Application of Energy Audit for Analysis Of power Consumption in Cable Manufacturing Industry_ Case Stud

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ABSTRACT

An energy audit is an inspection, survey and analysis of energy flows in building, processor system with the objective of understanding the energy dynamics of the system under study. Typically an energy audit is conducted to seek opportunities to reduce the amount of energy input into the system without negatively affecting the outputs when the object of study is an occupied building then reducing energy consumption while maintaining or improving human comfort, health and safety are of primary concern. This paper presents a physically based model and formulation for industrial load management. Lighting is an essential service in all the industries. The power consumption by the industrial lighting varies between 2 to 10% of the total power depending on the type of industry. Energy conservation and exploration of new energy avenues are the well accepted solution to fulfil the growing industrial demand in future. Implementation of energy audit can improve the plant efficiency and thereby reducing the energy wastages.

Keyword : - *Power between halogen lamps and metal halide lamp. Power between Conventional indicating lamps and Light emitting diodes. Saving in Cooling Tower.*

1 Introduction

Energy audits assist industrial companies or facilities in understanding how they use energy and help to identify the areas where waste occurs and where opportunities for improvement exist. However, an energy audit is usually conducted to understand how energy is used within the plant and to find opportunities for improvement and energy saving. Sometimes, energy audits are conducted to evaluate the effectiveness of an energy efficiency project or program.

All India installed capacity of electric power generating stations under various electrical utilities was 185.5 GW as on November 2011. The detail break up share of different type of generating stations is follow:

- Hydro power plants - 37367.4 GW
- Thermal power plants - 115649.48 GW
- Nuclear power plants - 4.8 GW
- Renewable Energy Source - 22.4 GW

Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipments, using high efficiency equipment and change of habits which causes enormous wastages of energy

2. Energy Audit Stages

The type of industrial energy audit conducted depends on the function, size, and type of the industry, the depth to which the audit is needed, and the potential and magnitude of energy savings and cost reduction desired. Based on these criteria, an industrial energy audit can be classified into two types: a preliminary audit (walk-through audit) and a detailed audit(diagnostic audit).

2.1 Preliminary audit (Walk-through audit)

In a preliminary energy audit, readily-available data are mostly used for a simple analysis of energy use and performance of the plant. This type of audit does not require a lot of measurement and data collection. These audits take a relatively short time and the results are more general, providing common opportunities for energy efficiency. The economic analysis is typically limited to calculation of the simple payback period, or the time required paying back the initial capital investment through realized energy savings.

2.2 Detailed audit (Diagnostic audit)

For detailed (or diagnostic) energy audits, more detailed data and information are required. Measurements and a data inventory are usually conducted and different energy systems (pump, fan, compressed air, steam, process heating, etc.) are assessed in detail. Hence, the time required for this type of audit is longer than that of preliminary audits. The results of these audits are more comprehensive and useful since they give a more accurate picture of the energy performance of the plant and more specific recommendation for improvements. The economic analysis conducted for the efficiency measures recommended typically go beyondthe simple payback period and usually include the calculation of an internal rate of return (IRR), net present value (NPV), and often also life cycle cost (LCC).

3. BASIC COMPONENTS OF AUDITING

To evaluate the performance of utilities various instruments have been used for analyzing the operating pattern.

- **Power Analyzer**

This instrument is used for measuring electrical parameters like kWh, kVA, power factor, frequency, harmonics. This instrument is used on line and can be able to record the real online data.

Fig -1: Power Analyzer

- **Manometer with pitot tube**
  This instrument is used for measuring pressure in air ducts carrying exhaust gases or air from fans or blowers.

Fig -2: Manometer with pitot tube

- **IR Thermometer**

This instrument is used to measure the temperature, It consists a lens to focus on the detector which converts the energy to an electrical signal that can be shown in units of temperature.

Fig -3: IR Thermometer

- **Ultrasonic flow meter**

This is a non contact flow measurement instrument. The ultrasonic signal travelling with the flow travels faster than a signal travelling against the flow. Ultrasonic flow meter measures the transmit time of both signals.

Fig -4: Ultrasonic flow meter

- **Lux Meters**

A light sensitive cell measures the incident light and evaluates that against the human daylight sensitivity curve.

