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WINGS TO YOUR THOUGHTS.....

A SURVEY ON ENERGY AUDIT IN RGPV BHOPAL

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Abstract: *Energy audit report searches electricity consumption of Administrative block of Rajiv Gandhi proudhyogiki vishwavidhyalaya (RGPV). The reason of this audit search areas of energy waste and to advance feasible option for resource conservation. In this paper also show that energy saving and reduction in discharge of environment pollution. During the audit of a day is the power of the consumption which anneals the condition of 7energy crises by supplying conservation technique. In RGPV there are lots of building and in administrative block lots of A. C. Which consume more power from the other instrument? So in this institute is heavy consumer of electrical energy so we have some technique to reduce energy conservation.*

Keywords: *- Energy audit, Energy saving, Energy conservation, Data collection, Recommendation*

1. INTRODUCTION

Energy audit is a study or survey to identify how and where energy is being used or converted from one form to another in a building or plant, to identify this opportunity and action plan to reduce this energy consumption. It is also a useful procedure to find out the best option for energy conservation. [1] An energy audit is an inspection, survey and monitoring of energy flow for energy conservation in an industry, process to reduce the amount of energy input into the system without affecting the output.

A common way to calculate energy saving is to building energy auditing. A detailed energy audit is compressive, time consuming and include review and analysis of the energy use from utility bills. The process of energy audit includes, historical energy data collection, formulation of energy audit programme to the actual implementation. [2] Audit functions in general order include:

- Identification of all energy systems
- Evaluation of conditions of the systems
- Analysis of impact of improvement to those systems
- Preparation of energy audit report.

2. TYPES OF ENERGY AUDITS

Preliminary energy audit, Detailed energy audit.[3]

Preliminary energy audit:

Preliminary energy audit is a before practice to detailed audit. It gives the prospect of the overall work. It is also called a simple audit or walk- through audit. It is simple and fast type of audit. It is execute in a limited spell of time and it focused energy supply and demand. It involves site operation, a brief review of facility energy bill and other operating data. In preliminary energy audit also involves the to find out the energy consumption in institute, search area for more detailed measurement, search immediate improvement or saving, to set a neutral point.

Detailed energy audit:

Detailed energy audit is also called comprehensive audit or investment grader audit. In this audit offers the most perfect idea of energy saving and cost. It is also called a key element of energy balance. It expands on the preliminary energy audit. It covers evolution of energy input for different processes, collection of past data on production levels and specific energy consumption. In detail audit we define energy use and losses through a more detailed review and analysis of equipment, systems, operational characteristics, and on-site measurements and testing.

And also calculation used to analyze efficiencies and calculate energy and cost savings based on improvements and changes to each system. The detail will also include an economic analysis of recommended ECMs.

3. METHODOLOGY

The purpose of RGPV (Administrative Block) survey is to determine general condition of institution with respect to energy performance and the institutional and potential motivation to improve the institutes Energy performance. This energy audit aimed at detailed idea about various end use energy consumption activities and identifying enumerating and evaluating the possible energy savings opportunity.

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3.1. Survey of ground floor administrative block

Room no.	Floor area	Working lumen	Total load
102	7.7X 3.8m	L off=120 L on=360	Fan=2 CFL 36W=3 Tube light=16 Computer=3(LCD)
103	7.7 X 3.8m	L off=125 L on=360	Fan=2,Printer=1 CFL 36W=1 Tube light=16 Computer=1(LCD)
104	8.4 X 8.4m	L off=186 L on=350	Fan=6 Tube light=13 Computer=3(CRT)
105	7.7 X 3.8m	L off=150 L on=400	Fan=1 Tube light=4
106	7.7 X 3.8m	L off=145 L on=330	Fan=1 Tube light=4
107	13.8mX11.4 m	L off=100 L on=150	Fan=1 Tube light=1 CFL 18W=2
GALLERY	22.5X3.8m	L off=260 L on=450	Fan=2 Tube light=29
Conference hall	18.5x18m	L off=330 L on=450	Fan=16 Tube Light=16 CFL 18W=20
Computer Lab	16mx15m	L off=250 L on=380	Fan=8 Tube Light=12 Computer=48(LCD)

