection of affordable and safer construction technology is the only option to overcome these disasters to provide safety to people in these countries.

The purpose of this research paper is to present some effective and low cost solutions for developing the earthquake resistant houses in developing and poor countries with large population like India. The paper, first, examines the available cost-effective housing construction models and then identifies the techniques relevant in Indian context and finally it recommends some affordable cheaper and safer construction methods that are earthquake resistant.

2. Major Causes of Building Failure during Earthquakes

Earthquake is a frequent phenomenon in so called 'earthquake zones' causing huge devastations and create a number of casualties like loss of life and damage to property. The after effects of an earthquake event like breakout of fire, blockage on water supply, electricity and transportation and failure of communication hamper the normal life very badly [7,8,9].

The earthquake caused shaking (vertical or horizontal) along with the inertia of buildings that causes frequent changes in building's weight distribution pattern, the use of poor quality materials and big structures are some of the major reasons for building failures. Greater the mass of building, more the lateral force is exerted on buildings, and this alone is the major component behind building damages [9,10,11]. When there are no strong joint-components like walls, beam, column, roofs and slabs, the buildings move on their own in accordance with the seismic vibrations and this movement depends on the buildings' weight and orientation. This results in the separation of building components, thereby causing the failure of the building [12,13,14]. Some of the major reasons for buildings' failure during Earthquake are

2.1 Failure of Soil

Earthquakes move the ground side and up and down simultaneously. The force behind this movement is powerful enough to turn soft soil immediately into quicksand, eliminating its ability to bear weight. Building constructed on either soft soil or on steeply sloped sites in a seismic zone, therefore, it is at special risk. When the shaking stops at last, these buildings are sometimes found slumping into the soil. This problem can be directly attributed to soil failure.

2.2 Failure of The foundation

The foundations of the buildings are generally designed in accordance with mass of the buildings, the mass distribution pattern, height of the building, the soil quality and seismic activity profile of the region where the building is going to be raised. One of several factors that determine the ability of a foundation to withstand an earthquake is the buildings mass. But buildings are not generally constructed to bear the irregular, intense and multi-directional side-to-side stresses that occur when the building is hit by the seismic waves during an earthquake. As a result a building may literally slides off its foundation under the influence of shock waves. The reinforcements to the foundation wall and use of anchor bolts to firmly join the building to its foundation generally help in avoiding this type of failure.

2.3 Failure of Soft Floors

Generally the buildings or other structures are constructed at the top of a ground-floor lobby or parking lot. These lower-level floors lack in interior shear walls are generally known as soft floors. These are mainly characterized large open spaces with concentrations of building mass above. During the earthquake failures of the buildings in past, it has been observed that the upper levels of a building often remain undamaged while the lower floors fail. This is because the concentration of forces at soft floors, that have fewer walls and little infill. A Soft floor is like a break in the structural continuity of the building. The soft floors are, therefore, less rigid as compared to the other floors of the building and hence are susceptible to failure in the event of an earthquake [15].

2.4 Failure of building joints

A building's shape impacts its ability to resist the jerks caused by earthquakes. Generally the buildings with irregular shapes, having a number of extensions and additions are worst affected. The problem is generally with the joint of new and old buildings with insufficient clearance between the various parts [15]. These connections don't accommodate the natural inclination of the different structures to move independently of each other and hence prove to be highly disastrous during earthquakes.

2.5 Failure due to building material used

The building materials used in the construction of a building play an important role as far as failure during earthquakes is concerned. The construction of a building requires putting together a number of dissimilar components to give it a wholesome integrity and if these have not been tied properly with each other with a tolerance to the differential movements, then it may also cause a failure during earthquake.

3. Earthquake Resistant Buildings

A number of studies and investigations of earthquake disasters have shown that damages are generally caused by the lack of proper engineering practices followed during building construction [16,17]. In order to construct an earthquake resistant building some important features have started emerging from the past experiences and modern techniques being followed across the world [18,19]. These may prove to be quite helpful in developing the indigenous technology relevant to the countries like ours.

3.1 Construction materials and practices

A building must be constructed in accordance with design specifications about the use of materials, the arrangement of reinforcement, the concrete work, etc. Poor quality and placement of concrete was often observed in damaged buildings due to the lack of technology. Poor concrete work is sometimes attributed to the error in structural design; e.g., reinforcement may be congested in a section due to;

- (a) The use of small cross sectional area.
- (b) The use of lap splicing.
- (c) The anchorage of beam reinforcement in the already-congested beam-column joints.

Construction work must be closely inspected and guided by structural engineers during construction processes. Construction workers must be trained as well as educated to handle right materials and to execute the work properly.

3.2 Importance of structural detailing in shear resistance

The collapse of reinforced concrete buildings has been often caused by brittle shear, as observed in a number of studies on earthquake damages. The failure of building is attributable to the use of;

- (a) 90-degree hook at hoop ends.
- (b) Wide spacing of hoop reinforcement.
- (c) Thin hoop reinforcement.
- (d) Pain bars as longitudinal reinforcement.

3.3 Beam-column connections

No lateral reinforcement was found within beam-column connections failing in shear in case of Japan earthquake [12]. After spalling of concrete cover from the joint, the column longitudinal reinforcement was observed to buckle. The bottom reinforcement of a beam was often anchored straight in the beam column connection. This is a common detailing practice in non-seismic regions, but will not allow flexural yielding under reversed loading. If a rectangular column is used, the beam reinforcement cannot be anchored in the narrow side of the beam-column connection.

3.4 Structural Planning

Structural engineers should consider the overall performance of a structure during medium as well as high intensity earthquake motions [19];

- (1) Resistance or ductility: A structure can be designed earthquake resistant by either providing a large lateral resistance but with limited ductility (strong structure) or by providing large ductility but with relatively small lateral resistance (ductile structure). Naturally, a ductile structure suffers extensive structural as well as non-structural damages by a strong earthquake, or suffers minor damages even by frequent medium-intensity earthquakes. Consequently, the repair cost of the ductile structure must be significant. A strong structure will not be damaged until the resistance is reached during an earthquake. For this reason, the use of structural walls has been recommended for a long time [13].
- (2) Weak-beam strong-column mechanism vs. Soft first-story mechanism: Less than three-quarters of the soft first-story buildings were operational compared to ninety (90.2) percent of the other buildings. The collapse of soft first-story structures is generally caused by brittle shear failure in the first story columns. The resistance and ductility must be improved in this type of construction [13]. The weak-beam strong-column mechanism has been preferred by many structural engineers because it dissipates earthquake-input energy at many

distributed localities and reduces ductility demand at each planned yield hinge region.

- (3) Non-structural elements and building content: For the life safety, the structure should naturally be prevented from collapsing. At the same time, the response of a structure towards earthquake must be controlled to prevent heavy furniture and equipment to cause damage to the floor or to prevent heavy equipment from falling from shelves. The Ministry of Health and Welfare, Japan, reported that 65 persons were killed under overturning heavy furniture. Non-engineer residents were greatly scared by the damage of non-structural elements, such as partition walls, windows and doors. Stiff or weak or brittle brick walls filled in a flexible moment resisting frame, fails at an early stage even during medium intensity earthquakes. Providing some gap on both side of a column could reduce such damage. Non-structural elements must be protected from damage because if those elements fall then they can cause danger for people escaping from the building, because the failed elements may block doors from opening, and because the building may not be occupied until the damaged elements are replaced. Furthermore, the cost of repair work depends upon the damaged non-structural elements rather than the repair work on structural elements.

3.5 Fire Prevention and Resistance

Large numbers of people were killed by fire in the 1906 San Francisco Earthquake, U.S.A., and the 1923 Kanto (Tokyo) Earthquake [6,20]. Fire is a major disaster after a strong earthquake in a large urban area. In Kobe, the mortar or plaster cover protecting timber construction fire fell off during a severe vibration, and the exposed timber structure caught fire after the earthquake motion.

4. Low Cost Earthquake Resistant Building Technology and Practices

As evident from above discussion, there are conventional, economical and simple construction practices that should be considered while designing earthquake resistant buildings, which can reduce cost and ensure a safer housing. The material cost is nearly 70 to 80 percent of the total cost, and this cost should be made appropriate by selecting the suitable contraction materials. All traditional earthquake-resistant construction technologies provide the

building with the capacity to bear the large earthquake stresses without failure. These technologies can be divided into the following general categories according to the structural behavior consideration [21,22,23];

- (1) Technologies using ductile building materials- such as building made of timber and bamboo.
- (2) Technologies with strong architectural designs such as buildings with symmetric plan and elevation.
- (3) Resilient structure technologies; such as buildings with bands and braces.
- (4) Use of Light Weight Elements that reduce seismic forces.

Keeping in view the aforesaid technologies to counter earthquake damages, the following building construction methodologies may be adopted in a country like India.

- Adobe Buildings with Earthquake Resistant Components [21]
- Masonry Buildings with Earthquake-Resistant Components [22]
- Rice Straw/Wheat Straw Buildings [23]
- Wooden, Timber or Bamboo Houses
- Corrugated iron (C.I) sheet built house

There are a number of other low cost earthquake resistant materials suitable for construction. Wardah tumbler tile is a lighter, cheaper, durable and is a weather resistance material for roofing purpose [22,24]. Ferro cement is another option for roofing and walls. It is prepared by putting cement mortar and closely-spaced-wire-mesh together to give a thin rigid structure, Pre-cast Hollow Concrete Blocks, Fly Ash Bricks, Flash sand lime bricks, Light Weight Walling and Roofing Blocks made of Fly Ash, Bonded Fiber Roofing Sheets, Metal Polymer/Plastic Composite Sheets are other low cost building materials. Rice husk is yet another promising cost effective building material that can be used for making boards and acoustic wall paneling..

5. Recommendations in Indian Perspective

Choosing low cost building material does not mean that it will perform poorly during earthquakes. Instead selection of low-cost building material is an essential prerequisite for providing safe and affordable houses to increasing population across the globe. The first priority should be given to the locally available materials like stones, wood, bamboo, adobe and agricultural solid waste like;

rice/wheat straw. These materials would be very helpful in lowering down the construction expenses. However, to attain the desired degree of strength, some structural designs and modifications in these materials are necessary for making them strong enough to counter the stresses generated during an earthquake. Bamboo and wood are lighter, flexible and ductile materials; therefore, these can be effectively used in making the earthquake resistant houses. They can be used in constructing frame, partitions, and hence can be effective earthquake resisting members. Similarly, Ferro-cement, rice straw, rice husk, and potter like materials are also other less expensive materials. Some of the recommendations are;

1. Carry out a site investigation
2. Identify a robust place (avoid drainage paths, steep slopes, landfills, flood plains etc.)
3. Position the foundations on rock or firm soil, stepped foundations must be avoided.
4. Make a compact design of building with closely spaced walls in all directions and symmetrical shape.
5. Plan a low height house preferably single story
6. Light weight material must be used in walls to reduce the effects of horizontal forces during earthquakes;
7. The roofs must be very light so that sideways push on the walls may be avoided otherwise wall will fall on people during earthquake;
8. Avoid long walls without intermediate support and tie walls together at the top;

Secondly, we must augment the local non-engineered constructions with the provisions of earthquake resistant components. There are more non-engineered structures than engineered ones in most of the developing countries around the world. The earthquake time lateral forces can be easily nullified by providing at least three bands respectively at at plinth, lintel and at roof level. Providing vertical joints shall greatly help in countering the vertical forces. The joints of the wall should be made stronger with stitches irrespective of the type of the building materials used, be it stone, adobe or brick. It will be effectively resisting the significant amount of lateral/horizontal, as well as, vertical forces. This will greatly help in preventing the loss of life and property during an earthquake.

The training of the work force employed in the construction industry is of vital importance to achieve the goal of constructing the earthquake resistant houses for the masses. Awareness to community people may also be helpful in achieving this objective. The guidelines and rules for constructing the earthquake proof non-engineered

structures must be prepared at local level and their strict compliance should be a legal binding to all the stakeholders and residents of these houses. Proper guidelines for implementing the building Code and norms regarding earthquake resistant components must be formulated for all seismic zones at national level.

REFERENCES

- [1] Housner, G.W. (1984), Historical View of Earthquake Engineering, Proceedings, Eighth World Conference on Earthquake Engineering, San Francisco, Post-Conference Volume, pp. 25- 39.
- [2] Milne, J. and Burton, W.K. (1891) The Great Earthquake of Japan, 1891, Lane, Crawford & Co., Yokohama, Japan.
- [3] Dawang Sherpa (2010) Affordable Solution for Earthquake Resistant Building Construction in Haiti Southern Alberta Institute of Technology- SAIT Calgary, Alberta
- [4] M. Haseeb, Xinhailu, Aneesa Bibi, Jahan Zeb Khan, Iftikhar Ahmad, Rizwan malik, ,Construction of Earthquake Resistant Buildings and Infrastructure Implementing Seismic Design and Building Code in Northern Pakistan 2005 Earthquake Affected Area.
- [5] Devesh ojha, Dilip Kumar(2014), Low Cost Earthquake Resistant Housing Construction in India, , ISSN No.: 2250-0758 International Journal of Engineering and Management Research Available at: Page Number: 18-20.
- [6] Shunsuke Otani, Lessons learned from past Earthquakes(1997), Aunkara, Turkey
- [7] Veletsos, A. S. and Newmark, N. M. (1960), Effect of Inelastic Behavior on the Response of Simple Systems to Earthquake Motions, Proceedings, Second World Conference on Earthquake Engineering, Tokyo-Kyoto, Volume II, pp. 895 - 912.
- [8] Seismological Committee (1959), Recommended Lateral Force Requirements, SEAOC Code, Structural Engineering Association of California.
- [9] Applied Technology Council (1976), Tentative Provisions for the Development of Seismic Regulations for Buildings, National Science Foundation and National Bureau of Standards.
- [10] Architectural Institute of Japan (1987), Reports on the Damage Investigation of the 1985 Mexico Earthquake (in Japanese), 599 pp.

- [11] Architectural Institute of Japan (1992), Reports on the Damage Investigation of the 1990 Luzon Earthquake (in Japanese), 396 pp.
- [12] Architectural Institute of Japan (1993), Report on the Damage Investigation of the 1992 Turkey Earthquake (in Japanese), 221 pp.
- [13] Reinforced Concrete Committee (1996), Damage Investigation Report on Concrete Buildings, the 1995 Hyogo-ken Nanbu Earthquake (in Japanese), The Kinki Branch, Architectural Institute of Japan, 245 pp.
- [14] Takeda, T., Sozen, M. A., Nielsen, N. N. (1970), Reinforced Concrete Response to Simulated Earthquakes, Journal, Structural Division, ASCE, Vol. 96, No. ST 12, pp. 2557 - 2573.
- [15] Ambrose, J., & Vergun, D. (1995). Simplified Building for Wind and Earthquake Forces (Third Edition ed.). New York, NY, USA: John Wiley & Sons, Inc.
- [16] Scawthorn, C. (2007). Designing and mitigating earthquakes, Inaccessscience@McGraw Hill, Retrieved February 5, 2010, from <http://www.inaccessscience.com> DOI-8542.YBO70130.
- [17] Mohammad Adil Dar, Prof (Dr) A.R. Dar , Asim Qureshi ,Jayalakshmi Raju, American Journal of Engineering Research (AJER) e-ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-02, Issue-12, pp-258-264.
- [18] S. Otani, Earthquake Resistant Building Construction, University of Tokiyo, Japan.
- [19] Masanory Numata, Earthquake resistant Design for Civil Engg Structures, Foundations and Earth Structures in Japan.
- [20] San Francisco Earthquake History 1915-1989. (n.d.). Retrieved February 9, 2010, from The Virtual Museum of City of San Francisco
- [21] Blondet, M., M., G. V., & Brzev, S. (2003, March). Earthquake-Resistant Construction of Adobe Building: A Tutorial. Retrieved February 3, 2010, Joyce, C. (2010, January 14). NPR
- [22] Sarkar, R. (2006). Post Earthquake Housing Construction Using Low Cost Building material. Retrieved February 3, 2010
- [23] Battersby, S.(2009). House of Straw, Retrieved February 15, 2010, from http://nees.unr.edu/projects/straw_bale_house/house_of_straw.pdf
- [24] Dar M.A., Dar A.R. , Qureshi A. and Raju J. (2013), A Study on Earthquake Resistant Construction Techniques, Am. J. of Engg. Res., 02 (12) pp.258-264.

NON-ROI Position Based Image Watermarking for Medical Images

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Abstract - In this paper, image watermarking is used for embedding data of patient into medical image, detection of tamper inside region of interest and recovering the original region of interest. Telemedicine includes transmission of medical images from one place to another. The medical images can be changed as they may pass through unsecure networks. The modification can be intentionally or accidentally. The medical images contain one or more region of interests (ROI) and other part is called region of non-interest (RONI). The ROI is used for diagnostic decision. The patient data and recovery of ROI is embedded in region of non-interest. Many watermarking methods have been studied for tamper detection and for recovery of ROI.

Keywords – Watermarking, ROI , NROI, Tamper detection, recovery

1. Introduction

With the development of internet and digital technology, the availability and usage of digital information has increased rapidly. People can process, exchange and store digital contents more simply than ever. The creation and delivery of data i.e. image, audio, video, digital data has increased. However, against this advantage, a new set of problems concerning security such as unrestricted duplication, manipulating and distributing of multimedia have arisen. So, copying of the digital content without any quality loss is not so difficult. So, there is great need of prohibiting such illegal copyright of digital media during communication [2]. Therefore, ownership protection and content verification have become a significant issue. Digital watermarking (DWM) is the powerful solution to this problem.

1.1 Digital Image Watermarking

Digital watermarking is a process of embedding digital information called watermark into the digital multimedia data. Digital Watermark is the digital content such as text,

audio, logo, and graphics that are hidden in such a way that it is not visible to human eye. Watermarking technique is used for several purposes including content authentication, owner identification, data integrity and copy control. Watermarking usually assumes embedding of secret signal that should be robust and imperceptible within the host data. The watermarking techniques can be of different types depending upon the input. It can be text watermarking, image watermarking, video watermarking and audio watermarking. In this proposed work, image watermarking is being considered.

To protect the digital images, four types of watermarking methods are has been developed. These are Robust watermarking, Semi-Fragile Watermarking, Fragile Watermarking and Hybrid Watermarking[10]. The robust watermarking methods are mostly used for copyright protection of images as it is difficult to remove robust watermarks from digital images. Robustness indicates the ability of correctly extracting watermark data after undergoing different type of attacks. Robust watermarks can withstand intentional as well as unintentional attacks like scaling, cropping, compression and so on. The Semi - Fragile watermarks sustain only unintentional attacks. The Fragile watermarking techniques are used for checking the authentication of digital images. If any tampering or modification occurs, the fragile watermark is removed from watermarked image. Hence, absence of any watermark from the watermarked image shows that the image is tampered. The hybrid watermarks combine both the fragile and robust watermarks. The robust watermarking is used in privacy control and the fragile watermarking is used in integrity control of digital images. The two types of attacks are namely signal processing attacks and geometric attacks. The signal processing attacks include compression, filtering and noise addition. The geometric attacks include scaling, rotation, shearing, cropping and random bending [2]. A good watermarking method must be robust, imperceptible and secure.

1.2 Image Watermarking Procedure

A Watermarking system consists of a watermark embedding system and a watermark recovery system. The system also has a key which can be either public or a secret key. The key is used to enforce security which prevents unauthorized access to data. In embedding process, the inputs are original image or cover object, watermark and private key. During the decoding process, the inputs are watermarked image and private key [10].

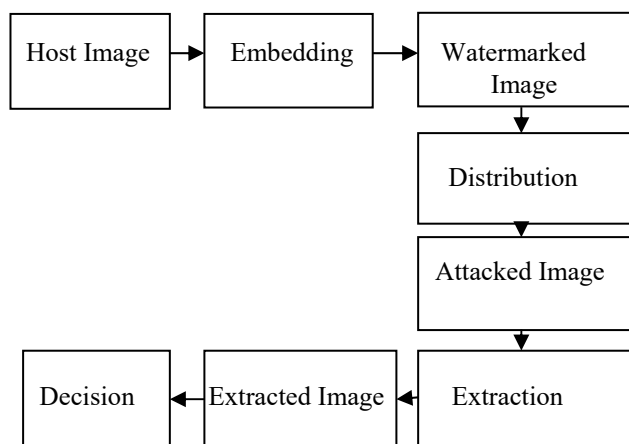


Fig.1. Image watermarking procedure

1.3 Watermarking in Telemedicine

Telemedicine makes use of telecommunication and technologies for providing health care in distant rural areas. Transmission of medical and imaging data helps to provide suitable diagnostic procedures that can be carried to treat patients. The medical image contains one or more region of interests and other part is non- region of interest. Content of ROI is important for diagnostic decision. It is better not to embed any data inside ROI. Any modifications caused to ROI during transmission should be detected and the original ROI must be recovered exactly. The recovery helps in avoiding wrong diagnosis as well as retransmission of medical image. The recovery data of ROI is generally embedded in NROI .When any modification is detected inside the ROI of the received medical image, the data inside NROI is extracted and used to recover original ROI [1]. Many watermarking techniques have been studied using various medical images like CT scan, MRI scan, ultrasound and PET scan.

2. Review Process

In [1], Rayachoti Eswaraiiah and Edara Sreenivasa have proposed a novel medical image watermarking method based on integer wavelet transform. It defines the integrity of ROI, identifies tampered blocks inside ROI, provides robustness to embedded data in RONI regions and recovers original ROI. The embedded data contains hash value of ROI, recovery data of ROI and data of patient. Data is embedded using IWT. The image is segmented into ROI and NROI and the patient's data is converted into binary form. Hash value of ROI is calculated using SHA-1 technique. Recovery data of ROI is generated and compressed. The generated watermark is encrypted and then embedded into NROI using integer wavelet transform. The extraction algorithm is applied on received medical image and original ROI is obtained. Experimental results show that the proposed method provides robustness to the watermark data embedded inside RONI.

In [2], Tianrui Zong has given an image-watermarking method to deal with attacks. In the embedding process, first preprocess the host image by using a Gaussian low-pass filter. Then, a number of gray levels are selected by using a secret key and the histogram of the filtered image with respect to these selected gray levels is constructed. A histogram-shape-related index is used to choose the pixel groups that have highest number of pixels. A safe band is built between the chosen and non-chosen pixel groups. Histogram-shape-related index tackles with the geometric attacks like cropping attacks and RBAs. The use of histogram shape related index and safe band results in good robustness. A novel high frequency component modification mechanism is also used in embedding scheme to improve the robustness and compensate the side effects of Gaussian filtering. At the decoding end, the watermarked pixel groups are identified based on the available secret key. The use of secret key makes this watermarking method more secure. The simulation results show superior performance.

In [3], Seenivasagam has proposed inversion attack resilient zero watermarking system which is used for medical image authentication. It makes use of hybrid contourlet transform for the medical image authentication. This proposed scheme preserves the fidelity of host image and makes use of triangular number generating function and Hu's image invariants to confront the inversion attack.

The effectiveness of higher order Hu's moments to realize non-invertible watermarking systems has been established. An experimental result show the robustness of system against ambiguity attacks and allows secured medical image exchange between remote radiologists.

In [4], Xiao examined a separable data hiding in an encrypted image based on compressive sensing. The original image is encrypted by the content owner by using an encryption key and some space is left for the data hider to embed data. So, the image becomes enlarged. The additional data is embedded to the image by the data hider at a fixed location for a specific purpose. Because of the enlarged image, the image can be compressed to the original size by using CS along with data hiding key. Hence, the encrypted image with embedded data is formed.

If the receiver is having both the data hiding key and the encryption key, it is possible to recover the original image and extract the additional data by exploiting CS recovery algorithms.

In [5], Alam has proposed work that includes the initial image preprocessing tasks. It involves filtering of the host image and then embedding the secret image and the image data in the source image. Then the stego image is used as an input to the digital signature framework which provides the secure, authentic and error-free transmission over the wireless channel of our secret data.

In [6],], Xiaohong Deng gave a new region-based tamper detection and recovering technique that makes use of both reversible digital watermarking and quad-tree decomposition for authentication of medical images. In this method, first quad-tree decomposition is used to divide the original image into blocks and then pixel's linear interpolation is computed as each block's recovery feature. These recovery features as the first layer watermarking data is embedded by using simple invertible integer transformation. The logistic chaotic map is used to choose the reference pixel of each block so as to enhance the security. The second layer watermark consists of quad-tree data. The essential parameters and second layer watermark are embedded by LSB replacement. During the authentication phase, watermark is extracted and host image is recovered and a similar linear interpolation method is used to get feature of each block. The detection and localization of tampers can be achieved by comparing the

Extracted feature with the recomputed one. The extracted features are utilized to recover tampers with high similarity to their original state. The experiment results indicate that the proposed method achieves high embedding capacity, good quality of marked and restored image and also has more accuracy for detection of tampers as compared to the similar existing schemes.

In [7], Sakthivel S.M. has proposed a new spatial domain watermarking of grayscale images and has also given its VLSI Implementation without changing its contents in real time using a secret key. The secret key is formed by searching the values of watermark pixels in the host image contents and the location maps are marked in the secret key. Hence, this algorithm is called PVSA- Pixel Value Search Algorithm. This proposed algorithm does not alter the host image and shows high robustness to the signal processing attacks. The process of watermark extraction is simple as the host content is extracted using a key. The robustness of the algorithm is checked against several signal processing attacks using MATLAB.

In [8], Lavanya proposed a data hiding method by modifying the histogram of medical images and making the use of difference based on block division. The reversible data hiding method considers the difference of the pixels by using histogram modification. This increases the data hiding capacity. The medical image is divided into equal size blocks. The location map is generated and compressed and then embedded. The data is watermarked into original difference image. At receiver side, difference image is calculated from received image and then watermark is extracted. The location map is decompressed from extracted watermark. In this study the block division is preferred to enhance the data hiding capacity.

In [9], Osamah M. Al-Qershi presented a new hybrid watermarking scheme for DICOM images. In this method, two techniques are combined to obtain advantages of both and meet the requirements of authentication and hiding of data. This method divides the medical image into two parts namely region of interest (ROI) and the remaining region is called region of non-interest (RONI).The data of patient is embedded into ROI by using a reversible technique which is based on difference expansion, while recovery data and tamper detection are embedded into RONI by using a robust technique which is based on discrete wavelet transform. The experimental results shows that this method hides the patient data with good

visual quality and the most important area for diagnosis, ROI is recovered exactly at the receiver side.

3. Comparison table

Table1: Review comparison table

Sr. no.	Topic	Author Name	Method & Technique
1.	Robust medical image watermarking technique for accurate detection of tampers inside ROI and recovering ROI	Rayachoti Eswaraiyah, Edara Sreenivasa Reddy	Integer wavelet transform
2.	Robust Histogram shape-based image watermarking	Tianrui Zong, Yong Xiang	Histogram shape related index
3.	Inversion attack resilient zero watermarking scheme for medical image authentication	Seenivasagm Vellaisamy, Velumani Ramesh	Hybrid Contourlet transform
4.	Separable data hiding in encrypted image based on compressive sensing	Di Xiaio, Shoukuo Chen	Compressive sensing algorithms
5.	An investigation into image hiding steganography with digital signature framework	Fahim Irfan Alam, Md. Mohaiminul Islam	Structural Digital Signature
6.	Authentication and Recovery of medical diagnostic image using dual reversible digital watermarking	Xiaohong Deng, Zhigang Chen	Reversible digital watermarking
7.	A real time watermarking of grayscale images without altering its contents	Sakthivel.SM Dr.Ravi Sankar.A	Pixel Value Search Algorithm
8.	Data hiding using histogram modification of difference in medical images based on block division	A.Lavanya, V.Natarajan	Histogram modification on method using difference in medical images
9.	Authentication and data hiding using a	Osamah M. Al-Qershi	Discrete wavelet

hybrid ROI-based watermarking scheme for DICOM images	Bee Ee Khoo	transform
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4. Future Work

The future work will be focused on embedding the recovery data and patient data in non-region of interest so that embedding distortion is minimum and to make the watermarking method more robust and secure. The proposed work and the existing techniques will be implemented and results will be compared in PSNR, MSE and NC values. Also the future work will make use of medical images whose ROI size is large.

5. Conclusion

We have reviewed and presented various image watermarking techniques for tamper detection inside region of interest and recovering original region of interest in various types of medical images. Each method has its own suitable application, advantages and disadvantages. The future work can combine these methods to design proper algorithms. Robustness, quality, security and imperceptibility are the factors to be considered. We hope this work will provide susceptible material for researchers as well as freshers in the image processing and medical field.

References

- [1] Rayachoti Eswaraiyah, Edara Sreenivasa Reddy, "Robust medical image watermarking technique for accurate detection of tampers inside region of interest and recovering original region of interest", IET Image Processing, vol.9, iss.8, Sep 2015, pp 615-625.
- [2] Tianrui Zong, Yong Xiang, Iynkaran Natgunanathan, Song Guo, Wanlei Zhou, and Gleb Beliakov, "Robust Histogram Shape Based Method for Image Watermarking.", IEEE Transaction on circuits and systems for video technology, vol. 25, no. 5, 2014, pp 717-729.
- [3] Vellaisamy, Seenivasagam, and Velumani Ramesh "Inversion attack resilient zero-watermarking scheme for medical image authentication." IET Image Processing ,vol.8, iss.12,2014, pp. 718-727.
- [4] Xiao, Di, and Shoukuo Chen, "Separable data hiding in encrypted image based on compressive sensing." Electronics Letters ,vol.50, no. 8, 2014, pp 598-600.
- [5] Alam, Fahim Irfan, and Md Minarul Islam , "An investigation into image hiding steganography with digital signature framework." In Informatics, Electronics & Vision (ICIEV), International Conference on, IEEE , 2013, pp. 1-6.
- [6] X.Deng, Chen. Z, Zeng F, Zhang .Y, Y.Mao, "Authentication and recovery of medical diagnostic image using dual reversible digital watermarking", Journal of Nanoscience and Nanotechnology, vol.13,2013,pp 2099-2107.

[7] Sakthivel.S.M., Dr. Ravi Sankar.A, “A Real time watermarking of grayscale images without altering its contents”,2015 International Conference on VLSI –SATA, IEEE,2015.

[8] Lavanya, A., and V. Natarajan,"Data hiding using histogram modification of difference in medical images based on block division." In Recent Trends In Information Technology (ICRTIT),International Conference ,IEEE ,2012, pp. 141-144.

[9] Al-Qershi.O.M, Khoo B.E , “Authentication and data hiding using a hybrid ROI-based watermarking scheme for DICOM images”, Journal of Digital Imaging, vol. 24,2011, pp 114-125.

[10] Digital Watermarking and Steganography Fundamentals and Techniques by FrankY,2008.

