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Case Study

ENERGY AUDIT: A CASE STUDY OF UNIVERSITY

Lakshminarayana, G[1] and Jayatheertha, HJ[2]

[1]EEE Department GITAM University, Hyderabad
[2]EEE Department GITAM University, Bengaluru

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ABSTRACT

Ceiling fan and lighting forms a significant load of educational institutions. If energy efficient super fan and light emitting diode tube light is used in place of normal fan and tube light then a significant amount of energy can be saved on the load side and hence reduce the burden on the generating station. In this paper, the method of evaluation of energy audit is given using super fan and light emitting diode tube light. GITAM University, Hyderabad campus, data is used in this paper for case study and the results showed that the payback period is less than two years from the monthly energy savings obtained due to super fan and light emitting diode tube light

INTRODUCTION

Technical Educational institutions play important role in creating knowledge where the staff and students are actively involved in teaching learning process. The advantages of energy management measures in educational institutions are given below

Reduces load on generating station Financial gains to the institutions employing energy conservation measures after the payback period.

Environment-friendly because compact fluorescent lamps contain mercury and their disposal is an environmental concern so LED tube lights are used which are eco-friendly.

When students in technical education institutions know about energy management procedures implemented in their institutions then there is every possibility that the energy conservation procedures also implemented in their houses.

The present energy audit is done at GITAM University, Hyderabad campus, India where the fluorescent tube light is replaced by energy efficient LED tube light and ceiling fan is replaced by energy efficient super fan. The energy auditing procedure is given in the following section.(2)

Energy Auditing Procedure

Start

Step1: Initially the time period is set to zero years for the following cases

Fluorescent tube light and normal ceiling fan.
LED Tube light and super fan
Year=1;
Extra Capital cost=0;
Yearly savings=0;
Count=1;

Step2: Capital investment is done at the starting of the financial year for both cases i) and ii)

Step3: Extra capital cost = [Capital cost of case ii)] - [Capital cost of case i)]

Step4: The extra capital cost is assumed to be deposited in fixed deposit of a nationalized bank say State Bank of India (SBI).

Step5: The monthly electricity bill savings = [the monthly electricity bill of case ii)] – [The monthly electricity bill of case i)]

Step6: The monthly electricity bill savings are deposited in the recurring deposit of SBI for a period of one year.
Savings = sum obtained at the end of one year.

Step7: procedure for calculating payback period

While (count! =1)

Extra Capital cost = [Extra capital cost] + [FD interest for one year on Extra capital cost];

Yearly savings= Yearly savings + Savings;

**Corresponding author: Lakshminarayana, G*
EEE Department GITAM University, Hyderabad

If (Extra Capital cost > Yearly savings)

Year=Year+1;

Repeat step4, step5 and step6;

Yearly savings= Yearly savings + [FD interest for one year on Yearly savings]

Else

Count=1;

Print pay back year= Year;

End

Note1) after lifetime expiry of LED tube light and super fan fresh capital investments has to be made.

STOP

Evaluation of energy Audit

GITAM University First Floor ref(1)

ROOM NO.	No. of Lights	Light Wattage	Cost	No. of Fans	Fan Wattage	Cost	Total wattage	LED Wattage	Light Wattage	Cost	SUPER A1 wattage	FAN WATTAGE	Cost	Total wattage
J201	10	10*95	2*100*10 =2000	10	10*80	10*1500=15000	1750	16*2	10*32=320	1000*2*10=20000	35	10*35=350	3700*10=37000	670
J202	10	10*95	2*100*10=2000	10	10*80	10*1500=15000	1750	16*2	10*32=320	1000*2*10=20000	35	10*35=350	3700*10=37000	670
J203	10	10*95	2*100*10=2000	10	10*80	10*1500=15000	1750	16*2	10*32=320	1000*2*10=20000	35	10*35=350	3700*10=37000	670
J204	24	24*36	100*36=3600	10	10*80	10*1500=15000	1664	16*1	24*16=384	1000*24=24000	35	10*35=350	3700*10=37000	734
J205	10	10*95	2*100*10=2000	10	10*80	10*1500=15000	1750	16*2	10*32=320	1000*2*10=20000	35	10*35=350	3700*10=37000	670
J206	10	10*95	2*100*10=2000	10	10*80	10*1500=15000	1750	16*2	10*32=320	1000*2*10=20000	35	10*35=350	3700*10=37000	670
J211	27	27*24	27*550=14850	0	0	0	648	16*1	27*16=432	LED bulb	35	0	0	432
J212	7	7*95	2*100*7=1400	8	8*80	8*1500=12000	1305	16*2	7*32=224	1000*2*7=14000	35	8*35=280	3700*8=29600	504
J217	1	1*95	2*100=200	2	2*80	2*1500=3000	255	16*2	1*32=32	1000*2*1=2000	35	2*35=70	3700*2=7400	102
J218	2	2*95	2*100*2=400	2	2*90	2*1500=3000	370	16*2	2*32=64	1000*2*2=4000	35	2*35=70	3700*2=7400	134
J219	2	2*95	2*100*2=400	2	2*90	2*1500=3000	370	16*2	2*32=64	1000*2*2=4000	35	2*35=70	3700*2=7400	134
J220	2	2*95	2*100*2=400	2	2*90	2*1500=3000	370	16*2	2*32=64	1000*2*2=4000	35	2*35=70	3700*2=7400	134
J221	2	2*95	2*100*2=400	2	2*90	2*1500=3000	370	16*2	2*32=64	1000*2*2=4000	35	2*35=70	3700*2=7400	134
J221T	3	3*43	3*100=300	0	0	0	129	16*1	3*16=48	1000*1*3=3000	35	0	0	48
J222T	6	6*36	2*125*6=1500	0	0	0	216	16*1	6*16=96	1000*1*6=6000	35	0	0	96
J Director	15	15*(95+36+36)	15*(2*100+4*125)=10500	3	3*80	3*1500=4500	2745	16*4	15*64=960	1000*4*15=60000	35	3*35=105	3700*3=11100	1065
Corridor	39	39*43	39*100=3900	3	3*80	3*1500=4500	1917	16*1	39*16=624	1000*1*39=39000	35	3*35=105	3700*3=11100	729
	180		Rs 47850	84	TOTAL	RS 126000	19109			RS 264000		TOTAL	Rs 310800	7596

