International Journal Of

Recent Scientific Research

ISSN: 0976-3031

Volume: 7(6) June -2016

DESIGN ANALYSIS OF POWER SAVER LIGHTING SYSTEM FOR ENGINEERING EDUCATION COLLEGE BUILDING BY DIALUX SOFTWARE

Kartik K Patel., Jayesh B Patel., MItresh A Modi and Chirag B Patel

THE OFFICIAL PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH (IJRSR)
http://www.recentscientific.com/ recentscientific@gmail.com

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 7, Issue, 6, pp. 11945-11949, June, 2016

International Journal of Recent Scientific Research

Research Article

DESIGN ANALYSIS OF POWER SAVER LIGHTING SYSTEM FOR ENGINEERING EDUCATION COLLEGE BUILDING BY DIALUX SOFTWARE

Kartik K Patel*[1]., Jayesh B Patel[2]., MItresh A Modi[3] and Chirag B Patel[4]

[1,2,3,4]Department of Electrical Engineering V.P.M.P Polytechnic, Gandhinagar, India

ARTICLE INFO

Article History:

Received 05th March, 2016
Received in revised form 08th April, 2016
Accepted 10th May, 2016
Published online 28st June, 2016

Key Words:

Lighting ; Conventional ; LED ; Designing ; DAILux

ABSTRACT

In 2005, the International Energy Agency published that electricity consumption for lighting Consumption for lighting of the sector service. Around Two thirds of the lighting systems now a days are based On technology developed before 1970, and they have lower Performance that the current technology. A complete change of the lighting system and the implementation of control and regulation systems can provide relevant energy savings. This work presents a comparison about the energy efficiency of different control lighting systems applied to office spaces located in Spain. The work is based on DIA-LUX calculations to perform day lighting, lighting systems and lighting controls are compared using fluorescent lighting level distribution on the work plane. [1][2]

INTRODUCTION

Over centuries artificial lighting has made a significant progress from candles, gas to Kerosene Lamps to today's incandescent, fluorescent Lightings. As a result the overall operating cost of light has been reduced to 4.5 orders of magnitude since the 1700s. The world uses 0.74% of GDP in the Light, World GDP of 64.58 T$ (USD). Which means 550 B$ in Lighting. Hence Lighting should be such that will reduce the cost for that energy efficient Lighting is the best possible solution to reduce the overall cost. For that energy auditors and engineers are focusing on the use of energy efficient lighting devices which will help in the reduction in the overall cost of Lighting. Recent trends witness companies incurring a one-time cost to install LED lights in place of halogen bulbs, implement real time energy monitoring and measurement software tools, etc. Physiological changes that occur as a person ages include reduced pupil size, cloudier lenses, and reduction in the amount of photoreceptors that play a dominant role in low- level lighting, all have a significant impact on visual performance as light levels decrease.

Because the physiology of the human eye is such that visual performance degrades as a person ages, implementation of lighting systems that can account for that degradation is critical[3].As the age of the ground staff varies from 20 years to 50 years the certain degradation in that Ferber is taken in to consideration and proper illumination is needed to be provided so that they would carry out the maintenance work and at the same time it is needed a proper lighting is essential for maintaining the security of the assets in the substation.

In India the BEE is the prime institution which keeps the Lighting parameters into consideration hence the LUX is needed to be maintained accordingly. Yet the transmission companies need to maintain the proper LUX taking into consideration various standards of Lighting as been specified in IS.

Present Senario of Lightning System in India

The efficacy of light source is measured in Lumens/watt. The efficacy of LED is Compatible with the present light source but the efficiency of LED lighting is very high. As in normal incandescence lamp is having efficiency of around 18 lumens/watts and LEDs are in the range of 40 Lumens/watt, but in Incandescence lamps most of the power (watts) lost in heat as the efficiency of Incandesce lamp is very low in the range of 10-15%. As there is no heat developed in LEDs this power towards heat will be reduced, only losses taking place will be in driver circuits which account for 10-15% losses, thus a higher efficiency in the range of 85-90 % can be obtained. That makes a potential difference in saving in energy in LED lighting.

The research is going on in development of LED with high lumens/watt output. The maximum achieved

Efficacy is 132 lm/w, but it is yet to be commercialized.

*Corresponding author: *Kartik K Patel*
Department of Electrical Engineering V.P.M.P Polytechnic, Gandhinagar, India

Terms Related To Illumination

Illumination

Illumination is the light available on the surface. The illumination of the surface is covered by amount of light falling on it. It is measured in lumens per square meter or lux.

Light

The term light is defined as radiant energy range that will give radial sensation, or it is radiant energy which will give sensation of vision on human eyes. It is denoted by (Q) and unit is lumen-hour.

