

GOVT DEGREE COLLEGE GAMBHIRAOPET

DEPARTMENT OF PHYSICS

2021-22

STUDENT STUDY PROJECT

ON

“LEDS – POWER & MONEY SAVERS”.

GAMBHIRAOPET



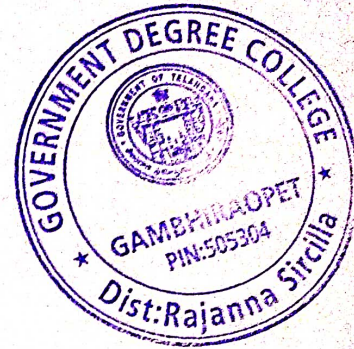
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SUPERVISOR: N.ADIVISHNU, LECTURER IN PHYSICS



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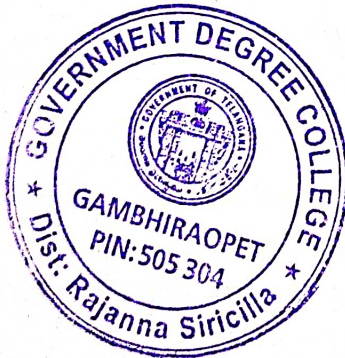
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CERTIFICATE

This is certify that I,II& III year B.Sc (M.P.C & M.P.Cs) students participated in study project conducted by the department of physics under the supervision of **N.ADIVISHNU** titled on "LEDS POWER & MONEY SAVERS" regarding student study project for 2021-2022.




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TITLE OF THE PROJECT:

“LIGHT EMITTING DIODE (LED)” IS OUR BEST LIGHTING CHOICES TO SAVE OUR MONEY *and POWER*

Hypothesis

LED lamp of ^{1.5} watt emits the same amount of light as by the other lamps of 60watt and one of the fastest way to cut our energy bills.

AIMS AND OBJECTIVES

1. Switching to energy-efficient lighting.
2. By replacing our home's most frequently used light bulbs such as halogen incandescent, CFL by LED light bulbs are available today for money saving.
3. LED light bulbs provides the choices in colors

REVIW OF LITERATURE

We use light bulbs everyday to brighten up our homes, dark corridors, streets and many more.

Lighting consumption constitutes about 30% of residential consumption as per a study by Ministry of Environment and Forest in India. Its contribution in your electricity bill may vary from 10-20% depending on your total bill. Although it may not be a major contributor in the electricity bill, the energy efficient options are fairly simpler to implement and provide higher rate of returns.

Latest technical advancements in lighting provide with a lot of options for energy savings today. The energy saving lighting options are a little expensive compared to the old incandescent options and old tubelights, but the payback time for them considering the savings it provides is quite short depending on the usage (mostly less than a year for average usage). Also the life of the new energy saving lighting options are far better than those of the old lights, which makes them much more attractive. There are several lighting options that are available in the market which are discussed below:

Incandescent Bulbs: The traditional yellow light bulbs which were available in various variants: 40W, 60W and 100W, are the most inefficient in terms of energy consumption. 90% of the energy they consume is lost as heat and only 10% is converted into useful light. Although they are still quite inexpensive (Rs 10/-) and a lot of households still use it, but they are the energy guzzlers. Many countries in the world have stopped producing them. Even if they are still there in working condition in several households, it makes a lot of sense to replace them with energy efficient options just from a cost saving perspective



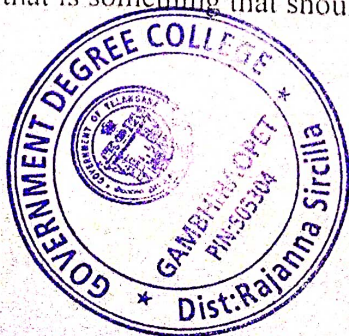

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Tubelights: The fluorescent lamps are better than Incandescent bulbs (50-70% better in providing same amount of light) and they have been there in the market since quite some time. It started coming in the form of tubelights (something which most of us have known since our childhood) and later graduated to come in form of CFLs. In past tubelights used to come with electromagnetic ballast which caused the lights to flicker on start. Now a days we get electronic ballast which prevents the fluorescent lamps to flicker.

