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CASE STUDY

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ENERGY AUDIT: AN ECONOMICAL CASE STUDY

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ABSTRACT

More energy consumption and its negative effects on environment and human life are also increased in recent years in India as well as in world, due to which it is very essential to reduce this effect by using different methods. The energy audit is the best to use energy successfully in proper way and to save energy & contribute it to recourses of energy. "Energy Audit is not just a management of energy but it is the best use of available energy recourses and technics to utilize energy in a specific way and select the best option to conserve energy economically without harming environment". In this paper a simple economic analysis is given to select perfect option for different common systems.

Keywords: energy; audit; management; economic; saving

I. INTRODUCTION

Energy is a tool to measure economic development of any country. Most of the country's Import oils, coals, etc to complete their energy demand. This import of energy effects their economic development. So if any country is independent for their energy demand then the economic growth will be easier to achieve. Energy dependency can be reduced by many methods like use of natural resources which are available or by reducing energy loses by auditing.

Demand of energy is increasing in India due to change in life style, population, etc. The resources of energy which are used today in India are limited. To use the available resources in proper way it is important to know some techniques to increase efficiency and reduce energy loses. One of the best method to do this is auditing of existing system to find out different ways to reduce energy consumption.

II. IMPORTANCE OF AUDIT

Demand of energy increases rapidly, due to increase in standards of living and also population. it is necessary for any country to achieve the energy requirements. This can be done by different methods like by supplying energy as per demand or by reducing energy consumption by using different methods. It is easy to supply energy as per requirement but only for limited time because there are limitation of energy resources. Due to this, we must use energy auditing to reduce losses in

systems so that resources could be there for long time.

Energy audit is the analysis of the financial accounts/records, by a qualified accountant, and procedures of a firm or organization. It is the best way to reduce the energy consumption in any of system. It gives the suggestions whether to invest in any system or not.

III. METHODS OF ENERGY AUDITING

Audit can be classified in different ways. Energy audit can be classified in three types depending on money invested and time consumed.

A. Walk Through Audit

B. Intermediate Audit

C. Detailed Audit

A. Walk Through Audit

The preliminary energy audit alternatively called as simple audit, screening audit or walk through audit, is the simplest, cheapest and quickest type of audit. It is carried out in a limited span of times and it focuses on major energy supplies and demands. This is the simplest auditing methods in which major usage and wastage of energy considered to analyze data. Decision is taken faster than any other type of audit due to due to less work to be done. Identify low-cost/no-cost measures and provide cost and savings estimates of those measures. one should also identify and list potential capital improvements that merit further analysis and provide initial judgments about potential costs and savings.

B. Intermediate Audit

In this method of auditing, data is required to analyze in more detail. Smaller areas of energy saving are considered and the cost effectiveness is also considered in account to get better economical implementation of audit. One should break down the energy use by end-use category. One should identify and provide cost and savings estimates for all practical measures that meet the owner's constraints and economic criteria. This type of audit will be able to identify all energy conservation measures appropriate for the facility given its operating parameters. A detailed analysis is done for each and every system available.

C. Detailed Audit

It is also called as comprehensive audit or investment grader audit. As the name suggest this is more comprehensive than intermediate audit. Detailed analysis is done for each and every system as well as subsystem of that system which are available for audit. It covers estimation of energy input for different processes, collection of past data on production levels and specific energy consumption. It is a comprehensive energy audit action plan to be followed effectively.

IV. METHODS OF ENERGY SAVING IN VARIUOS SYSTEMS

a. Use electronic ballast instead of magnetic ballast
b. Replacing Resistance Regulators With Electronic Regulators in Fans
c. Replacing CRT Monitors with LCD Monitors
d. Replacing Geysers with Solar Water Heating System (SWHS)
e. Use of Motion Sensors in Corridors and Toilets
f. Use electronics chokes in florescent tube
g. Maintain proper thermal insulation wherever there are ACs
h. Install tubelights in proper position, orientation,with reflector and electronic ballast
i. Use Master Switch outside each room
j. Use of LED lights for streets
k. Check star ratings for all new installations
l. Use LPG for cooking in place of electric heaters
m. New constructions and renovations should be energy efficient