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Review of Major Electrical Blackouts

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Abstract – Blackouts occur in the electrical power systems for a variety of reasons that include lack of investment in transmission network, control equipment failure, human errors, and atmospheric lightening etcetera. Understanding these causes and implementing actions to correct them represents the basis for minimizing the power cuts resulting from major disturbances in a transmission network. Starting with an analysis of the main blackouts experienced in the past, this paper will qualitatively compare the events of blackouts till present. After discussing the events of blackouts, the measures adopted to prevent their occurrence in future and general conclusions on the basis of lessons learned are concluded.

Keywords – *Electrical blackouts, Grid failure, Power system reliability, Power system security, Cascading failure.*

1. Introduction

Electrical blackout means complete failure of electrical power over a vast area. It is generally caused by shut down of main generating units or shut down of large transmission line feeding a large area. To include a power outage in a electrical blackout, the outage must not be pre-planned by the service provider, affecting at least 1000 people for at least one hour [3]. This generally happens from excessive overloading of units and from natural disasters. Although these huge blackouts rarely happens but left a large number of consumers without electric supply. The side effects of blackouts are mainly economic downfall to electric generation entity and severe disturbance to consumers from continuity of supply.

From the study of past and present of electrical blackouts, it is concluded that they cannot be stopped. However, from their study, the probability of events of their occurrence can be minimized. But the prevention of such events and minimizing their affects is still a great challenge as the complexity of modern power system is continue to increase. The main purpose of this paper is to qualitatively study and review the events of occurrence of blackouts

such as to learn lessons from the mistakes and to give methods for their prevention and to decrease their affects if they happen any time in future based on their study.

2. List of major electrical blackouts

In this paper the events of the major electrical blackouts are reviewed. These blackouts were most severe and affected a large number of people for several hours without supply. Their description is given under the subheadings.

2.1 Northeast blackout of 1965 [3]

It happened in Ontario of Canada on November 9, 1965 and affected more than 30 million people in 207000 sq kilometer area. It occurred because of a human error, the maintenance workforce wrongly set up a relay on too low setting on 230 kilovolt transmission lines between Niagara generating station number 2 in Queenston, Ontario. At 5:16 pm a small increase in demand from Robert Moses generating plant in Lewiston, New York results in shifting the load to other transmission lines in the network, making them overloaded. Hence a cascading phenomenon occurs of tripping of lines resulting in to isolating the Beck station from all of the Southern Ontario. New York City was dark by 5:27 p.m. Power restoration was uneven as many generators had no auxiliary power to use for startup. Power in western New York was restored in few hours as independent generating plant at Eastman Kodak Company in Rochester, New York provided auxiliary power to restart other generators.

Measures were taken to prevent the repetition. Reliability councils were formed to establish standards, share information and improve coordination among electricity providers. The investigation force found the lack of voltage and current monitoring was a contributing factor to the blackout. The electric power research institute helped the power industry to develop new metering and monitoring systems that have become SCADA systems in today's use.

2.2 Thailand Nation wise Blackout of 1978 [8, 3]

It happened in Thailand at 07:40 am (GMT +7), affecting more than 40 million people on March 18, 1978. This was country wide blackout results because of failure of generators in south Pranakhorn power plant in Samut

Prakan which further failed many generators across the country. The electricity generating authority of Thailand found a faulty high voltage cable along the main transmission route from central Thailand to the south as cause of blackout. The Northern provinces of Thailand experienced a blackout for 1 hour, Northwestern Provinces received 15 minutes, the central provinces received 1 hour, Bangkok and its neighboring provinces blacked out for more than 2 hours. The southern provinces received 30 minutes blackout. Within 9 hours and 20 Minutes, the authorities were able to restore power across the country.

2.3 Sothern Brazil Blackout of 1999 [3, 8]

It happened at 10:16 pm on March, 1999 affecting 75 to 97 million people. The blackout affected the areas of Sao Paulo, Rio de Janeiro, Minas Gerais, Goias, Mato Grosso, Mato Grosso do Sul and Rio Grande do Sul. The blackout lasted for about five hours and severely affected Sao Paulo and Rio de Janeiro, two of Brazil's biggest cities. A chain reaction was started at substation in Bauru, Sao Paulo when a lightning strike occurred at 10:16 pm causing tripping of 440kv circuits at substation that resulted in the shutting down Itaipu, which was one of the biggest hydroelectric power plants. The 750kv AC lines and 600kv DC lines that connected the plant with rest of the system could not take the load and tripped too. During 1999 the Brazil was undergoing a severe investment crisis, which limited the spending on maintenance and expansion of the power grid. This was supposed to be the major cause of the blackout as the maintenance of power grid was not regular.

2.4 India Blackout of 2001[3, 10]

It happened on January 2, 2001 affecting 226 million people nearly quarter of Indian population. It existed for about 12 hours after failing of a substation in Uttar Pradesh which resulted in collapse of the northern grid. The Indian industry estimated that the loss was about 2.5 to 5.0 billion rupees (\$107.1 million). Over 1500MW of generation was lost. It took 16 – 20 hours to bring back the supply. The main cause of blackout appeared to be inadequate transmission equipment because of government's negligence towards regular maintenance and changing of equipments. Some experts told that some of the grid's equipment were decades old and were not able to withstand the sharp voltage fluctuations.

2.5 Italy Blackout of 2003 [3, 8, 9]

It happened at 03:20 hours on September 28, 2003 and had affected total of 56 million people, about all of Italy. On the basis of initial reports from ENEL (Ente Nazionale per l'energia Elettrica), the power line which supplied the electricity to Italy from Switzerland was damaged by storms, also two 400kv lines between France and Italy tripped due to sudden increase in demand. This loss of two lines causes cascading of the remaining lines in the interconnected system as ENEL lost the control of grid. It lasted for about three hours and energy was restored in the northern regions but 5% of the population remained affected till next two days. Researchers have modeled this blackout as a cascade of failures in interdependent networks.

2.6 Northeast blackout of 2003 [3, 7]

It happened at 04:10 pm on August 14, 2003 and had affected 10 million people in Ontario and 45 million people in eight US states. It was considered to be the most widespread and severe blackout in history after 1999 southern Brazil blackout as it took near about a week to restore the power. The main cause of the blackout was a software bug (Race condition) in alarm system in control room of the First Energy Corporation in Ohio, resulted in to the malfunctioning of the system.

2.7 Java-Bali blackout of 2005 [3, 11]

It happened at 10:23 am (UTC +7) on August 2005 across Java and Bali affecting about 100 million people. It resulted from failing of a transmission line between Cilegon and Saguling both in Western Java. Because of sudden shortfall of power supply, the power went out in most areas of Java which includes all major cities. Power resumed in most areas of Jakarta at about 05:00 pm (UTC +7) on the same day.

2.8 Brazil and Paraguay blackout of 2009 [3]

It happened at 22:15 BST on November 10, 2009 at Brazil and Paraguay, affecting about 60 million people. The blackout started about 22:15 on Tuesday and lasted until about 02:45 on Wednesday. The main cause of this blackout was that the heavy rains and strong winds short circuited three transformers which shut downs the line giving loss of 14 GW of power. The Itaipu dam was shut down for the first time in its 25 year history. This blackout affected 18 states out of 26 states of Brazil.

2.9 India blackout of July 2012 [3, 12, 13]

Two severe electrical blackouts affected the mostly the northern and eastern regions of India on July 30 and 31, 2012. On July 30, 2012 at 02:35 IST the circuit breaker on 400kv line of Bia-Gwalior was tripped. This line fed into the Agra-Bareilly transmission section so the breakers at that station also tripped such that the power failure cascaded through the grid. This results in shutting down of all major power stations in the state giving shortage of 32 GW. It was so severe that it broke the record of Jan 2001 blackout which affected 230 million people but this blackout affected over 300 million people (25% of Indian population at that time).

On July 31, 2012 the system was again failed at 13.02 IST because of relay problem near Taj Mahal, this results in shutting down of power stations near the affected areas. NTPC limited stopped 38% of its power generation capacity. More than 620 million people were affected about half of the Indian population at that time. At that time 22 out of 28 states were without power. The worst affected zones were Northern, West Central, South Eastern, North Central region.

The power minister, at that time, gave the statement that, "Everyone overdraws from the grid. Just this morning I held a meeting with power officials from the states and I gave directions that states overdraw should be punished. We have given instructions that their power supply could be cut". Hence, the main cause of this blackout should be poor planning and irregular sharing of electrical information of different areas with each other.

2.10 Bangladesh blackout of 2014 [3, 8, 14, 15]

It happened at 11 am on Nov 1, 2014 affecting more than 160 million people. The blackout hit the entire South Asian country after a failure on a line that imports power from neighboring India, authorities said. The blackout lasted into the night, plunging streets in the capital of Dhaka into darkness as people used candles and flashlights to find their way. Power started to come back around 11 p.m. Saturday. And government officials said at a news conference Sunday morning that the electricity supply had been fully restored. An eight-member team has been set up to investigate exactly what caused the massive outage. Smaller-scale power cuts are frequent in Bangladesh, a poor nation that struggles to generate enough electricity to meet its needs. But the country hadn't experienced a nationwide blackout since the aftermath of a powerful cyclone in 2007. A significant proportion of the

population wouldn't have been affected by Saturday's outage, though. Around 40% of Bangladeshis don't have access to electricity from the national grid, according to the Bangladesh Power Development Board.

2.11 Pakistan blackout of 2015[3, 7, 16, 17]

It happened in January, 2015 because of breaking down of transmission line by rebel attack. The rebels damaged a 500kva transmission line, which transfer electricity from private sector Hubco power plant to national grid, in Naseerabad district, which lies in southwestern Baluchistan province. The power failure was considered to be worst as it cut electricity in 80% area of the country including major cities and capital Islamabad. Pakistan's electricity distribution system is complex; a severe fault in one area often leads to cascading effect and breakdowns in the other areas of generation and transmission.

2.12 Turkey blackout of 2015 [3, 14, 19]

It happened on at 10.36 am on March 31, 2015 started from Istanbul, affecting 49 out of 81 Turkey's provinces and 70 million people. It is supposed to be caused by combination of hydro production oversupply, reduced thermal generation and maintenance on transmission lines. It is supposed to be worst in 15 years. The main cause of this blackout is considered to be the tripping of four 400kv lines because of overloading. This tripping resulted in to the cascading effect and thereby tripping the more lines in the interconnected network.

2.13 Srilanka Nation wise blackout of 2016 [3, 4, 5, 14]

First, it happened on February 25, 2016 for three hours because of a lightning strike at national power grid. Second time it happened on at 2:15 pm March 13, 2016 lasting for about 7 hours till 10 pm because of damage in 220kv substation at Biyagama. A power transformer at the Biyagama station near Colombo exploded, causing the blackout. It is considered to be worst power cut in last 20 years.

3. Conclusion [1-20]

From the study of various blackouts that had occurred in past, one thing is true that they are unpredictable and cannot be stopped. However from learning the lessons

from their occurrence we can take some preventive measures to minimize the probability of their occurrence and can also find the vulnerable conditions. One is essential that the working staff and workforce should be regularly trained such that blackouts that occur because of human error are prevented from happening, as the northeast blackout of 1965 was result of human error. Regular maintenance and expansion of power system is essential as we have seen in Southern Brazil blackout of 1999, Brazil was undergoing a severe investment crisis during 1999, which limited spending on maintenance and expansion of the power grid. This gives favoring condition in initiating the blackout. Proper planning and designing is must such that in the event of extreme conditions, the situation can be intelligently controlled. Many blackouts had occurred from extreme overloading of lines and equipment. So regular checking of contingency conditions and improve the dispatch plan can avoid such conditions. A country is generally divided in to various zones from electricity point of view, the electrical information belonging to one part of zone or area should be regularly shared with other parts so that under extreme conditions we have a preplanned solution. The blackouts that occur from the result of natural calamities like: storms and tall tress connecting two conductors with each other etcetera, are unpredictable but to prevent them some methods can be used like regularly cutting the vegetation near the transmissions line, preventing the sagging of conductor below normal level etcetera. The equipment installed in substations and transmission lines should not be used beyond its expected service life. Learning lesson from northeast blackout of 2003, the software and firmware of every digital monitoring device should be regularly checked and upgrade such that any bugs and vulnerabilities are regularly removed.

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References

- [1] O.P. Veloza and R.H. Cespedes, "Vulnerability of the Colombian electric system to blackouts and possible remedial actions", IEEE Power Engineering Society General Meeting, 2006, 1932-5517.
- [2] K Ramanathan, "Collapse of the Northern Regional Grid of India", TERI, New Delhi, India.
- [3] www.wikipedia.org
- [4] www.news.com.au/world/breaking-news/sri-lanka-suffers-nationwide-blackout/news-story/b1463456df601ee29d80a0d1276bdf8d
- [5] zeenews.india.com/news/south-asia/sri-lanka-deploys-troops-after-worst-blackout-in-20-years_1865436.html
- [6] www.wsws.org/en/articles/2001/01/ind-j09.html
- [7] www.nytimes.com
- [8] www.wsj.com
- [9] A. Berizzi, "The Italian 2003 blackout", IEEE Power Engineering General Meeting, 2004, Vol.2, pp. 1673-1679.
- [10] www.wsws.org/en/articles/2001/01/ind-j09.html
- [11] www.news.bbc.co.uk/2/hi/asia-pacific/4162902.stm
- [12] R. Das Saswato "Northern India Recovering from hudge blackouts", IEEE Spectrum 2012.
- [13] J. Romero Joshua, "Blackouts Illuminate India's Power Problems", IEEE Spectrum, 2012.
- [14] www.reuters.com
- [15] www.npr.org
- [16] www.nbcnews.com
- [17] www.theguardian.com
- [18] www.bbc.com
- [19] www.cnn.com
- [20] www.ndtv.com

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Microwave Low observable - Stealth Technology: A Review

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Abstract -Stealth technology is to avoid detection by employing the combination of system with radar to reduce visibility in the IR visual, radio frequency and audio spectrum. While no device is totally invisible to the radar, stealth technique prevent conventional radar from tracking or detecting the target effectively, This paper shows importance of ferrites as low observable materials.

Keywords - *Stealth, RCS, Infrared, Visual, Acoustic, Plasma*

1. Introduction

Stealth technology is also known as Very Low Observable or VLO Technology. This technology covers a huge range of techniques in aircraft, ships and missiles. Main purpose is to make them invisible (ideally less visible) to radar, infrared like other detection methods. Stealth technology is not considered as single technology but it is a combination of various technologies that used to attempt to detect the vehicle.

This is not new concept in military. Goal of military technique and technology is to operate in such a way that enemy fail to acknowledge any activity. However, as detection and interception technologies such as radar, IRST, missiles etc. has increased. A 'stealth' vehicle generally designed in such a way to have controlled or reduced signature.

Attacking with surprise provide the attacker extra time to perform its important mission and exit before defending force can understand and counter-attack.

Stealth technology uses the special radar absorbent materials or flat angular surface design also other techniques to reduce the amount of reflected radiation to a radar installation, which causing an vehicle or other target not to appear or appear much smaller signal.

1.1 Detection Techniques

Following techniques are used for detection of target

- RADAR
- Visual detection
- Heat detection

- Turbulence detection

Radar is a system which allows the location, speed, or/and direction to be tracked of a vehicle. The word "radar" stands for Radio Detection And Ranging. Device uses radio waves signals to detect targets. It works by sending pulses of electromagnetic waves and then collecting echoes bounced back by targets which are of interest. A radar may be transmit megawatts of power in single pulse, only a tiny fraction of energy is typically bounced back to receive at the radar antenna. The strength of power returned from a target depends on four major factors:

1. Power transmitted in the direction of target
2. Amount of power that impacts the target and is reflected back in the direction of the radar
3. Amount of reflected power that is intercepted by the radar antenna
4. Length of time in which the radar is pointed at the target.

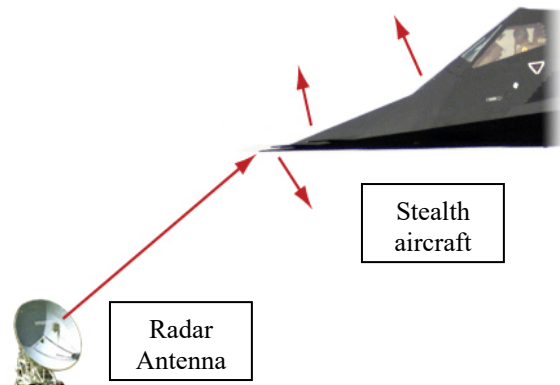


Fig.1. Stealth fighter

2. STEALTH TECHNIQUES

Stealth Technology is used to reduce their detection by enemy, mainly by an enemy RADAR. Other methods are focus on measuring the acoustic (sound) disturbances or visual contactor or infrared (heat) signatures. Stealth technologies are work on reducing or eliminating the telltale signals. Planes or vehicles are also covered with a layer of radar absorbent materials which reduce the other signature of the plane might leave. The shape also has to

do lot with the 'invisibility' of the stealth planes. The extreme aerodynamics will keeps air turbulence to the minimum value and also it cut down on flying noise. Low-noise engines are used in plane. Hot fumes are being mixed with the cool air before leaving the vehicle or plane. This fools heat sensors and also keeps heat seeking missiles out from getting lock on their targets. Stealth technology are of following types

2.1 VISUAL STEALTH

Low visibility is essential for the stealth aircraft. It is achieved by coloring aircraft to blend in with its environment.

2.2 INFRARED STEALTH

Infrared radiation emitted by the all matter above the absolute zero; the hot materials, such as engine, exhaust gases or wing surfaces gets heated by friction with air. They emit more infrared radiation than the cooler materials. The heat-seeking missiles and other weapons track the hot aircraft parts.

2.3 ACOUSTIC STEALTH

Although sound moves very slowly to be effective to locating signal for the antiaircraft weapons, for low-altitude flying acoustic is still the best to be inaudible for ground observers.

2.4 PLASMA STEALTH

Plasma absorbs radio waves, therefore it is theoretically possible to diminish the RADAR reflectivity of an aircraft otherwise non-stealthy aircraft by a factor of 100 or more by generating plasma at the nose and leading edges of an aircraft and allowing it flow backward over the fuselage and wings.

To meet goal, an aircraft must "stealthy" in following areas:

- Hard to detect on the radar;
- Hot emissions from engines must be minimal;
- It must be quiet
- Engines should not produce exhaust smoke or contrails in cold atmosphere;

Figure 2 shows the various generations of the stealth fighter aircraft

Two ways to create invisibility:

1. The airplane can be shaped so that any radar signals it reflects are reflected away from the radar equipment.
2. The airplane can be covered in materials that absorb radar signals



Fig.2. Generations of the stealth fighter aircraft

Active cancellation

Active cancellation is a theoretical approach of military jamming system that involves sampling of incoming radar signal, analyzing and then returning this signal slightly out of phase, thus "cancelling" it out

3. Radar Cross Section (RCS)

The Radar Cross Section (RCS) defined as the measure of power scattered from target to the certain direction, i.e., a measure of how detectable the target is by radar system. RCS is a measure of backscatter or the radar return of target. A larger RCS indicate that an object is more easily to be detected with radar.

4. Methods of RCS Reductions

4.1 Purpose Shaping

This theory was adopted to analyze RCS for the various geometric shapes. The purpose shaping is used to direct

most of reflected radar wave's signal away from incident direction. It will create the "cone of silence" along direction of aircraft's motion.

4.1.1 Plane Alignment

According to optics and the electromagnetic theories, the curved surface used to reflect radar waves in the collection of directions, a plane in contrast reflect them in more directions. There are only planes and the sharp transitions between the planes so there will nothing normal to incident radar wave's therefore, no radar wave will be reflected back toward the transmitter. At the same time, number of angles and planes are kept minimum to reduce the directions of reflection of radar signal.

4.1.2 Flying Wing

It is an ideal shape for aircrafts in stealth. It minimizes number of leading edges, this in turn, reduces the radar echo signals. Northrop's B-2 "Spirit" bomber adopted flying wing shape as "zig-zag" at the tail, this reducing its radar echo to small as a 0.1 m² metal object.

4.2 Materials and Absorption

4.2.1 Materials of the Aircrafts

Metal is the most commonly material used in aero-engineering, it is a good radar echo producer. Modern aircrafts, such as the B-2 Spirit and F-22 Raptor, uses the lot of composite materials instead of metal. These materials are blends of carbon and other chemicals. These are reflective.

4.2.2 Radar Absorbing Materials (RAM) and Radar Absorbent Structure (RAS)

Usually the non-resonant RAM used to coat reflective surface. RAM will absorb the incident radar waves and then convert them into heat. Resonant RAM is seldom used because, one type of material only responds to the creation of destructive interference pattern against the one specific wavelength in contrast to the non-resonant RAM, RAM and Radar Absorbent Structure is used in the ground combat vehicles, ships and submarines.

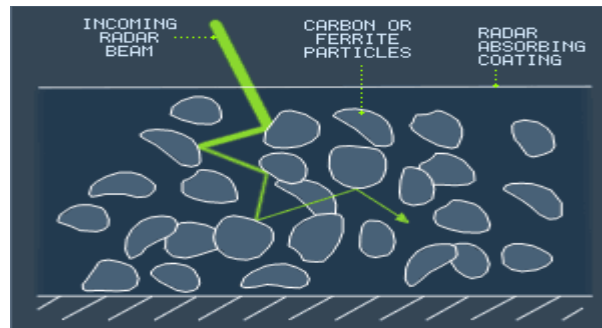


Fig.3. Radar Absorbing Material working



Fig.4. Radar absorbing honeycomb material



Fig.5. Stealth technology on the Sea Shadow



Fig.6. Thick and Thin Radar Absorbing Sheets

Ferrites as absorbers

Classification of ferrites can be mail according to crystal structure that is, cubic hexagonal vs. ferrite or magnetic

behavior; that is, hard vs. soft ferrite. Soft ferrites can easy to magnetize and demagnetize. Whereas hard ferrites are difficult to magnetize and demagnetize. Ferrites are used in three areas of electronic low level applications, power applications and Electro-Magnetic Interference (EMI) suppression. Ferrites material having high magnetic permeability. This property allows to store stronger magnetic field.

Thus ferrites properties related to microwave engineering, radar engineering, electromagnetic compatibility (EMC), electromagnetic immunity (EMI), and signal integrity (SI). Hexagonal ferrites can be used for detection and suppression of signal. it is also used to frequency-selective measurements of the signal parameters; to providing proper non-reciprocal isolation in system.

Most commonly known RAM types is iron ball paint. It contains tiny spheres coated with carbonyl iron or ferrite. This convert the radar energy into heat. The heat is transferred to aircraft and dissipated. The microwave absorbers material can be use to minimize the electro magnetic Reflection from the metal plate such as aircraft, ships, tanks, and electronic equipment. Figure 7 shows the use of absorber paint on stealth aircraft.



Fig.7. Stealth Aircraft uses Iron Ball Paint

For the purpose of preparing a low reflecting absorber in the high frequency range (GHz), two fundamental conditions must be satisfied. (i) The incident wave can enter the absorber by the greatest extent. (ii) The electromagnetic wave entering into the materials can be almost entirely attenuated and absorbed within the finite thickness of the absorber.

Conclusion

Stealth technology includes everything that minimizes signatures and signals and of preventing or delaying detection and identification of aircraft, ground combat

vehicles, ships and submarine. Ferrites, as Radar absorbing materials (RAM) and coating, play a key role in the stealth technology, and their use a major factor in radar cross section reduction. They are also used to eliminate electromagnetic interference (EMI) Problems and electromagnetic Compatibility (EMC) Problems. These problems include false images on radar; reduce performance due to system to system coupling, EMI etc. The microwave absorbers can be use to minimize the electromagnetic Reflection from metal plate such as aircraft, ships, tanks, anechoic chambers and electronic equipment.

References

- [1]. Stealth Technology Page. <http://iron-eagles.tripod.com/stp.htm>
- [2]. Items 17 Stealth. www.fas.org/nuke/control/mtrc/text/mtrc_handbook_item17.pdf
- [3]. Fiber Radio Optical ARCS. http://iron-eagles.tripod.com/articles/fiber_radio_optical_arcs.htm
- [4]. Perspectives on Plasma. <http://www.plasmas.org/basics.htm>
- [5]. Russians offer radical stealth device for export, Jane's Defence Weekly, March 17, 1999, p. 52
- [6]. MFI Multifunction Frontline Fighter, <http://www.aeronautics.ru/mig142article.htm>
- [7]. Mikoyan MiG 1.42. <http://www.aeronautics.ru/mig142frames.htm>
- [8]. S-37 Berkut (Golden Eagle) http://iron-eagles.tripod.com/eb_ac_files/s37.htm
- [9]. R. M. OGORKIEWICZ: The quiet approach. Jane's International Defense Review, September 2002, p. 33
- [10]. MCS – Protection on the Move. <http://www.barracuda.se/node1358.asp?productId={CF828E95-F074-11D3-8487-00508B6F1312>
- [11]. CV90 Tracked Armoured Combat Vehicles. <http://www.army-technology.com/projects/cv90/index.html>
- [12]. Visby Class Corvette, Sweden. <http://www.naval-technology.com/projects/visby/index.html>
- [13]. Naval Stealth Technology. <http://www.kockums.se/AboutKockums/navalstealthmain.html>
- [14]. Naval The Early History of Stealth. <http://www.milnet.com/milnet/shistory.htm>
- [15]. S. VASS, Stealth technology deployed on the battlefield, AARMS,2000,257–269
- [16]. V.K. Saxena, Stealth and Counter-stealth Some Emerging Thoughts and Continuing Debates, Journal of Defence Studies, 6(3),2012,19-28.

- [17] D. Singh, A. Kumar, S. Meena, and V. Agarwala, Analysis of Frequency Selective Surfaces for radar absorbing Materials Progress In Electromagnetics Research B,2012, 38, 297-314
- [18] S. Cadirci,RF stealth (or low observable)and counter RF stealth technologies: implications of counter RF stealth solutions for Turkish air force ,naval postgraduate school, March 2009.
- [19] H.W Yang, Yan Liu, Runge Kutta Exponential Time Differencing Method Analysis Of Non-Magnetized Plasma Stealth, Springer science business media,May 2010.
- [20] M.J. Huang, Recognition Of Major Scattering Sources On Complex Targets Based On The High Frequency Radar Cross Section Integrated Calculation Technique, Journal of shanghai university, August 2002,316-321.
- [21] C. Sudhendra,P.Jose,A. Pillai, K.Rao, Resistive Fractal FSS based Broadband Radar Absorber, Lecture notes on Electrical engineering, 2013, 21-29.
- [22] M.H. Carpentier, Microwave Technology, The microwave engineering handbook,3, 1993, 267-330.
- [23] B. Li, K. Cao, J. Xu and F. Li, Passive Radar System Based on GNSS Signal Illumination, China Navigation Satellite Conference,2012.
- [24] J. Khan, W. Duan, Radar Cross section Prediction and Reduction for Naval ships, Journal of Marine science and application, 2, June 2012, 191-199.
- [25] R.Zhu and Y.Ma, Feature Extraction Of Radar Emitter Signal Based on Wavelet Packet and EMD, Application lecture notes in electrical engineering (Springer Verilog), 2012,1-447.
- [26] J. Park, J.S. Choi, J. Kim, B.H. Lee, Long-term stealth navigation in a security zone where the movement of the invader is monitored,International Journal of Control Automation and systems, June 2010, 604-614.
- [27] T.Bandyopadhyay, Y. Li,M.H.Ang. Jr., Stealth Tracking Of an Unpredictable Target Among Obstacles, Springer Tracts in Advanced Robotics, 2005, 43-58.
- [28] R. Hierl, H. Neujahr, P. Sandl, Military Aviation, Information Ergonomics, 2012, 159-195.
- [29] A.P. Bryzgalov, The Potential Efficiency Of Estimating The Coordinates Of A Radio-Frequency Radiation Source By Means of a Passive Radar Installed On A Moving Carrier, Journal of Communications Technology and Electronics

Cryogenics: A Review

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Abstract - The cryogenics is a modern technology related to the study of behavior of materials at a very low temperature. In today's days due to lack in technological advancement and due to the high cost of the process it is less explored. But it is expected that in near future it is the most demanding technology. This technology is so much preferred because it is not only the study of behavior of materials, it also help in the investigation of action of low temperature on organisms.

Instead of being a mystery, it is the most interesting and yet to be explored technology. If more development takes place in this field then it would be a boon to the mankind.

Through the concepts of cryobiology some rear species, organisms, cells, tissues, etc. could be preserved for future purpose which will be very beneficial.

By the help of cryosurgery some dangerous diseases like cancer could be cured, which would lead to less loss of life due to this epidemic.

The principle of cryoelectronics can help in exploring the behaviors of the superconductive materials.

At the end, the most hot topic in cryogenics is cryonics, which claims in reviving human life even after dead is yet to be witnessed.

Keywords - Cryogenics, Cryonics, Cryobiology, Cryosurgery, Cryoelectronics.

1. Introduction

Cryogenic is that branch of science and engineering that deals with the behavior and characteristics of various material at a very low temperature. The temperature range for cryogenic study is 100K to 0K i.e. about -173°C to -273°C . The word cryogenic is a combination of two Greek words 'cryos' and 'genes'. 'Cryos' means very cold and 'genes' means born.

Theoretically, it is said that cryogenics process is carried out at a very low temperature range of 100K to 0K. But it is not

possible to attend this temperature range practically. So the practical temperature range available is about 123K to 175K.

The process of cryogenics is divided into various parts: cryobiology, cryosurgery, cryoelectronics, cryonics, etc.

In today's day the field of cryogenics is the most influential and the yet to be explored one. As the required temperature range is very difficult to be attend so this field is not much explored. This is one of those future technologies that has a very demanding future and has good scope of advancement. Cryogenics is a latest field that uses many features of nano technology. Cryogenics has found its existence due to the continuous advancement in the field of nano technology specially the carbon nano tubes.

This new field of technology traces its roots during the time of Second World War. During this time a scientist found that metals at very low temperature show unusual behavior. He named it as cryogenic hardening. Later in 1966 Ed Busch used these properties of metal at low temperature for industrial applications. For the process of cryogenic to be carried out special chemicals called the cryogens are use. The most common cryogen to be used is liquid nitrogen.

2. Parts of Cryogenics

As cryogenics is that branch of engineering that deals with behavior of material at very low temperature. Depending on the material under study, cryogenics has various parts. The important parts of cryogenics are as following:

- i. Cryobiology
- ii. Cryosurgery
- iii. Cryoelectronics
- iv. Cryonics

2.1 Cryobiology

Cryobiology is a combination of cryogenics and biology. Therefore it can be said that cryobiology is that branch of biology that studies the behavior of various living organism at

a very low temperature. The material under study may be cells, tissues, proteins, various organs or the organism as a whole. The importance of cryobiology is that it very efficiently study with the adaptive nature of organisms to very cold environment.

The history of cryobiology can be traced back during the early of 2500BC, when it was recommended that bleeding can be stopped of swelling can be prevented at a low temperature.

