

Energy Conservation

some cost reduction measures

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The author highlights five cost reduction measures for energy conservation : identify inefficient energy use, upgrade machinery & process in the context of energy efficiency, improve maintenance practice, promote employee awareness and conservation in domestic consumption.

Energy Sources are the prime movers of all forms of economic activity. One of the basic requirements for the progress of economy and the welfare of the society are energy. We have never been in a position where we can claim that our energy requirements have been fully taken care of. Energy has become too precious to be used in an ignorant and reckless manner. It is now well understood that global energy resources are numbered and thus needs to be used with care. Energy historically especially electrical energy has always been considered a cheap ingredient for our modern society. But with the continuous and insatiable demand for energy and gradual decline in deplorable inputs for the production of energy, the cost of energy has now assumed significant proportions. Now realisation has gradually dawned upon mankind that nothing can be more costly than the

absence of energy. In the pre-liberalisation era Indian companies only had to domestically compete with each other but after liberalisation the entire economic scenario has changed. The new mantra for survival is global competitiveness. No longer can Indian companies enjoy the luxury of operating in a protective environment and be under the impression that the market will absorb whatever it can produce and at whatever price it can produce. Globalisation has changed the equation for Indian manufacturers. Today the need of the hour is to be economically competitive i.e. the goods produced should meet the quality of the 'best' in the world. However there is a paradigm of contradiction, which a company has to face. It has to produce best quality at optimum cost.

Cost cutting measures has always been a sensitive issue with due regards to a compromise between quality, safety and efficiency. One of the favorite avenues for cost cutting has been rationalisation of down sizing

the work force which has always been, a controversial issue. But to be economically and globally competitive, a very important and largely unexplored avenue is energy conservation. Energy conservation beyond doubt has considerable potentials for cost savings. Research has shown that there is a huge amount of power being wasted in every sector everyday resulting in enormous losses. Even if a small percentage of this wastage is harnessed it will lead to saving that would run in millions. The potentials for cost saving by proper and conservative use of energy has caught the attention of many companies and energy conservation is fast becoming the cornerstone of new development even in advanced countries. In India, although several companies have made an effort towards higher profits by reducing energy consumption, especially electrical energy consumption, however the general appreciation regarding the benefits is still at an inceptive level.

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Thus energy conservation envisages threefold benefits.

- 1 The users would save in energy bills,

- 1 The country will save scarce resources in installation of additional capacity in generation and transmission of energy and on all inputs used for production of

- 1 The manufactured products will be inline with global trends satisfying local needs and also making them internationally marketable.

Energy preparedness is the foundation supporting the economic health of our country. Failure to meet the demands of energy seriously hampers economic growth. Energy conservation should not be misunderstood to suppression of the demand of energy needed for the economy. It is the suppression of the wastage in the use of energy so that more productive activity can be undertaken with the energy conserved. Actually energy conservation can be taken as a new source of energy and also the cheapest as the energy saved is readily available without much investment and time gap. In India there is a lot of gap between the energy requirement and the energy produced. A very easy and fast way of bridging the gap is focus due attention on energy conservation.

Thus it is imperative to detect energy wastage on all levels and to implement conservation measures and save cost which in turn will result in additional profits and that can make a difference between survival and doom. The following are some of the ways can make a big difference in the energy conservation process:

- 1 Identify inefficient use of energy in the plant, shop floor and utility items like pumps, fans, compressors and production processes,

- 1 Upgrade machines equipment and production processes by adopting energy efficient technology,

- 1 Improve maintenance practices,

- 1 Promote employee awareness about efficient utilisation of energy,

- 1 Conservation in domestic consumption.

Identify inefficient use of energy in the plant, shop floor and utility items like pumps, fans, compressors and production processes

: Industry uses about fifty percentage of our total consumption of electrical energy. In industry there are about eight to ten energy intensive industries like steel, aluminum, fertiliser, refineries, chemicals, and petrochemicals, cement, textile, paper, etc., which consumes more than sixty percentage of the energy used by the industrial sector. In-depth energy audit can reveal the possibilities of introducing known methods of waste heat recovery, improved combustion, retrofitting or equipment for better operation and efficiency, changing layout, etc. It is estimated that about 25% improvement in the energy efficiency of the industrial sector is possible by improving the efficiency of pumpsets substantially, by modifying in foot valves, piping pumps, motors and switchgears. Thus energy consumption efficiency can be improved by improving on the specification, selecting latest designs and by proper maintenance of the production facilities. Proper loading of transformers for more than 85% can reduce the number of transformers which in turn reduces power loss in transformers. Installation of transformers near load centers will save power by eliminating transmission power loss. A good power factor is essential for efficient working of any electrical utility. A good power fac-