3.2 .Survey of first floor

Room no.	Floor area	Working lumen	Total load
202	8.4m X 3.8 m	L off=80 L on=285	Fan=2 Printer=1 Computer=2(LCD) Tube light=8 AC=1(splint)
203	8.4 m X 3.8m	L off=95 L on=191	Fan=2 Tube Light=8 Computer=2(LCD) AC=1(splint) Photocopy=2
204	8.6 m X 4.6m	L off=150 L on=270	Fan=2 Tube Light=8 Printer=1 Computer=2(LCD) AC=1(splint)
205	7.1 m X 7m	L off=24 L on=145	Fan=4 Tube Light=16 AC=2
206	8.4 m X 4.2m	L off=156 L on=282	Fan=2 Tube Light=8 Computer=5(LCD) AC=1 Printer=1
207	8.4 X4.2m	L off=156 L on=282	Fan=2 Tube Light=8 AC=2 Computer=2(LCD) Printer=2
208	16.8 X 12.6m	L off=21 L on=68	Tube Light=22 Computer=1(LCD) Printer=1 Cooler=1
209	8.4mx4.2m	L off=25 L on=150	Fan=2 Tube Light=8 TV=1
212	3.3mx3.4m	L off=29 L on=330	Fan=1 Tube Light=2
213	7.2mx4.8m	L off=40 L on=150	Fan=4 Tube Light=8
214	16.8x15m	L off=100 L on=230	Fan=22 Tube Light=44 Pinter=2 Photocopy=2 Cooler=4
215	5.4mx9.5m	L off=80 L on=180	Fan=1 Tube Light=4 CFL=1(36w)
216	4.2mx4.2m	L off=70 L on=150	Fan=2 Tube Light=4 CFL=1(36w)
219	3mx3m	L off=221 L on=306	Fan=1 Tube Light=3 Computer=1(LCD) Cooler=1
232	7.2mX 6m	L off=300 L on=350	Fan=2 Tube Light=3 Computer=2(LCD) Printer=1
Gallery	22.5x3.8m	L off=260 L on=450	CFL=8(36w)

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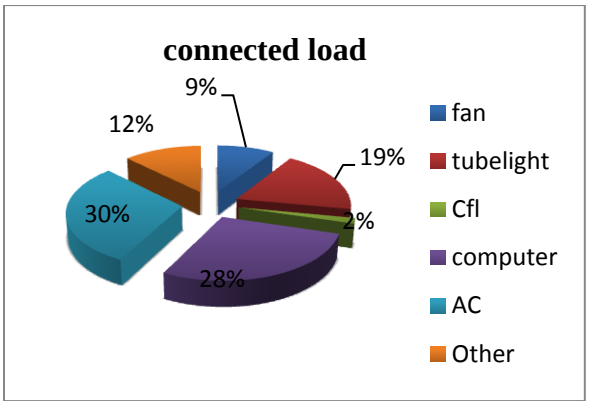
3.3 Survey of second floor

Room no.	Floor area	Working lumen	Total load
303	7.2m X3.6m	L off=150 L on=250	Fan=2 Tube light=8 Computer=1(LCD)
304	7.2m X3.6m	L off=150 L on=250	Fan=4 Printer=1 Tube Light=8 Computer=2(LCD), AC=1(splint)
305	8m X 6.6m	L off=100 L on=320	Fan=4 Tube Light=16 Computer=1(CRT),AC =1(splint) Printer=1
306	8m X 6.6m	L off=100 L on=320	Fan=4 Tube light=16 Computer=1(LCD),AC =1(splint)
307	8.4m X 8.4m	L off=100 L on=320	Fan=4 Tube light=16 AC=2(splint)
308	8.4m X 8.4m	L off=100 L on=320	Fan=4 Tube Light=16 AC=2(splint) Computer=1(LCD)
313	8.4m X 7m	L off=101 L on=307	Fan=1Tube Light=8 CFL 18W=1
315	8.4m X 7.4m	L off=101 L on=330	Fan=2 Tube Light=8 CFL 18W=1
316	8.4m X 7.4m	L off=99 L on=318	Fan=2 CFL 18W=2 Tube Light=8
318	9mX4.2m	L off=120 L off=340	Fan=2 Tube Light=4 CFL 36W=1 Computer=2(LCD),AC =1(splint) Printer=1
Degree section	8.4mX8.4m	L off=100 L on=160	Fan=4 Tube Light=12 Computer=5(CRT),coo ler=2 Printer=2
Gallery	22.5mX3.8m	L off=240 L on=450	CFL=8(36W)

3.4 Energy audit survey of administrative block

The loads were segregated based on end use as lighting and fans, air conditioning, computer, printer etc. The details are given below.



4. ENERGY SAVING CALCULATIONS

4.1) Energy saving by replacing tube light by CFL:

I) Energy saving cost estimation of full load

Total no. Of lamp =380

Actual wattage of tube light with choke=50W

Energy consumed by TL for operating of 10 hours per day =380x50x10 =190000 watt-hours

Energy consumed by TL for operating of 10 hours per month =190000x24 working days =4560000W-h=4560 kWh

Energy cost per day (1kWh = Rs 5.15)

Monthly energy consumed cost by TL =Rs. 5.15X4560= Rs23484/-

Yearly energy consumed cost by TL =23484x12=281808/-

II) Energy saving by replacing the CFL of equal similarities of tube light 13 watt CFL can give an illumination o/p=800 lumens. 40 watt TL can give an illumination o/p=2400 lumens. Therefore no. of 13 watt CFL required to get the illumination level =345 watt of CFL= 50 watt of TL in term of illumination o/p(the actual wattage of 13 watt CFL=15 watt with choke.