A very important aspect of cryobiology is cryopreservation. Cryopreservation deals with preservation or storing of various biological materials for future study. The biological material stored may be any plant or cells, tissues, embryo, etc. animals or human being. This preservation may be necessary for some medical purpose.

This extension of cryogenics is also necessary sometimes during the process of transplantations. This so because many time it is necessary for storing the transplantable organs to be stored for use in future. The common organ going through this process is the heart.

The society for cryobiology, founded in 1964, is one of the prominent world organization which look after the process of cryobiology and cryopreservation.

2.2 Cryosurgery

Cryosurgery is that branch of modern science that makes use of very low temperature to destroy dangerous tissues or cell through surgical process. Historically, cryosurgery is being used for treatment of various diseases and disorders. The common diseases or disorders under the roof of cryosurgery are moles, skin tags, skin cancer, etc. Apart from this skin related disorder, cryosurgery also finds its application in the treatment of various internal disorders also like liver cancer, lung cancer, oral cancer, etc. Talking of past, this process was used to treat hemorrhoids. The cryosurgery is advantageous because it uses the destructive force of low temperature on cells.

The treatment through cryosurgery in today's time is most commonly used in the treatment of various types of cancer and tumors. Also treatment of various skin and tissue related problems are cured through this process.

Although this process is quiet effective of treatment of various complicated diseases, but the treatment through cryosurgery is only possible for a localized disease. Also the solid tumors that are larger than 1cm cannot be removed using cryosurgery.

Cryosurgery is carried out with the help of some chemicals used as cooling solution that can bring the affected area to a low temperature. The commonly used chemicals for this purpose are liquid nitrogen, carbon dioxide, argon, dimethyl ether-propane, etc.

2.3 Cryoelectronics

Cryoelectronics is the branch of engineering that studies the behavior of superconductive materials at cryo temperature or low temperature. Cryoelectronics has its one individual branch known as cryotronics. Cryotronics is the practical application of the principle of cryoelectronics.

2.4 Cryonics

Cryonics is the most commonly used concept in the field of cryogenics. It deals with the process of preserving dead bodies of human beings and animals at a very low temperature commonly known as cryo temperature. In cryonics the scientist have a possibility that in future through the process of nano technology the dead bodies can be revived that is the bodies can be again brought to life by the use of various processes of nano technology.

At the beginning the animals were under inspection in cryonics. In history it is found that a mouse was first inspected in cryonics in 1972 followed by a goat in 1976.

3. Applications of Cryogenics

3.1 Cryogenics in the Space Industry

Cryogenics find a wide range of application in the exploration of space. The cryonics chemicals is used as rocket fuels.

3.2 Cryogenics in Aviation and Aerospace Industry

Cryogenics find a wide range of application the aviation and aerospace industry. It includes the heat treatment of jet engine turbine blades. The military aircrafts use argon and nitrogen to create an inert environment over fuel in the fuel tank.

3.3 Cryogenics in Metallurgy

As some metal show some unusual behavior at very low temperature. So, cryogenics in the metallurgical process increases the life of metal to be extracted.

4. Future Scopes

The cryogenics technology is a new technology and has come into limelight in latest years only,. So, there has not been much development in the field of cryogenics. Also the required

temperature for the entire process to take place is very low which is not possible to be achieved normally. But with the advancement in technology this won't be very difficult in near future.

This is one of the most exploratory fields with the use of nano technology. Also many engineering colleges have now started a branch named Cryogenics Engineering for further study in this field. Through the development in this field more fascinating facts about nature, science, engineering, technology, etc. can be found out.

References

- [1] *Bilstein, Roger E. (1996). Stages to Saturn: A Technological History of the Apollo/Saturn Launch Vehicles (NASA SP-4206) (The NASA History Series). NASA History Office. pp. 89–91. ISBN 0-7881-8186-6.*
- [2] "Cryonics is NOT the Same as Cryogenics". Retrieved 5 March 2013.
- [3] Thermal, Timmy. "*CryogenicLabels*". MidcomData. Retrieved 11 August 2014.
- [4] "ESO Signs Technology Transfer Licence Agreement for Cooling System". Retrieved 11 June 2015.

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INVISIBLE CLOAK

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Abstract - We all live in the age of science and technology. These two fields have completely changed the world from what it was in past and to what it is now. Every now and then we heard about the new inventions which sometimes seem to be magic. Thus the collaboration of science and technology has changed many fictions into facts. Out of the enormous inventions of science, one is "Invisible cloak". The invisible cloak is a fictional theme and method by which the physical objects become undetectable or invisible. In the invisible cloak, the human and object became invisible with the help of some special type of material or cloth. In this paper, we mention the basic idea used behind the construction and working of invisible. We describe the different technologies like ultra thin technology, Japanese technology and the use of invisible cloak in different fields.

Keywords- *Invisible cloak, Metamaterials, Ultrathin technology.*

1. Introduction

We all live in the era of science and technology. Science and technology has changed the lives of people to great extent. It has made the life simple, easy and fast. Science has changed the fiction into facts. Today, the inventions in the field of science are so advanced that sometimes it seems to be the magic. Every now and then we heard about the new inventions which seemed to be impossible in past but transform into reality only due to the efforts of scientists. Out of the million remarkable inventions of the science one is the "invisible cloak". In 1931, Edgar Ric Burroughs uses the concept of invisible cloak in novel "A Fighting Man Of Mars"^[1]. The concept of invisible cloak was also used in Samuel R Delancy's novel Dhalgren in 1975.^[1] The Harry Potter novel by J K Rowling also uses the concept of invisible cloak.^[1] In the Harry Potter movies, Harry uses the cloak to hide himself while enter into forbidden area of school. In the video games like Battlefield Heros Team Fortress 2 and halo series the cloaking devices are used.^[1] We all heard about the invisible cloak in fairy tales and saw in Harry Potter series, but no one thinks that this magic cloak can be possible in real world. But after the years of efforts of scientists this

invisible cloak comes into practical existence. The first practical invisible cloak was created in 2006 by British

scientist.^[1] This cloak made the object invisible only to microwave radiation. But it was not a complete invisible cloak. It cast a small shadow of the wearer. Later on, the concept of invisible cloak is given by many scientists using different technology. Some scientists use metamaterials as the basis of this invisible cloak. Metamaterials are synthetic materials which are made by science. These materials have a property which does not occur naturally. Due to these properties the light is rerouted after reflection from cloak and made the object invisible. The technology of invisible cloak has many potential uses, ranging from the military applications to bio medical, computing and energy harvesting. It can also be used for security encryption purposes. The brief descriptions of some technologies used in making the invisible cloak are narrated in this paper.

Before proceeding towards the different technologies, first we should discuss the most important material used in the formation of invisible cloak.- Metamaterials.

2. Metamaterials

Metamaterials are the synthetic materials that are made by science to acquire the properties that does not occur naturally. Metamaterials are formed by placing the composite materials such as metal or plastic in assemblies of repeating pattern having the wavelength smaller than the phenomena they involve.^[2] These materials have the property to manipulate the electromagnetic waves and have negative refraction coefficient. Since we know that light is the main factor which enable us to see the objects. We are able to see any object only if the light is reflected from that object or is generated by the object. Light is an electromagnetic radiation having the perpendicular vibrations of electrical and magnetic fields. Natural materials only affect the electric component of light but metamaterials not only affect the electric but also the magnetic component of light. This results in enlarging the area of possible interactions. Thus these materials reroute the light falling on them and make the object invisible. The surface of invisible cloak is made up of metamaterial.

Metamaterials used in the formation of invisible cloak are made up of lattice of materials having the wavelength less than the wavelength of light we want to bend. The silk based metamaterials called as "split ring resonators" consist of 10000 gold resonators attached to 1cm² piece of silk are used to make invisible cloak.^[3] Since the silk is not rejected by human body, thus this can be used to coat the internal organs during the surgery so that doctors can easily see what lies behind them.^[3]

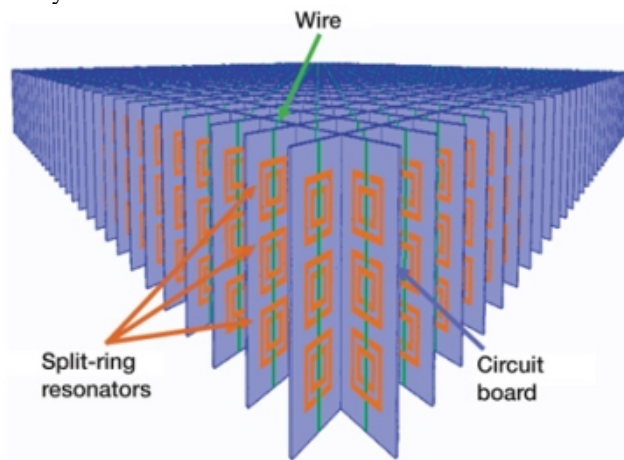


Fig. 1 Structure of Metamaterial.

3. Ultrathin Invisible cloak -US Technology

Scientists of Lawrence Berkeley National Laboratory and University of California under the US department of energy have created an invisible cloak called as "Ultrathin invisibility skin cloak" that can adapt the shape of any three dimensional object and make it invisible under the presence of visible light.^[4] Xiang Zhang, the director of Berkeley lab claims that this is the first technology that can make the three dimensional object invisible because the past researches can make only two dimensional objects invisible.^[4] Since this technology can work only at microscopic level, but scientists are very sure that they can enhance this technology up to macroscopic level in nearby future. Zhang adds on that his research team works for last ten years on the phenomena of how light interacts with metamaterials. They make many researches and finally they are able to change the path of light or make it bend backwards to make the object optically undetectable.

3.1 Construction

This skin cloak is made up of brick like structure of gold nanoantennas whose thickness is only 80 nanometers.^[4] They are wrapped around a 3D object which is microscopic in size. Metamaterials form the surface of this invisible cloak which have the special properties to bend the electromagnetic waves. This cloak looks like a coat. The inventors of this cloak says it is easy to implement and can be made practically up to macroscopic level. They said that since it is difficult to make the cloak work in air and if they make use of prism an additional phase shift is introduced which can make the object visible, but recent advancements in metasurfaces make use of subwavelength sized elements which manipulate the phase of propagating wave.^[4]

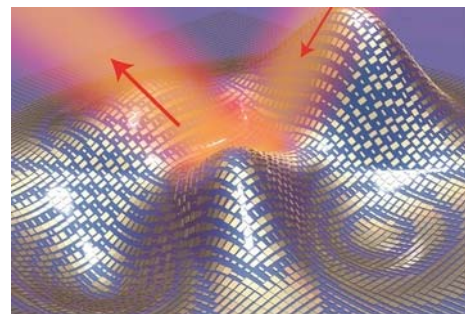


Fig. 2 Illusion of ultrathin technology.

3.2 Working

When light falls on this three dimensional object covered by invisible cloak covering the area of approximately 1300square meter, the light reflected off the surface of object is similar to the light reflected from flat mirror making the object invisible and not detected even by phase sensitive detection. This cloak can be activated or deactivated by adjusting the polarization of these nano antennas.

4. Japanese Technology

Dr. Susumu Tachi and his team from Keio university uses a "Retro reflective projection Technology" i.e. a process that superimposes the virtual world onto the real world, to make a invisible cloak.^[6] They make use of a computer, a projector, and a video camera to make the background images to shine on the front of a subject wearing a special

fabric made up of metamaterials. This fabric is only 50 micron wide.^[6] This cloak create the illusion of invisibility by reflecting the light back at the source.



Fig.3 Japanese technology.

4.1 Working

In this Japanese technology, the camera is attached behind the wearer to take the background view of the wearer and the computer processes this view and pass along it to the projector which filter this view through a half mirror and then projects it on the front of wearer .By adjusting the angle, the cloaked person looks completely invisible. Here the angle of projection is an important parameter which must be controlled carefully to make the wearer invisible.

5. Invisible cloak in Military

Now a days the concept of invisible cloak also taken place in the field of military. The British Ministry of Defense announced in October 2007 that they made an invisible tank with the help of invisibility clock technology.^[7] The silicon material is used for the coating of tank and the cameras and projectors are fixed on the tank. The concept behind this is that the cameras are adjusted to some angle to take the footage of the surrounding and then project it on the projector.^[7] Thus the image of surrounding is only projected on the tank with the help of this, an illusion of invisibility is created and the viewer does not detect any tank.

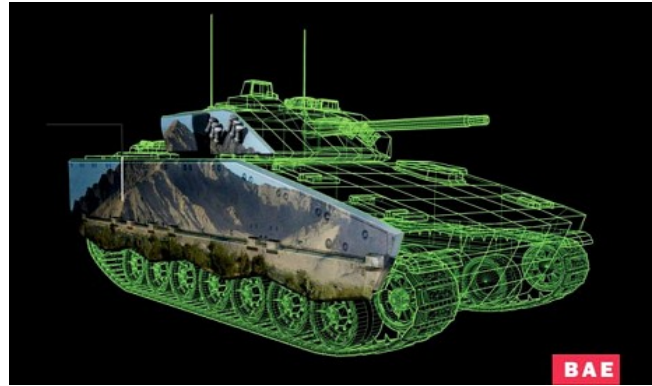


Fig.4 Invisible tank.

But there are some limitations of this technology. The major one problem is that sometimes cameras failed to adjust the angles and thus the view of surrounding is not displayed on the projector. This will make the tank some bit visible. Due to these problems, scientist trying to manufacture the invisible tank without the use of camera and projectors .

6. Future scope

The research is still going on this field. The scientists of US are trying to make the ultrathin technology at macroscopic level. Recently scientists have made and test an invisible cloak that can make the object invisible to heat.^[8] Thus they are making the cloak which senses the heat and make the object invisible. A news also come from US Defense Advanced Research Projects Agency that they are doing the research on making an invisible cloak for security of their soldiers in war situations. They are researching on making a shield that can protect the soldiers from enemy fire and that shield can repair itself in case of any destruction.^[9]

The new technology arises to bend the light is the Quantum stealth. Quantum stealth is a type of material that completely hide the target^[10]. In this, the material bends the light around the target and make target invisible. This material removes visual, night vision and target shadow also. This technology will adopted by the military in the future but now a days the work in progress in this

technology. This technology is adopted in the future in the aircraft, submarine, sniper, combat aircraft to make them undetectable.



Fig 6 quantum stealth material.

References

- [1] https://en.wikipedia.org/wiki/Cloak_of_invisibility
- [2] <https://en.wikipedia.org/wiki/Metamaterial>
- [3] <http://www.iop.org/resources/topic/archive/metamaterials/>
- [4] <http://www.livescience.com/52216-ultrathin-invisibility-cloak.html>
- [5] <http://tachilab.org/modules/projects/rpt.html>
- [6] <http://www.tokyotimes.com/japan-invents-invisibility-cloak/>
- [7] <http://science.howstuffworks.com/invisible-tank.htm>
- [8] <http://futurescope.co/post/50238568250/thermal-invisibility-cloak-in-first>
- [9] <http://science.howstuffworks.com/invisible-tank.htm>
- [10] www.hyperstealth.com/quantum-stealth/

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A Novel Technique for Multicasting technique for Path Establishment to Transmit Audio-Video Data in MANET

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Abstract: MANET is infrastructure less, decentralized multi hop network where the nodes are randomly to move in any direction, there each node works as a router and host to send packet to each other, there is no any requirement of fixed infrastructure. There are various challenges in MANET like security, QoS, routing etc. In this paper multicasting in MANET has been discussed. Further enhancement in DSR protocol has been done using multicasting nodes. Network Performance has been evaluated in terms of throughput, packet loss and delay.

Keywords: MANET, Routing, Multicasting, Throughput, DSR, AMODV

1. Introduction

MANET is a mobile ad-hoc network. An ad-hoc network is set of wireless mobile nodes that have ability to communicate with each other without the help any centralized administration [1]. MANET has a dynamic topology due to the mobility of nodes. Wireless network contain collection of mobile hosts (nodes) that are communicate with each other through the wireless links. MANET is infrastructure less, decentralized multi hop network where the nodes are randomly to move in any direction, there each node works as a router and host to send packet to each other, there is no any requirement of fixed infrastructure. MANET provide successful solution in several cases, where any wired or wireless infrastructure is not accessible damaged or destroyed and overloaded due to some reason such as military operations, emergency and

Rescue operations, disasters relief efforts and tactical batter field; as well as conferences and class rooms or in research area like a sensor network [2]. MANET is network which is fully distributed and able to work at anywhere without the help of any centralized administration or access points or base stations.



Fig.1 MANET Network

1.1 Challenges in MANET:

There are many challenges in MANET which are as follows:

1.1.1 Routing: The most common challenging issue in MANET is Routing data packets in between nodes when there is change in the topology. Another challenge for MANET is multicast routing because the nodes are move randomly in the network. Several of the protocol based on the reactive routing rather than proactive routing [2].

1.1.2 Security and Reliability: In an ad-hoc network security is a biggest problem due to the nasty neighbors that are relaying on the information. So there we need of some security mechanism such as the authentication and the management of key provide the security to each node

in MANET. Another problem introduced in MANET is due to the wireless links that have finite transmission area is reliability [3].

1.1.3 Quality of service (QoS): The common challenge in changing environment is providing the different quality of service level. An adaptive QoS must be implemented over the traditional resource reservation to support the multimedia services [1].

1.1.4 Inter-networking: To interact with an ad-hoc network, inter-networking between MANET and infrastructure network is often expected in many terms. The coexistence of routing protocol for mobile hosts is a challenge to manage the speed of nodes.

1.1.5 Power consumption: For various light-weight mobile devices, the communication related function should be optimized for lean power consumption. Conservation of power and power aware mobility management [4].

1.1.6 Multicast: Multicast is able to support multi-party wireless interaction. The multicast routing protocol must be able to deal with the speed of nodes that include any time leave or join the network, so the multicast tree is no longer static [12].

2. Review of Literature

In this paper [3], simulation of secure AODV protocol is carried out by using various simulation parameters such as no. of mobile nodes, routing protocol, traffic, and transport protocol and packet size. Performance metrics PDR, end to end delay and packet delivery ratio are used to check the performance of network. Simulation is carried out by using NS2. In this paper the author provide the method to detect and prevent of gray-hole attack and also to know the behavior of malicious node. The algorithm is provides the better solution to improve the performance of ad-hoc. In this paper [4] they have compared AODV, DSDV, DSR and ZRP protocol using the tool NS2 and was compared in term of packet delivery ratio, average delay, routing overhead and average throughput. In order to evaluate the performance of the protocols network size was 1200m x 1200m. Antenna model was Omni directional, simulation time was 10 second and the traffic type was CBR (constant bit rate) and number of nodes varies. The author have concluded that, in case of packet delivery ratio, AODV has better performance when number of nodes increase, packet delivery ratio also increase, DSDV performance is worst in this case. Average throughput of AODV was better while the DSDV

was worst performance. In case of routing overhead ZRP has better performance. Due to smaller zone radius and DSR was worst. In case of average delay ZRP was better performance due to minimum delay, ODV is worst because the higher drop. In this paper [5] author compared the routing protocols (DSDV, DSR, and ZRP). They have used the network simulator NS2 and were compared in term of packet delivery ratio and throughput by varying the pause time and the number of nodes. In simulation environment, they have constructed, the network area 500m x 500m, traffic type CBR (constant bit rate), antenna type was omni and packet interval 0.2 sec, radio propagation model was two ray ground. Number of nodes and pause time varying in this scenario. Simulation was carried out using NS2.33. They have concluded that DSR performance is same for different pause time while DSDV and ZRP when pause time increase packet delivery fraction decrees. When the number of nodes rises up, the packet delivery fraction decrease but still maximum in case of DSR as compare to DSDV and ZRP but ZRP have better performance in case of lesser number of nodes as compare to DSDV, ZRP performance goes down when no. of nodes increase. In case of throughput was increase when pause time increase for all DSDV, DSR and ZRP but maximum for DSR. But when pause time increase throughput DSDV and ZRP almost same. In term of no. of nodes increase the throughput of DSR increase but decrees for the ZRP when no. of nodes increases.

In this paper [6], they explained an advanced OLSR (AOLSR) protocol is proposed based on a modified Dijkstra's algorithm which enables routing in multiple paths of dense and sparse work topologies. The routing is based on the energy of nodes and links (implied from the lifetime) and the mobility of the nodes. It is a hybrid ad hoc routing protocol because it combines the proactive and reactive features. It is another form of source routing protocol which allows a sender of a data packet to partially or completely reveal the route the packets take through the network Two cost functions are introduced to build link-disjoint or node-disjoint paths. Secondary functions, Two cost functions are introduced to build link-disjoint or node-disjoint paths. Secondary functions, namely path recovery and loop discovery process are involved to manage the topology changes of the network. AOLSR protocol is analyzed and compared with the existing MANET routing protocols namely, dynamic source

routing (DSR) and OLSR. Its performance is observed to be satisfactory in terms of average end-to-end delay, packet delivery ratio (PDR), average time in first-in-first-out (FIFO) queue, and throughput.

3. Routing in MANET

Sending multiple copies of packets to different nodes is called multicasting. Wired and wireless networks both are supported by both multicasting routing protocols. There are many challenges and tasks which must take in consideration when deploy multicasting routing protocol. Limitation of network scalability, battery consumption, limited bandwidth and poor security. There are three types of multicasting routing protocol [7].

1. Tree based Multicasting
2. Mesh Based Multicasting
3. Hybrid Multicasting

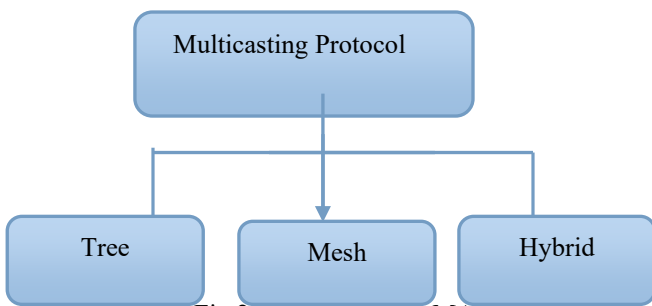


Fig.2 Multicasting in MANET

In Tree based multicasting, structure can be highly unstable routing multicast protocol because it needs reconfiguration frequently. MADOV, ADMR are its example [8]. Mesh based multicasting routing are those which has more than one path may exist between source receiver repair. CAMP and ODMRP are its example. Hybrid is combination of both the technique. AMroute is its example.

3.1 Multicast Distance Source Routing (MDSR): MDSR is an extension of DSR protocol. It is based upon shared trees on-demand to connect multicast group members. MDSR has a capability of multicast, unicasts and broadcast.

MDSR protocol can be route information obtained when searching for multicast; it can also increase unicasts routing knowledge and vice-versa [9]. When a node wishes to join a multicast group or it has data to send to the group but does not has a route to that group, it originates a route request (RREQ) message. Only the

members of the multicast group respond to the join RREQ. If an intermediate node receives a join RREQ for a multicast group of which it is not a member or it receives a route RREQ and it does not have a route to that group, it rebroadcast the RREQ to its neighbors. But if the RREQ is not a join request any node of the multicast group may respond [10].

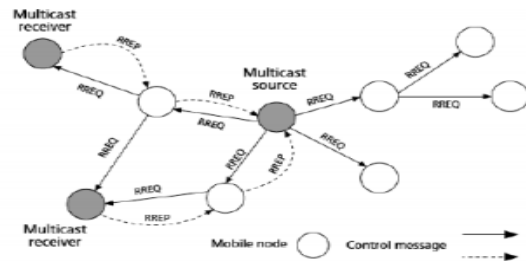


Fig. 3 RREQ and RREP

4. Proposed Methodology

In DSR protocol there is some problem during communication process. DSR has broadcast nature. First of all it floods RREQ packets to all the nodes. The nodes which has destination address sends RREP message to the source nodes. The node which has not destination address also receive RREQ message which is wastage of bandwidth and other resources. To overcome this problem we have to multicasting protocol.

To overcome DSR problem, first of all we have to divide our network into smaller region and deploy network as same manner as existing method. There are multicasting nodes in each region which further communicate with other nodes. Source node is at centre region.

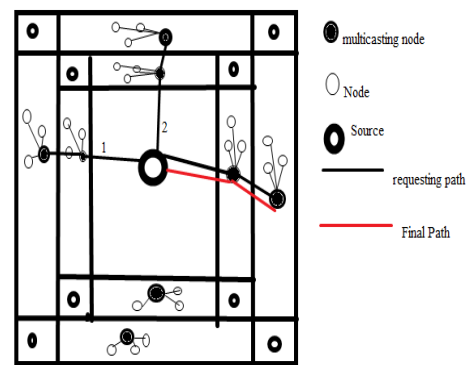


Fig 4 Network Clustering

In fig 4.1 the network is dividing into regions. Source node is present is at centre region. Some nodes are

present at corners. In each region there are multicasting nodes. Adjacent nodes send their data to multicasting nodes which helps to communication with nodes of other regions. Suppose source wants data it first of all send query to the multicasting node of one region. If data is available there then it replies back to source otherwise send message further to outer regions multicasting node. Same process repeat for all other multicasting nodes also. The node which has data, reply to its adjacent multicasting node which further sends data to source.

5. Experimental results

The whole scenario is implemented on Ns2.



Fig. 5 Packet Loss

As illustrated in figure 5, due to broadcast nature of AODV protocol the packet loss is high in the network. The proposed technique will maintain multicasting tree which leads to reduction in network packet loss.

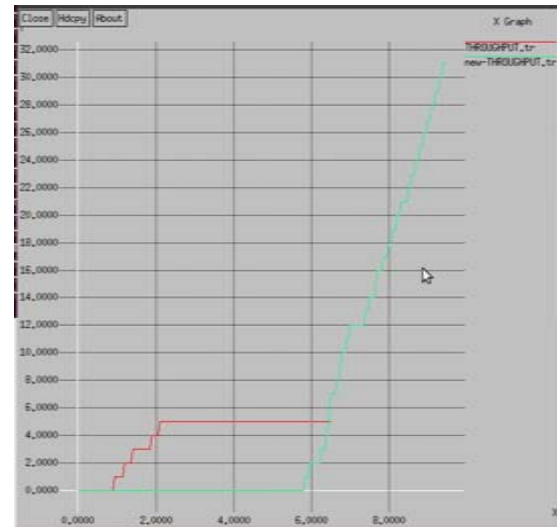


Fig. 6 Throughput

As shown in figure 6, the network throughput is high as compared to existing broadcasting nature protocol. Due to high bandwidth consumption of existing technique leads to reduction in throughput. In the multicasting technique bandwidth consumption is less which leads to improvement in network throughput.



Fig. 7 Delay

As shown in figure 7, the delay in the proposed technique is less as compared to existing technique. This is due to less bandwidth consumption in the proposed technique.

6. Conclusions

Now days, Routing of the network is most important and very biggest challenge in Mobile Ad-Hoc Network. Routing is responsible for degradation of the network performance. In this paper to surf audio-video multicasting technique has been proposed. DSR protocol has broadcast nature which consumes more bandwidth and degrades network performance. Network performance has been analyzed in terms of throughput, delay and packet loss.

References

- [1] A. Samuel Chellathuri, E. D. (2013). "EZRP: Evolutionary Zone Routing Protocol". ICACCS , 1-5.
- [2] Ashish K. Maurya, D. S. (Nov,2013). "Simulation based Performance Comparison of AODV, FSR and ZRP Routing Protocol in Manet". IJCA , 23-28
- [3] Awadesh Kumar, P. S. (July,2013). "Performance Analysis Of AODV ,CBRP,DSDV and DSR MANET Routing Protocols using NS2 simulation". IJ Computer Network and Information Security , 45-50.
- [4] Deepak Kumar, S. C. (May,2012). "Performance Comparison Of DSDV and AODV Routing Protocols in MANET". IJECCT , 120-124.
- [5] Divangna Gupta, R. K. (aug,2014). "Simulation of Different Routing Protocols in MANET Using NS2" International journal of Scientific and Research Publication , 1-5.
- [6] Dhanalakshmi Natarajan and Alli P Rajendran (2014), "AOLSR: hybrid ad hoc routing protocol based on a modified Dijkstra's algorithm", Natarajan and Rajendran EURASIP Journal on Wireless Communications and Networking, IEEE
- [7] R. Manoharan and E. Ilavarasan (May, 2010). "Impact of Mobility on the performance of the multicast routing protocol in MANET", IJWMN, vol.2, No.2
- [8] Luo Junhai a,b, Xue Liu b , Ye Danxia (2007). "Research on multicast routing protocols for mobile ad-hoc networks", Elsevier,
- [9] Er. Rubia Singla, Er. Jasvir Singh (2014). "Review on Node-Disjoint Multipath Routing Based on AOMDV Protocol for MANETS", International Journal of Computer Science and Information Technologies, Vol. 5 (3), pp 2755-2757
- [10] Laxman H. Sahasrabudde and Biswanath Mukherjee, "Multicasting Routing Algorithms and Protocols: A Tutorial"
- [11] Mahesh K Marina and Samir R Das (2006). "Ad hoc on-demand multipath distance vector routing", WIRELESS COMMUNICATIONS AND MOBILE COMPUTING Wirel. Commun. Mob. Comput
- [12] Mina Vajed Khiavi and Shahram Jamali (2013). "Performance Comparison of AODV and AOMDV Routing Protocols in Mobile Ad Hoc Networks", International Research Journal of Applied and Basic Sciences, ISSN 2251-838X /Vol, 4 (11):3277-3285.

Design Photovoltaic System for a Building

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Abstract - The objective of this work is to design a suiting photovoltaic system for a flat roof in BGIET college library , Sangrur. The production of the photovoltaic system is found with the use of the simulation software. Input to the simulation software such as meteorological data has been evaluated. The energy production of the final two or three alternative systems is evaluated with respect to the energy consumption within the building where the installation is to be located.

Keywords - *pvsyst, meteornorm, optimal*

1. Introduction

These are known as so called time-step simulation programs. All of the mentioned simulation programs except DASTPVPS apply for grid-connected systems. SOLDIM, PVS, PV*SOL, Greenius, PV Design Pro and PVsyst all apply for standalone systems, hybrid systems, PV pumping systems and some apply for other technologies such as wind, fuel cells, solar thermal plants etc. All provide an economical overview of viability. PVS, PV*SOL, PVsyst, PV Design Pro and SOLDIM provide shading calculations down to intervals of one hour. In addition PVS, PVsyst, PV Design Pro and SOLDIM provide a solar radiation generator .

PVsyst is considered one of the most comprehensive programs of the ones listed, and also one of the most complicated to use. PVsyst has a higher accuracy of shading calculations than PVS and PV*SOL, and is the only program which provides a 3D representation of the PV field. Greenius provides an extensive economical calculation, while the other programs are fairly similar with varying degrees of functionality .The simulation software PVsyst was used in this study in order to calculate the production of the PV installation and to estimate the installation. PVsyst is developed at the University of Geneva by Andr e Mermoud . PVsyst has the option of simulating a preliminary design or a project design. In

addition PVsyst has a tool option, where background data management and didactic tools are located.