V. CASE STUDIES

TABLE I; Use electronic ballast instead of magnetic (conventional) ballast

Average Power of conventional ballast FTL	56 W
Average Power of electronic ballast FTL	44 W
Power saved per FTL = (56-44)W	12 W
Average Use of FTL per year = 270*7h	1890 h
Total Energy saved per year=1890*12/1000	22.68 kWh
Saving in Rs. Per year=22.68*2.7	Rs. 61.236

Cost of Replacing FTL	Rs. 150
Capital Cost Recovery time =150/61.236	**2.45 year**

TABLE II: Replacing Resistance Regulators With Electronic Regulators in Fans

Average Power saved per fan	8 W
Average Use of fan per year = 200*9h	1800 h
Total Energy saved per year = 1800*8/1000	14.4 kWh
Saving in Rs. Per year = Rs. 14.4*2.7	Rs. 38.88
Cost of Replacement	Rs. 150
Capital Cost Recovery time =150/38.88	**3.85 year**

TABLE III: Replacing CRT Monitors with LCD Monitors

Power saved	250 W
Average Use per year = 270*6h	1620 h
Total Energy saved per year = 1620*250/1000	405 kWh
Saving in Rs. Per year = Rs. 405*2.7	Rs. 1093.5
Cost of Replacement	Rs. 6000
Capital Cost Recovery time =6000/1093.5	**5.48 year**

TABLE IV: Replacing Geysers with Solar Water Heating System (SWHS)

Cost of a SWHS	Rs. 17,000
Capacity of SWHS	100 LPD
Average Capacity of Geyser	50 L
No of geysers one SWHS can be used to replace	2
Average power of Geysers	2 kW
Average use per year = 5*180h	900 h
Energy saved per year by replacing Geysers by SWHS = 2*2*900	3600 kWh
Saving in Rs. Per year = 3600*2.70	Rs. 9,720
Capital Cost Recovery time = (17000)/(9720)	**1.75 year**

TABLE V: Use of Motion Sensors in Corridors and Toilets

Average number of tube lights in a corridor	4
Average power of the tube lights	50 W
Average number of motion sensors required	3
Average reduction in usage per day by motion sensor	4 h
Total energy saved in corridor per year = (4*50*4*365)/1000	292 kWh
Saving in Rs. Per year = 292*2.70	Rs. 788
Cost of installation per motion sensor	Rs. 250
Energy saved per year by replacing Geysers by SWHS = 2*2*900	3600 kWh
Total cost of installing motion sensors in a corridor = 3*250	Rs. 750
Capital Cost Recovery time = (750)/(788.4)	**0.95 year**

TABLE VI: Use electronics chokes in florescent tube

Average Power saved	20 W
Average Use per year = 350*9h	3150 h
Total Energy saved per year = 3150*20/1000	63 kWh
Saving in Rs. Per year = Rs. 63*2.7	Rs. 170.1
Cost of Replacement	Rs. 260
Capital Cost Recovery time =150/38.88	**1.528 year**

CONCLUSION

Energy audit is an effective tool to identify various most effective ways to manage energy to reduce consumption of any system. Due to increase in competitiveness, it is important to reduce cost of any product and auditing is best for that. One can easily decide as per requirement that which replacement is good for available system by above cost benefits of different system replacements. This approach could be useful for a system to reduce essential energy cost and also several other benefits like better quality, higher profit and most important satisfaction of contributing in world energy saving.

REFERENCES

[1]. Mr. Nilesh R. Kumbhar, Mr. Rahul R. Joshi, "An industrial energy auditing: basic

approach," International Journal of Modern Engineering Research (IJMER), Vol.2, Issue.1, pp-313-315.

[2]. Albert Thumann, and William J. Younger, Handbook of Energy Audits, 7th ed., The Fairmont Press, Inc., CRC Press, 2008.

[3]. Moncef Krarti, Energy Audit of Building Systems an Engineering Approach, 2nd ed., CRC Press, 2011.

[4]. Malkiat Singh, Gurpreet Singh, Harmandeep Singh, "Energy audit: a case study to reduce lighting cost," Asian Journal of Computer Science and Information Technology, 2: 5, pp-119-122.

[5]. Shashank Shrivastava, Sandip Kumar and Jeetendra Mohan Khare, "Improving Industrial Efficiency by Energy Audit," International Journal of Scientific Engineering and Technology, Vol. 2, Issue.4, pp-291-294.