Energy Audit of Lighting System

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Abstract: Depending on type of industry lighting systems power consumption varies between 2 to 10% of the total power consumption. Energy saving in lighting system adds contribution to energy conservation of an industry. The present paper describe about an improvement of energy efficiency of the interior lighting at Yuti Textile Processors Private Limited, Dyane shiwar Kusumba road, Malegaon, Nashik. The energy savings through lighting systems were evaluated to be 107.49 Kwh/day. Analysis shows that industry can save about Rs. 235523.73 annually and payback period of less than 0.5 years.

Keywords **- - Energy Audit, power Consumption, Payback Period.**

I. INTRODUCTION

An energy audit is inspection to determine how and where energy is used and to identify opportunities for energy savings. There is now a universal recognition of the fact that new technologies provide the most hopeful prospects for the future. The opportunities lie in the use of existing renewable energy technologies, greater efforts at energy efficiency and the dissemination of these technologies and options. This energy audit of the industrial area has been carried out and reported in this paper.

II. ENERGY AUDIT AND ENERGY MANAGEMENT

2.1 Energy Audit Objectives

As per the Energy Conservation Act, 2001, passed by the government of India, energy audit is defined as "The verification, monitoring and analysis of use of energy including submission of technical reports containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption."[1]

The objective of Energy Management is to Achieve and maintain optimum energy procurement and utilization, throughout the organization and to minimize energy costs / waste without affecting production & quality to minimize environmental effects. [2]

2.2 Energy Management

Energy management is define as *"The judicious and effective use of energy to maximize profits (minimize costs) and enhance competitive positions"* [2]. The main objective of energy management is to achieve and maintain the load requirement, to minimize the cost of energy and to minimize environmental effects.

2.3 Energy Audit Methodology

The methodology adopted for this audit was as follows:

- Data Collection: - In preliminary data collection phase, type of lights, quantity, ratings and location was collected. This data collection was performed by using different tools such as observation, interviewing key persons and measurements.
- Data Analysis –Saving in electrical energy for various sections was calculated.
- Recommendation – On the basis of results of data analysis and observations, some steps for reducing power consumption without affecting the comfort and satisfaction were recommended along with their cost analysis.

III. SURVEYING THE INDUSTRIAL AREA

Preliminary Audit: -

Preliminary energy audit is a relatively quick exercise to:

1) Establish energy consumption in the organization.
2) Estimate the scope for saving.
3) Identify the most likely (and the easiest areas for attention.
4) Identify immediate (especially no-/low-cost) improvements/ savings.
5) Set a 'reference point'.
6) Identify areas for more detailed study/measurement.
7) Preliminary energy audit uses existing, or easily obtained data.

IV. ENERGY CONSUMPTION

No	Section	Working Hours		Current Kwh /Day	Lumens	Required Watts	Proposed Watt Kwh /Day	Saving In Watts	Saving Per Year (Rs)
		12 Hrs	24Hrs						
1	Mercerise	0	57	71.136	2080	20.8	30.096	41.04	89918.64
2	Bleaching	0	15	18.72	2080	20.8	7.92	10.8	23662.8
3	Bleaching	20	0	12.48	2080	20.8	5.28	7.2	15775.2
4	Bleaching	7	0	4.368	2080	20.8	1.848	2.52	5521.32
5	Stenter	4	0	2.496	2080	20.8	1.056	1.44	3155.04
6	Belpress	0	21	26.208	2080	20.8	11.088	15.12	33127.92
7	Coustic Recovery Plant	5	0	3.12	2080	20.8	1.32	1.8	3943.8
8	Lathe Section	0	5	6.24	2080	20.8	2.64	3.6	7887.6
9	Near Steam Boiler	0	2	2.496	2080	20.8	1.056	1.44	3155.04
10	Entery side	7	0	4.368	2080	20.8	1.848	2.52	5521.32
11	Thermopack Boiler Section	4	0	2.496	2080	20.8	1.056	1.44	3155.04
12	Behind Boiler Section	0	15	18.72	2080	20.8	7.92	10.8	23662.8
13	Coal Fired Boiler	0	3	9.36	5200	52	1.584	7.776	17037.216
	total	**47**	**118**	**182.208**			**74.712**	**107.49**	**235523.73**