The power consumption of CFL =15x3=45 watt

Hence total wattage of TL =380x50 watt=19000 watt

No. Of CFL required to replace all TL at the rate of 13 wattx3, 39 watt CFL= 50 watt TL=19000/39 watt=487

Power saving by CFL replacement =487x11 watt=5357 watt

Energy consumption from CFL for an operated average hour/day for 12 hours =5357wattx12 hours=64284W-h

Daily cost energy consumption by CFL =64.28x5.15 kWh = Rs 331/-

Monthly energy cost saving due to CFL=Rs 331x24 days =Rs 7944/-

Yearly energy cost saving due to CFL=7944/- x12=95328/-

Payback period calculation:

Investment on 1 CFL of 13 watt =Rs. 90/-

Total cost of replacement=Rs 487x90=Rs.43830/-

Payback period =43830x12/95328

=5 month 16 days

4.2) Energy saving by replacing desktop of CRT monitor with LCD monitor

Computer with CRT monitor of 400 watt

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Total no. Of system=09
Total power consumption = 09x400=3600watt=3.6 kW
Total energy consumption= power consumption x operating hours/day=3.6x8 kWh =28.8 kWh
Energy cost /day =28.8x5.15=Rs.148.32/-
Total annual energy cost=energy cost/day x no. Of days =Rs. 148.32x288=Rs.42716.16/-
Computer with LCD monitor of 250 watt
Total power consumption = 09 x 250 =2250 watt=2.25 kW
Total energy consumption / day =2.25 x 8 hours=18 kWh
Energy cost/day =18 x 5.15=Rs.92.7/-
Total annual energy cost =Rs 92.7 x 288 days=Rs 26697.6/-
Annual cost saving =Rs (42716.16-26697.6)
=Rs 16018.56/-

4.3) Energy saving by remote controlled fans

I) Remote controlled fan verses conventionally controlled fan
Energy saving by controlled fan and conventionally controlled fans=80w x operating hours (per day per fan) =80w x 8 hours/day=640Wh/ day/fan
Energy cost /day/fan =0.64x5.15
=Rs.3.296/-
Cost of energy consumption for 121 fan /day
=3.296/- x 121
=Rs 398.81/-
Annual cost of energy consumption by regular controlled fans =Rs 398.81 x 288 days=Rs 114859/-
II) Remote controlled fan can be operating based on user requirement may reduce the operating time.
Let us operate the fan on need basis as remote control is available. It will reduce the operating hours (Assume that the wattage is same)
=80w x 6 hours
=480Wh/day
=0.48kWh/day
=0.48 x Rs 5.15
=Rs 2.472/-/day
Annual energy consumption by remote controlled fan = 2.472 x 121 x288 =Rs 86144.25/-
Cost saving =114859-86144.25
=Rs 28714.74/-
Total cost of additional unit remote operating switch =Rs 400/- x 121=Rs 48400/-
Payback period=48400x12/28714.74=1 year 8 month 6 days.

5. RECOMMENDATIONS

It is recommended to replace fluorescent lamp by CFL which are bulky construction and possibility of breaking is less. Installation is easy.

a. All internal walls should be painted using Enameled paint which would reflect light.
b. Use focused light for reading place.
c. Use good lighting system will reduce the power burden on the system.
d. Good light ventilation and air ventilation to classroom may solve the problem of energy consumption
e. Replacement of CRT monitor by LCD monitor not only gives the cost benefit interns of energy saving but also play a significant role of radiations due high potential.

6. CONCLUSION

Energy conservation is very important in our life, because every where energy needed and energy consumption is increasing day by day and power generation is not fulfilling the demand. So major problem occur now a day. In our project energy audit report on RGPV (Administrative Block) we study the data and this data is calculated and compare with standard data. During the energy audit we observe some point which is very useful for energy conservation. First point is that the consumption of AC and computer about 58% of the total power consumption, in which 30% of AC consumption and 28% of computer s consumption. So most of the important point is that here we save lots of energy. Second point is that the energy consumption by tube light is19% which is also third more power consumption in administrative block. We also suggest some recommend nation by using this recommend nation energy conservation is done. By adopting proper measures as suggested in the report, i.e. de-lamping, replacements etc., energy awareness to make the people aware the importance of energy the required result can be achieved.

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