

Energy Conservation in Stairways: A Case Study

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Abstract- It has become an onus on all citizens to contribute towards the environment by conserving energy. Sometimes in the prima-facie of it looks like a small or minute contribution. But when looked upon over a period of time, the savings would be substantial. One such case is saving of Electricity in stairways of multistoried complexes. A case study is undertaken to prove the contribution of led lights in the stairways for energy conservation.

Index Terms- Stairway, Fluorescent bulb, LED bulb, Payback Period

1. INTRODUCTION

We see the evolution of different types of light bulbs used by the common man. It is from filament bulbs to florescent bulbs, from fluorescent lamps to CFLs and from CFLs to LEDs now. CFLs have some issues like mercury content contributing towards the harmful effects on environment if not properly disposed and recycled. Hence the current focus is shifting towards the LED bulbs. Normally these buildings keep the lights on for the whole night (6pm to 6 am) irrespective of the people moving around or not. In most of the multistoried buildings, people are not using the stairway as the building is having elevators. Therefore as there is no public movement on the stairway, there is no point in providing the bright fluorescent tubes. Instead bulbs having lesser wattages with lesser lumens are sufficient for stairway lighting. This way a good amount of electrical energy can be saved.

2. DETAILS OF CASE STUDY

2.1. Data collected for the building under case study

Type: Residential
No of floors: 12
No of fluorescent tubes (existing):12
Type of tubes used for lighting: Standard T8
Wattage of tubes: 36W, four feet length each
Lumens per tube: 2400
Rated life of each tube: 10000 Hours

Type of light: Cool white
Dimmable: No
No of hours the tubes are on per night: 12 (6 PM to 6AM)

Calculation of Electrical energy utilized annually:
 $36W * 12 \text{ hours} * 12 \text{ numbers} * 365 \text{ nights} = 1682 \text{ KWH}$

2.2. Data collected for the light bulbs recommended

Type: LED
Wattage per bulb: 5
Lumens per bulb: 360
Type of bulb: Warm white
Special characteristic: Dimmable
Life: 25000 hours
Calculation of energy requirement: $5W * 12 \text{ hours} * 12 \text{ numbers} * 365 \text{ nights} = 262.8 \text{ KWH}$
Thus we observe these light bulbs utilize only 16% of the energy and the savings in energy is around 84%.

2.3. Pay Back Period calculation

The cost of LED bulbs of 5W: Rs 550 each
Total number of bulbs required: 12
Therefore cost of bulbs= Rs6600
Cost of additional bulb holders (Adopters) required: $Rs 25 * 12 = Rs300$ for 12 numbers (one time investment only)
Cost of installation of new adopters: $Rs 50 * 12 = Rs 600$ for 12 numbers (one time investment)
Total cost involved: $Rs 6600 + Rs300 + Rs600 = Rs7500$

Annual Savings in Energy bills:
Considering a minimum of Rs 5/- per unit (KWH)
Energy costs paid due to Fluorescent= $1682 \text{ KWH} * Rs5 = Rs 8410$
Energy costs paid due to LED bulbs= $262.8 \text{ KWH} * Rs5 = Rs 1314$

Thus saving in bills annually=Rs 8410-Rs1314=Rs 7096

Payback period= Rs 7500/Rs 7096=1.05 Years

After this Payback period, it is only the savings in energy bills year after year.

Since the case study is for the illumination of stairways, CCT & CRI are not considered as the author feels they are not important. Hence comparison of the same is not considered.

Apart from the Pay Back Period, there are many hidden advantages like life of LEDs are more than twice of that of fluorescent tubes. Hence maintenance expenses will reduce. Above all, the most important fact is the “Energy Conservation” achieved which is the need of the hour.

3. CONCLUSION

Thus we observe that the energy conserved is quite substantial for one building. There are lakhs of such buildings in each city and hence the energy conserved will be remarkable provided the public awareness regarding the energy conservation is increased. Also if only provision of LED bulbs in stairways are made mandatory for multistoried buildings by the concerned authorities.

REFERENCES:

- [1]Actual case study undertaken at the residential complex in Navi Mumbai.
- [2] Anil Valia, Designing with Light.
- [3]Cayless.M.A & Marsden.A.M, Lamps and Lighting.
- [4]Gordon, Handbook of Lighting Surveys & Audits.