Outline of the work

First structured in chronological order of the steps that are necessary in order to perform a simulation of a stand alone PV system in the simulation software PVsyst:

1. Project
2. Orientation
3. System
4. Module layout

In order to perform the simulation, all of these steps has to have define parameters. In order to define the parameters some background information will be provided..

2. PROJECT: Geographical Location and Meteorology

The geographical location of the project and the local weather conditions influence the optimal tilt of the PV modules and is, therefore, of great importance. The building in this study is located in sangrur india at a latitude of approximately 30.3°N.

2.1 Solar Radiation and Meteorology

The amount of effect produced by a PV module relies on how much radiation it receives at its precise location. The energy produced by the sun at a temperature close to 5800 K (5526.85°C) is emitted primarily as radiation. When the radiation enters the atmosphere it can collide with clouds and air molecules and the radiation can then scatter or be absorbed . The beam or direct radiation is the radiation which is not reflected or absorbed and reaches the surface of e.g. a PV module in a direct line from the sun. The radiation after a scattering can either be re-emitted into the atmosphere or reach the surface of the module, this is called diffuse radiation. Albedo radiation is the radiation reaching the module surface after being reflected by the ground. Global radiation consists of all three components: beam, diffuse and albedo radiation .

On account of the absorption and scattering, the amount of solar radiation that reaches the Earth's surface decreases. The radiation passes through gases when entering the atmosphere, as a result the radiation at Earth's surface has a different spectral composition than the radiation which has not passed through the atmosphere.

The PV modules are rated at Standard Test Conditions (STC),

which are:

- Solar radiation = 1000 W/m²
- Cell temperature = 25° C
- Ambient temperature = 20° C
- Wind speed = > 1 m/s

Although the global irradiance can be as high as 1000 W/m² and even somewhat higher, the available irradiance is usually considerably less because of the rotation of the Earth and adverse weather conditions. Naturally much stronger over-irradiations may be expected for the lower latitudes near the Equator, with magnitudes exceeding 1800 W/m². However, the contribution of over-irradiance events to the annual irradiation is very small.

2.2 Position of the sun

The location of the sun is defined by two angles:

- Altitude (α)
- Azimuth (ψ)

the altitude of the sun is the angle between the sun and the ground. This angle is always between 0° and 90°. The sun rises in the east and sets in the west. Azimuth is the angle between north and the point where the sun is positioned. Altitude and azimuth can be determined from the following equations:

$$\sin \alpha = \sin \delta \sin \varphi + \cos \delta \cos \varphi \cos \omega$$

$$\cos \psi = \frac{\sin \alpha \sin \varphi - \sin \delta}{\cos \alpha \cos \varphi}$$

where δ is the declination and ω is the hour angle. The declination is the angle of deviation of the sun from directly above the equator. The hour angle is the difference between noon and the desired time of day in terms of a 360° rotation in 24 hours. The equation describing the declination is often given as an approximation since a year is not exactly 365 days.

National Aeronautics and Space Administration (NASA) and the astronomical applications department under the U.S. Naval Observatory (USNO) both provide information concerning the azimuth and altitude angles of a given location described with coordinates. The USNO site takes as an additional input the time zone of the specific site. NASA gives monthly average hourly altitude angles and azimuth angles. The azimuth and altitude numbers provided by USNO and NASA are, therefore, not exactly the same.

2.3 Meteorological data sources

Within PVsyst there are possibilities to define new monthly meteorological values and re-define the location of the project as well as import both monthly and hourly meteorological data from a number of other databases, seen in Table 3.1.4. A comparison of the free web based databases was done alongside with local meteorological data where possible. When opening the meteorological file the latitude and longitude of the location is defined in decimals as well as in degrees and minutes. The altitude above sea level and time zone are also displayed. The monthly meteorological values are displayed along with the data source. The monthly meteorological values which are required are the horizontal global irradiation and the ambient temperature. Extra data which could be provided are data for the horizontal diffuse irradiation and the wind velocity. A custom-made second meteorological set was assembled, with a focus on monthly irradiance and temperature values, since these are the ones compulsory in order to run a PVsyst simulation.

Database	Region	Values	Variables	Availability
Meteonorm	Worldwide	Monthly	Gh, Ta, WindVel	Software
Meteonorm	Worldwide	Hourly	Gh, Dh, Ta, WindVel	Software
Satellite	Europe	Hourly	Gh, NO Ta	Web free
US TMY2	USA	Hourly	Gh, Dh, Ta, WindVel	Web free
ISM-EMPA	Switzerland	Hourly	Gh, Dh, Ta, WindVel	Included in PVsyst
Helioclim (SoDa)	Europe	Hourly	Gh, NO Ta	Web restricted
	Africa	Hourly		
NASA-SSE	Worldwide	Monthly	Gh, Ta	Web free
WRDC	Worldwide	Hourly	Gh, NO Ta	Web free
		Daily		
		Monthly		
PVGIS-ESRA	Europe	Monthly	Gh, Ta, Light turbidity	Web free
	Africa			
Helioclim -1 (SoDa)	Europe	Monthly	Gh, NO Ta	Web restricted
	Africa			
RETScreen	Worldwide	Monthly	Gh, Ta, WindVel	Software, free
SolarGIS	Europe	Hourly	Gh, Dh, Ta	Web, paid access
	Africa			
	Asia, Brazil, West Australia			

Table 1. Solar Data Sources

3 Orientations

For this project it was chosen to use fixed tilted PV modules. Other options are seasonal tilted modules, tracking systems, one or two axis tracking systems or BIPV such as roof tiles or shades. Systems with one or two axis tracking are mostly used for ground mounting. In addition, such systems are assumed to require more maintenance since there are more mechanical parts, and thus not very practical for roof installations. Furthermore,

such mounting systems are more expensive. The modules should be directed towards south in order to obtain as much irradiation as possible. This corresponds to an azimuth angle of 0° . Magnetic and geographical south should in theory be the same. Due to the magnetic flux lines on Earth they deviate with varying degree depending on location. The modules should be directed towards geographic south, and not magnetic south, since this would affect the system yield .

3.1 Optimum Tilt Angle

The amount of radiation collected on the solar modules should be as large as possible. The tilt angle of fixed modules can be maximized with regards to seasonal performance or annual performance. The optimum tilt angle β_{opt} , illustrated in Figure is defined as the tilt angle of highest annual irradiation and depends on both latitude (φ) and local climate. The rule of thumb with regards to the highest annual performance is a tilted angle approximately equal to the latitude of the site. This corresponds to an azimuth angle of 0° . Magnetic and geographical south should in theory be the same. Due to the magnetic flux lines on Earth they deviate with varying degree depending on location. The modules should be directed towards geographic south, and not magnetic south, since this would affect the system yield . The larger the latitude, the larger the difference between summer daytime and winter daytime and, therefore, the larger the difference between the summer and winter irradiation. As a result it can be anticipated that as the latitude increases, the optimal tilt angle should give priority to the collection of summer over the collection of winter irradiance.

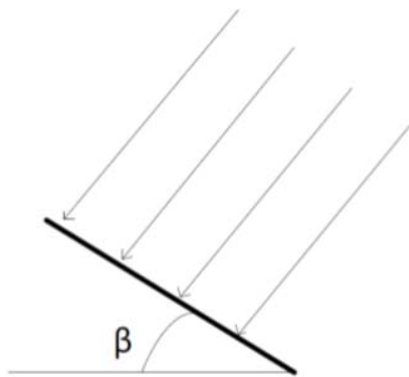


Fig 1. Tilt angle

3.2 Horizon and Near Shadings

In PVsyst there has been made a distinction between far and near shadings. The far shadings are defined as shades cast by the horizon while the near shadings are defined as shades cast by near objects which change during the day.

3.3 Horizon

The far shadings are supposed to act globally on the PV plane. Acting globally would mean that it would not give any partial shading on the installation. The sun would either be or not be visible on the field. Horizon defining shadows would naturally consist of surrounding environment such as mountains and are defined with a horizon line in PVsyst . The obstacles should be limited to approximately twenty times the PV-array size . The length of the PV installation is approximately 40 meters, which gives a radius of approximately 800 meters before obstacles could be defined as horizon. The reason for this is that the horizon line is supposed to be viewed in the same way from any point of the field.

When a horizon line is accounted for in PVsyst the beam component of the irradiance is or is not visible on the field. PVsyst determines the exact time when the sun crosses the horizon line and weights the beam hourly value before performing the transposition. The diffuse part of the irradiance is assumed isotropic in the program. The diffuse part does, therefore, not depend on the position of the sun, it is the same irradiance which is coming from any direction of the sky and is therefore a constant factor during the year . The albedo contribution in PVsyst is considered to be linearly decreasing according to the horizon height. When using meteorological data from ground stations the horizon effect is already taken into account for that station. A comparison of the measuring station horizon with respect to the field horizon could be accounted for.

3.4 Near Shadings

Shadings which change during the day and the season and only partly affect the PV field are the near shadings. The fraction of how the PV field is effectively shaded is defined in PVsyst by shading factors. In order to calculate the shading factor at any time as a function of the position of the sun requires a full 3D representation of the field and its surroundings.

The 3D representation of the building was constructed mainly by the help of drawings of the building and Google Earth. Some assumptions were in addition made when considering the height of roof top shading elements with the assistance of photos taken during the site assessment. As mentioned there is a 800 meter radius where near shading objects should be taken into account. Inside this radius the twelve storey building is located. This building was, therefore, represented in 3D, with measurements . Moreover, Google Earth was used in order to place the building in approximate accordance with the PV field.

4 Simulations

This chapter documents the process of finding the final three systems providing the best PR and energy production. Parameters which have been altered are the modular tilt angles, pitch distance, fraction of electrical effect and multiple inverters. A base case was used in order to compare the effect of varying these parameters. These figures also illustrates how a general simulation report is presented in PVsyst.

Table 2. Parameters and Equipments

Stand Alone System:	
Simulation parameters	
PVsyst Evaluation mode	
Project : Stand Alone system College library	
Geographic Situation-	
Latitude	30.3°N
Longitude	75.9°E
Time defined as Legal Time Time zone UT+5.5	
Altitude 241 m	
Simulation parameters	
Collector Plane Orientation	
Tilt 25° Azimuth 20°	
Models used Transposition Perez	
PV Array Characteristics	
	PV
module Si-poly Model Poly 60 Wp 36 cells	
Manufacturer- Generic	
Total area- Module area 9228 m ²	
Cell area 7758 m ²	
Battery	
	Model
S-460 Manufacturer Surette	Battery Pack
Characteristics	
Voltage -96 V	
Nominal Capacity 224943 Ah	
Nb. of units 16 in series x 773 in parallel	
Regulator Model	
	Generic
Default with MPPT converter Technology	
Converter Maxi and EURO efficiencies 97.0/95.0 %	
Battery Management Thresholds Charging	
108.0/104.6 V	
Discharging 94.1/100.8 V	

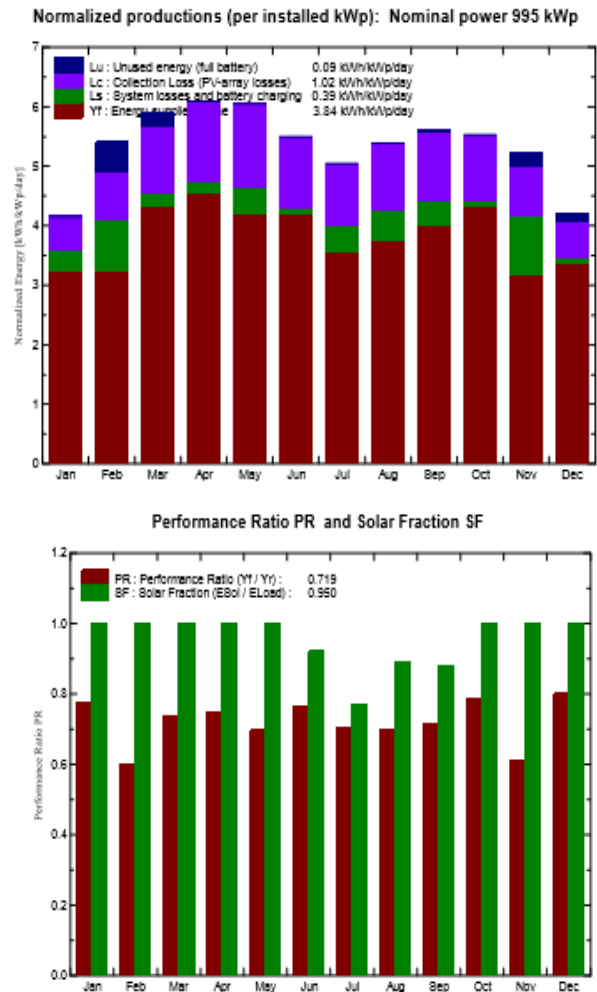


Fig. 2. Performance ratio of system

Table 3. Monthly production of system

MONTH	KWH
JANUARY	99627
FEBRUARY	90570
MARCH	133588
APRIL	136038
MAY	129855
JUNE	136038
JULY	142222
AUGUST	129855
S/EPTEMBER	136038
OCTOBER	133588
NOVEMBER	95099
DECEMBER	104156

give the most realistic picture of the price situation per now. However, such prices could change in a possible next phase of implementation and would only be valid for the time when or if such a request was to be answered. The income aspect of the installation would depend on whether the installation would cause the Hafslund customer to become a surplus customer in accordance with the definition given by NVE.

Two methods which take into consideration the economic aspects of the installation are:

1. Simple payback
2. Life cycle costing

Simple payback is calculated by the following formula

$$T = C / S$$

where T is the payback period in years, C is the initial investment cost and S is the annual cost savings of electricity that does not need to be purchased. In order to perform life cycle costing, a life cycle cost analysis is used in order to determine the cost per kilowatt-hour for the PV system. The life cycle cost analysis has been made in order to determine the investment cost of the equipment, the operation and maintenance cost. In addition component life time and replacement costs should be taken into consideration. To determine the cost per kWh the following equation is used :

$$\text{cost/kWh} = \frac{\text{Present value of the system over X years}}{\text{Yield (kWh) generated over X years}}$$

New simulation variant
Balances and main results

	GlobHor kWh/m ²	GlobEff kWh/m ²	E Avail MWh	E Unused MWh	E Miss MWh	E User MWh	E Load MWh	SolFrac
January	97.5	125.2	106.9	0.05	0.00	99.6	99.6	1.000
February	119.0	147.6	124.5	14.43	0.00	90.6	90.6	1.000
March	160.1	177.3	141.2	6.42	0.00	133.6	133.6	1.000
April	175.2	177.6	135.6	0.17	0.00	136.0	136.0	1.000
May	194.9	181.8	137.3	0.01	0.00	129.9	129.9	1.000
June	176.5	159.4	122.7	0.01	10.64	125.4	136.0	0.922
July	165.2	151.3	117.4	0.05	32.67	109.6	142.2	0.770
August	168.9	161.9	125.8	0.11	13.81	116.0	129.9	0.894
September	154.8	163.2	126.6	0.21	16.52	119.5	136.0	0.879
October	141.8	166.7	131.3	0.08	0.00	133.6	133.6	1.000
November	115.1	153.0	126.9	6.92	0.00	95.1	95.1	1.000
December	93.6	127.2	107.9	4.86	0.00	104.2	104.2	1.000
Year	1762.5	1892.2	1504.3	33.31	73.64	1393.0	1466.7	0.950

Legends: GlobHor Horizontal global irradiation
 GlobEff Effective Global, corr. for IAM and shadings
 E Avail Available Solar Energy
 E Unused Unused energy (full battery) loss
 E Miss Missing energy
 E User Energy supplied to the user
 E Load Energy need of the user (Load)
 SolFrac Solar fraction (EUsed / ELoad)

5. Economics

A simple overview of the economic aspects of the final alternatives should be done in order to get an idea of the costs of such an installation. All manufacturers of modules and inverters should receive a request concerning the selling price of the module or inverter used in order to

Loss diagram over the whole year

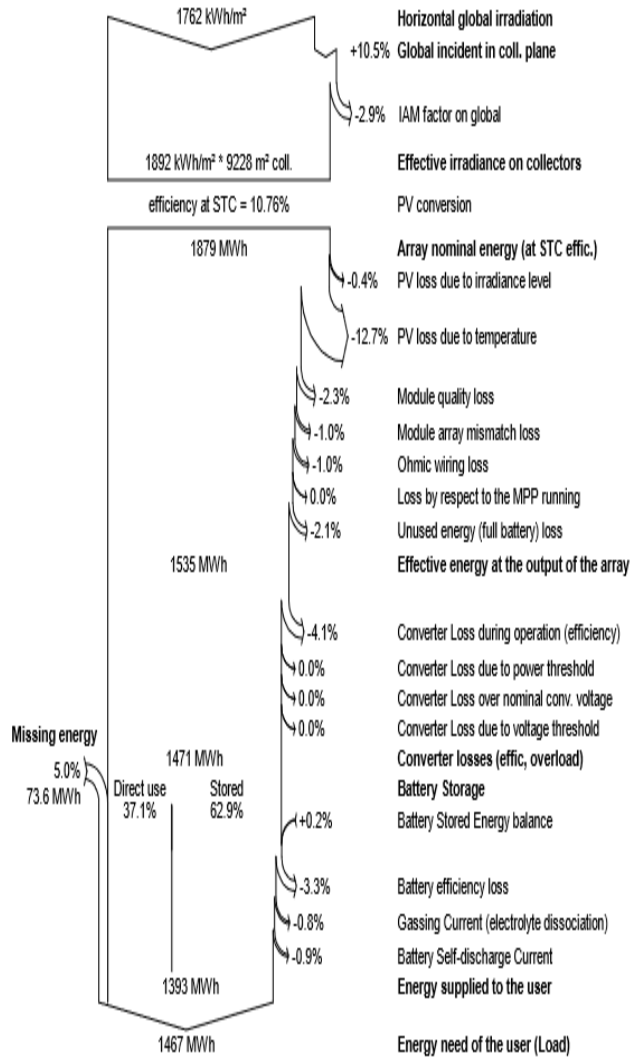


Fig 3. Loss Diagram in whole Year

References

[1] Klise G. T., Stein J.S. 2009. Models Used to Assess the Performance of Photovoltaic Systems, SANDIA REPORT (SAND2009-8258) .
 [2] Duffie J.A., Beckman W.A. 1999. Solar Engineering of Thermal Processes, second ed. Wiley Interscience, New York.
 [3] Baker, N. and K. Streemers, 2000. Energy and Environment in Architecture, A Technical Design Guide, London.
 [4] Florin Agai, Nebi Caka, Vjollca Komoni, "design optimization and simulation of the photovoltaic systems on

buildings in southeast Europe", international journal of advances in engineering and technology, nov. 2011.
 [5] Causes of Global Warming. (September 2012). [Online]. Available: http://www.ecobridge.org/causes_of_global_warming.html
 [6] Emergence of Photovoltaic. (September 2012). [Online]. Available: <http://ezinearticles.com/?Emergence-ofPhotovoltaics&id=601630>.
 [7] Solar PV - Solar PV Inverters. (September 2012). [Online]. Available: <http://www.solarpv.co.uk/solar-pv-inverters.html>

Review on Analysis of Faults in Power System Using Symmetrical Component Approach

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Abstract- Electric power system networks are susceptible to faults. The computation of bus voltages and branch currents due to faults is an usual tool for power system analysis. The aim of this paper is to present a systematic approach of calculating fault currents for performing the error analysis of multiphase distribution networks based on the symmetrical components. The multiphase distribution system is described by an equivalent three-phase system; hence, the single phase and two-phase line segments are domain in conditions of their succession values. The designed technique allows analyzing unbalanced distribution networks which is otherwise a complicated task.

Keywords: *Fault calculation, power system modeling, symmetrical components, and software packages etc.*

1 INTRODUCTION

During common operating conditions, current will flow through all fundamentals of the electrical power system within pre-designed values which are proper to these elements' ratings. Any power system can be analyzed by calculating the system voltages & currents under normal & abnormal scenarios. The primary objective of any short-circuit analysis software tool is to calculate the fault currents and voltages. From the fault analysis results, circuit-breaker capacity and protective relay performance can be determined. The severity of the fault depends on the short-circuit location, the corridor in use by fault current, the system impedance and its voltage level. In order to maintain the continuance of power supply to all clients which is the core purpose of the power system existence, all faulted parts must be isolated from the system momentarily by the protection schemes. When a fault exist within the relay protection zone at any transmission line, a signal will expedition or open the circuit breaker isolating the faulted line. To complete this task successfully, error analysis has to be conducted in every location arrogant several fault

conditions. The goal is to determine the best possible safety scheme by determining the fault currents & voltages. Many methods are available that can be employed for fault calculation but symmetrical component approach is the simplest and the easiest one, involving modeling of the network. The phase coordinates modeling requires a special action for many of the network components such as transformers and generators. However, these basic power system elements are modeled in straightforward manner using sequence networks. Last, but not the least, the coupling among different sequence networks of an unbalanced line is very small in sequence components. However, the mutual couplings are significant in actual phase description and therefore a complete impedance model must be considered in analysis using phase coordinates.

The development of single-phase and two-phase distribution feeders is not uncommon in rural areas, especially in developing countries. The existence of these multiphase feeders prevents the application of sequence components for distribution system fault analysis. Therefore, the full phase variables model is normally used in fault analysis of distribution systems. Hence, many features of symmetrical elements such as in transformers and generators symmetrical component model can no longer be exploited. This paper introduces a novel modeling approach for implementing single-phase and two-phase lines in the state of the art fault calculations packages based on symmetrical components.

The unbalanced line segments are represented by an equivalent three-phase line in which dummy lines and dummy nodes are represented to retain the three-phase structure of both the single-phase and two-phase line segments.

Hence, the equivalent three-phase structure can be represented in terms of sequence networks after some

manipulation. The proposed approach allows the well established fault analysis based on symmetrical components to solve multiphase systems. The method provides an alternative for the phase variables which utilizes models with a high degree of complexity. The proposed method allows many of the available software packages in use by industry today to perform fault analysis of multiphase distribution systems based on sequence components.

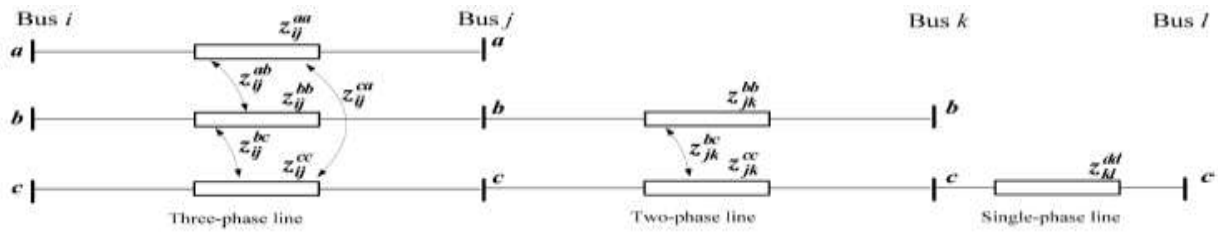


Fig.1. Unbalanced multiphase distribution feeder.

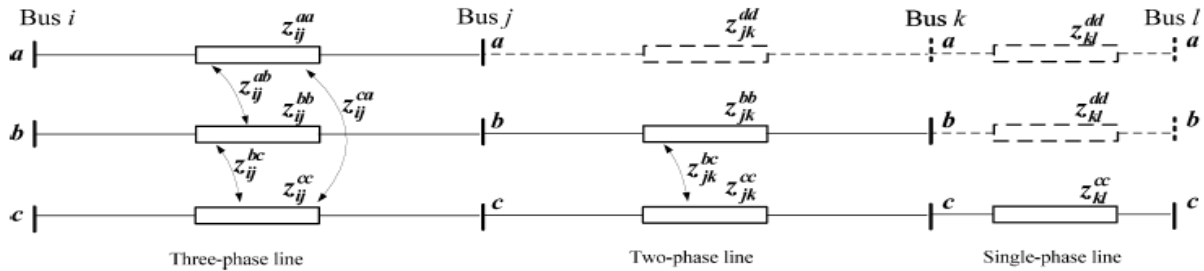


Fig2. Representation of unbalanced multiphase system using dummy lines and nodes.

2 THREE PHASE LINES

The three-phase transmission lines are usually represented by a connected network. Fig. 1 shows an example of a three-phase line link between nodes “i” and “j”. The series resistances and inductances between nodes are connected in the middle. The shunt capacitances of the transmission lines are divided into two halves and lumped at nodes connected to the line terminals. The line series impedance is given by

$$Z_{ij}^{abc} = \begin{bmatrix} Z_{ij}^{aa} & Z_{ij}^{ab} & Z_{ij}^{ac} \\ Z_{ij}^{ba} & Z_{ij}^{bb} & Z_{ij}^{bc} \\ Z_{ij}^{ca} & Z_{ij}^{cb} & Z_{ij}^{cc} \end{bmatrix}$$

The voltage and the current relationship of the three-phase line shown in Fig. 1, between node “i” and “j”, is given by

$$\begin{bmatrix} I_i^{abc} \\ I_j^{abc} \end{bmatrix} = \begin{bmatrix} (Z_{ij}^{abc})^{-1} & -(Z_{ij}^{abc})^{-1} \\ -(Z_{ij}^{abc})^{-1} & (Z_{ij}^{abc})^{-1} \end{bmatrix} \begin{bmatrix} V_i^{abc} \\ V_j^{abc} \end{bmatrix}$$

I. Two phase line

The two-phase lines are modeled as a three-phase line by using a imitation line and dummy node as shown in Fig. 1. The real line connected between node “j” and “k” consists of phase “b” and “c”. The upstream node of the dummy line at node “j” is a real node which exists, in the actual network. The other node of the imitation line at node “k” is a imitation node. This imitation node does not exist in the real network and does not have a load.

The current that flows from phase “a” at node “j” toward phase “a” at node “k” is zero and therefore, the voltage drop

across the imitation line is zero. This is true since there is no coupling between the imitation line and the other real phases of the line, and the injection at the imitation node is zero. Therefore, the series impedance of the dummy line can be set to any arbitrary impedance “Zdd” which will satisfy the ohm’s law relationship for the dummy line. The series impedance of the two-phase line, shown in Fig. 1, is given by

$$Z_{jk}^{abc} = \begin{bmatrix} Z_{jk}^{dd} & 0 & 0 \\ 0 & Z_{jk}^{bb} & Z_{jk}^{bc} \\ 0 & Z_{jk}^{cb} & Z_{jk}^{cc} \end{bmatrix}$$

3 SINGLE PHASE LINES

The single-phase line shown in Fig. 1 consists of phase “c” only. The line is connected between node “k” and node “i”. Two dummy lines are required to represent the missing phases “a” and “b”. The upstream node of the dummy lines, node “k” has imitation node “a” and real node “b”. The other terminal of the line at node “i” has two dummy nodes for phase “a” and “b” as shown in Fig.1. imitation nodes do not have any load since they do not exist in reality. The currents that flow in the imitation lines are zero, as the dummy lines “a” and “b” are not coupled with the real line “c”. The series impedances of the dummy lines can be assigned with any arbitrary impedance “Zdd” similar to the two-phase line model. Similarly, the single-phase line can also be represented by a complete three-phase circuit. The single-line series impedance is expressed as follows:

$$Z_{kl}^{abc} = \begin{bmatrix} Z_{kl}^{dd} & 0 & 0 \\ 0 & Z_{kl}^{bb} & Z_{kl}^{bc} \\ 0 & Z_{kl}^{cb} & Z_{kl}^{cc} \end{bmatrix}$$

4-SYMMETRICAL COMPONENTS MODELING

A. Symmetrical components

The symmetrical components method is a method for analyzing unbalanced systems. It is a linear transformation that converts phase values to a new set of components called symmetrical components as follows:

$$V_a = V_{a0} + V_{a1} + V_{a2}$$

$$V_b = V_{a0} + a^2 V_{a1} + a V_{a2}$$

$$V_c = V_{a0} + a V_{a1} + a^2 V_{a2}$$

In matrix form,

$$\begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & a^2 & a \\ 1 & a & a^2 \end{bmatrix} \begin{bmatrix} V_{a0} \\ V_{a1} \\ V_{a2} \end{bmatrix}$$

In above “a” is a complex number also referred to as transformation operator. The symmetrical component method converts the symmetrical three-phase networks into three separate and uncoupled networks, called sequence networks. The following subsection presents the development of various component models.

B. Generator Model

The generators are designed with maximum winding symmetries. Hence, they are represented by three uncoupled sequence networks.

C. Transformer Models

The classical transformer model has been established by transforming the sub matrices of the phase components transformer model as follows:

$$Y^{012} = A^{-1} Y^{abc} A$$

D. Multiphase Line

The series impedance matrices of the three-phase line are transformed into their counterparts in sequence components as follows:

$$Z_{ij}^{012} = A^{-1} Z_{ij}^{abc} A$$

If a three-phase line is fully transposed, its impedance and admittance matrices in will be symmetrical as given by

$$Z_{ij}^{abc} = \begin{bmatrix} Z_{ij}^s & Z_{ij}^m & Z_{ij}^m \\ Z_{ij}^m & Z_{ij}^s & Z_{ij}^m \\ Z_{ij}^m & Z_{ij}^m & Z_{ij}^s \end{bmatrix}$$

By transforming to its counterparts in sequence components, its matrix will be diagonal matrix as follows:

If a three-phase line is fully transposed, its impedance and admittance matrices in will be symmetrical as given by

$$Z_{ij}^{abc} = \begin{bmatrix} Z_{ij}^s & Z_{ij}^m & Z_{ij}^m \\ Z_{ij}^m & Z_{ij}^s & Z_{ij}^m \\ Z_{ij}^m & Z_{ij}^m & Z_{ij}^s \end{bmatrix}$$

By transforming to its counterparts in sequence components, its matrix will be diagonal matrix as follows:

$$Z_{ij}^{012} = \begin{bmatrix} Z_{ij}^{00} & 0 & 0 \\ 0 & Z_{ij}^{11} & 0 \\ 0 & 0 & Z_{ij}^{22} \end{bmatrix}$$

However, if the three-phase line is untransposed, the phase components admittance matrices in (1) are full and symmetrical but not phase-wise balanced, i.e., . Hence, the sequence admittance matrix will be full and unsymmetrical. For an exact coupled line representation, the sequence coupled line model can be decomposed into three independent sequence circuits. This can be achieved by replacing the coupling, i.e., the off-diagonal elements, by an equivalent current compensation. This exact line model representation is suitable for power-flow analysis.

The symmetrical line model of the multiphase line is invaluable for performing the fault calculations analysis of multiphase systems based on the symmetrical components. In case of the three-phase line, the standard symmetrical line model is used.