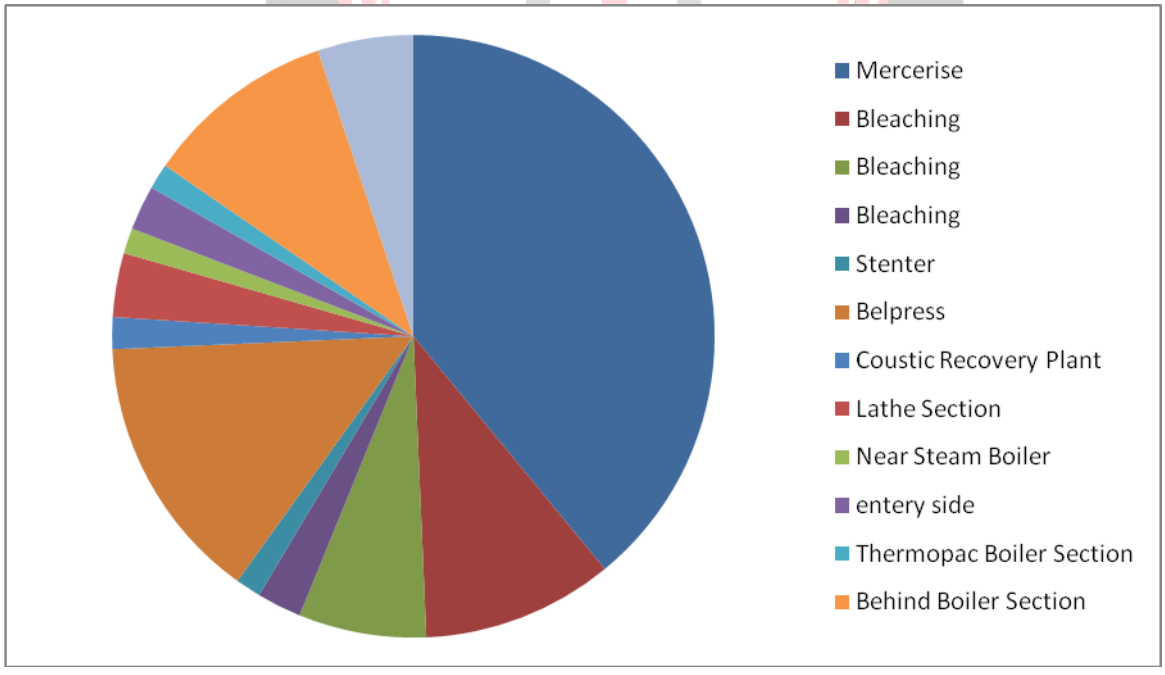

Fig1: Consumption of energy by lighting system of various departments

V. ENERGY SAVING CALCULATION

Total energy consumption of current lighting system = 182.208 kWh/day

Proposed energy consumption of current lighting system =74.712 kWh/day
Total saving in energy consumption = 107.49 Kwh/day

$$\text{Improvement in energy efficiency of lighting system} = \frac{\text{Total saving in energy consumption}}{\text{Total energy consumption of present lighting system}} * 100$$

$$= \frac{107.49\ \text{Kwh/day}}{182.208\ \text{kWh/day}} * 100$$

$$= 58.99\%$$

Saving in Rs./year =107.49*300*7 = Rs.225729
Average cost of replacing fluorescent lamp = 550 Rs. /lamp
Total cost of replacing fluorescent lamp = 550*165 =90750 Rs.
Capital cost recovery time = 90750/225729=0.402 year
Hence capital cost recovery time is 0.402 year, hence it is highly recommended to replace all fluorescent tube lights with LED tube lights.

VI. CONCLUSION

This paper illustrates energy saving in lighting system due to modern lighting. Energy efficiency could improve by almost 59%, total energy saving 107.49 Kwh/day and annual saving of Rs. 235523.73. This work could reduce annual electricity bill. These measures are proposed as good combination of high energy efficiency performance without affecting quality of light available at the working place.

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