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Energy conservation techniques for optimum utilization

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Abstract- *Energy plays a key factor in the economic growth and development of a country. With the urbanization and industrialization energy consumption has increased by leaps and bounds. This in turn has forced for the more energy generation. Energy generation by traditional or conventional method requires a large amount of fossil fuels which are depleting, as the natural earth reserves are being extinct. Hence generation by renewable energy sources may be a solution to fill the demand supply gap. But for generation from renewables technology breakthrough or new developments is essential. Energy conservation may be one of the viable solutions to bridge the demand supply gap.In this paper various energy conservation techniques are suggested.*

Keywords: *Urbanization, depleting fossil fuels, demand supply gap, Energy conservation.*

I INTRODUCTION

The ever increasing energy consumption due to the increasing population has led to widening the supply and demand gap. As the natural reserves are diminishing and depleting other alternate solutions are to be thought of. Different energy efficiency methods and conservation opportunities are to be adopted for sustainable development. Study of energy conservation techniques and energy efficiency is done in this paper for reducing energy consumption by various conservation techniques. Environmental issues such as carbon emission due to fossil fuels etc. can be taken care of if the energy consumption is reduced as a whole.

Energy conservation:
According to law of conservation of energy, energy can neither be created nor be created nor destroyed.Less use of energy may be termed as energy conservation. It is a result of behavioral change..
Example: Turn off light when not required, make use of daylight in the morning hours,use of public transportation etc.

Energy efficiency:
Effective use of energy is called energy efficiency. It is a technological change.
Example:Replacing incandescent lamp with CFL is an example of energy conservation. By using CFL consumption is less but same amount of light is given which does not cause discomfort to the consumer.

Combination of energy conservation and energy efficiency is considered to be an ideal solution.

II AREAS FOR ENERGY CONSERVATION

There are three areas of the electrical system : Generation, Transmission, distribution and Consumers. Consumers may be domestic, commercial and industrial.

2.1 Conservation techniques in Generating station

To generate 1MW power, generation cost is Rs 4.5 to 5.25 cores and T& D cost is Rs.2 cores but cost of saved power is Rs.1Crores/MW. Time period to set a power plant is 5 years; to set up transmission line 1 year, and to plan energy conservation is only 1 month. We have less opportunity for EC in generating area but we can improve the performance efficiency of generators by optimization of load, optimal distribution of load among different units, periodical maintenance and also increasing the capacity by adopting advanced technology using renewable energy sources.

2.1.1Use of combined cycle power plan

This is one of the energy conservation option in generating stations.By using combined power plants such as combined MHD, gas turbine-steam turbine power plant the efficiency can be improved at a low investment cost with simplicity and flexibility in operation and having less environmental impact.

2.1.2 Co- Generation

Co-generation can be defined as the simultaneous generation of steam and electricity by an industry – with or without involvement of a utility or by a utility itself. By using the reject heat, cogeneration plants can achieve a thermalefficiency as high as 80%. Co-generation makes use of this waste heat in two basic thermal cycles – toppingcycles andbottoming cycles. In a bottoming cycle, burned fuel produces process is thenconvertedtoelectricalor mechanical power. In topping cycle, fuel is burned to produce electrical orMechanical power; the waste heat from the power – production system then serves as process heat.

2.1.3 Generation by using renewable

A.Small Hydro

Small hydro offers a promising source of energy with a small gestation period.
Water is available as a natural resource and renewed year after year without polluting environment and known as a zero cost input. It can be operated independent of grid to feed local loads.

B . Solar power plants

Solar energy is found in abundance and free of cost which can be exploited easily for power generation. Unlike fossil fuels generation by solar does not pollute the environment.

C. Wind power plants

In coastal and hilly areas where wind is blowing at speed of 25 to 30 km /hr., wind turbines can be installed for generation of electricity. Power can be generated without much pollution.

2.2 Conservation techniques in Transmission and distribution

T& D losses in India are of the order of 26%.T & D losses are due to poor quality of line insulation, low P.F, bad operating conditions, random extension of distribution network, low quality of construction and inadequate maintenance.
These losses can be reduced by implementation of HVAC transmission, improving power factor, HVDC transmission, and better line insulation.

2.2.1Conservation opportunities in transmission line

A. HVAC transmission: As transmission voltage increases cost of conductor, insulation, transformer, switchgear etc.increases .By using optimum transmission voltage better economy is achieved.

B .Power factor improvement: Power factor is important in energy conservation. Low power factor leads to more current which causes the oversizing of the conductor, heating of cables and hence more cost. By improving Power factor improvement enhances the efficiency of electric equipment. Considerable incentives in tariff are offered.

2.2.2 Conservation opportunities in distribution line

A.. Optimal use of distribution transformer: To improve voltage HT/LT line length ratio should be optimized by using an economical combination of (HT) and (LT) distribution transformer.

B.. Use of power factor controller: Low power factor will lead to increased current which increases losses and will affect the supply voltage. We can use Power Factor Controller or Automatic Power.

C. Installation of separate transformer for lighting: In most industries, lighting load contributes 2 to 10%. Switching operation and load variation causes voltage fluctuations if both lighting loadandpower load is fed by same transformer The performance of neighboring power load apparatus is affected . Hence, the lighting equipment has to be isolated from the power feeders. Thevoltage system which in turn increases its efficiency.

D. Improving power supply quality: Maintaining the voltage level within the BIS standards i.e. with tolerance of +/-6%and frequency with tolerance of +/-3% motor performance improves and also life.

E. Optimum loading: Proper selection of the rating of the motor will reduce the power consumption. If the motor is operating at less than 50% of loading (η<50%) significant power saving can be obtained by replacing with properly sized high efficiency motors. If the motor is operating at loads below 40% of it‟s capacity, an inexpensive and effective measure might be to operate in star mode.

2.3 Conservation opportunities in consumer

2.3.1 Energy conservation in lighting system
The quality of work, reduction in accidents and protection to workers can be had from a good lighting system. It also improves or enhances production in industries.

2.3.2 Optimal use of natural light
Maximum use of sunlight is the best option for conservation.Transparent roof and north light roof can permit the maxim use of natural light.

2.3.3 Use of energy efficient CFL
Incandescent lamps can be replaced by CFL which ensures great power saving .

2.3.4 Energy Conservation in Motors
In industries70% of total electrical energy is consumed by only electric motors driven equipment's. losses. Stopping idle or redundant running of motors or lights will save 100% power. Hence if conservation can be done here it would save a considerable amount of energy

2.3.5 Improving transmission efficiency
Proper selection of power transmission means (belts, gears) will reduces transmission

2.3.6 By use of Soft Starter
Soft starters are essentially stator voltage controllers; helps to overcome above problem. It helps to restrict starting current and also provide smooth start and stop operation.

2.3.7 By improving power factor
For improving p.f.connect the capacitor bank, which will improve the p.f. of the system from installation to generating station. Maximum improvement in overall system efficiency is achieved, which also reduces Max. Demand of the system and that will reflect in energy bill.

2.3.8 Use of high efficiency or Energy efficient motors
The energy efficient motors have reduced losses through improved design, better materials and improved manufacturing techniques. Generally motor life doubles for each 10 0C reduction in operating temperature. While selecting EEM, select with 1.15service factor, design for operation at 85% of rated load.

III CONCLUSION

By implementing the above mentioned techniques in various sectors like generation ,transmission , distribution and consumer end we can conserve energy to a large extent which can bridge the gap between generation and demand of supply and save the environment as well.

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