tor can be achieved by installation of suitable capacitors. Various utilities like pump compressors, humidification plant, de-humidification plant, etc., can constitute a large percentage of the power requirement of an industry. A proper design of utility systems can save considerable power. Proper control of feed water and proper quality of treated water helps in reducing scale-formation on the boiler tubes and also lowers the blow downs and the boiler operates at peak efficiency and in turn saves fuel. The frequency of blow down of boiler must be decided after correctly analysing the feed water for the total dissolved solids, which will reduce the loss of head steam. Main steam lines should be properly lagged to prevent heat losses due to radiation. Insulation of flange valves can be carried out to economise steam. The existing systems should be studied to know the energy consumption status. Improved systems can be worked out by modifying or by replacing sub-assemblies to achieve further energy savings. Professional consultants and various manufacturers can be consulted to draw ways to optimise consumption of power. These steps can be undertaken as a short-term action for saving energy consumption.

Upgrade machines equipment and production processes by adopting energy efficient technology : The upgradation of energy efficient equipment and processes and adoption of energy efficient technologies are a gradual and long-term process and involves high initial capital outlay. At the design stage itself the company should strive for equipment and technologies which are energy efficient. Energy efficient equipment and technologies may initially cost more but the low running cost will plough back the high cost

of acquisition. Normally ten years is considered to be an average operational life off a motor. For those applications using continues operations in the industry such as blower, pumps, conveyers, etc., the operating cost is very high and the initial purchase cost in comparison with the running cost over the life of the utility is insignificant. This clearly dictates that due consideration should be given to the operating cost before arriving at any purchase cost. However, the majority of purchase decisions are still made on the basis of the initial purchase cost ignoring the operating costs. The industry should always incline for energy efficient motors, which are initially costly but their operating cost are on the lower side as compared to standard motors. Energy efficient motors have the following advantages over standard motors:

EE motors can withstand wider voltage and frequent fluctuation and higher ambient temperature without breakdown.

These motors can take: occasional as well continues overloads without damaging winding.

The life of insulation of EE motors is considerably higher than standard motors

When motor run on partial loads, the savings of EE motors are even more pronounced as compared to standard motors.

Similarly switchgear with low power consumption e.g HRC fuses with no joints and hence lesser power loss has been developed. Also soft starters along with other intelligent devices are also amongst those, which help keeping the power bills in control. In addition to above, EE design like better and high quality insulation of furnace and high efficiency compressors will save a lot of

power. In the industrial sector 80% of the load is from motor and pump sets. Many of these often run idle or under partial load. Load sensing motor controller can reduce working hours of these motors and pump sets resulting in considerable energy saving. Use of energy efficient lighting in the factories (e.g pressurised sodium vapour lights) can save a lot of energy as compared to conventional bulbs. Lights, Fans, air-conditioners, coolers, etc., remain working even they are no longer required. These must be consciously switched off. A light sensitive switching on/off device can be installed. Some of the basic points to be kept in mind while designing the layout are:

- 1) Make maximum use of sunlight.
- 2) Use adequate size of wires and standard quality switches and other electrical fittings.
- 3) A void use of oversized motors.
- 4) Improve Power Factor.
- 5) Equalise load on transformers and feeders.
- 6) Ensure optimum load on all machines and disconnect idle drive when not in production.
- 7) Use gas in place of electricity for cooking and heating.
- 8) Use bio-gas in place of electricity in rural areas.
- 9) All idle machines, unwanted lights and fans should be switched off.
- 10) Use of solar energy as and where possible.
- 11) Use of waste heat generated in the exhaust of diesel generators to heat water for use in boilers.
- 12) Shutting off compressors one by one during lunch, dinner breaks and during change of shifts i.e. during low end period can lead to considerable savings.

- 13) Installing thermostat in the circuit of air-conditioners which shut off the plant when the temperature reaches the required temperature.
- 14) Use of Sodium Vapour Lamp for providing adequate lighting while going easy on power.
- 15) The walls should be painted with light colours so that illumination is better.