In the case of the single-phase elements, the value of the existing phase in will act as the diagonal value in the absence of any coupling between the phases. This selection for the dummy impedance in makes the single line segment symmetrical. Hence, the classical representation of a symmetrical or transposed line can also be applied similarly to unsymmetrical models.

In the case of a two-phase line segment, two methods can be used for calculating the sequence data:

Method “1”: the coupling between the two phases should be ignored and the average value of the diagonal is assigned for the diagonal elements.

Method “2”: the line model given by is firstly converted to sequence component according to, then the coupling among the sequence networks is ignored.

5 CONCLUSION

This paper has offered a simple technique for performing the short-circuit analysis of multiphase distribution systems based on the sequence networks. The multiphase unbalanced distribution system has been represented by an corresponding three-phase network and then converted into its sequence networks counterparts. The sequence networks are then utilized with standard error calculations correspondence to calculate fault currents of unbalanced distribution systems. The solution of the IEEE multiphase distribution feeder shows that the calculated solution using the planned method is very

similar to the exact solution premeditated using the full phase components power system models. The planned method allows many of the existing software packages to perform short-circuit analysis of unbalanced distribution systems.

6 REFERENCES

- [1] J. Arrillaga and N. R. Watson, *Computer Modeling of Electrical Power Systems*, 2nd ed. New York: Wiley, 2001.
- [2] J. M. C. Filho, R. C. Leborgne, P. M. da Silveira, and M. H. J. Bollen, "Voltage sag index calculation: Comparison between time-domain simulation and short-circuit calculation," *Elect. Power Syst. Res.*, vol. 78, no. 4, pp. 676–682, Apr. 2008.
- [3] W. H. Kersting, *Distribution System Modeling and Analysis*. Boca Raton, FL: CRC Press, 2002, pp. 269–299.
- [4] T.-H. Chen, M.-S. Chen, W.-J. Lee, P. Kotas, and P. V. Olinda, "Distribution system short circuit analysis—A rigid approach," *IEEE Trans. Power Syst.*, vol. 7, no. 1, pp. 444–450, Feb. 1992.
- [5] W. H. Kersting and W. H. Phillips, "Distribution system short circuit analysis," in *Proc. 25th Intersociety Energy Conversion Engineering Conf.*, Reno, NV, Aug. 12–17, 1990.
- [6] X. Zhang, F. Soudi, D. Shirmohammadi, and C. S. Cheng, "A distribution short circuit analysis approach using hybrid compensation method," *IEEE Trans. Power Syst.*, vol. 10, no. 4, pp. 2053–2059, Nov. 1995.
- [7] S. M. Halpin and L. L. Grigsby, "Fault analysis of multiphase unbalanced nonradial power distribution systems," *IEEE Trans. Ind. Appl.*, vol. 31, no. 3, pp. 528–534, May/Jun. 1995.
- [8] M. Todorovski and D. Rajicic, "Handling three-winding transformers and loads in short circuit analysis by the admittance summation method," *IEEE Trans. Power Syst.*, vol. 18, no. 3, pp. 993–1000, Aug. 2003.
- [9] C. Y. Teo and B. G. He, "Integrating three-phase load flow and short circuit current calculation for a low voltage system," *Elect. Power Syst. Res.*, no. 53, pp. 123–132, 2000.
- [10] M. E. Baran and I. El-Markaby, "Fault analysis on distribution feeders with distributed generators," *IEEE Trans. Power Syst.*, vol. 20, no. 4, pp. 1757–1764, Nov. 2005.
- [11] T. N. Boutsika and S. A. Papathanassiou, "Short-circuit calculations in networks with distributed generation," *Elect. Power Syst. Res.*, vol. 78, no. 7, pp. 1181–1191, Jul. 2008.
- [12] R. K. Gajbhiye, B. Gopi, P. Kulkarni, and S. A. Soman, "Computationally efficient methodology for analysis of faulted power systems with series-compensated transmission lines: A phase coordinate approach," *IEEE Trans. Power Del.*, vol. 23, no. 2, pp. 873–880, Apr. 2008.
- [13] K. L. Lo and C. Zhang, "Decomposed three-phase power flow solution using the sequence component frame," *Proc. IEE, Gener., Transmiss., Distrib.*, vol. 140, no. 3, pp. 181–188, May 1993.
- [14] M. Abdel-Akher, K. M. Nor, and A. H. Abdul-Rashid, "Improved three-phase power-flow methods using sequence components," *IEEE Trans. Power Syst.*, vol. 20, no. 3, pp. 1389–1397, Aug. 2005.
- [15] J. D. Glover, M. S. Sarma, and T. J. Overbye, *Power System Analysis and Design*, 4th ed. Austin, TX: Thompson, 2008, pp. 439–468.
- [16] W. H. Kersting, "Radial distribution test feeders," in *Proc. PES Winter Meeting*, Jan. 28/Feb. 1 2001, vol. 2, no. 28, pp. 908–912
- [Online]. Available: <http://ewh.ieee.org/soc/pes/dsacom/testfeeders.html>

Role of Information Technology in Retail Industry

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Abstract-The multiplied deployment of new technologies inclusive of smart mobile gadgets and social networks and the developing significance of in-store technological answers create new possibilities and demanding situations for outlets. As the road between online and physical channels is blurred, a new technique to channel integration is rising-the omni-channel, which goals to deliver an unbroken patron enjoy irrespective of the channel. This introduction presents the consequences of cognizance organization discussions on the position of data generation in retail, new commercial enterprise models, and the destiny function of traditional shops as e-trade advances. Key troubles that emerged from the discussion consist of the need for channel integration, the impact of cellular technologies, the developing position of social media, and the changing role of bodily brick-and-mortar shops, the want to reply to numerous customer requirements, the balance among personalization and privatize, and, in the end, deliver chain redesign.

Introduction

Transformation is sweeping the retail enterprise. Customers today are much higher informed and more related. They need cellular purchasing, personalized carrier and instant gratification. Those adjustments are giving upward push to a host of innovations around omni-channel retailing, cellular apps, client information mining, responsive supply chains and present day in-shop self-assist technologies. This paper summarizes the way in which individuals perceived the function of IT in retail. Amongst those interviewed, there was settlement that technology have to clear up problems, no longer generate new ones; it ought to no longer be implemented just to be there, however for a defined motive. It become additionally understood that era can appeal to a few but no longer to all clients. In-save generation need to be invisible to customers and nicely examined before implementation to make certain that glitches and troubles are eliminated, as those can fast alienate customers. A successful approach in era implementation must be aligned with the client, store, and product manufacturer. The difficulty arises as to who have to be liable for customer enjoy integration: the store, manufacturer, or technology

company. In its modern-day state, technology must supplement but no longer replace the store team. Store employees have to be involved as technology customers. At the equal time, shop employees are perceived as a potential barrier to technology implementation; consequently, education and era merchandising amongst group of workers are required. That is especially important in corporations wherein a huge proportion of staff is a part-time and no longer technology minded. Technology is each retailer's favorite employee. The only that comes in early, stays late, never complains about the climate, and is always keen to leap in and make contributions. Technology is the employee that makes certain your stock is accurate, the shelves are saved full, and receipts are tallied at the give up of each day. It shall us the shop manager attention on their clients and the competition. Technology is the backbone of every industry. It can be something from a sequence of spreadsheets all the means to the completely integrated systems that supervise each facet of the trade. In its simplest form, retail is promotion of those things that citizens desire to purchase. Technology should address and support all necessitate the retailer has. Retailing is the system of promoting goods and offerings to the every person for personal and non-commercial enterprise use. The maximum essential example of retail agencies are departmental shops, discount shops, comfort shops and it even includes computer kiosks and catalog advertising. Retailers commonly buy in bulk portions from wholesalers after which promote it in smaller quantities to consumers for private and non-business use. Retailing industry is very vital from monetary factor of view and a country having a strong retailing industry may also has a sustainable competitive benefit in the worldwide markets. It is essential to notice that retailers are an important part of supply chain of a product/provider and are at the give up of the deliver chain. That is a technology of evolution and innovation.

Historical Evolution

The origins for retail enterprise in India can be traced with the emergence of Kirana stores and mom-and-pop stores. These shops used to cater to the local people. Steadily the authorities started assisting the rural retail and lots of indigenous franchise shops got here up with the assist of Khadi & Village Industries fee. The economic system started out to open up in the 1980's ensuing within the alternate of retailing. The primary few groups to provide you with retail chains have been in textile area, as an instance, Bombay Dyeing, S Kumar's, Raymonds, and so on. Later Titan released retail showrooms within the prepared retail region. With the passage of time new entrants moved on from production to pure retailing.

The recent history of retail, Here's a cursory overview:

Local culture – the Corner Store: 1900s

In 1900s, the local place shops dominated retail. There were some catalogs, but the overwhelming purchasing revel in become on the corner shop. People walked to the store to get the goods. Choice was restricted. In some of the bigger towns, you can discover more but you have been essentially limited via what you could convey back to our home.

Mass modernization culture - Department store: 1900 - 1940

As the automobile hit the streets at scale in 1920s, it wasn't definitely until the 1940s while these were main stream. With the automobile, human beings should cross farther and carry greater. At the identical time, in-home refrigeration allowed buyers to stock greater. Retail moved from nearby corner stores to preferred traders and branch shops.

Suburban culture – Mall: 1950s - 1970s

The population booms and the explosion of suburbia led to outdoor shops, strip centers, and mass stores. This turned into the time of the true mall, as well as the heyday of the television advertisements.

Digital culture – E-commerce: 1990 – 2013

Perhaps we should call this the online shopping sites that are flipkart, snap deal, myntra, etc. but the appearance of e-commerce has shaken the retail global to its middle.

IT Involvement In Retail

- To increase the organization's capacity to respond to the evolving market through enhanced speed and flexibility.
- To gather and examine consumer records even as improving differentiation.
- To work successfully; shops need one gadget operating across shops to ensure the handiest use of stock and enhance commercial enterprise strategies.
- Retailers are beginning to observe that technology's role is one in all an enabler. Essentially, records era can speed up procedures and deliver value saving benefits to the business enterprise.

How High-Tech Is Changing Retail

The retail enterprise is undergoing widespread changes in the merchandising technique, so says a latest survey via retail consulting firm RSR. The best of the national performers have chosen up on a critical approach: target your save's choice of goods to the wishes and pastimes of particular groups. It is better for income and for controlling costs. The savviest shops recognize this and they're using technology to help provide them facet. According to the survey, firms that outperform industry averages for annual same-shop sales comparisons tend to apply and recognize specialized system software program tools to control precise aspects of merchandising. The maximum important tool became forecasting. Such structures assist predict what goods customers might need and stocking styles to fulfill client demand while minimizing the quantity of capital invested in extra inventory. Three quarters of the outlets surveyed stated that retail forecasting is extraordinarily important to monetary achievement.

This is an interesting shift. Inside the beyond, forecasting systems had been largely seen as deliver chain management gear, where the focal point turned into on reducing operational charges. Now such systems and techniques have grown to be essential to make bigger income possibilities, shifting from a strictly bottom-line awareness to a pinnacle-line one. As RSR says, Advances in hardware computing power make sku-level forecasts now not only possible, but vital. Almost similarly as important as call for forecasting is consumer analytics. This makes an extraordinary deal of sense. You can't create an amazing call for forecast without understanding your clients and what they could want. Approximately 34% of the respondents plan to optimize product collection for key consumer segments this year.

Importance of Information Technology in Retail

The significance of records technology in retail stems from the importance of data. Facts is not anything however statistics that aids selection making. The proper statistics, within the right shape to the proper setoff humans at the proper time, is one of the best tools within the store. Records are usually almost about a specific time frame. Whilst to the consumer it's far only an ordinary buy, let us examine the facts that the shop has accumulated from this transaction and how the information helps the retailer.

Efficient Stocking of merchandise

The things purchased gives information on products sold in the store; that is the basis of income evaluation and selections on replenishment re-ordering and merchandise making plans. If this information is passed directly to the producer; it can assist lessen production time. This is specifically genuine in case of favor objects that have a very quick life cycle. For example records collected on this manner may additionally imply youngster buying sure styles in jeans or colors, within the tee shirts from the store. To carrier this section of the target market the store may need replenishments faster. Using technology aids the gathering and transmission of data. The developments in sales may be analyzed. This facilitates keep away from conditions of stock out enables spot products or merchandise timely markdowns and higher inventory turns.

Collection of Data

The usage of technology aids data collection. Data or facts may be accrued about clients, their purchases the frequency in their shopping for and the typical basket size. This statistics enables the retailer distinguish the customers who shops at his keep frequently and also praise them. As an instance statistics accumulated about a client may also screen alternatives for certain brands; this may be used for similarly verbal exchange with the client regarding promotional gives etc. The statistics on purchase made is likewise passed on to the credit card organization for charge to the merchant establishment and also for billing the purchaser.

Efficiency in Operations

The use of information technology serves as a foundation for integrating the functioning of various departments. While a retailer decides to use the energy of era to resource commercial enterprise, the funding in terms of money is typically excessive. However the advantages of

the use of statistics generation are many. As the method gets computerized the time involved especially challenge is decreased. As an instance, someone manually billing a patron for buy made will take a longer time in comparison to a person who is needed to experiment inside the items the use of the factor of sale systems.

Helps Communication

Communication in the business may be faster with the usage of software like Lotus Notes. Retail shops can also talk with each different and with the warehouses. This will be done 24 hours a day and 7 days a week. Electronic data Interchange (EDI) also can be used for conversation with suppliers and carriers.

Ten Technology Trends That Will Revolutionize Retail

1. **Multichannel retail calls for channel-synthesizing technology:** At Oracle, we name this commerce everywhere, and the newly launched Oracle Retail model 14 is loaded with functionality that permits it. Oracle Retail v14 helps approaches that assist clients purchase, choose-up, or return items through any retail channel and help outlets meet demand without constraints throughout the ones channels.
2. **Analytics deliver technological know-how to the art of retail:** For years, retailers have handled a number of the most important statistics warehouses inside the world. So they have already got big statistics; now they need to use the ones many terabytes to optimize operations, refine pricing, count on call for, and offer the product variety clients need.
3. **Mobility is tons extra than a phone app:** Retailers can create a more seamless experience for clients, and increase the productivity and effectiveness of personnel, via incorporating cell technologies beyond phone buying. For example, shop personnel may be ready with capsules which have point-of-sale abilities. And Tesco, one of the international's leading outlets, even added its very own 7-inch tablet laptop, which may be used for in retailer shopping.
4. **Visibility adds price to inventory:** It's one element to recognize which you have a pallet of product XYZ in a warehouse someplace; it's an awful lot better to be able to inform your patron that XYZ is on its manner and scheduled to reach at a close-by keep at 9 a.m. The following day. Outlets need complete inventory making plans, replenishment, and warehouse management abilities, and that they

should be able to proportion the valuable statistics inside those apps with clients.

5. **Customer relationships management by no means receives easier:** CRM is a two-manner avenue, however for stores; it's a consistent, and every now and then steep, uphill climb. Despite the fact that a consumer is thrilled once they depart your save, you have got simply raised the bar of expectation higher for his or her subsequent go to. Consisting of advertising and marketing and loyalty apps-that work in live performance with a properly crafted CRM approach.
6. **Integration is everything:** Multichannel retail need to be seamless-for both retailers and customers-and that calls for a degree of structures and facts integration that is going properly past what most businesses have in location. There are various motives for that: on line operations have been at the start set up as a separate sales channel in many places; stores have gathered a mish-mash of special-motive technologies for the web, products and supply chain management, and so forth; and mobile devices and social media create totally new facts streams. The coolest information is that no longer all facts integration wishes to take place in real time, which can be needlessly inefficient and luxurious. The trick is to understand where actual time is critical and wherein it's no longer.
7. **Your clients can (and ought to) be anywhere:** Globalization represents a big increase possibility for retailers, but it's complex, nuanced, and idiosyncratic, as unique areas of the world have their very own languages and currencies, economic and tax policies, and logistics challenges. In components of China, as an example, stores nonetheless depend on bicycle couriers for deliveries.
8. **The transaction hinges on having the proper product at the proper time and place and on the great viable price:** There's not anything new about this cost proposition, however there's lots new about the way it's performed. Collection making plans focused assortments, existence-cycle management of individual items, charge optimization, markdowns, and inventory alignment are just a number of the ways that retails can improve performance.
9. **Broaden a strategy for show rooming:** The famous practice of show rooming-where customers go into a shop to browse, then make decrease-priced purchases on line-is a reason of angst for the brick-and-mortar men. However bodily store retailers can fight again with actual-time fee matching and by means of equipping in-keep employees with

mobile technologies and facts that puts them on a fair keel with cell phone-carrying shoppers.

10. **Go social, because you already are:** In-save purchasing is a extraordinarily social activity—it's face to face and we run into friends and neighbors while out and approximately. So it most effective makes feels that stores could leverage social media to take full gain of the consumer engagement they already enjoy. Retailers must plug into the social buzz, concentrate to clients, capitalize on what they research, and use social gear and advertising best practices to construct even higher and greater seamless consumer relationships.

Conclusion

The papers offer a treasured contribution to understanding the role of facts technology in retailing. The growing use of cellular devices and social networks makes the traditional on-line–bodily channel dichotomy out of date, as the strains between channels are blurred. From those changes a new commercial enterprise version is rising—the omnichannel, so that you can be much less focused on the channel used and greater on the interaction between the patron and the emblem. However, earlier than one of these level of go-channel integration may be finished, stores aiming to put in force an omnichannel approach can also want to awareness on inclusive of cellular and social networks as new channels, balancing privacy and customization, and redesigning their supply chain community, at the same time as on the equal time retaining in thoughts distinct consumer necessities.

References:

- [1] <http://www.forbes.com/sites/oracle/2014/01/13/10-technology-trends-that-will-revolutionize-retail/>
- [2] <http://www.wipro.com/industries/retail/>
- [3] <http://www.inc.com/erik-sherman/successful-retailers-use-technology-to-boost-sale-and-margins.html>
- [4] <http://www.ijec-web.org/past-issues/volume-18-number-4-summer-2014/introduction-to-the-special-issue-information-technology-in-retail-toward-omnichannel-retailing/>
- [5] <http://newhope360.com/blog/importance-technology-retail>
- [6] <http://www.citeman.com/9890-the-importance-of-information-technology-in-retail.html>
- [7] <http://www.slideshare.net/nethanp/role-of-it-in-retail-industry>
- [8] <http://dl.acm.org/citation.cfm?id=1611269>
- [9] <https://books.google.co.in/books?id=5tnIDdWLQIOC&pg=PA445&lpg=PA445&dq=conclusion+of+informati>

- on+technology+in+retail+management&source=bl&ots=T7MQjKORBE&sig=3bifTu1vgD1Ik_snBSwr2hyOWis&hl=en&sa=X&ved=0ahUKEwiBmK_5zeDJAhWCB44KHRJFCuwQ6AEIVDAI#v=onepage&q=conclusion%20of%20information%20technology%20in%20retail%20management&f=false
- [10] <http://www.ukessays.com/essays/information-technology/technologies-in-the-modern-retail-industry-information-technology-essay.php>
- [11] <http://pubsonline.informs.org/doi/abs/10.1287/isre.2.1.1>
- [12] https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwivcvs-20eDJAhVGHY4KHWAAbAVwQFggtMAE&url=http%3A%2F%2Fijmrr.com%2Fadmin%2Fupload_data%2Fjournal_jitendra%2520singh%2520%25204nov14mrr.pdf&usg=AFQjCNGGhMoMM8qeyC982SGahKM9Dv_g-Q
- [13] https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=7&cad=rja&uact=8&ved=0ahUKEwivcvs-20eDJAhVGHY4KHWAAbAVwQFghPMAY&url=http%3A%2F%2Fijmrr.com%2Fadmin%2Fupload_data%2Fjournal_jitendra%2520singh%2520%25204nov14mrr.pdf&usg=AFQjCNGGhMoMM8qeyC982SGahKM9Dv_g-Q
- [14] <http://www.tandfonline.com/doi/abs/10.1080/07421222.2004.11045794#.VnF74dIrLIU>
- [15] <https://www.linkedin.com/pulse/20130607115409-12921524-how-did-we-get-here-a-short-history-of-retail>
- [16] <http://www.indianmirror.com/indian-industries/retail.html>

Cloud Computing Security- A brief

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Abstract: The current emergence of cloud computing has extensively altered every body's notion of infrastructure architectures, software program shipping and improvement fashions. Projecting as an evolutionary step, following the transition from mainframe computers to customer/server deployment fashions, cloud computing encompasses factors from grid computing, application computing and autonomic computing, into an revolutionary deployment architecture. This fast transition toward the clouds, has fuelled issues on a crucial difficulty for the achievement of statistics structures, verbal exchange and statistics security. From a security angle, a number of unchartered risks and challenges have been introduced from this relocation to the clouds, deteriorating tons of the effectiveness of traditional protection mechanisms. As a end result the goal of this paper is twofold; first of all to evaluate cloud security through identifying precise safety necessities and secondly to try and gift a possible answer that gets rid of those capability threats. This paper proposes introducing a relied on 0.33 birthday celebration, tasked with assuring particular security traits within a cloud surroundings. The proposed solution calls upon cryptography, specifically Public Key Infrastructure operating in concert with SSO and LDAP, to make sure the authentication, integrity and confidentiality of worried data and communications. The answer, offers a horizontal stage of carrier, to be had to all implicated entities, that realizes a safety mesh, inside which crucial believe is maintained [1].

Cloud computing is an revolutionary data system (IS) structure, visualized as what may be the future of computing, a driving force worrying from its audience to rethink their understanding of running systems, customer-server architectures, and browsers. Cloud computing has leveraged customers from hardware requirements, at the same time as decreasing usual purchaser aspect requirements and complexity.

As cloud computing is reaching improved popularity, concerns are being voiced about the security issue brought thru the adoption of this new model. The effectiveness and performance of conventional safety mechanisms are being reconsidered, as the traits of this modern deployment version, fluctuate extensively from them of traditional architectures. In this paper we strive to

Demystify the specific safety demanding situations brought in a cloud surroundings and clarify troubles from a protection attitude. The belief of agree with and safety is investigated and unique protection necessities are documented. This paper proposes a safety answer, which leverages customers from the safety burden, through trusting a third celebration. The third birthday celebration is tasked with assuring unique protection characteristics within a allotted information system, even as realizing a consider mesh between concerned entities, forming federations of clouds. The studies technique followed in the direction of achieving this purpose, is based on software program engineering and information structures layout tactics. The basic steps for designing the machine architecture encompass the gathering of requirements and the evaluation of summary useful specifications.[1]

Introduction to Cloud Computing

The call cloud computing, turned into inspired through the cloud symbol this is regularly used to represent the net in waft charts and diagrams. A awesome migration to the clouds has been taking vicinity over latest years with end customers, "step by step" keeping a developing wide variety of personal statistics, together with bookmarks, images, tune files and plenty greater, on far off servers reachable via a community. Cloud computing is empowered via virtualization generation; a technology that in reality dates again to 1967, but for decades became to be had best on mainframe systems. In its quintessence, a number laptop runs an utility called a hypervisor; this creates one or more digital machines, which simulate bodily computer systems so faithfully, that the simulations can run any software program, from running systems, to stop-user programs [3]. At a hardware stage, a number of physical devices, inclusive of processors, tough drives and community devices, are positioned in datacenters, impartial from geographical region, which might be chargeable for storage and processing wishes. Above this, the mixture of software program layers, the virtualization layer and the control layer, allow for the powerful management of servers. Virtualization is a vital detail of

cloud implementations and is used to provide the vital cloud characteristics of place independence, resource pooling and rapid elasticity. Differing from traditional network topologies, inclusive of patron-server, cloud computing is able to provide robustness and alleviate site visitors congestion issues. The management layer is able to monitor site visitors and reply to peaks or drops with the creation of latest servers or the destruction of non-vital ones. The control layer has the extra capacity of being able to put in force protection monitoring and rules at some point of the cloud [3].

Security

Cloud and protection have long been two words that didn't match together within the tech global. In reality, for years, while citing "cloud protection" to IT specialists, they'd snort or snicker, reminding you that there has been "no such issue as security troubles in cloud computing." [5] Cloud computing security is the set of manipulate-primarily based technologies and rules designed to adhere to regulatory compliance rules and guard information, information programs and infrastructure associated with cloud computing use. Because of the cloud's very nature as a shared aid, identification management, privacy and access controls are of particular situation. With more companies the use of cloud computing and related cloud carriers for statistics operations, proper safety in those and other potentially prone regions have turn out to be a priority for companies contracting with a cloud computing issuer.

Cloud computing protection processes ought to cope with the safety controls the cloud company will incorporate to keep the purchaser's information security, privateers and compliance with important regulations. The processes may even in all likelihood include a business continuity and data backup plan inside the case of a cloud security breach [4].

Cloud computing protection refers to the set of tactics, approaches and standards designed to provide facts protection assurance in a cloud computing environment.

Cloud computing safety addresses each bodily and logical protection issues throughout all of the distinct carrier fashions of software, platform and infrastructure. It also addresses how these offerings are brought (public, personal or hybrid transport model).[6]

There are some of safety dangers associated with cloud computing that ought to be safely addressed:

- **Loss of governance.** In a public cloud deployment, clients cede manipulate to the cloud issuer over a number of troubles that may have an effect on security. But cloud service agreements may not provide a commitment to clear

up such troubles at the part of the cloud provider, therefore leaving gaps in safety defenses.

- **Responsibility ambiguity.** Obligation over factors of protection can be cut up between the company and the patron, with the potential for critical parts of the defenses to be left unguarded if there may be a failure to allocate responsibility in reality. This cut up is likely to differ depending on the cloud computing model used (e.g., IaaS vs. SaaS).

- **Authentication and Authorization.** The reality that sensitive cloud sources are accessed from anywhere at the net heightens the need to set up with certainty the identification of a user -- specifically if users now consist of employees, contractors, companions and clients. Sturdy authentication and authorization will become a vital problem.

- **Isolation failure.** Multi-tenancy and shared assets are defining traits of public cloud computing. This hazard class covers the failure of mechanisms separating the usage of garage, reminiscence, routing and even recognition between tenants (e.g. So-known as guest-hopping attacks).

- **Compliance and legal risks.** The cloud purchaser's funding in reaching certification (e.g. to demonstrate compliance with industry standards or regulatory necessities) may be lost if the cloud provider can't provide proof of their very own compliance with the relevant requirements, or does no longer permit audits via the cloud consumer. The purchaser need to check that the cloud issuer has appropriate certifications in area.

- **Handling of security incidents.** The detection, reporting and subsequent management of protection breaches may be delegated to the cloud provider, however these incidents impact the patron. Notification rules need to be negotiated inside the cloud provider agreement so that customers are not caught unaware or knowledgeable with an unacceptable delay.

- **Management interface vulnerability.** Interfaces to manipulate public cloud sources (along with self provisioning) are usually reachable through the net. Considering that they allow get right of entry to larger sets of assets than traditional web hosting vendors, they pose an extended hazard, particularly whilst mixed with far flung access and web browser vulnerabilities.

- **Application Protection.** Traditionally, applications were protected with defense-in-intensity security answers based on a clean demarcation of bodily and digital resources, and on trusted zones. With the delegation of infrastructure safety responsibility to the cloud issuer, corporations need to rethink perimeter safety on the network degree, applying extra controls on the person, utility and data level. The identical stage of user get entry

to manage and protection ought to be carried out to workloads deployed in cloud offerings as to those strolling in conventional facts facilities. This requires developing and dealing with workload-centric guidelines as well as imposing centralized management across distributed workload times.

● **Data protection.** Here, the fundamental issues are exposure or launch of touchy statistics as well as the loss or unavailability of facts. It is able to be hard for the cloud provider purchaser (inside the function of Records controller) to efficiently test the facts coping with practices of the cloud issuer. This trouble is exacerbated in cases of multiple transfers of facts, (e.G., between federated cloud services or wherein a cloud issuer makes use of subcontractors).

● **Malicious behavior of insiders.** Harm resulting from the malicious actions of humans operating inside an employer may be substantial, given the get admission to and authorizations they revel in. That is compounded inside the cloud computing environment because such activity might arise within both or each the purchaser organization and the issuer organization.

● **Business failure of the provider.** Such failures may want to render information and packages vital to the customer's commercial enterprise unavailable over an extended period.

● **Service unavailability.** This could be caused by hardware, software or communique network disasters.

● **Vendor lock-in.** Dependency on proprietary offerings of a particular cloud carrier issuer should result in the client being tied to that provider. The lack of portability of packages and records across companies poses a hazard of statistics and service unavailability in case of a exchange in vendors; therefore it's far an important if every now and then omitted factor of protection. Lack of interoperability of interfaces associated with cloud services further ties the patron to a particular issuer and might make it hard to interchange to any other company.

● **Insecure or incomplete data deletion.** The termination of a agreement with a company won't bring about deletion of the consumer's information. Backup copies of statistics typically exist, and can be blended on the identical media with other clients' statistics, making it impossible to selectively erase. The very gain of multi-tenancy (the sharing of hardware resources) thus represents a higher risk to the purchaser than devoted hardware. [2]

Conclusion

Cloud computing is converting the way we use the internet. The cloud will be the following evolution in the records of computing. There are many new technologies

emerging at a fast fee, every with technological improvements and with the ability of creating human's lives less difficult. But, one must be very cautious to recognize the security risks and demanding situations posed in using this technology. Cloud computing is not any exception. In this paper key security issues and challenges which can be presently confronted inside the Cloud computing are highlighted. The cloud might be the next evolution within the history of computing.

References

1. <http://www.sciencedirect.com/science/article/pii/S0167739X10002554>
2. <http://www.cloud-council.org/deliverables/CSCC-Security-for-Cloud-Computing-10-Steps-to-Ensure-Success.pdf>
3. <http://www.sciencedirect.com/science/article/pii/S0167739X10002554>
4. <http://searchcompliance.techtarget.com/definition/cloud-computing-security>
5. <http://www.forbes.com/sites/sungardas/2015/05/20/why-cloud-computing-security-is-no-longer-an-oxymoron/#30b8c833cd1d>
6. <https://www.techopedia.com/definition/25114/cloud-computing-security>

E-Commerce & Its Trends– A Brief Review

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Abstract- E-commerce is the shopping for and promoting of goods and services, or the transmitting of budget or data, over an electronic community, in the main the net. Those business transactions occur in business-to-business, business-to-consumer, consumer-to-consumer or consumer-to-business. The terms e-commerce and e-business are regularly used interchangeably. The time period e-tail is also from time to time used in connection with transactional techniques around online retail. Digital trade or e-commerce is a term for any form of enterprise, or commercial transaction that entails the switch of information across the internet. It covers a range of different forms of organizations, from client primarily based retail sites, thru auction or music sites, to enterprise exchanges buying and selling goods and services between groups. Ecommerce allows clients to electronically alternate goods and offerings and not using barriers of time or distance.