Luminous Flux

The total light radiated per second from luminous source per second is known as luminous flux. It is dented by (F) and unit is lumen.

Luminous Intensity

A point light source which gives luminous flux per unit solid angle in one direction is known as luminous intensity of that light source.

Brightness

The brightness of the surface is defined as the luminous intensity per unit projected area of the surface in a given direction. It is denoted by (L) and is measured in candela/m^2.

Lumen

It is defines as the amount of luminous flux given out in a space represented by one unit of solid angle by a source having intensity of one candle power in all directions.

Candle Power

It is a light radiating capacity of a source in a given direction and is defined as the number of lumens given out by a source in a unit solid angle in a given direction. It is denoted as C.P.

Lux

It is the unit of illumination and is defined as the luminous flux falling per square meter on the surface which is everywhere perpendicular to the rays of light from a source of one candle power and one meter away from it.

Foot Candle

It is the unit of illumination in FPS system and is defined as the luminous lux falling on the surface of a sphere of one foot radius where the light is falling from the center of sphere from one candle power source.

Mean horizontal candle power

It is defined as the mean of candle powers in all directions in the horizontal plane containing a source of light.

Mean spherical candle power

It is defined as the mean of candle power in all directions and in all planes from the source of light.

Mean hemisphere candle power

It is defined as the mean of candle power in all directions above or below the horizontal plane from a source of light.

Reduction factor

It is the ratio of the mean spherical candle power to the mean horizontal candle power.

Plane angle

It is an angle constructed on a particular point by two straight lines in one plane is denoted by delta and is expressed in radians.

Solid angle

It is the angle generated by the surface passing through the point in space and the periphery of the area and isdenoted by omega and expressed in steradians.

Maintenance factor

It is the ratio of illumination under normal working conditions to the illumination when things are perfectly clean.

Utilization factor

It is the ratio of total lumens reaching the working plane to total lumens given out by the lamp is called utilization factor.

Introduction About Autocadd Software

- AutoCAD is a commercial software application for 2D and 3D computer-aided design (CAD) and drafting — available since 1982 as a desktop application and since 2010 as a mobile web- and cloud-based app marketed as AutoCAD 360.
- Developed and marketed by Autodesk, Inc., AutoCAD was first released in December 1982, running on microcomputers with internal graphics controllers. Prior to the introduction of AutoCAD, most commercial CAD programs ran on mainframe computers or minicomputers, with each CAD operator (user) working at a separate graphics terminal.
- AutoCAD is used across a wide range of industries, by architects, project managers, engineers, graphic designers, and other professionals. It is supported by 750 training centers worldwide as of 1994.[1]
- As Autodesk's flagship product, by March 1986 AutoCAD had become the most ubiquitous CAD program worldwide.

Fig.1 Symbol of AUTOCAD Software

Introduction of Dailux Software

DIALux is continuously being developed by a team of 20. You can plan in DIALux with the luminaries of the world's leading

manufacturers and therefore have the greatest possible freedom in the design process. And the list of international partner companies is getting longer and longer[6].

Fig. 2 Symbol of DIALux Software

Benefits of the Software

The software gives the layered structure of the whole system then it will help in selecting the no of lights required for the project will help in selecting the types, height, angle, development of LUX required for the project.

Simple, effective and professional light planning gives the following additional benefits:

- Latest luminaries data of the world's leading manufacturers
- Latest state of the art software always available free of charge
- Energy evaluation at the drop of a hat
- Coloured light scenes with LED or other colour changing luminaries indian standards as per bee

BEE: - Bureau of Energy Efficiency

Bureau of Energy Efficiency is an Organization which specifies Standards of Different Sections which was set up at 1st March 2002.

Table 1 Indian Standards

Education		
No.	Types of Interior	Required Lux (Min-Avg-Max)
1	Assembly Hall	200-300-500
2	Teaching Space	200-300-500
3	Lecture Theaters	300-500-750
4	Seminar Rooms	300-500-750
5	Art Rooms	300-500-750
6	Needlework Rooms	300-500-750
7	Laboratories	300-500-750
8	Library	200-300-500
9	Music Rooms	200-300-500
10	Sports Halls	200-300-500
11	Workshop	200-300-500
12	Canteen	150-200-300
13	Computer Centre	300-500-750
14	Staffroom	200-300-500

Tools

1) LUX Meter (KM LUX-99)

2) Measuring Tape

3) Calculator

4) Laptop

Types of Lightning System

- Conventional Lightning System
- Led Lightning System

Case Study of Conventional Lightning

The Software was used to design lighting for conventional lights. Here we have given example of classroom. The conventional lights are placed at different location in the classroom and the values are obtained of the particular section. It is necessary to maintain LUX throughout this section as per standards. We placed conventional lights (Philips) at different points t required illuminations.