Improve maintenance practices:

Maintenance can be defined as keeping constant the existence of any state, to preserve from capture, loss or deterioration of a system. Various cautions are required for the proper upkeep of a system in the past, it was assumed that maintenance cost must necessarily be high in order to achieve high equipment availability. However industry experience has showed otherwise The two results are not mutually exclusive. Two important factors, which cause low availability and high power consumption, are frequent equipment failure and breakdowns. Both are expensive to correct in terms of labour and material costs. It is a proven fact that an inefficiently maintained and run plant consumes more power as compared to a well maintained plant. The achievement of good maintenance results depends on certain basic concepts that have been tested and proven in the manufacturing/processing industry which include:

- 1) Selection of the correct equipment for the job.
- 2) Trained and qualified workforce.
- 3) Good operating practices.
- 4) Adequate spare parts supply.

5) Well planned preventive maintenance.

Even small preventive maintenance measures like proper and timely lubrication and inspection can achieve a lot in the efficient operation of the plant and efficient consumption of power. Preventive maintenance is intimately related to bad operation of equipment. The industry has now started realising the importance to efficiently maintenance practices, which has lead to the development of solutions like Enterprise Resource Planning (ERP), Electronic Document Management Systems, Computerised Maintenance Management Systems (CMMS), Project Scheduler, Plant Information Systems etc. which led to improved productivity, efficiently, cost control and optimum utilisation of energy resources.

Promote employee awareness about efficient utilisation of energy: everyone who uses can save energy. This subject has been discussed in various forums, seminars, workshops, time and again. But much greater efforts on a national scale is required in a planned and sustained manner to make an impact on the overall energy situation in the country. We have to understand that energy conservation is an imperative necessity in the given situation. These efforts should be supplemented and supported by the government the public sector, the private sector and energy users. The top management should fully involve itself in all these efforts and if possible appoint an energy manager or a committee to focus attention on energy conservation. They should involve all departments and employees and educate them and carry out awareness campaign. The top management should motivate and encourage the employees of all sections to give use-

ful suggestions. With regular reviews and, exchange of ideas and information the results will be surprising. This phase is necessary in every conservation plan so that the right culture of energy is built up. One of the most effective ways to curtail your energy conservation is to train and inspire the workforce to conserve energy and avoid wasteful consumption. Conservation programs that are implemented in an effective and informative manner can ensure maximum memorability for 911 recipients. One very effective way of generating energy conservation culture is by bring out attractive incentive on the cost saving resulting from energy conservation. The above approach is very effective and can bring good results as the employees are fully motivated and can bring an everlasting attitudinal change to become energy conservation conscious. The government should also encourage the above measures by putting-up demonstration projects for known technologies, provide financial and other incentive for investments, revise the energy tariffs to make energy conservation attractive and formulate concrete programs for energy conservation with large participation and monitor these programs closely

Conservation in domestic consumption: even though domestic consumption as compared to industry consumption is quite low. But still we can reduce power consumption by implementing simple conservation measures and educating the employees about the need and effects of energy conservation. Simple points like switching off all unwanted heating and lighting in unoccupied rooms can help in conservation of power. Some points of saving energy in domestic uses are:

Change over of bulbs to florescent tube, not only gives better illu-

mination but also cuts down on power bills.

Use of fans as and when required only with periodical servicing would reduce energy consumption and losses due to friction.

Refrigeration, air-conditioners and coolers consume a lot of energy. Often thermostat controls are kept at maximum expecting better cooling. This results in the compressors running for longer periods adding to the power consumption. The thermostat setting should be kept on the optimum position for optimum cooling and low power bills. Also proper maintenance of refrigerator, in particular the airtight gaskets on the door, proper operation of the thermostat cutout will reduce power bills. Also for efficient use of refrigerator, frequent opening of the door should be avoided. Use of power saving high efficiency compressors in refrigerators, air-conditioners and coolers can help in low power consumption.

Toaster, electric irons, water heater etc. also consumes a lot of power Provision of thermostat cut-out helps to consume lesser energy also the habit of switching off when not required saves a lot of energy.

Strict monitoring and control can prevent streetlight burning even during daytime and save a lot of power. Light sensitive switching off/on devices should be installed

Inference

Considering the fact that the cost of energy is skyrocketing with every passing day It is economically viable as well as advantageous to conserve energy in every possible manner. Such conservation programmes can not only give an organisation a leading edge over its competition but also conserves energy which is a national and scarce resources.