I. Introduction

E-commerce is the buying and selling or facilitation of buying and selling in services or products using pc networks, together with the net. Digital trade draws on technologies including cellular trade, electronic finances switch, supply chain control, internet advertising, online transaction processing, and EDI, stock control structures, and automatic facts series structures. Modern-day digital trade typically makes use of the sector huge internet for at the least one part of the transaction's existence cycle, even though it can additionally use other technologies which include e mail [2].

Electronic transactions have been some time used in the form of electronic Data Interchange or we can say that EDI. It necessitates each supplier and customer to make a dedicated information link among them, wherein ecommerce provides a price-powerful technique for groups to set up a couple of, ad-hoc hyperlinks. Digital trade has also led to the improvement of electronic market places in which suppliers and potential clients are delivered collectively to conduct together beneficial alternate. The street to developing a success online store

can be a difficult if ignorant to ecommerce standards and what ecommerce is supposed to do for your on-line commercial enterprise. Learning and information the pointers required to correctly put in force an e-business plan is a essential element to becoming a success with on line store building [1].

It Include following things:

On line shopping web sites direct to purchasers

Presenting or participating in on-line marketplaces, which process third-party business-to-customer sales Business-to-business buying and promoting Congregation and by means of demographic data all the way through web associates and social media Business-to-business electronic data interchange. Marketing to potential and established clients by way of electronic mail or fax accomplishing prevail for launching new products and services [2].

E-commerce is performed using a spread of applications, along with e mail, fax, on line catalogs and purchasing carts, electronic Data Interchange, file transfer Protocol, and net offerings. Maximum of this is business-to-business, with some companies attempting to use e mail and fax for unsolicited advertisements to customers and different business potentialities, as well as to send out e-newsletters to subscribers. The advantages of e-commerce encompass its around-the-clock availability, the speed of get right of entry to, a much broader selection of goods and offerings, accessibility, and worldwide reach. Its perceived downsides include every so often-limited customer service, not being capable of see or contact a product prior to purchase, and the necessitated wait time for product delivery. To ensure the security, privatizes and effectiveness of e-commerce, corporations have to authenticate enterprise transactions, manipulate get entry to sources which include WebPages for registered or decided on customers, encrypt communications and put in force security technologies inclusive of the Secure Sockets Layer [3].

II. What is e-commerce?

By means of definition e-commerce refers to businesses and clients buying and selling merchandise online. Most people of e-commerce websites at the internet are retail shops selling merchandise directly to the general public. However there also are a proportion of on line shops devoted to commercial B2B sales or wholesale interest. E-trade does now not handiest consult with the promoting of physical merchandise; it can additionally talk over with the selling of services in which bills for the services are made online. As a general rule an e-trade internet site is a website where a switch of finances is finished electronically - therefore e-commerce.

How does e-commerce work?

For the reason that there are multiples of various products and services for consumers and the huge number of various methods these products and services may be added, e-commerce by its nature is varied in the manner it works. In its most basic form of e-commerce works as follows:

1. Consumers pick out a service or product on an internet site.
2. Consumers pay electronically at the internet site or the usage of a third party payment issuer along with PayPal.
3. The business owner or we can say that service provider receives the order and price and the order is fulfilled.

Making payments online is completed by a comfortable or safe connection to make sure that sensitive statistics such as credit score card information and private facts are kept private [4].

E-Commerce Markets and Trends

Many purchasers are switching to online purchasing, or really integrating the exercise into their normal buying via gaining knowledge of purchases on-line before shopping for in shops. Worldwide, there are other interesting tendencies at play, from infrastructure problems to time of day shopping patterns. A brand new Remarket examines those international e-commerce trends [5].

The Various E-commerce trends are as follows:

1. Mobile commerce

2. Social commerce
3. Wearable technology
4. Shipping, inventory, and same day service
5. Compliance in the cart

1. Mobile commerce

Effective cellular trade or mobile commerce isn't going on in a vacuum. Cell shoppers don't use telephones to the exclusion of in-store or full website studies and buying. Purchasers don't live in a single channel. Flipping among tablet, phone, laptop, and save is simply a part of today's shopping revel in. It's not tough to imagine a customer learning a product on line, assessment buying while in the store, and later ordering the object from their iPad. Driven by technological modifications that create opportunities to capture extra of the market, fee and delivery of products throughout channels becomes ubiquitous. Consumers anticipate stores to give them what they need, when and in which they want it.

Mobile-centric techniques have to remain top of mind with outlets going into next year, with an importance on:

Easy to use and comfy cell price alternatives - whether Apple Pay will stay up to the hype and shine wherein others have unsuccessful to take hold off on keep on to be visible. What is obvious is that cell charge alternatives are a must-have.

Optimized mobile net - miniature screens are large and companies who optimize the mobile web revel in will be higher located to seize market share.

Hybrid shopping - combination among brick and mortar, on-line, mobile commerce and other platforms will be the norm in preference to a game-changer in 2015. Now not best are extra ecommerce traders optimizing websites for cell, they're imposing cell payment and brick meets click techniques to seize greater sales. More channels mean extra cash.

2. Social commerce and personalized marketing

Social commerce sales of corporeal goods are probable to rise up. As consequence, ecommerce merchants must socialize greater in the event that they want to face out from their competition and guard their manufacturers. Citizen reviewers, raving lovers, and, sure, complainers, take to the blogosphere and Twitter verse to advocate merchandise, percentage favorites, make or ask for suggestions and lodge lawsuits. Now, extra than ever, engagement is fundamental, and the customer is always,

continually right! In adding up to apply effectual mobile and omni channel approach, elegant traders will make use of communal networks to make specially manufactured goods and service contributions. because people revolve to their peers on Facebook, Twitter, and Pinterest for proposal, social promotion be obliged to be component of several ecommerce company strategy-an approach that center about:

- **Big data and analytics** - Big data will be extra generally used to recognize customer activities and outline strategies to modify contributions. Somewhat than assembling information siloed in the research department, agencies can leverage “clients also bought,” desire lists, facebook marketing campaign likes and Pinterest board sports to market to clients in niche product regions.
- **Responsive content material and interactive layout** - Responsive internet design with purposeful custom designed views and customized in place of company content material might be a logo differentiator.
- **As-they-occur deals and sales** - goal and face book launched a beta model of Cartwheel, a market disrupter that unites social web with in-save deals and actual-time financial savings. With Cartwheel, facebook leads the customer to his or her choices while they're within the bricks and mortar saves. Comparable efforts will probably take off in 2015 and provide a possibility for ecommerce shops to set the standard for capturing extra social internet market place proportion.

3. Wearable technology

The word on the street for 2015 is passive internet get right of entry to. Nowhere is that this extra obvious than in wearable generation. Even as Google Glass had many worried about looking like Robocop or a 3rd grader with headgear, Apple's iWatch promises to supply comparable comfort without messing up your hair. What this indicates for ecommerce is better get access to clients, clean like smart phones, however harder to be unable to find or drop in the road. Wearable's will placed the internet inside clean attain, making it a part of the millisecond time-check walking the lives of kind A's all over.

- Quick updates on rate changes, promotions, and marketing incentives presented to greater purchasers greater of the time.
 - Area-primarily based deals that tie advertising statistics to the actual-time place of the client.
 - Bridging the gap between online and brick-and-mortar, more channels accessed speedier will lead to happier purchasers.

4. Shipping, inventory, and same day service

Until now, brick-and-mortar stores have had a strategic benefit over online shops that immediately completion. Buy now, depart the store together with your item has been the call of the sport for bodily shopping given that layaway and not on time gratification became an artifact of bygone days. Go away it to ecommerce to persuade consumers that touching, feeling, hauling items, and rubbing elbows with the multitude aren't important. Way to faster, inexpensive, and less complicated shipping, clients want now not sit round pining for the UPS any further.

It includes:

- **Shipping** - it all ongoing out when Zappos offered free during the night delivery and returns at the clicking of a mouse. The window of transport has given that gotten smaller similarly, as organizations move to same day and 30 minute delivery options.
- **Stock manipulate and availability** - you can't ship nothing, so e-commerce agencies have had to get tighter and more accurate whilst making inventory seen to now a days's client i.e. simplest one item left in inventory.
- **Success by way of Amazon** —as companies contract out success and shipping to 1/3 parties like Amazon, the turn on success is quicker, and doubtlessly extra correct.

5. Compliance in the cart

Lightning speedy shipping, wearable technology, and market place-disrupting offers are best window dressing if the underlying infrastructure isn't correct and compliant. Just like the good-looking, guileless homecoming king, it's easy for outlets to be distracted by way of the hot, reputedly smooth trap i,e ecommerce, and ignore the brainy, sizeable wall flower: compliance.

It includes:

- **PCI compliance** — the information is full of hacked customer financials and fraudulent shopping. Now not even the biggest brands are spared. PCI compliance in the beginning set out to defend consumers from those kinds of breaches, but in-house auditing and guarantee systems are regularly lacking. The expenses of misplaced records to consumers and corporations are inside the billions. Even as this won't scare many consumers faraway from on line shopping, it'd

gradual sales increase if protocols aren't accompanied and strict protections aren't in area.

- **Checkout accuracy** — clients anticipate to peer a very last fee at checkout that consists of accurate shipping costs and estimates, application of coupons, discounts, or inducement, and tax. Exactness in the course of the checkout technique is vital to preserving purchaser pleasure and loyalty and developing your customer base.
- **Sale and use tax** — If the countrywide effort to necessitate on-line tax achieves something, the already hard, threat-susceptible sales tax hassle will extend. Dealers need an answer which could right away and as it should be observe tax costs and rules throughout channels and fee structures, including mobile, in addition to state lines [6].

5. <http://www.adweek.com/socialtimes/top-global-e-commerce-markets-and-trends-infographic/626303>
6. <http://www.avalara.com/learn/whitepapers/5-ecommerce-trends-watch-2015/>
7. <https://www.ocf.berkeley.edu/~atgeno/conclusion.html>

Conclusion

After cautious observation, it is concluded that e-commerce has indisputably appear as a crucial part of our society. The World Wide Web is and could have a massive component in our everyday lives. It's miles consequently important that small businesses have their very own to preserve in competition with the larger websites. In view that internet builders have decreased down the expenses for their services, it has grow to be less expensive for small businesses to apply the sector huge web to promote their products [7]. E-commerce has accelerated swiftly over the past five years and is anticipated to continue at this price, or even accelerate. In the close to destiny the limits among traditional and digital commerce turns into more and more blurred as an increasing number of organizations move sections in their operations onto the internet. Business to Business is E-commerce between organizations instead of among a commercial enterprise and a client. B2B corporations regularly deal with masses or even heaps of different agencies, both as customers or providers. Carrying out those transactions electronically gives huge competitive advantages over traditional strategies. While implemented well, ecommerce is regularly quicker, cheaper and extra handy than the traditional strategies of bartering goods and services. [1]

References

1. <http://www.networksolutions.com/education/what-is-ecommerce/>
2. <https://en.wikipedia.org/wiki/E-commerce>
3. <http://searchcio.techtarget.com/definition/e-commerce>
4. <http://www.netregistry.com.au/resources/what-is/ecommerce/what-is-ecommerce/>

Investigation on The Compaction Property of Soil By Using Fly Ash and Gypsum-A Review

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Abstract - Fly ash is a substance which causes pollution of air, water and soils; ultimately it disturbs our ecological cycle and disturbs our environment. Fly ash produced due to burning of coal. The fly ash or fuel pulverized fuel ash (PFA) is the residue from the combustion of pulverized coal collected by the mechanical dust collectors or electrostatic preceptors or secretors from the fuel burnt, load on the gases of thermal power plant. Its composition varies with the type of fuel gases of thermal power plants .its composition varies with the type of separator, etc. Disposal of this type of material required huge amount of land vehicle for their transportation. This can be controlled the pollution by the utilization of fly ash as a construction material. In this paper we want to focus on the improvement of soil by the addition of fly ash and polymer by different proposition respectively (i.e. 10, 15, 20%) (i.e. 2 and 4%) to achieve the optimum moisture content and maximum dry density. The given result combination of gypsum and fly ash in soil is more effective than fly ash treatment only

1. Introduction

There are different types of industrial wastage generated during various processes and very complex. There are bad effect of disposal and storage of this substance if it contact with surface, sub surface, air and groundwater without treatment of it. A major shift to coal as an energy source adjunct with more stringent air quality standards will result in the increasing production of vast quantities of the already difficult-to-dispose coal residues in the environment. Since coal residues contain potentially hazardous substances, improper handling and disposal could cause undesirable environmental effects. The physical and chemical properties of coal ashes are dependent on the coal's geological origin, combustion conditions, efficiency of particulate removal, and degree of weathering before final disposal.

The disposal of fly ash disturbs the ecological and environmental at large extent hence there fly ash having

disposal problem. In India, about 76% of electrical energy is generated using coal as fuel in thermal power plants. More than 70 millions tones of fly are generated by the thermal power plants; vast majority is fly ash having low lime content. The solution of this problem may be achieved through bulk utilization of the fly ash as a construction material in different civil engineering and infrastructural projects.

To increase the strength, fly ash may be stabilized with suitable amount of lime and gypsum. Several investigators have reported the influences of the addition of fly ash on soil properties. The effect of fly ash is noted mainly through the pozzolanic reactivity. The percentage increase of fly ash content in fly ash-soil mixtures leads to a decrease in the dry density due to the low specific gravity of fly ash. Fly ash from thermal power plants can be considered either as a waste material. Indian coals have very high ash content. The fly ash content of coal used by thermal power plants in India varies between 25 and 45%, with average fly ash content being 40%. As a consequence, a large amount of fly ash is generated from thermal power plants, causing several disposal related problems. In spite of initiatives taken by the government, several non-governmental and research and development organizations for fly ash utilization, the level of fly ash utilization in the country was estimated to be less than 10%. Globally, less than 25% of the total annual fly ash produced is utilized. Two methods are in practice to dispose of the generated fly ash. They are wet disposal and dry disposal methods with ash ponds being the most common methods of disposal in India effectiveness of fly ashes for stabilization of fine grained soils. It is revealed from the previous studies that

there is wide variation of the geotechnical properties of fly ash when it is stabilized with soil and any binding material.

2. Materials and Methods

The experimental program in this investigation was conducted with silty sand, fly ash and gypsum. Light brown silty sand (SM) as per IS: 1498-1970. The specific

gravity (Gs) of the soil is 2.45 and it does not exhibit any plasticity. The fly ash used in this study was low calcium class F fly ash obtained. The fly ash had a dark grayish colour with a carbon content of (6-8%). The specific gravity of fly ash was 2.04 and it also does not exhibit any plasticity. The gypsum is also used in this study. Different percentages of fly ash (i.e. 10, 15 and 20%) and gypsum (i.e. 2 and 4%) were added to the soil and the tests were performed. Proctor compaction tests were performed to determine the maximum dry density (MDD), Moisture content (OMC) for soil-fly ash and soil-fly ash-gypsum mixtures. The tests were conducted in accordance with Indian Standard test method (IS: 2720-Part 7).

3. Test Results and Discussions

Standard proctor tests have been analyzed to study the effect of fly ash and gypsum on the engineering behavior of soil.

3.1 Standard Proctor Test

The standard proctor tests were conducted on the soil sample with different percentages of fly ash and gypsum. The optimum moisture content and maximum dry density of the samples were determined. The test results shows that with the increasing proportion of fly ash in soil sample the optimum moisture content increases and maximum dry density decreases and same pattern were observed with the varying percentages of gypsum.

This standard (Part VII) lays down the method for the determination of the relation between the water content and the dry density of soils using light compaction. In this test a 2.6.kg rammer falling through a height of 310 mm is used.

Cylindrical Metal Mould - It shall be in accordance with relevant Indian standards on specification of compaction mould

Balances: one, of capacity 10 kg sensitive to 1 g and other of capacity 200 g sensitive to 0.01 g.

Oven- thermostatically controlled with interior or non-corroding material to maintain temperature between 105°0 and 110°0.

Container - any suitable non corrodible airtight container to determine the water content for the test conducted in the laboratory.

Steel Straightened - a steel straightedge about 30 cm in length and having one bevelled edge.

Sieve-4.75mm and 20mm IS sieve conforming to the requirements of IS: 460 (Part I)-1978.

Mixing Tool - Miscellaneous tools, such as tray or pan, spoon, Trowel and spatula, or a suitable mechanical device for thoroughly mixing the sample of soil with additions of water. Metal Rammer - It shall conform to IS: 9198.1979.

4. Conclusions

Soil stabilization as a cost-effective method is utilized in order to improve the properties of poor soil by adding the binder and by-products. The experiments conducted to study the effect of fly ash and gypsum addition on the geotechnical behavior of soil.

Based on the experimental results and discussions as presented above the following conclusion can be drawn:

□ With an increase in the percentages of fly ash in soil specimens the optimum moisture content increases and maximum dry density decreases.

□ On addition of gypsum in soil -fly ash mixtures firstly an increase in both optimum moisture content and maximum dry density is observed. Further by increasing the percentage of gypsum the optimum moisture content increases and maximum dry density decreases.

Table I

Fly Ash	OMC (%)				Max. Dry Density (kN/m ³)				
	0 %	10 %	15 %	20 %	0 %	10 %	15 %	20 %	
Gyp- sum	0 %	12 .0	15	17	18	17	15.40	15.30	14.91
	2 %	---	19	20	22	---	15.99	15.70	15.30
	4 %	---	20	22	23	---	15.99	15.40	15.11

References

- [1] Bera A.K., Ghosh A. (2007): Compaction Characteristics of Pond Ash. *Journal of Materials*, ASCE, 19, 349-357.
- [2] Consoli N.C., Prietto P.D.M., Carraro J.A.H and Heinech (2001): Behaviour of compacted soil-fly ash-carbide lime mixtures. *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE 127(9), 774–782.
- [3] Edil T.B., Acosta H.A. and Benson C.H. (2006): Stabilizing soft fine grained soils with fly ash, *Journal of Materials in Civil Engineering*, ASCE 18(2), 283-294
- [4] Indian Standard test method (IS: 2720-Part 7).
- [5] *Soil Mech. & Foundation Engg*, by K.R.Arora
- [6] Laboratory Investigation on the Compaction Properties of Soil mixed with Fly ash and Gypsum by Manjul Chandravanshi.

Design & Analysis of Accurate CBIR System Using ROI Technique and SVM Classifier

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Abstract – Image Retrieval is a very popular and current research area in the field of image processing. Currently the retrieval based system may working on text based searching or any other things which results in garbage of images .So, selection of output becomes very crucial problem as per user query. So to avoid such kind of problems we have introduced a new CBIR system and analyze such retrieval which gives accurate output with user choice. To design such a system we have used the region of interest technique which is apply on the image and the used a classifier namely SVM classifier. Support Vector Machine is very helpful to obtain such a accurate results. So in this paper the proposed method which is using ROI and SVM is used and discussed. The experimental results shows that our system is an accurate system with fast image retrieval process.

Keywords - Introduction, Region of Interest, SVM Classifier.

1. Introduction

CBIR is image retrieval system where the content means Content-based” means that the search analyzes the contents of the image rather than the metadata such as colors, shapes, textures, or any other information that can be derived from the image itself . A typical query image consists of both relevant and irrelevant regions. The irrelevant regions causes problem to the effectiveness of existing content based image retrieval systems. Irrelevant regions can be removed by defining ROI in the query image [1][3]. Depending upon the method of formulating region based query, RBIR can be categorized into two classes: namely system designated ROI and user based ROI, out of these the user based approach is more useful and we

also have used this approach to make a accurate retrieval system. The general architecture is also shown in Fig 1

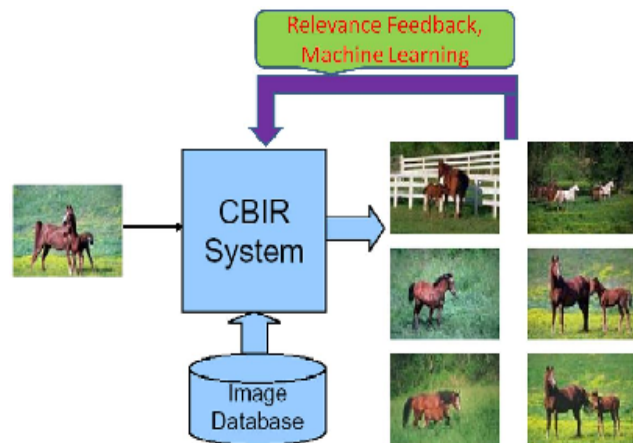


Fig. 1 A typical architecture of CBIR System

2. Region of Interest

ROI based approach is very helpful and representing image in the database.UDR approach is more promising as it enables the user to express his intent in the query formulation.[5][[6] But in UDR approaches, it is difficult to formulate an accurate query if there are variations in the sizes of ROI.

2.1 Selection using Global features

Global feature based CBIR fails to compare the regions or objects in which a user may be interested. Therefore Region Based Image Retrieval (RBIR) is more effective in reflecting the user requirement. [2]The goal of CBIR

systems is to operate on image data and, in response to a visual query, extract relevant images from the dataset.

2.2 Selection using Local feature Local features includes the color and texture features. So for color feature extraction we have used HSV and for texture we have used GLCM (Grey level co-occurrences matrix)

2.3 Preprocessing: We have used already preprocessed data that is Corel dataset which contain 1000 images and contains 10 different classes. It contains African people, buildings, buses, dianasores, flowers, horses. and food etc.

2.4 Feature extraction: Feature extraction is the main heart of CBIR system. The feature extraction finds the image detail in the form of feature value which is the set of value also known as feature vector for every pixel. Region based retrieval systems generally use small feature vector because if the regions in the layout is more then it leads a to wastage of time to compare features of regions within the given image. [4][7]Proposed approach requires selective comparisons; and the length of feature vector can be more enough to make the region accurately without affecting the computation time.

3. SVM Classifier

3.1 Why SVM classification is used

Previously methods like neural network were used for supervised and unsupervised learning. This gives good result for such type of learning. MLP uses feed forward and recurrent network.[10] But these simple NN shows for simple input- output for learning and another multi layer perception (MLP) shows multiple input and output for universal approximation of continuous nonlinear function . But there are some facts which come in front of us

1. Local minima
2. How many neurons might be needed for a task?
3. If Neural networks solution combined with others method this may not give unique result .

And also these facts after implementing not provide such a good results So SVM classification is used. SVM based have given different trainings and tested the whole dataset. The comparison table no 1 shows that we have received 98.50% accuracy on 80% training and 95.27% on 50% and 89,10% on 20% training. The GUI output is also shown in Fig 2

3.2 Confusion matrix

Confusion matrix gives the information about actual and predicted classes. It gives the information of all true positive and true negative values, false positives and false negatives values in the form of matrix [5]. The diagonal elements of the confusion matrix give the information about the all true positive rates. The parameters such as true positive rate, false positive rate, precision, recall and accuracy can be easily calculated from the confusion matrix. In this paper we have made confusion matrix at different training percent and then we have compare their values.

Table 1: Comparison Table at Different Training Percent of SVM

Sr. no	Trainig	Testing	TPN Images	FPN Images	Accurac y
1.	20%	100%	614	386	89.10%
2.	50%	100%	799	201	95.27%
3.	80%	100%	929	21	98.50%

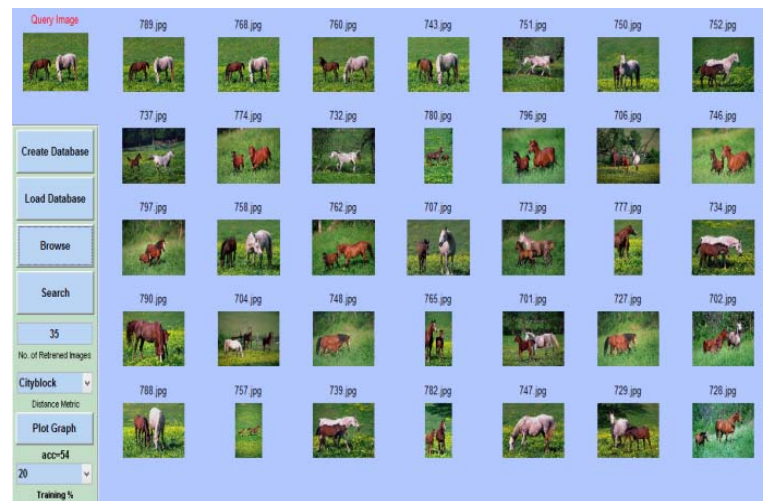


Fig. 2 Retrieval of images as GUI output Screen.

3.3 Measurement of Parameters

To check the performance of system there is need of some parameters on which we can conclude the results . For proposed system we have used precision, Recall and accuracy.[6][9] Here the true positive images are those which are relevant and also exist in the database. true positive images are those which are relevant and also exist in the database true negative images are those which are relevant but not exist in the database . False positive images are those which are not relevant but exist in the database False negative images are those which neither in database and nor relevant. The formula is show\n below.

$$\text{Accuracy } A = \frac{T_P + T_N}{T_P + T_N + F_P + F_N} \quad (1)$$

Where:-

TP: - TRUE POSITIVE

TN: - TRUE NEGATIVE

FP: - FALSE POSITIVE

FN: - FALSE NEGATIVE

$$\text{Precision } P = \frac{T_P}{T_P + F_P} \quad (2)$$

$$\text{RECALL } R = \frac{T_P}{T_P + F_N} \quad (3)$$

4. Conclusion

In this study, a region based approach is proposed for content based image retrieval (CBIR) system.. A corel dataset containing 1000 images are used for checking the performance of system. The SVM classification is used to retrieve the relevant images from a large database. Accuracy, Precision and Recall is evaluated by using SVM classification and the confusion matrix is made to conclude our results. The proposed method is taking very

less time in retrieval. The average accuracy evaluated for the proposed approach is 98%.

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References

- [1] N. Shrivastava and V. Tyagi, "Content based image retrieval based on relative locations of multiple regions of interest using selective regions matching," *Inf. Sci. (Ny)*, vol. 259, pp. 212–224, Feb. 2014.
- [2] Sasheendran, Nivya, and C. Bhuvaneshwari. "An effective CBIR (Content Based Image Retrieval) approach using Ripplet transforms." *Circuits, Power and Computing Technologies (ICCPCT), 2013 International Conference on*. IEEE, 2013.
- [3] Singha, Manimala, and K. Hemachandran. "Content based image retrieval using color and texture." *Signal & Image Processing: An International Journal (SIPIJ)* 3.1 (2012): 39-57.
- [4] Baharudin, Baharum. "Effective content-based image retrieval: Combination of quantized histogram texture features in the DCT domain." *Computer & Information Science (ICIS), 2012 International Conference on*. Vol. 1. IEEE, 2012.
- [5] Sahil Charaya, Sonika Jindal and Bhavneet Kaur, "A Survey of Colour and Texture based Feature Extraction Methods to Content Based Image Retrieval", in 4th International Conference on Advancements in Engineering And Technology ICAET-2016, ISBN No. 978-81-924893- 1-5
- [6] Sahil Charaya, Sonika Jindal and Bhavneet Kaur, "Content Based Image Retrieval Using Selective Region Matching With Region of Interest and SVM", in International Journal of Computer Applications (IJCA) ISBN :973-93-80891-36-5.
- [7] Penatti, Otávio AB, Eduardo Valle, and Ricardo da S. Torres. "Comparative study of global color and texture descriptors for web image retrieval." *Journal of Visual Communication and Image Representation* 23.2 (2012): 359-380.
- [8] Bhavneet Kaur, Sonika Jindal, "Accelerating CBIR System using Graphics Processing Unit in OPEN CV environment" ,(IJCA) International Journal of Computer Applications, Volume 8,Page No. 8,September,(2015) ISSN: 0975 – 8887
- [9] Bhavneet Kaur, Sonika Jindal, "An Implementation of Feature Extraction over medical Images on OPEN CV Environment", (ICDCCom)2014 International Conference on Devices, Circuits and Communications, Pages 1–6,September 2014,DOI: 10.1109/ICDCCom.2014.7024695
- [10] Sasheendran, Nivya, and C. Bhuvaneshwari. "An effective CBIR (Content Based Image Retrieval) approach using Ripplet transforms." *Circuits, Power and Computing*

*Technologies (ICCPCT), 2013 International Conference on.
IEEE, 2013.*

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Effects of Global Competitiveness on Strategic Human Resource Management

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Abstract - Global market is changing hastily and competition is fierce than ever. International economic system, worldwide competition and global clients are all factors driving into trade into the manner companies manage their businesses. Because of which the usage of standardization method emerge as strategic priorities for corporations needing to benefit or maintain worldwide competitiveness. This paper covers the fundamentals of human resource management, strategic human resource management and global competitiveness as well as its effects.

Keywords- Human resource management, strategy, competitiveness, innovation, standardization

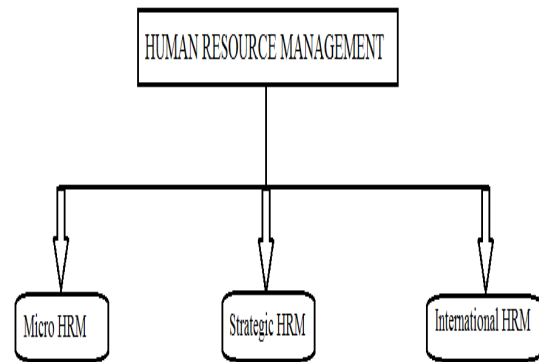


Figure I

1. Introduction

Global competition is changing the way companies manage their business. In old competition, traditional competitive strategies stress positioning in existing and well defined markets, striving to enhance market share. The new competition involves pre-positioning in future and yet undefined markets and co-developing these markets with others. Firms compete not to maximize market share but to maximize value, hence effecting strategic human resource management.

2. Human Resource Management

Human resource management is the management of labor and those to maximize employee performance in service of worker's strategic objective. It is on the whole concerned with management of corporation, focusing on rules and on device. Human resource control is extra involved with employee gain design, employee recruitment, training and improvement, performance appraisal, staff making plans, rules and legal troubles.

Human resource management has 3 principal subfields:-

- Micro human resource management - it covers the sub function of HR coverage and exercise.
- Strategic human resource management - it's far related to long term decision taken at the pinnacle of the business enterprise.
- International human resource management - it issues itself with HRM in companies working throughout national barriers.

3. Strategy

The term strategy is associated with the long-term decisions taken at the top of the enterprise. It envisages questioning beforehand of live on and increase in distinctly aggressive environment.

Strategic management is the process of formulating, implementing and evaluating enterprise techniques to reap organizational objective. It is a manner by which organizations plan to cope with the diverse aspects of management like problem perception, divergent thinking, substantial resources, decision making, and innovations.

4. Strategic Human Resource Management

Strategic human resource management is to ensure that human resource management is fully integrated into strategic planning, that HRM policies coherence both across policy areas and across hierarchies and policies are accepted and used by managers as a part of their everyday work. It includes strategy formulations, strategy implementation, evaluation and control.