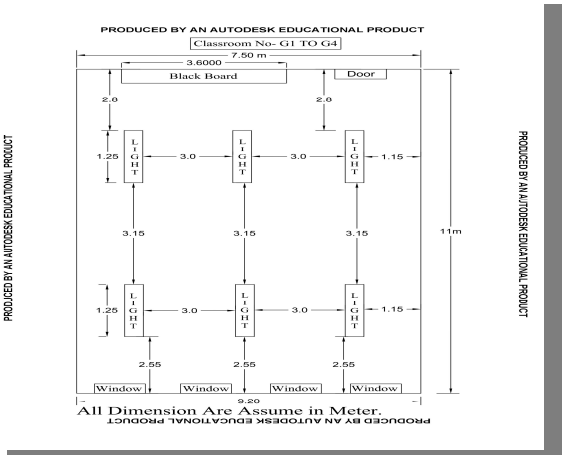


Fig.3 CAD File of Classroom

Lightning designing in dialux software

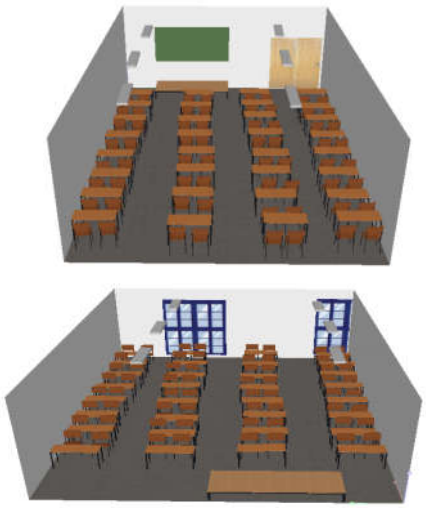


Fig.6 Conventional Lighting Design in DIALux Software

Conventional Light Lux Measurement Table

Table 2 LUX Table

DATE:14/9/2015	LUX-MEASUREMENT (WITH LIGHT)		CLASS : F1	
SEASON:WINTER UNIT : LUX			TIME: 4:20 PM METER: KMLUX99	
10	125	135	56	44
9	113	140	110	85
8	110	88	111	123
7	82	85	86	110
6	68	75	93	56
5	62	65	110	75
4	66	78	120	88
3	91	44	155	110
2	95	69	226	120
1	52	71	224	110
BENCH NO.	A	B	C	D

The above table is LUX table obtained in software. As per Indian standard the minimum value should be 300 lux and the maximum value should be 750 lux. But as observed in the table, the required LUX is not obtained. So we are going to place LED lights in different points to get required LUX.

RESULTS OF CONVENTIONAL LIGHT

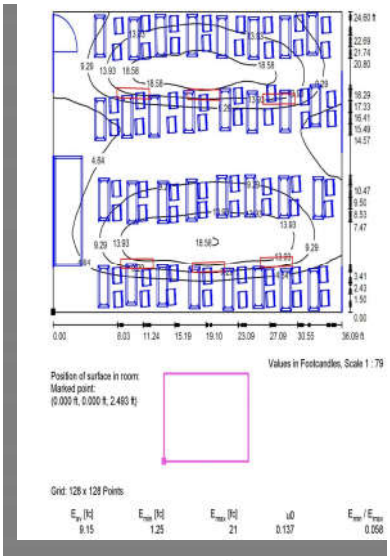


Fig.7 Isoline

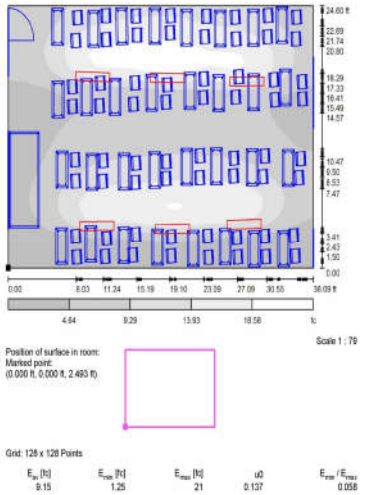


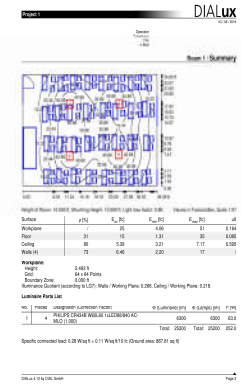
Fig.8 Grey Scale

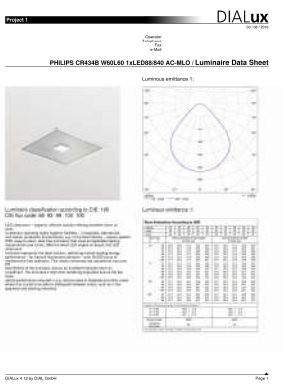
Case study in led lightning system

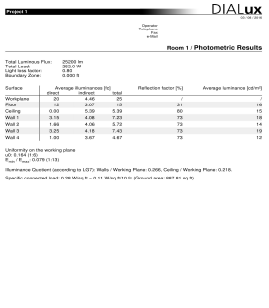
Fig.10 LED Lightning Design in DIALux Software