extra cost for LED= column K-column D=Rs 216150

extra cost super fan column N-column G=Rs184800

Ist floor savings =11513 watts= 11.513 kw
operating time= 8hours/day= 240hours/month

total energy saved per month=13657 kwh for all the floors

LED extra cost rupees			fan extra cost rupees		
Floor I	216150		184800		
Floor III	312300		279400		
Floor IV	264200		283800		
Floor V	264700		305800		
TOTAL	1057350		1053800		total extra cost=21,11,150
		kwh		kwh	
without Led, super fan kw		hour/month=240	with led super fan kw		
Floor I	19.109	4586	7.596	1823	
Floor III	25.866	6207.84	9.997	2399.28	
Floor IV	23.822	5717.28	9.251	2220.24	
Floor V	24.763	5943.12	9.809	2354.16	
TOTAL	93.56	22454.24	36.653	8796.68	

electricity bill without led super fan per month
(93.56*50)+(6.63*50)+(7.38*50)+(8.13*200)+(8.63*200)
+(9.13*21954)= 209170 ref(4)

electricity bill with led sf per month
(36.653*50)+(6.63*50)+(7.38*50)+(8.13*200)+(8.63*200)
+(9.13*8296)=81627 ref(4)

savings per month=127543 rupees

savings per year=1530516

rd interest=110962

total first year savings=1641478 rupees

fd interest for second year=(7.25%)=123110 ref(6)

savings second year end=123110+1641478+1530516+110962= 3406066

energy saved cost - capital cost second year end=977703 rupees

pay back period is less than two years

capital cost= 2111150
interest one year=153058
(7.25%) ref(6)
total capital after one
year=2264208 rupees

interest for second year=164155
total capital end of second
year=2428363

CONCLUSION

Energy auditing is done using Light Emitting Diode tube light and super fan for a case study in GITAM University Hyderabad, India. The energy savings showed that the payback period is less than two years and the savings is 9, 77,703/- Indian rupees at the end of the second year.

From third year onwards 16, 41,478/- Indian rupees is saved every year.

The Evaluation of energy audit is given in this paper. The evaluation has been done based on the income due to energy saved on the monthly electricity bill and annual income generated during a year.

If monthly energy savings due to Light Emitting Diode tube light and super fan are put in recurring deposit of state bank of

India at the annual interest rate of 7.25% then at the end of the first year the income generated is 16, 41,478/- Indian rupees.

The extra capital cost due to Light Emitting Diode tube light and the super fan is found to be 21, 11,150/- Indian rupees. If the capital invested is put at fixed deposit rate of 7.25% in state bank of India then the expenditure at the end of the first year is 22, 64,208/- Indian rupees.

At the end of the first year, the financial deficit is found to be 6, 22,730 /- Indian rupees.

If first-year income generated 16, 41,478/- Indian rupees is put at fixed deposit rate of 7.25% in state bank of India then at the end of the second year the income generated is 34, 06,066/- Indian rupees.

If the expenditure at the end of the first year 22, 64,208/- Indian rupees is put at fixed deposit rate of 7.25% in state bank of India then at the end of the second year the capital cost is 24, 28,363/- Indian rupees.

Hence the payback period is less than two years

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