5. Objective of strategic human resource management

- I. Analyze the opportunities and threats existing in the external environment.
- II. Formulate strategies that will match the organizations strength and weaknesses.
- III. Implement strategies so formulated.
- IV. Evaluate and control activities to ensure that organization's objectives are duly achieved.

6. Global competitiveness

It can be defined as the degree to which a nation can, under free and fair market condition, produce goods and services that meets the test of international market while at the same time maintaining or expanding the real income of citizens. It is said, "A competitive world offers two possibilities-you can lose, or if you want to win, you can change."

7. Historical Background

History affects both the opportunity available to competitors and the effectiveness with which competitors can exploit them.

The early 17th to 18th century witnessed intense competition among industrial firms but, by and large, they did not have much individual influence on competitive outcomes. Instead in most lines of business-firms had an incentive to remain small and employ as little fixed capital as possible. The small industrial firms that were emerging required very little formal making plans or approach within the contemporary experience.

In the mid 19th century, the strategic HR Management emerged as a way to control market force and to shape the competitive environment .over the time the largest multidivisional companies managed to alter the competitive environment across industries. It limited competition as firms rushed to expand capacity. During 1950s and 1960s many large multinational corporation considered global competition as a factor in planning. By 1960s, business policy focused on

matching "strength" & "weakness"-its distinctive competence-with the "opportunities" & "threats" that it faced in the market place. The framework referred to by the acronym SWOT, was a big step in bringing explicitly competitive thinking to bear questions on strategic management. It was put by Kenneth Andrews as:

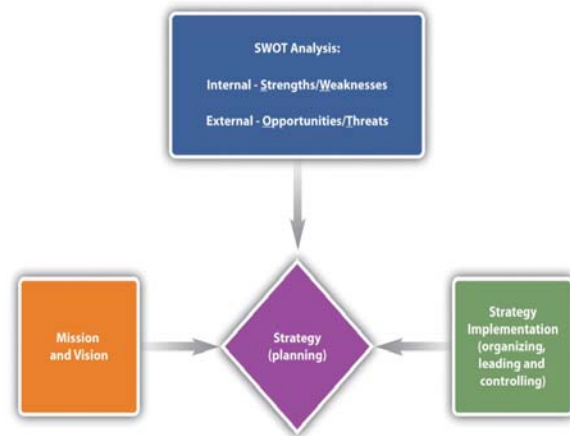


Figure II

Over the time companies started focusing on their impact on mainstream strategic management.

8. Effects of global competitiveness

- I. Growth in productivity has surpassed by major trading partners. Productivity growth rate is greater than our own.
- II. Real hourly wages in the business sector have remained virtually stagnant and actually declined in the past 5 years.
- III. Our manufacturing sector is not generating the kind of real returns on assets that encourage investments.
- IV. Trade deficits are at all time high.

No single indicator gives an adequate representation of our nation's competitive performance. These all points to the declining ability to compete. We see it effect both in domestic markets and in our ability to sell abroad.

9. Approach to global competitiveness

Our ability to compete in world depends on decision made by public servants and private citizens. Decision makers in both public and non-public sectors need to make advanced competitiveness a concern on their agendas. As a nation, we can no longer afford to ignore the competitive results of our moves our inactions. Global competition requires a new vision and a new resolve. We need to fulfill these goals:-

- I. Create, apply and protect technology.

- II. Increase supply of capital available for investment and reduce its cost to nations business.
- III. Develop a more skilled, flexible and motivated workforce.
- I. Make trade a national priority at home and to strengthen the world trading system in which we operate.

We must be capable of compete if we are going to meet our country wide goals of a rising standards and strong national security for our people.

10. Conclusion

Human resource management has become a business field. It is viewed as a support function to business, helping to minimize cost and reduce risks. HRM is concerned with strategy planning. Strategy means decision concerned with long term development of the enterprise. It can never be constant. It is and always has been a moving target. Society and economics are the two factors that influence techniques used in global competitive environment. Global competition is defined as the existence of competing organizations that serve international customers. Business are moving globally and forming more diverse teams. Due to the changes in the business, most companies focus on lowering employee turnover and on retaining the talent held by the workforce. Early value based work was the focus but today the leading edge of competition is the combination of fast responses and the increasing variety. Companies are slipping into commodity-like competition where customers buy mainly on price. But the efficiency does not meet the need of any customer. Over the decade the outsourcing has risen substantially, which has given companies more money while decreasing the economy. To face the new reality of global competition, it is required to have new vision and a new resolve. If we can forge these, we can and will meet the challenges of this new reality. Peter Drucker said that, "Managing is not just passive, adaptive behavior: it means taking action to make desired results come to pass."

Global competitiveness can be overcome by injection innovation into decision making at all levels of the organization. Real innovations require broad cultural alternate based totally on values, hints and final results primarily based size system that give flexibility to all employees while mitigating risks for the business as a whole. This can be done by standing out in the global market by differentiating themselves and creating new markets. Done properly a company can stay ahead of curve and beat the competition while also easing its move into new global markets.

Reference

- [1] The global emerging market: strategic management & economics-by Dr.Vladimir kuint,Taylor &Francis,2009
- [2] "Global standards to overcome global marketplace" by Lowell's., SAE Technical Paper, 981494, 1998
- [3]"Global competition with global competence" by DaSilva, C.,SAE Int. J .Mater.Manf.1(1):169-173,2009
- [4] Human resource management: scope, analysis and significance by Peter Boxall, John Purcell and Patrick M.W right
- (5)Lamb,Robert,Boyden Competitive strategic management, Englewood Cliffs,NJ;Prentice hall,1984
- [6] "The effect of human resource management practices on the perception of organizational and market performance of the firm" by Gedaliahui H.Harel and Shay S.. Tzafirir

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STRESS MANAGEMENT

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Abstract

We all expect stress at geographic point as stress could be a natural human response to its environment. In fact, moderate levels of stress thought of essential motivators. However, high levels of stress have adverse impact on physical and emotional health of worker. So to confirm a secure and productive setting at geographic point, it's our responsibility to assess and manage levels of stress. We have a tendency to establish stress as a serious hygiene issue that has got to be managed. The aim of this paper is to produce insight that may facilitate the reader additional improve his/her management capabilities in managing stress at the geographic point.

Key words- stress, motivators, responsibility, productive environment

1. INTRODUCTION

Stress could be a giant part of existence. Stress has several definitions and there square measure some ways to manage stress. Most stress happens at our busiest moments; college, work and residential. Those square measure the foremost common places for stress to make. Even so stress is ineluctable. Geographical point stress is to be expected. Stress itself isn't essentially a nasty factor. In fact, Hicks & King of Great Britain (2007) means that stress could be a human response to numerous aspects in his/her setting that comes naturally. They any imply that stress will typically act as a motivator. However, high stress levels have the capability to interfere with a human productivity. Besides, it will have a good impact on their physical and emotional health. Excessive stress is additionally pricey. Therefore, it's vital for workers to spot any signs of stress among their colleagues and themselves early enough to forestall impacts on the organization's performance levels.

This may facilitate people acknowledge the underlying downside and look for measures to deal with it. Ultimately, it'll cut back the impact of stress on structure performance and productivity.

2. SYMPTOMS OF STRESS

The body responds to fret negatively. Several biological changes happen that embody however aren't restricted to the following: muscles tension, respiration heavily, dry mouth, sweats, tremors, dilating of pupils, responses aren't clear and there area unit more. These changes will cause health issues if older too of times. The body usually becomes worn down creating it a lot of vulnerable to changing into sick. Betting on however serious the strain, will confirm the severity of its impact. There area unit many **facet** effects that occur from stress. Sleep disorder is another issue that stress could give birth to. This occurs once someone is discontinuous with thoughts and queries that drive them crazy and cause an inability to sleep. Chronic pain, headaches and backaches may be stress induced once fraught. The muscles in these areas become tense below stress. Heart issues area unit the foremost common facet impact. The pain felt within the chest is tension caused by an element shortage to the guts. Heart attacks occur because of high pressure and might be fatal. Stress may hurt showing emotion like depression. Depression may be another facet impact from stress which is a serious disorder to subsume. Pressures of life could extremely get to a private creating them feel down. A number of the symptoms mentioned antecedently could also be a symptom of depression ensuing from stress. Symptoms of depression could embody diet, sleeping issues headaches, body aches. People WHO area unit depressed ought to look for counsel.

3. SOURCES AND TYPES OF STRESS

3.1 Sources:

Stress may be a present development. However, there square measure varied factors each at intervals and out of doors the geographic point that result in excessive stress among workers in a company.

- i. 1st and foremost is that employee having a lot of work appointed than its potential to complete in a very traditional work day. This typically ends up in workers operating their entire duty period while not taking any breaks. Overwork is one in every of the main sources of stress.
- ii. The second supply of stress among workers is career and job ambiguity. This happens once there square measure such a big amount of activities happening within the company with thus very little communication that it makes them unsure concerning company objectives and their specific role in achieving them.
- iii. Another supply of stress among staff is lack of appreciation. Once staff desire they need dedicated most effort to the organization, it's common that they expect some recognition either within the type of profit packages or at the terribly least, some type of acknowledgment(e.g. worker of the month award). If they feel that their efforts area unit underappreciated, their level of discontent and stress raises
- iv. Another issue that contributes to fret is once people desire they lack management over their role within the organization or the results of their efforts within the geographical point. Mistrust among people within the work setting is another major supply of stress. Additionally, geographical point politics disrupt and negatively have an effect on positive behavior among staff. This ends up in state of affairs wherever people perpetually doubt themselves and square measure too involved regarding what their colleagues square measure thinking or oral communication regarding them.
- v. A further supply of stress may be a scenario wherever there's inconsistency within the performance management processes. Think about the subsequent two work examples. First; Associate in Nursing worker receives raise however no

corresponding performance reviews. Second; Associate in Nursing worker receives a positive assessment from management and shortly when he gets discharged. This makes people at intervals such a corporation stressed as a result of they can not understand their fate.

In different words, inconsistency in management ends up in things wherever people feel in secure concerning their job performance and security.

3.2 Types of Source:

1. Time Stress:

This is wherever people lack enough time to finish all of their allotted duties. Hence, they worry and worry that they're going to, at some purpose, fail to try to to one thing necessary. Such employees feel tired, hopeless and sad regarding their standing. Employees beneath this sort of stress worry regarding deadlines and most of the time rush to avoid being late.

2. Anticipatory Stress:

This describes the strain that employee's expertise concerning the long run. Some employees are naturally upset regarding the very fact that one thing would possibly get it wrong within the close to future. For instance, he can get demoted as his of project are going to be purloined by somebody else.

3. Situational Stress:

Stress happens once people are in Associate in Nursing discouraging scenario over that they need no management. Most of the time, this happens because of a crisis that happens within the organization. Such things could involve a conflict of interest, loss of acceptance or amendment is standing in a person's cluster. For example, think about a scenario wherever admin staffs are asked by management to create changes to a system at the expense of security safeguards

to change some practicality. The employees whose recommendations are unnoticed can expertise situational stress as they execute a task they grasp is harmful to the welfare of the organization. Moreover, once people create major mistakes before of the management and/or their colleagues, it makes them stressed.

4. Encounter Stress:

This type of stress revolves around individual contacts. Individuals get stressed once they are anxious concerning interacting with a specific cluster of people or a specific person. It usually happens during a state of affairs wherever employees move with purchasers or customers World Health Organization could also be in some sort of distress. Physicians and social employees are terribly acquainted with this sort of attributable to the sorts of individuals they influence.

4. STRESS MANAGEMENT TECHNIQUES

There area unit many other ways to manage stress. Not each means of managing stress is true for each person, as a result of everyone's reaction to fret is totally different. There's no right or wrong answer.

1. Away is by active a straight forward respiration exercise. They quiet down a personal and facilitate them relax. There are a unit many various techniques for respiration which will cutback stress.
2. Stress counselors will suggest an explicit technique for every person. Reposeful and respiration work along. Reposeful could embody doing one thing gratifying, such as taking a walk, paying attention to music, finding out a hobby, reading or just sitting or lying down in peace and quiet.
3. Moderate physical exertion is in a different way of reducing stress, however it's vital to recollect to

not make it. Physical exertion doesn't essentially mean running the mile. It may merely means stretching. We all grasp that happy exercise additionally reduces stress.

4. Biofeedback is additionally the way of managing stress. This involves observation specific areas of the body with Associate in Nursing device that's attached to a district of the body. The device makes a noise, and also the pitch of the sound is set by however relaxed the individual is
5. Consumption of food well can facilitate for managing stress. Healthy foods keep the system sturdy, similarly as limiting the quantity of caffeine that's consumed daily. Caffeine hurries up the center and rate which might add stress. Quitting smoking is additionally a wonderful different way of reducing stress. But smoking features a similar impact that caffeine has on the body.

People that area unit below stress shouldn't communicate harmful stress relievers like smoking, drinking or unhealthy consumption. These unhelpful stress management methods could seem like they are relieving stress, however instead they're pain in the body, that results in additional stress. Counselor ought to be appointed at work to console and solve the matter related to worker and provides him correct steerage.

5. SCOPE OF STRESS MANAGEMENT

Today, stress management has become one in all the foremost vital agenda because it thinks about with the productivity and therefore the physical and emotional health of the workers. Stress management is critical for long happy lives with less hassle. There area unit many ways to agitate stress starting from the addressing the causes of stress to easily burning off its effects.

Advantage of stress management:

- Industrial and Business blessings of stress management:
- Less no of leaves because of stress connected disorders
- Less worker's compensation loss because of stress connected accidents or malady.

- Improved job Performance
- Less stressful, additional economical work.
- Improved employee attitude and perspective
- Improved employee overall Health
- Health advantage of stress management:
- Attenuated stress connected symptoms
- Improved sleep
- Attenuated Anxiety
- Less use of medication\
- Decreased Pain, increased ability to manage Pain
- Increased ability to relax physiologically.
- Increased sense of control and improved self-esteem.

6. CONCLUSION

Stress may be each positive and negative as moderate levels of stress are thought-about essential motivators however high levels of stress have adverse impact on physical and emotional health of worker. For many of the individuals, low to moderate quantity of stress change them to perform their jobs higher. However, a high level of stress or for that matter even an occasional – level stress meet an extended amount, eventually takes its toll, and therefore the performance declines. High level Stress has adverse effects on health of worker that decreases their productivity and potency. Therefore, there ought to manage stress because it has giant no. of benefits for workers similarly as workplaces. There are many stress managing techniques by implementing them associate leader are ready to produce healthy atmosphere to increase productivity and potency.

References

- [1] Hicks, T. & Caroline, M., (2007). A Guide to Managing Workplace Stress. California: Universal Publishers.
- [2] Cooper, L. C. & Payne, R., (2008). Causes, Coping and Consequences of Stress at Work. New York: Wiley.
- [3] Crandall, R. & Perrewe, L. P., (2005). Occupational Stress: A Handbook. New York: Taylor & Francis.
- [4] Nolan, M. (2009). Top Ten Sources of Workplace Stress and How to Fight Them. Retrieved from (Accessed on 11th October, 2013).
- [5] Weiss, T. W., (2012). Workplace Stress: Symptoms and Solution. Retrieved From . (Accessed on 10th October, 2013).
- [6] Albrecht, K., (2010). Stress and the Manager. New York: Simon and Schuster, Business and Economics.

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A Review: Study the Use of Vibration Energy For Charging Electric cars

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Abstract - With day by day oil price hikes and increasing environment pollution, especially in large cities electric vehicles are getting to more interesting than they were several years ago. Using electric vehicles in cities and large populated areas leads to less pollutions cause by common cars combustion engines (nitrogen oxides, carbon oxides, dust particles) the aim of this review paper is to make power generation more sustainable, economical and ecological by utilizing the advancement in the technology. In this article, we have developed a piezoelectric transducer works as electromechanical converter, which converts mechanical vibrational energy into electrical energy through the using mechanical vibration, therefore produce electricity. This technical paper focuses on one such advance of energy harvesting using piezoelectric material. Piezoelectric materials can be used as mechanism to transfer mechanical energy, usually ambient vibration, into electrical. A piezoelectric is that type of substance which produces an electric charge when a mechanical stress is applied. Piezoelectric materials have vast application in real field. So in this paper, our aim is to charging electric cars by some source which works for long time and does not become costly i.e., vibrating energy which totally replace electricity and use vibration present around us which are harvested economically.

Keywords - *Electric cars, Li-ion batteries, carbon nano-tubes, vibration energy and piezoelectric transducer, springs, electric energy, sustainable power, renewable energy, foot traffic, energy harvesting*

1. Introduction

The current era, this is witnessing a skyrocketing of energy costs and an exponential decrease in the supplies of fossil fuels when vehicles move on the road, the produce electricity in huge amount. The piezoelectric effect is implicit as the linear electromechanical interaction between the mechanical and the electrical state in crystalline materials with no inversion symmetry. Piezoelectric materials under the road are vibrated due to the vehicle suspension in the tyre that force the road and.

1 Battery technologies

2 Energy harvesting techniques

3 Charging Techniques

These technology and techniques help us to develop new efficient batteries, self-power generating gadgets and chargers.

2. Literature Review

Syahrul Hisham Mohamad et.al (2015) studied “A potential study of piezoelectric energy harvesting in car vibration. The aim of the study is designing and developing the circuit and it’s charging system for piezoelectricity. The electrical energy harvested is then charged the capacitor after passing through full wave rectifier. The harvesting system is made up of piezoelectric cantilever that will convert vibration to electrical energy. The system is then installed at a car engine because it produces optimum vibration and no effect on piezoelectric cantilever performance.

Vaclav Kaczmarczyk et.al (2011) investigated that “Electric vehicles charger as a part of home area network”. Electric vehicles are more considerate to the environment than traditional cars even when the energy produced by non-renewable energy resources is used for their charging. how to integrate electric vehicle charger to the home area network and electric vehicle charging station as a part of home automation network communication and object model of interoperable device. Further research should focus on the charging station function specification, design of communication interfaces and communication protocols used to cooperate both with supervisor interfaces and car battery management system. The charging station should be created, implemented and tested on real electric vehicle.

Mukti Nath Gupta et.al (2014) after complete study he investigate how to generate electricity due to vibration of moving vehicles using Piezoelectric effect. The objective was to make power generation more sustainable, economical and ecological by utilizing the advancement in the technology and works on the some very useful parameters like Piezoelectric effect vibration energy, energy harvesting. After all that he reached on the conclusion that the materials have the ability to transfer mechanical strain energy into electrical energy, the amount of energy generated depends on the number of passing vehicles and the number of Piezoelectric crystal on the roads.

3. Mechanism

The word piezoelectricity originated from Greek word, which means electricity by pressure. In certain when mechanical strain is applied crystals were polarized and the degree of polarization is proportional to the applied strain in contrast, deformation occurred when these materials exposed to an electric field. Crystals which acquire a charge when compressed, twisted, distorted are said to be piezoelectric. The nature of piezoelectric effect is closely related to the occurrence of the electric dipole moment in solids of decisive importance for the piezoelectric effect is the change of polarization P when applying a mechanical stress. This might either be caused by re-configuration of the dipole –inducing surrounding or by re-orientation of molecular dipole moment under the influence of the external stress. Piezoelectric effect can now be observed in the crystal.

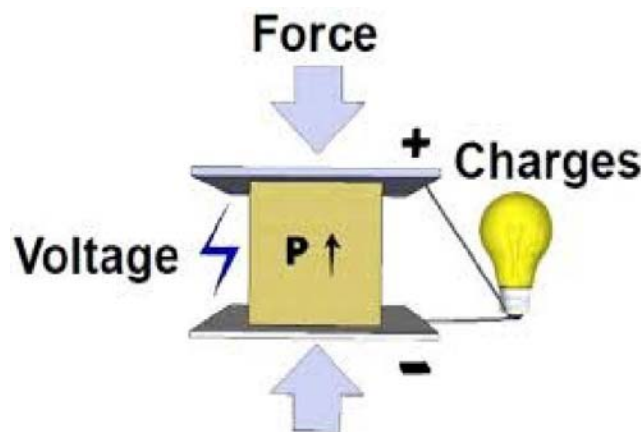


Fig-1 Mechanism of piezoelectric effect

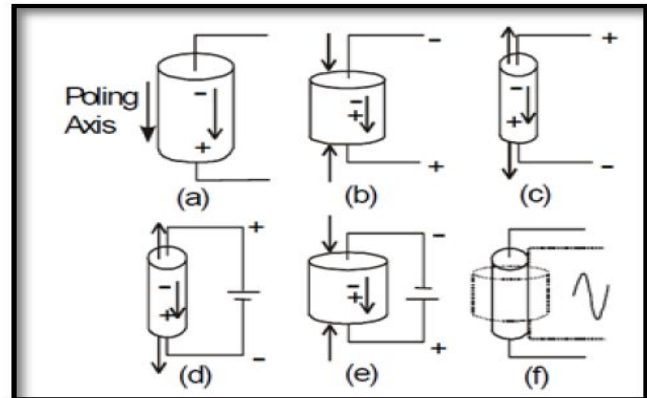


Fig-2 illustrates the piezoelectric effect. fig-2(a) shows the piezoelectric material without a stress or charge. If the material is compressed then a voltage of the same polarity as poling voltage will appear between the electrodes (b). If stretched, a voltage of opposite polarity will appear(c).conversely, if a voltage is applied the material will deform. A voltage with the opposite polarity as the polling voltage will cause the material to expand, (d), And a voltage with same polarity will cause the material to compress (e).If the ac signal is applied then he material will vibrate at the same frequency as the signal(f).VC

4. METHODOLOGY

The simulation setup of piezoelectric vibration-to-electricity conversion used in this study is described in the following sub-sections. Piezoelectric Sensing Element a piezoelectric behavior can be modeled in terms of acceleration and voltage as given by equation.

$$V = k * L^2 * a \quad (1)$$

The value of output voltage from the piezoelectric converter was based on equation 1. The detecting element modeled in Mat-lab SIMULINK. The acceleration input used for the detecting element is obtained from the vibration data obtained from experiment. The perfect gain for piezoelectric element of transfer function is taken as one.

1. When vehicles/traffic goes through that particular area, it enables the springs to contract which is placed at the level of the road.
2. After that when vehicle is passed, spring continuously expands and contracts, which continuously comes in contact with piezoelectric crystals which creates a pressure on the crystals.

3. When pressure is applied, it results in deformation and movement of positive and negative charges which induces electric field and finally electrical energy.

5. Applications

1. One of the main applications of the piezoelectric

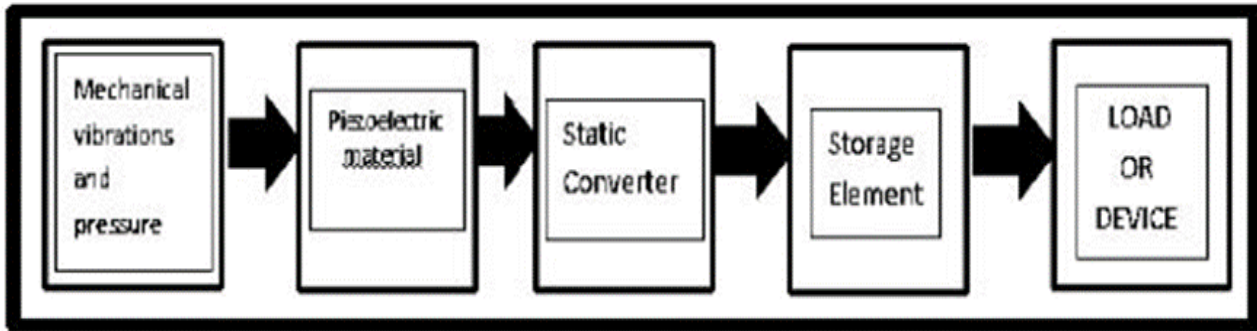


Fig 3 Mechanism

4. This output is fed to rectifier which converts a.c into d.c. either half wave or full wave rectifier can be used for this purpose.

5. To display the status of battery microcontroller is used that is, how much % of battery gets charged whenever vehicles goes on from that layer of piezoelectric transducers.

6. After this output is fed to inverters; an electrical device that transforms d.c to a.c. and finally electrical energy obtain saved in inverters only and can be used when needed. There is mili volts range obtained from a single piezoelectric crystal. So, we arrange many piezoelectric crystals in tandem to get higher voltage & the received energy is stored in lithium batteries.

7. Conversion of vibration energy caused by vehicles into electrical energy occurs in the given manner. When vehicles passes through the selected particular area it tends to contract the springs at level of the road sometimes just below the road (one with the increased sensitivity and long lasting life can be buried (0.5-1.5m) now when vehicles passes, spring continuously expands & contracts, which continuously comes in contact with piezoelectric crystals which creates a pressure on the crystals. When pressure is applied, it results in deformation & movement of positive & negative charge which induce electric field & finally electrical energy the output obtained from a single piezoelectric crystals in series so has to obtain higher voltage & received energy is stored in lithium batteries

Crystals which are also a part of our research paper is to use vibration energy to charge the electric cars.

2. This technique is also use to produce power to light up the street lights.
3. This technique is also use to produce power to light up the street lights.
4. In railway tracks a communicating train produces sufficient amount of vibrations. Thus piezoelectric crystals are placed closer to use those vibrations.
5. This technique is further use at Airports, Railway stations, Bus stops to obtain power to fulfill basic electricity needs.
6. This technique may be used at gym.
7. This technique may also be used in shoes, which will produce energy which is sufficient for charging a mobile of other domestic uses.



Fig. 4 Mechanism used in gym

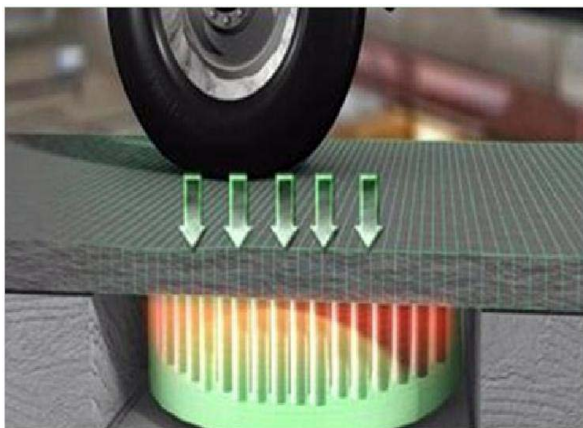


Fig.3 Mechanism used in gym and vehicles

6. Merits

- Piezoelectric energy conservation technique is a onetime installment and it requires very low maintenance which makes them cost efficient.
- They generate a voltage proportional to acceleration of the vehicles due to the deformation of the crystal so required no local power sources.
- By using this technique we can obtain a voltage of 2-10 V
- Minimize the Fuel consumption by using the electric car.

7. Demerits

- 1) Every piezoelectricity material stands for limit on temperature, voltage and stress.

- 2) One other limitation of the technology is that its implementation is not feasible in sparsely populated areas as the foot traffics is very low in such areas.

8 Conclusions

Piezoelectricity, by the means of vibration is one of the most conventional energy because the source of vibration is present almost everywhere moreover, it is environmental friendly and thus not pollute the environment. Car engine has been chosen as the source of vibration. The experiment was conducted at several points at the engine to obtain various result of energy harvesting. The circuit for this energy saving project contains of a full wave bridge rectifier and also consists of chargeable and dischargeable capacitor. The amount of energy produced depends upon the number of crossing vehicles and the piezoelectric elements on the road. Vehicles which are moving slowly emerges to generate slightly more energy than faster moving the vehicles, but further research is needed to conform this piezoelectric power generation system works successfully. It has enormous scope for future energy / power solution towards sustainability. According to both simulation and experimental results obtained, it can be estimated that as the acceleration magnitude increases, the direct voltage and direct current produced are also increased which means more power can be conserve.

9. Future scope

This idea plays an important role in saving or conserving energy for future generations. This stored energy can be used to provide power to other devices also or can be stored for further use. Also there are many other ways present for us besides electricity to charge up electric cars. These ways can also act as better substitute to electricity and can be used when electrical energy is not present or in areas where electricity has not yet reached.

References:

- [1] Holler, F. James; Skoog, Douglas A; Crouch, Stanley R (2007). "Chapter 1"Principles of Instrumental Analysis (6th ed.). Cengage Learning. pp. 9.ISBN 978-0-495-012016.
- [2] Syahrul Hisham Mohamad, Mohd Firdaus Thalas, Aminurrashid Noordin, Muhammad Sharil Yahya, Mohd

Hanif Che Hassan and Zulkifli Ibrahim, "A potential study of piezoelectric energy harvesting in car vibration" ARPN Journal of Engineering and Applied Sciences, Vol.10 (2015), ISSN 1819-6608.

[3] Mukti Nath Gupta, Suman and S.K. Yadav," Electricity Generation Due to Vibration of Moving Vehicles Using Piezoelectric Effect" Advance in Electronic and Electric Engineering, Volume 4, (2014), pp. 313-318.

[4]Leinonen M., Palosaari J., Juuti J., Jantunen H.: Piezoelectric energy harvester for vibrating environments using multiple beam topologies for wideband operation, Suomen automaatioseura, AP XIX 2011 Proceedings, Vol.41 (2011).

[5] Abbasi, Aqsa. "Application of Piezoelectric Materials and Piezoelectric Network for Smart Roads." International Journal of Electrical and Computer Engineering (IJECE) Vol.3, No.6 (2013), pp. 857-862.

[6] Manbachi, A. and Cobbold R.S.C. (2011). "Development and Application of Piezoelectric Materials for Ultrasound Generation and Detection". Ultrasound 19 (4): 187–196.

[5] Lee, BY; Zhang, J; Zueger, C; Chung, WJ; Yoo, SY; Wang, E; Meyer, J; Ramesh, R; Lee, SW (2012). "Virus-based piezoelectric energy generation" Nature nanotechnology 7 (6): 351–6.

[6] www.merriam-webster.com

[7] www.nptel.ac.in

[8] <http://en.wikipedia.org/wiki/Piezoelectricity>

[9] The Piezoelectric Effect, PZT Application Manual

A Review on Continuously Variable Transmission

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Abstract - This paper describes CVT which is the continuously variable transmission which was conceptualized more than 500 years ago and is now just beginning to replace traditional automatic transmissions in some automobiles. Its about time, this technology leads to smoother ride, improved fuel efficiency, reduced exhaust emissions and better acceleration. Automakers suddenly have jumped their feet first into continuously variable transmission development and now the race is on to see who can make the most of this fascinating, through hardly new technology. Mainly CVT consists of two cone shaped pulley, one is driver and other is driven. Changing the diameters of the pulleys varies the transmission ratio and gives the most appropriate ratio for a given situation But, Nissan is the world's first automaker to bring the unique, Toroidal CVT systems and instead of pulleys and belt used in recent CVT's, it uses rollers and discs. In this system there is no fear of breakage of belt unlike belt type CVT.

Keywords - CVT, Automatic transmission, Reduced exhaust emission, Toroidal.