Fig -5: Lux Meters

- **Thermograph**

Infra-red thermal monitoring and imaging measures the thermal energy radiation from hot and cold surfaces of an object.

Fig -6: Thermograph

4. ANALYSIS

Energy Audit of a cable industry has been conducted which is located in Savli district .This unit is also named Diamond power infrastructure ltd. case study conducted at plant name MVC plant.

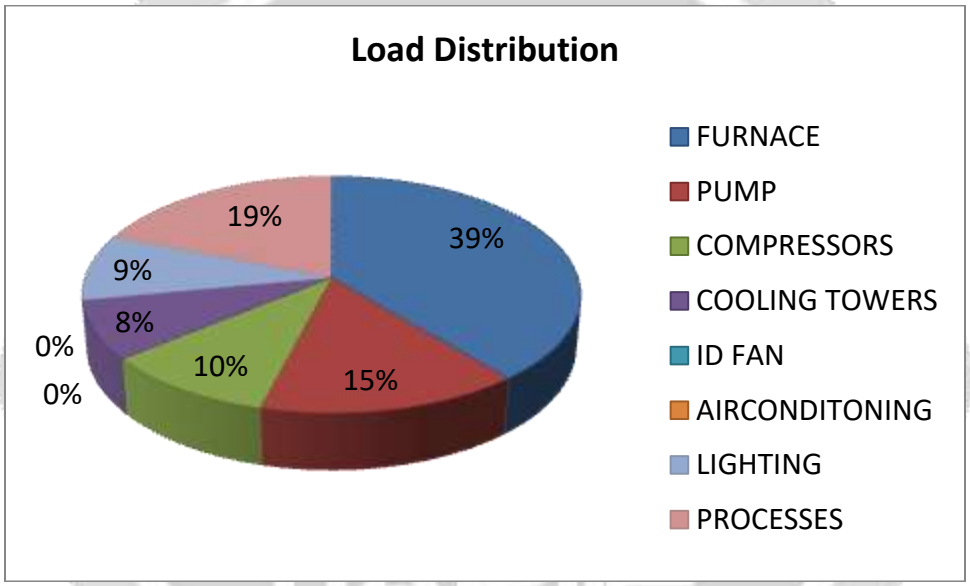

Fig -7: Load Distribution

5. Case study:

5.1 ENERGY SAVING ON LIGHTING SYSTEMS

A count on lighting is needed to be done, after identifying the proper locations. As a rule of thumb, the followings are the common methods of energy saving on the lighting system.

- **Halogen Lamps**
  There are total 90 halogen lamps in the Mvc Plant. Each is of 1000 watt rating. Halogen lamps are inefficient as compared to discharge lamps like metal halide lamps.
  Saving on this account will be:
  Total no. of halogen lamps of 1000 W = 90
  Total power consumption = 90x1000
  = 90000 W
  = 90 KW
  Power consumption by metal halide lamps = 90x400
  = 36 KW

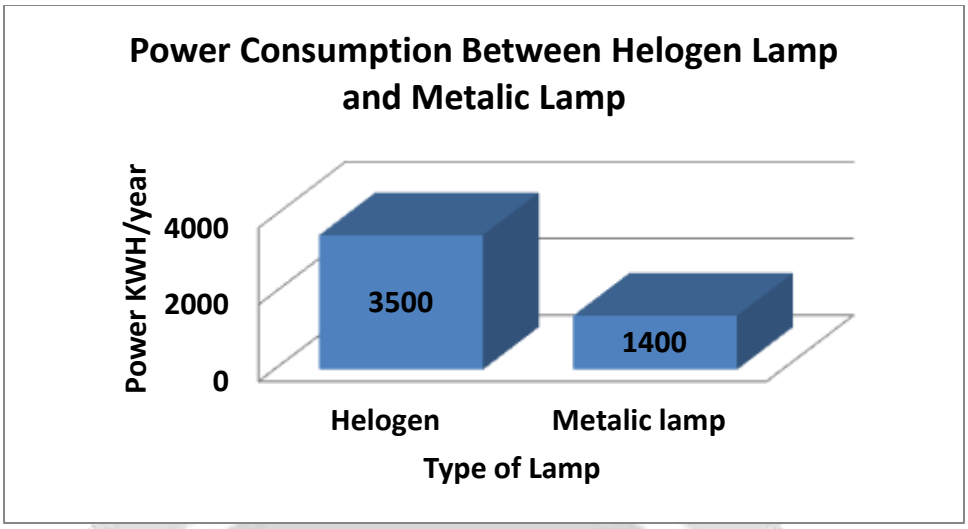

Fig -7: Comparison of Consumption of Power between halogen lamps and metal halide lamp.