The Software was used to design lighting for LED lights. Here we have given example of Classroom. The LED lights are placed at different location in the Classroom and the values are obtained of the particular section. It is necessary to maintain LUX throughout this section as per standards. We placed LED lights (Philips) at different points t required illuminations.

RESULTS OF LED LIGHTNING SYSTEMS







Calculation of Payback Period For Conventional Light Replaced By Led Lights

Total No. of Class in Collage: 20
Total No. of Laboratory in Collage: 41
Total No. of Other Rooms: 4

Total Power Consumption of **Class**: 7560 watt
Total Power Consumption of **Laboratory**: 15480 Watt
Total Power Consumption of **Other Rooms, Principal office,**

Admin Offices etc.: 8160 Watt

Total Power Consumption when **Conventional Light source** use: 31200 Watt

Total Power Consumption when **LED Light Source** Use: 12240 Watt

Energy bill Cycle	Total Hours per Day	Kwatt	Total Unit-Kwh	Total Days per Month	Per Unit Cost	Total Cost per Month in Rs.
For Conventional Light	10	31200	312000	26	4	32448
For LED Light	10	12480	124800	26	4	12979

Total Cost of LED with installation Cost= 550*520 = 286000 Rs.

Pay Back Period

Payback Period = Net Investment / Net Cash Flow = 286000/16848 = 18 Month
The Profit per Month = 16848 Rs.
Total Saving for One Year = 202176 Rs.
advantages and disadvantages

Disadvantages of Conventional Lights

- Waste of lot of energy as heat
- Smaller life
- High billing cost
- Less energy efficient
- Pollutants released into the atmosphere

Advantages of LED Lights over Conventional Lights

- Green technology
- Long source life
- High lumen efficiency
- Low maintenance
- No moving parts
- Low power consumption
- Little heat; no radiated heat from light
- Natural coupling for digital control
- Non-insect attracting
- Fast response

Table 3 Savings Table

LUX	INCANDESCENT	CFL	LED	SAVINGS
500	40 watts	9 watts	7 watts	Rs 990-2650

From above table it is observed that for same LUX the power ratings for different lightings are different. For example, if we use 500 LUX than for Incandescent lights it consumes 40 watts, for CFL lights it consumes 9 watts and for LED Lights it only consumes 7 watts. The savings per annum is around Rs 990-2640. So from this we can conclude that LED Lights consumes less power as compared to Conventional lights and it has Longer Life.

CONCLUSION

Initially, we had analyzed the present Conventional Lightning system. We had also observed that in some sections sufficient lighting is not getting. This we came to know by measuring the LUX assessment in different sections.Then we had designed all sections of which we had done LUX assessment in DIALux software. In this software, we had found the required output of some parameters such as Gray Scale, Lux Table and Isolines. We observed form this that how much required lux is getting at particular working sections. At this stage we came to conclusion that proper lighting according to the standard LUX is need to be installed which would be our future work. Apart from that we would be designing for same system in LED light.

References

1. IJERT A Case study on insufficient lighting Volume 05, Issue 05, May 2015, Page Number 778-780. Sharma Ajay G, Deepa Karwat and P A Shah.
2. IJSRD Volume 2
3. IJERT Volume 3
4. IJCR December-2015 Volume 12
5. http://www.dail.de/DAIL/.html
6. Indian Standard Code of practise For Interior Illumination Part 1, May 1994 Bureau of Indian Standard 1992.
7. http://en.wiki.dialux.com/index.php/General\
8. http://camerapedia.wikia.com/wiki/Dialux
9. http://www.dial.de/DIAL/en/dialux/software-history.html
10. Indian standard
11. http://copublications.greenfacts.org/en/energy-saving-lamps/l-3/1-light-electromagnetic-spectrum.htm
12. http://www.americanelectriclighting.com/Library/Photometry/default.asp?path=/American_Electric_Lighting

****

How to cite this article:

Kartik K Patel *et al*.2016, Design Analysis of Power Saver Lighting System For Engineering Education College Building By Dialux Software. *Int J Recent Sci Res.* 7(6), pp. 11945-11949.

TSSN 0976-3031