1. Introduction

CVT, also known as Single-speed transmission, variable pulley transmission or stepless transmission is automated transmission that can lead to change seamlessly through a continuous range of effective gear ratios. There are many types of CVTs, each having their own characteristics e.g. belt and chain type CVT, toroidal CVT, Hydrostatic, CVT, E-CVT, Power split CVT, magnet based CVT, planetary CVT etc. However the belt and chain type and the toroidal CVT are among the most commonly used CVTs, among all, in automotive industry. The CVT replace the gears with two variable diameter pulleys, with each one shaped like a pair of opposing cones, with a metal belt or chain running between them.

Each pulley halves are moveable. When the pulley halves come closer together the belt is forced to ride higher on the pulley, effectively making the diameter of pulley large. The flexibility of the CVT allows the input shaft to rotate at a constant angular speed. A belt driven design offers approximately 88% efficiency, which while lower than that of a manual transmission, can be offset by lower production and by enabling the engine to run at its most efficient speed for a range of output speeds. In these belt driven CVT's the problem is, these transmission belts break, no matter how well they are made. When they break, the complete transmission has to come out for a complete overhaul at great expense. CVT transmission that use chains are better, but they still break. Another version of CVT—the toroidal or Extroid CVT system, in which replacement of belts and pulleys with discs and power rollers is there. Although such a system seems drastically different, all of the components are identical to a belt and pulley system and lead to the same results—a continuously variable transmission. This varies the gear ratio by varying the angle of the rollers and contact between the rollers and the two discs. Mainly three rollers are used between two discs to vary the gear ratio.

2. History

In 1490, the first CVT was introduced by Leonardo Da Vinci. First patent for the belt CVT transmission was filed in Europe by Daimler & Benz in 1886 and a US patent for a toroidal CVT was granted in 1935. In 1910 Zenith motorcycles built a V2 motorbike with CVT that was so successful in hill climb events that it was banned from the events to give other motorcycles a chance at competing. In the late 1950s Dutch automaker DAF firstly started using CVTs in their cars, specially to produce an automatic transmission for a small, affordable cars. But technology limitations made CVTs unsuitable for engines with more

than 100 horsepower. In February 1987, Subaru launched the Justy mini car in Tokyo with an electronically controlled CVT developed by Fuji Heavy Industries. Justy was the first production car in USA to offer the CVT transmission. In 1992 Nissan introduced CVT to their Nissan March with the same principle as Subaru Justy. In late 1990s, Nissan introduced its own roller-based CVT to the market named toroidal CVT or extroid. Toyota also offered a CVT called Multidrive for models such as Toyota Avensis. In 2005 Ford introduced a chain driven CVT transmission for their higher powered cars like Ford Taurus, Ford 500 & Ford Freestyle. The 2008 model Mitsubishi Lancer model is available with CVT transmission. Suzuki has used CVT since on 2010 on their SX4 and Kizashi model.

3. CVT Classifications

CVT's are broadly classified into two main categories which are as follows:

- Belt or chain drive CVT
- Toroidal CVT or Extroid

3.1 Belt or chain drive CVT

In this most common CVT system, the two V-belt pulleys, which are split perpendicularly to their rotation axis and a v-belt runs between them. The gear ratio is changed by moving the two sheaves of one pulley closer together and two sheaves of the other pulley farther apart. Because of the belt's V cross section, it causes the belt to ride higher on one pulley and lower on the other. By doing this the effective diameters of the pulleys changes which in turn changes the overall gear ratio. Making the input pulley smaller and output pulley larger gives the low ratio for better low speed acceleration. As the car accelerates, the pulleys vary their diameter to lower the engine speed as car speed rises. This is the same thing a convention transmission does, but instead of changing the ratio in stages the CVT continuously varies the gear ratio hence its name. The v-belt needs to be very rigid in the pulley's axial direction in order to make only short radial movements while doing sliding in and out of the pulleys.

V-belts reinforced with steel are sufficient for low mass low-torque applications like utility vehicles. But higher mass and torque applications such as automobiles requires a chain. In a chain based CVT a film of lubricant is applied to the pulleys. It needs to be thick enough so that the pulley and chain never touch. Both belt and chain CVT system fall under the category of friction-limited drives as

their dynamic performance and torque capacity depends significantly on friction characteristics of the contact patch between belt/chain and pulley.

In CVT, the belt pull the entire vehicle by connecting the input and output shaft. This belt experiences tremendous force when the vehicle is accelerating. Though the belt is being made stronger by using new materials and type of belts, the belt may break while pulling a heavy vehicle.

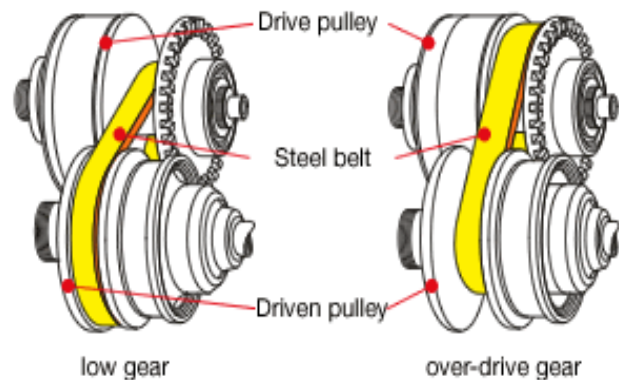


Fig. 1 Belt or chain drive CVT

3.2 Toroidal CVT or Extroid

The other version of the CVT, the toroidal CVT system replaces the belts and pulleys with discs and rollers. Although such a system seems totally different, all of the components are analogous to a belt and pulley system and leads to the same results. Here's how it works:

- a. One disc connects to the engine. This is equivalent to the driving pulley.
- b. Another disc connects to the drive shaft. This is equivalent to the driven pulley.
- c. Rollers or wheels located between the discs, they act like the belt and transmit power from one belt to the other.

The wheels are able to rotate along two axes. They can spin around the horizontal axis and tilt around the vertical axis, which in turn allows the wheels to touch down the discs in different areas. When the wheels are in contact with the driving disc near the center, it is mandatory that they must contact the driven disc near the rim, resulting in a reduction in speed and an increase in torque i.e. low gear. As the wheels make contact with the driving disc near the rim they must contact the driving disc near the center,

which in turn resulting in an increase in speed and a decrease in torque i.e. overdrive gear. A simple tilt of the wheel then incrementally changes the gear ratio, providing for smooth ratio changes. The gear ratio 1:1 is shown in the figure when both the discs rotate with equal speed.

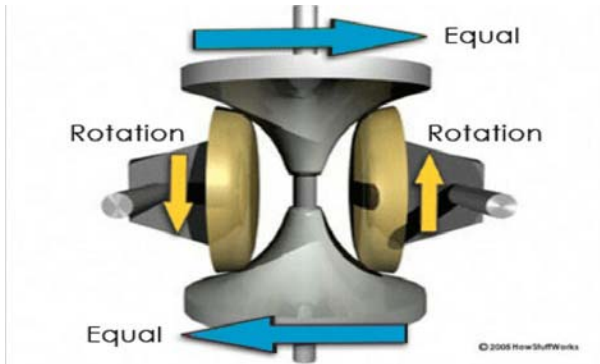


Fig 2 Gear Ratio

Fig. 3 shows the position of rollers in which they are certainly tilted. The contact of the rollers in this position is at the center with faster disc and at the rim with the slower disc as shown in figure. In this position one disc rotates faster and other is slower. This gives either a low gear or overdrive gear.

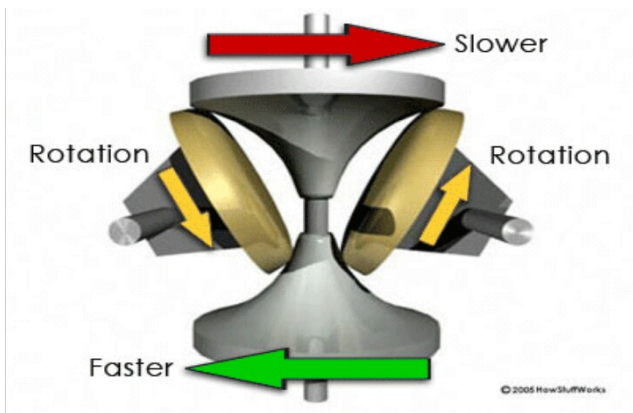


Fig. 3 Tilted Roller Position

In this CVT system drive however, does not come from a metal to metal contact, while a special “traction oil” serves to simultaneously lubricate, cool and provide the friction surface between the elements. By the application of the toroid CVT’s high surface pressure between elements cause Nissan’s traction oil to interlock molecules in such a way as to align them. The oil then bears all of the shear force between the elements. It is an elegantly and amazing

technology jointly developed with Japanese oil company Idemitsu.

The new Extroid CVT uses power roller’s two sets to transmit drive torque between an input disc connected to the crankshaft side and an output disc connected to the drive shaft side of the CVT. The electro-hydraulically controlled power rollers, four in all, change their angle of attack in relation to the input and output disc, varying the effective drive ratio.

4. Advantages

- CVT is built with fewer parts compared to conventional transmission, so they are less expensive to manufacture.
- This saving is passed along to consumers in a car’s selling price.
- Acceleration stays in a sweet spot to minimize the non-wanted power, thus improving a vehicle’s fuel efficiency.
- CVT provides “smooth and step less” ratio changes unlike conventional transmission systems which use sets of fixed gears.
- CVTs can smoothly compensate for changing vehicle speeds allowing the speed of engine to remain at its level of peak efficiency.
- CVT is lighter and smaller than conventional automatic transmission.
- The Extroid type CVT can withstand higher power torque.
- Their is improved acceleration due to lower power loss experienced.
- Adapts to varying load conditions and power demands to allows for a better ride.
- Better emission control and less greenhouse gas emission because of improved control of engine’s speed.

5. Disadvantages

- Driving the vehicle with use of CVT is a very different experience and many drivers do not like it because you do not feel the engine accelerating, you do not feel any shifts.

- This type of transmission requires ‘constant slipping’ to vary gear ratios, which can cause wear to the belt.
- Extroid type CVT is very costly.
- Oil for Extroid CVT is called Liquid GOLD and is very expensive.
- The problem in belt CVT is the belt breaks when they are subjected to high power applications, no matter how well they are made.

6. Conclusion

In the plan to improve fuel economy and dynamic performance of the vehicle, Continuously Variable Transmission plays a crucial role, its complete potential has not been realized so far in a mass production vehicle. Modern automatics are much better than old, but all the automatics use more than their manual equivalent. You can expect a loss of something like 20% of your top speed together with 30% increase in fuel consumption compared to a manual gear box. A mid 1990s Volkswagen Golf car with a 1.8L engine and a 5 speed manual gearbox will use an average of 9.3 liters per 100 km. with an automatics the same car will use 11.2 liters per 100 km. After that the all new CVT came into usage that solved the problems described above. This transmission could change itself internally to produce a wide range of different gears and with each one perfectly suited to the road conditions and driving style of the vehicle. There are no fixed gears in a CVT this type of transmission simply invents the right gear at the right time. In theory a CVT is a ideal gearbox. In practice however, most modern CVT gearbox suffer from the same problems as their ancestors: because they do not have the gears, many CVTs use belts instead. The problem in these is that the belt breaks and when they break the complete transmission has to come out for a complete overhaul at a great Cost. CVT gearbox that uses chains are better, but they still breaks. The EXtroid CVT is more effective as they use rollers and discs instead of belts and pulleys. Nissan is the first automaker who introduces this CVT in the market. Nissan and many other automakers use this CVT in their various car models like Nissan altima, maxima, versa , sentra, cube, Toyota corolla, Honda civic, Mitsubishi lancer etc.

- D. Rockwood, N. Parks, D. Garmire “A continuously variable transmission for efficient urban transportation” *Sustainable Materials and Technologies*, 2014, 36–41
- N.Srivastava, I. Haque “A review on belt and chain continuously variable transmissions (CVT): Dynamics and control” *Mechanism and Machine Theory*, 2009, 19–41.
- http://histomobile.com/dvd_histomobile/usa/tech/90-2.htm
- <http://auto.howstuffworks.com/cvt3.htm>
- http://www.nissanglobal.com/PDF/tcvt_e.pdf
- <http://www.odec.ca/projects/2007/viva7s2/proscosns2.htm>
- https://en.m.wikipedia.org/wiki/Continuously_variable_transmission

References

A Review on Comparison of Magnetic Abrasives Developed by Chemical Method with Already Existing Magnetic Abrasive Methods

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Abstract - To obtaining quality finish on metallic and non-metallic surfaces, Magnetically Assisted Abrasive Finishing (MAAF) processes are most suitable. In these processes, the cutting forces are generated and controlled by magnetic field developed in between the electromagnetic poles and magnetic abrasives. In spite of remarkable results of MAAF processes, the major limitation towards commercial adoption of this technology is the non-availability of cost-effective magnetic abrasives. The production techniques for preparing magnetic abrasives are time consuming and complicated therefore the existing magnetic abrasives are very costly. Best performance is shown by magnetic abrasives produced by Chemical Method while simple mixing technique does not show very good results. Chemical Method is more effective than sintering because chemical methods produce cheaper magnetic abrasives.

Keywords – MAAF, Chemical Methods, Conventional Machining, Magnetic Abrasive Machining.

1. Introduction

Abrasive machining is a kind of machining process where material is removed from a workpiece using a multitude of small abrasive particles. Grinding, honing, and polishing are common examples of such type of processes. Abrasive processes are usually expensive, but can give tighter tolerances and better surface finish than other machining processes. Abrasive machining processes can be classified into two groups based on how the grains are applied to the work piece. In bonded abrasive processes, the particles are bonded together within a matrix, and their combined shape determines the geometry of the finished work sample. For example, in grinding the particles are bonded together in a wheel. As the grinding wheel is fed into the part, its shape is transferred onto the workpiece.

In loose type abrasive processes, there is no structure connecting the grains. They could be applied without lubrication as dry powder, or they may be mixed with a lubricant to form slurry. Since the grains can move separately, they must be forced into the work piece with another object such as polishing cloth or a lapping plate.

There are a multitude of uses for abrasive machining in various industries. Various industrial applications demands very high surface finish up to the range of nanometers or even above with the evolution of modern manufacturing trends. Currently, it is required that the parts, used in manufacturing semiconductors, aerospace applications, atomic energy parts and medical instruments, have a very fine surface roughness. Amongst them, sanitary tubes, vacuum tubes and wave- guides are tough to be polished by conventional finishing methods such as lapping, due to their shapes. The surface roughness of these tubes affect the performance of the complete system, but the finishing technology for these tubes is very scant in manufacturing fields. Some newly developed non-conventional fine machining processes are used to obtain surface finish up to the required level. Some of those processes are as follows:-

- Magnetic Abrasive Polishing (MAP)
- Abrasive Flow Machining (AFM)
- Magnetic Float Machining (MFM)
- Magnetic Abrasive Machining (MAM)



(a)



(b)

Fig. 1 (a) Bonded (b) Loose

2. Working Principle

The Figure 2 shows the magnetic abrasive process for internal polishing. The principle of magnetic abrasive machining uses the machining force generated by the magnetic field strength as well as the gradient of the magnetic field. This gradient produces an attraction force between the abrasives as well as the machining pressure in the air gap. Therefore, the magnetic abrasives are attracted from the magnetic brush, and finish the surface without need for splashing by the rotation force of the work piece.

Two force components acting on a magnetic abrasive particle in a magnetic field are F_x and F_y , as follows:

$$F_x \propto V H \frac{\partial H}{\partial x} \quad (1)$$

$$F_y \propto V H \frac{\partial H}{\partial y} \quad (2)$$

where x and y represent the direction of the magnetic field and equipotential lines, respectively. V is the volume of magnetic abrasive and, $\partial H/\partial x$, $\partial H/\partial y$ are the gradients of the magnetic flux density in the air gap, which is as follows

$$B = \mu_0 H$$

Where B represents the magnetic flux density and μ_0 is the magnetic permeability in vacuum.

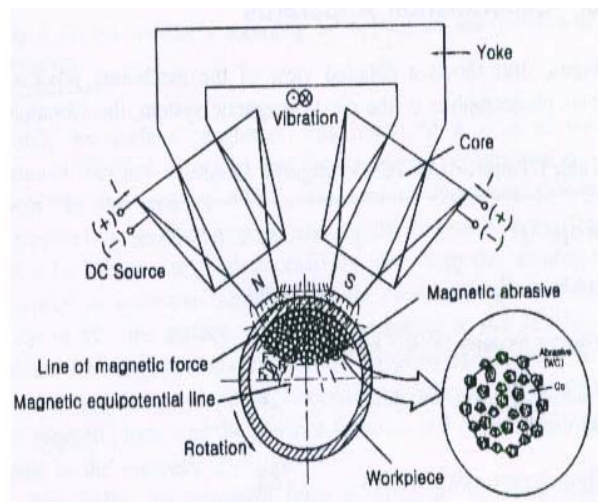


Fig.2 Schematic view of the internal polishing system using magnetic force and magnetic abrasives

3. Major Applications and Capabilities

MAAF processes can be used for the finishing of internal and external surfaces of tubes as well as flat surfaces. Some of the important applications are mentioned as follows:

- Internal finishing of long and large sized elbows, slender tubes etc.
- Able to attain wide range of surface characteristics by careful election of magnetic particles and abrasive particles.
- Roughness values varies from 100 μm - 1 nm.

- Texturing.
- Enhance surface properties such as wettability or decreasing friction.
- Capable to reaching hard to reach areas.
- Ability of modifying roughness without altering form.
- Setup has no relation with work piece material.
- Can efficiently finish ceramics, coated carbides, stainless steels, carbides and silicon.
- Flexible application of force and even pressure distribution decreases cost of assembly.
- Vibrations that are in the machining center and machining tool are not transmitted onto the workpiece surface.
- Precision edge finishing up to radius 0.01 mm.
- Finishing the parts in which high surface and high accuracy is required like vacuum tubes, wave-guides and sanitary tubes used in medical instruments.
- Internal finishing of thin austenitic stainless steel tubes, which conveys liquid medicines in pharmaceutical factories. One of the research studies showed that surface roughness value of a tube could reduce from original $0.63\mu\text{m}$ to $0.061\mu\text{m}$ after finishing time of 10 min and by giving the vibrations of 50Hz to the electromagnet.
- Finishing of shapes with narrow throat e.g. internal finishing of the bottom of a clean gas bomb with a narrow opening which is hard to finish the conventional processes. As an experimental result, a fine finished surface, $0.2\mu\text{m}$ (R_{max}), was obtained from a rough surface, $7\mu\text{m}$ (R_{max}).
- Finishing of hard to machine materials like silicon nitride. It is possible to finish Si_3N_4 bar using diamond coated magnetic abrasives. It was able to improve surface roughness of $0.45\mu\text{m}$ before finishing to $0.04\mu\text{m}$.

4. Main Advantages

Magnetic Field Assisted Finishing Processes involve the use of very low cutting forces. Therefore, the process causes very less thermal and mechanical damage during machining. In MAAF Processes cutting force is controlled by the magnetic field. Finishing process is essentially

completed without the need for designing costlier, rigid and vibration free machine tools. During implementation of these processes, the required machining elements can be simply incorporated into the existing conventional machine tools, which help to reduce the cost of new equipment. A list of main advantages of MAAF over other finishing processes is given below:

- Material surface is free of burns and thermal defects.
- Energy consumption is low.
- Implementation is simple.
- Ecologically safe.
- Increase in production rate by a factor of 1.5 to 3.0
- Non-ferrous materials like aluminum and its alloys, brass and its alloys can also be finished with ease.
- From economical point of view, it is most efficient.

5. Limitations

- Could be difficult to scale up to mass production operation.
- Not can be applicable to some "ordinary" finishing tasks where conventional finishing techniques are used.

6. CONCLUSIONS

On the basis of theory provided above it could be suggested that chemical methods are effective as compared to other existing magnetic mixing techniques. To produce magnetic abrasives instead of other mixing techniques, chemical technique is cost effective also. From future point of view we can say that instead of using SiC , some other abrasive components can be tried for preparation of magnetic abrasives like Aluminium Oxide, Boron Nitride etc.

REFERENCES

- Anzai, M., Yoshida, T. and Nakagawa, T. (1996), "Solid state reaction Between SiC and Iron", Material Chemistry and Physics. Vol. 74, No. 3, pp 258-264
- Baron, Y.M., Chae, J.W. and Lim, S.K. (1997), "Experimental Verification of Deburring by Magnetic

Abrasive Finishing method”, St.-Petersburg State Polytechnical University.

- Dixit, P.M., Jain, V.K. and Jayswal, S.C. (2004), “Analysis of Magnetic Abrasive Finishing with Slotted Magnetic Pole”, International Conference on Numerical Methods in industrial Forming Processes. Vol. 712, pp 1435-1440.
- Jain, V.K., Raghuram, V. and Singh, D.K. (2004), “Parametric Study of Magnetic Abrasive Finishing Process”, Mechanical Engineering Department, IIT Kanpur.
- Jeong- Du Kim (2003), “Polishing of Ultra-clean Inner Surfaces Using Magnetic Force”, Deptt. Of Mechanical Engineering, Sejong University, Seoul, South Korea.
- Kurobe, T., Imanaka, O. and Tachibana, S. (1983), “Magnetic Field Assisted Fine Finishing”, Bulletin Japan Society for Precision Engineering, Vol. 17, No. 1, pp 49-53.
- Raghuram, V., Jain, V.K. and Singh, D.K. (2008), “Analysis of Performance of Pulsating Flexible Magnetic Abrasive Brush (P-FMAB)”, Machining Science and Technology. Vol. 12, No. 1, pp 53-76.

Cryogenics Treatment: A Review

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Abstract - In this study the new technique for the heat treatment of metal is investigated i.e. 'Cryogenic treatment' which is widely used for various metals to enhanced their mechanical and metallurgical properties like wear resistance, corrosion resistance, hardness, impact strength, microstructure etc. As we know, in the heat treatments of various metals all the austenite does not convert fully into martensite. Some austenitic contacts remain in the metal after heat treatment. But with this subzero treatment on various metals the retained austenite converts into martensite. And thus the mechanical properties of metal enhanced by this cryogenic treatment. Cryogenic treatment is mostly used in mining industry equipment's, agriculture related equipment's, crushers, turbine blades etc. or where wear resistance is the most effective factor. Because with this treatment wear resistance sharply enhanced.

Keywords - Heat treatment, Austenite, Martensite, wear resistance.

1. Introduction

As today's industry there are wide varieties of mechanical parts made of various metals used as components of machines. And after some mechanical working of machines these parts becomes less effective i.e. these components wear outs, less strengthen, corrosive and in some cases breaks down. Various conventional heat treatments are applied on these metal components. But due to some limitations the conventional heat treatments are no longer so much effective. Therefore new technique i.e. subzero treatment or also called 'Deep Cryogenic' treatment is applied on the various metals to enhance the mechanical properties. The word, "cryogenics" is taken from the two Greek words – "kryos" which means 'frost' or freezing and "genic" meaning to 'produce' or generated [1]. Its meaning is just the study of metals subjected to very low temperature. Also, this technique is stress relief technique as whenever any material under any manufacturing operation is subjected to stresses. Basically

the cryogenic treatment is classified into two types of techniques.

1. Shallow Cryogenic Treatment.
2. Deep Cryogenic Treatment.

The above classification depends upon the minimum temperature required for the processing. In shallow cryogenic treatment (SCT), specimens are cooled down to -80°C, while in deep cryogenic treatments (DCT) much lower temperature are reached by using liquid nitrogen(-196°C) or liquid helium (-269°C) as a cooling agents [2]. Both these techniques are used for different requirements of temperature for different metals.

1.1 Cryogenic Process:

In cryogenic treatment, there are various stages on which the process is to be carried out. Basically there are four stages i.e.

1. Austenitizing
2. Quenching
3. Cry processing
4. Tempering

1.1.1 Austenitizing:

Steel is heated at high temperature to change the crystal structure into face centered structure. Basically in this process, austenite is converted into martensite. And martensite temperature is to be achieved. This martensite temperature is different for different metals it also depends upon the carbon contents in the metals.

1.1.2 Quenching:

When the austenitizing temperature reached the metal is cooled in any quenching media. Quenching media may be water, oil or air. After cooling the austenite transforms

into martensite. And the structure changes from face centered structure to body centered structure (martensite). With this process the hardness, strength and wear resistance of the steel increases to some contents. But after this process, always some retained austenite in the steel which is up to 20-30% [1].

1.1.3 Cry processing:

Cryogenic treatment is the additional process after the conventional heat treatment to converts the retained austenite into martensite which is always present after conventional heat treatment. Cryogenic treatment is more ecofriendly, non-toxic and non-explosive [1].

1.2 Set up for cryogenic treatment:

In the setup of cryogenic treatment liquid nitrogen cylinder with complete valves is required for the storage of liquid nitrogen and from this cylinder the liquid nitrogen goes to cryogenic treatment chamber with the adjustment of required rate of liquid nitrogen. In the chamber proper space is provided for the placing of samples of metals on which the cryogenic treatment is to



be done.

Fig. 1 cryogenic treatment setup

One exhaust for the removal of cycled nitrogen is provided on the top of cryogenic treatment chamber. Another important part of this set up is control panel which is electronically attached with the cryogenic treatment chamber. From this control panel we can adjust the rate of cooling, rate of soaking and rate of heating. I.e. the cycle of cryogenic treatment can be controlled by control panel. The setting of above parameters is also visible on the small screen on the control panel.

1.3 Cycle for Cryogenic treatment:

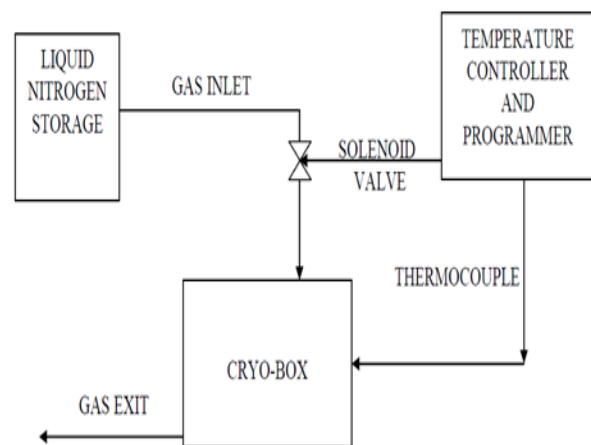


Fig. 2 Block diagram of cryogenic treatment setup

Generally, both shallow and deep cryogenic treatment procedures are operated in four stages, as shown in Fig. The following sequences are as follows:

- (a) Slow cooling to predetermined low temperature.
- (b) Soaking for predetermined amount of time.
- (c) Slow heating to room temperature.
- (d) Tempering.

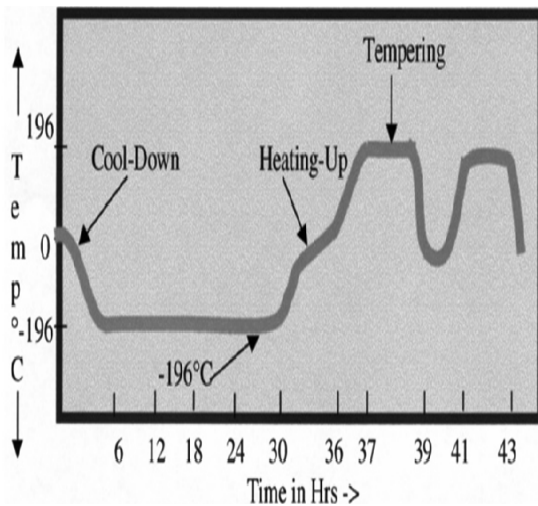


Fig 3 Different stages during a cryogenics process

1.4 Cryogenic treatment showing four stages:

1.4.1 Slow Cooling:

This is the first stage for the cryogenic treatment. In which the samples are slowly cooled to the cryogenic temperature (-196°C for DCT). The rate of cooling has negligible or very less effect on the mechanical and wear properties of metal [1].

1.4.2 Soaking Time:

This is the time for which the samples are paced in the cryogenic treatment chamber at the cryogenic temperature. It may vary from 8 to 40 hours [3]. The long “soaking period” is needed to allow transformation of retained austenite to martensite and to precipitate the fine carbides and the crystal lattice to achieve the lowest energy state possible throughout the material, whereas evidence have also shown that this change begins within the first 8 hour. Soaking period does not affect the hardness too much, but the wear resistance increases effectively by increasing the soaking period [4].

1.4.3 Heating Rate:

After soaking period is over, typical heating segment starts that brings the temperature back up to the room temperature. This cycle is reverse of the cooling cycle, which can take greater than or equal to cooling cycle. This cycle is very important cycle, as warming up too fast can generate crack in the work material.

1.4.4 Tempering:

Tempering is done after the cryogenic treatment. It is the process of reheating the steel at temperature, which is lower than the transformational temperature to improve the mechanical properties in steel (such as impact resistance, ductility and toughness etc.).

2 Advantages of Cryogenic treatment:

There are many advantages of the process. Following are the main advantages of cryogenic treatment process:

1. Reduces friction and wear properties as well as surface roughness.
2. Alters and refines the molecular grain structure.
3. Allows the machining of parts to tighter tolerances.
4. Increases dimensional stability on critical components.
5. Relieves stress fracturing
6. Provides for easy machining and redressing.
7. Increases component durability and life span.
8. Lowers replacement cost and downtime due to increases wear and use.

3 Disadvantages of Cryogenic Treatment:

1. High cost of operation (When employed for one piece).
2. Processing difficulties (Temperature difficult to maintain).
3. Difficulties to manufacture the equipments used for the treatment.
3. D. Das, A. K. Dutta, K. K. Ray, "Optimization of the duration of cryogenic processing to maximize wear resistance of AISI D2 steel" cryogenics, 2009,176-184.
4. K. Amini, . Akhbarizadeh, S. Javadpour, "Investigating the effect of holding duration on the microstructure of 1.2080 tool steel during the deep cryogenic treatment" vacuum, 2012, 1534-1540.

4 Conclusion:

Cryogenic treatment or subzero treatment is more effective treatment than the conventional heat treatment. Some of the inferences concerned with above study are as follows

1. With the use of this technique, the retained austenite present in the metal after conventional heat treatment gets converted into martensite.
2. Various properties like wear resistance, strength, corrosion resistance, hardness etc. enhanced by cryogenic treatment.
3. Cryogenic treatment is applicable for various industries like mining industry, agriculture related equipment's, dies and tools, turbine blades etc.

Referances:

1. P.I. Patil, R.G. Tated "Comparison of Effects of Cryogenic Treatment on different types of steels" international journal of computer application, 2012, 10-29.
2. G. Prieto, J. E. Perez Ipina, W. R. Tuckart "Cryogenic treatments on AISI 420 stainless steel Microstructure and mechanical properties" Material Science & Engineering, 2014, 236-243.