Analysis of Electricity Consumption at the College of Mechanical Engineering and Proposals for Improving Efficiency and Reducing Costs

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Summary

The aim of this work is to apply energy efficiency in the Faculty of Mechanical Engineering where we will focus only on the saving of electrical energy for which a study of the facilities will be carried out, as well as solutions will be presented to establish them and achieve a continuous improvement .

INTRODUCTION

The present project establishes the profitability that would be achieved with the implementation of LED luminaires in the Faculty of Mechanical Engineering. For which a preliminary study of the feasibility of the project was carried out. This led to the development of an LED lighting system to which an economic study was carried out to obtain its profitability for 10 years. With which we demonstrate that using LED luminaire, large savings are achieved in the long term and also an improvement in the modernity of our faculty.

PRESENTATION OF THE PROBLEM

In the Faculty of Mechanical Engineering is using improperly the electrical energy with respect to classroom lighting and library, the doors are opening when the air conditioning is using also the multimedia equipment and the computers turned on after use.

This increases the energy losses in your facilities. Consequently, an economic expense, which can be used in improving the faculty.

OBJECTIVES

General objective

• Perform energy efficiency in the Faculty of Mechanical Engineering.

Specific objectives

• Raise cost-effective solutions to use electrical energy efficiently.
• Determine the parameters to be analyzed.
• Evaluate how cost-effective solutions are for a given term (years).
• Determine the viability of the project with a vision for the future

DESCRIPTION OF THE SOLUTION

It is proposed to replace the existing 36W and 40W mercury fluorescent lamps with LED lamps of the same light output, but with the advantage of a significant saving in electricity consumption of about half.

Advantage

1. Greater energy efficiency.
2. Longer life.
3. They are greener.
4. They are not a source of heat.
5. Low maintenance.

	Fluorescente	LED
Contiene Mercurio y metales pesados	SI	NO
Usa cebador	SI/NO(HFP)	NO
Usa balastro	SI	NO
Genera energía reactiva	SI	NO
Consume con tubo fundido	SI	NO
Potencia tubo 60cms	18W	9W
Potencia tubo 120cms	36W	18W
Potencia tubo 150cms	58W	22W
Consumo balasto/driver 1x60cms	3W-7W	1W
Consumo balasto/driver 1x120cms	5W-7W	2W
Consumo balasto/driver 1x150cms	7W-11W	3W
Emite infrarrojos (IR)	Si	NO
Emite ultravioletas (UV)	Si	NO
Temperatura de superficie	80°	40°
Rango de temperatura de trabajo	de 5° a 45°	de -20° a 60°
Peligro por rotura	SI	NO
Tensión de trabajo	240V	12V
Riesgo eléctrico	SI	NO
Vida útil (en horas)	6.000/17.000	50.000
Vida media	8.000/19.000	80.000
Oscurece techos / decolora	SI	NO
Produce parpadeo durante el uso	SI	NO
Encendido instantaneo	NO	SI
Encendido a plena luminosidad	NO	SI
Sobre consumo por encendidos múltiples	SI	NO
Degradación lumínica por cada 3.000 horas	30%	2%

The first step was the evaluation of the current expenditure in the faculty with respect to the electric energy (luminaire) of the three floors, with which later a lighting system is established with LED's lights (election of the Thyristors).The profitability of the same is realized for the approximate useful life (10 years) of LED lights. This demonstrates that in the long run a great saving in the consumption of electric energy is obtained.

RESULTS

After the evaluation the following results were obtained.

TIPO DE LUMINARIA	Pisos	Nº de luminarias	Potencia de consumo total [kWatts]	Costo total en Energía mensual [S/.]
FLUORESCENTES	1	259	18.648	2349.648
LED	1	259	9.324	587.412

TIPO DE LUMINARIA	Pisos	Nº de luminarias	Potencia de consumo total [kWatts]	Costo total en Energía mensual [S/.]
FLUORESCENTES	2	147	10.584	1333.584
LED	2	147	5.292	333.396

TIPO DE LUMINARIA	Pisos	Nº de luminarias	Potencia de consumo total [kWatts]	Costo total en Energía mensual [S/.]
FLUORESCENTES	3	168	12.096	1524.096
LED	3	168	6.048	381.024

PISOS	FOCOS	LED	AHORROS
1	2349.648	587.412	S/ 1762.236
2	1333.584	333.396	S/ 1000.188
3	1524.096	381.024	S/ 1143.072

- In the tables can be observed the results obtained when making the changes in the faculty of mechanical engineering, besides saving money you get a lower energy expenditure.

- When carrying out the evaluations with the software, it is concluded that for all floors, 30 W fluorescents with the same distribution set up at the university will be used.

CONCLUSIONS

- There were many proposals for solutions, but the most optimum and the most relevant for the application of energy efficiency was the installation of motion sensors and change the lighting by LED lights.
- The current with which the thyristor would work is 8 amps (higher value obtained from the three floors) considering for the three floors the same value for a safety factor subject.
- The solutions presented are optimal for the 10-year shelf life of the sensors; With great savings for this term.
- It is not necessary to carry out all the investment together, it is possible to program the expenses over several months, starting with the change of luminaires, placing the sensors floor to floor.
- Our project has considered as a priority the comfort of users (students, teachers, workers in general). So it is not affected, which has been demonstrated.
- From the optimization made it possible to conclude that for the rooms of the first floor the ideal would be to use 6x4 spotlights, however, since the ceiling is quite high it would be advisable to use 8x6 spotlights.
- In the case of the second and third floors, the number would be 6x5 spotlights.