Saving = 54KW

Saving in units if working hrs and Days are assumed to be 10 and 350 resp. = 54x10x350

= 189000 KWH

Saving in Rupees @ Rs. 5.56/unit = Rs. 5.56x189000

= Rs. 1050840

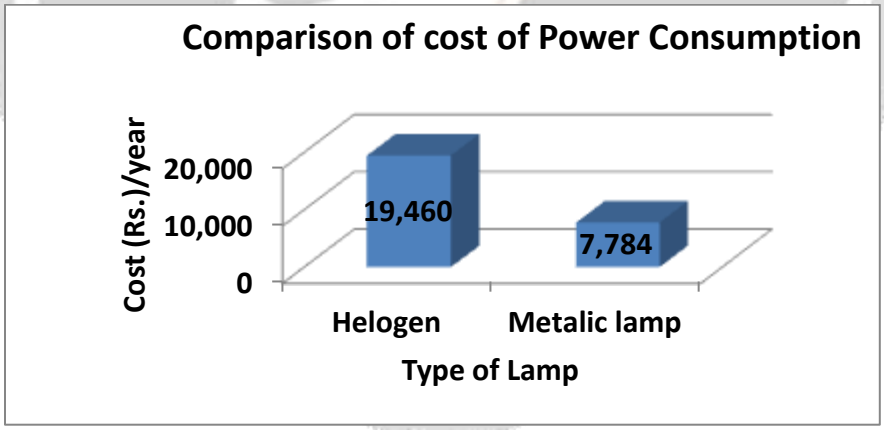

Fig -8: Comparison of cost of Power Consumption between halogen lamps and metal halide lamp

Price difference between two types = Rs. 9000

Cost involved in replacement = Rs. 9000x90

= Rs. 810000/-

Payback period = 810000x12/ 1050840

= 9 months

- **Indicating Lamps**

Conventional indicating lamps consume about 5-10 watts and their life is about one year. Light emitting diodes (LED) consume 1.5 watts only and have a life of 5-6 years. There are around 40 conventional indicating lamps. Indicating lamps installed in Mvc Plant are also replaced by LED's it will result in energy conservation. Saving per year will be as follow:

Power consumed by conventional lamps = 7 watt

Power consumed by LED = 1.5 watt

Difference in power consumption = 5.5 watt

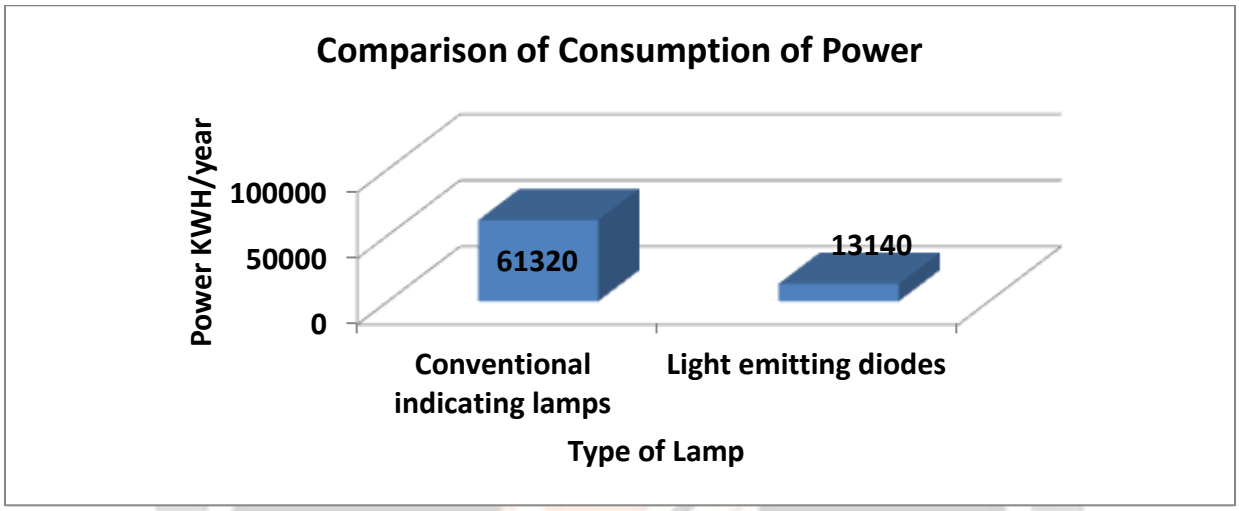

Fig -9: Comparison of Consumption of Power between Conventional indicating lamps and Light emitting diodes.

Saving in power per year by assuming the indicating lamps remain on for all 24 hrs and days

= 24x365x40x5.5 /1000

= 1927 KWH

Amount saveable @ 5.56per unit = 5.56x1927=Rs. 10714/-

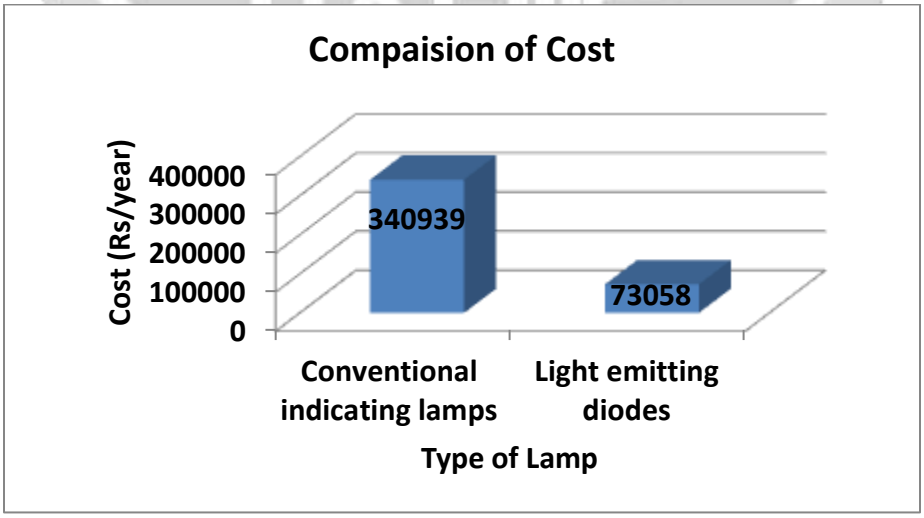

Fig -10 Comparison of cost of Power Consumption between Conventional indicating lamps and Light emitting diodes

- **COOLING TOWERS**
  Cooling tower performance is evaluated and on the basis of that Range and Approach of the cooling tower has been calculated.
  Proposal-: Proposal 1 is to replace the aluminium blades with light weight FRP blades which give approx saving of 4 lakh.

Table -1: COOLING TOWERS

Description	Exiting load	Proposal1	Proposal 2
Recommendation	Blades arrangement		Control system
Material of blades	aluminium	FRP	
Connected load(kw)	59.5	59.9	59.9
Operating load	47.6	39.03	45.22
Average working hours(hrs)	7000	7000	7000
Total annual consumption (kwh/yr)	333200	273224	316540
Energy efficient (saving)%		20	5
After proposal savings(kwh/yr)		59976	16660
Cost saving			
Average unit rate		7	7
Annual cost savings (rs/yr)		419832	116660
Annual cost savings Rs in lakh		4	1
Total investment of blades Rs lakh		3	1
Payback period (month)		9	6

6. CONCLUSION

Energy audits in itself will not lead to energy savings. They need to be followed by actions. Mandatory energy audits make it right from the beginning that a possible reduction in energy consumption can be achieved in a relatively short period of time.
With this aim the authors have undertaken a case study of an industrial unit because industries are the major power consumers. The data provided in this paper shows that how we can save electric energy by incorporating some changes in the installation and making it energy efficient. The government should make it mandatory for every industrial house in the country for energy audit.

7. REFERENCES

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