Most tubelights today have electronic ballast. Tubelights are also available in various variants: T12, T8 and T5. These numbers represent the thickness of the tubelight. The smaller the number, the higher the efficiency. *T5 tubelights with electronic ballast are the best available fluorescent tubelight options in the market.* A T12 tubelight with a electromagnetic ballast typically consumes 55W of electricity but a T5 with electronic ballast will consume only 28W of electricity (comparison is for a 4 feet tubelight). Thus a T5 provides about 50% electricity saving over a regular T12 tubelight. T8s are typically 38W tubelights and are better than T12s. Although T5s are little expensive, the payback is within a year. Also their life is quite good and they last for 3-4 years at least. Many companies give 1-2 year replacement warranty on T5s. Thus the payback happens within the warranty period.

CFLs: CFLs have been regarded as the best energy saving option in our country since quite some time. CFL is a variant of fluorescent lamps (or tubelights) but has a different application. CFLs act as a point source of light (light originating from one point) whereas tubelights are line source (tubelights have bigger lengths) and thus the area covered by tubelights is lot more than that of CFLs. This is the reason why a lot of people feel that CFLs produce lesser lights than tubelights. Even with equal wattage (2x14W CFLs) the amount of light is felt lesser than a T5 tubelight (of 28W) because of CFL being point source. CFLs being compact in size provide options to create smaller (lower wattage) bulbs that can cater to locations where tubelights provide extra brightness (more than required). CFLs provide up to 70% energy savings over a typical incandescent bulb. Although a little more expensive than a incandescent, payback happens within a year.

LEDs: LEDs are the latest and most efficient lighting option which is available in the market. Their electricity consumption is 50% less than that of CFLs and fluorescent lamps for the same amount of light. LEDs also are long lasting with a life of about 10-25 years and their performance remains the same throughout their lifetime (Tubelights and CFLs get dim with time). Although a little expensive (with a payback of about 2 years), the benefit with LEDs is that it is maintenance free. Once installed, it will not need any repair or change for at least 10 years. A lot of companies manufacturing LED options give replacement warranty for up to 10 years which makes the option even more attractive. The only drawback of LEDs is the angle covered by the light. CFLs and tubelights provide lights in 360° where as for LEDs the angle depends on the kind of reflectors used in the bulb. Some do provide larger angles so that is something that should be checked before buying.

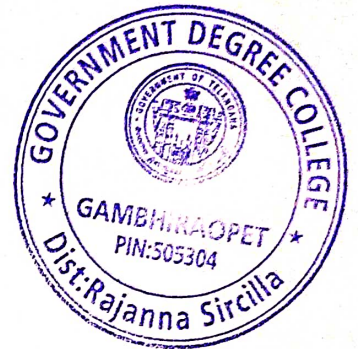
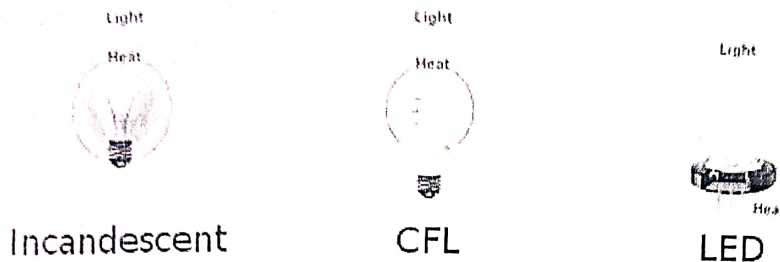



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What is LED and how it differs from other types of lights?

LEDs are a member of type of lighting most commonly referred as solid-state lighting. This type of lights illuminate when current passes through a semi conductor material. They produce more "light" and very less "heat". In comparison an incandescent bulb lights up when the filament in it heats up. Thus it releases 90% of its electricity as heat. CFLs or tubelights light up when electricity current is passed through tube containing gases. CFLs also release heat but less than incandescent and more than LEDs.

The other major difference is that LEDs are unidirectional (or emit light in a specific direction) but incandescent and CFLs emit light in all directions.



FOR LIGHTS LOOK FOR LUMEN AND NOT JUST WATTS




Wattage of the bulb or tubelight has been traditionally used as the measure of amount of light produced by it, but watts does not represent the actual amount of light produced. The amount of light produced is represented by a term called lumen. So to compare two lights, one should compare the lumen of output and the angle of delivery of light. Wattage just helps one estimate the power consumption

For lights look for lumens and not just watts.

Watts is what a light source consumes

Lumens is amount of light it gives

Efficiency of light is measured in lumens/watt

 A 100 watts incandescent bulb gives 1600 lumens	 A 23 watts CFL gives 1400 lumens	 All Tubelights (28 watts T5 and 36 watts T8) give about 2600 lumens.
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BECAUSE SAVING ENERGY SAVES MONEY

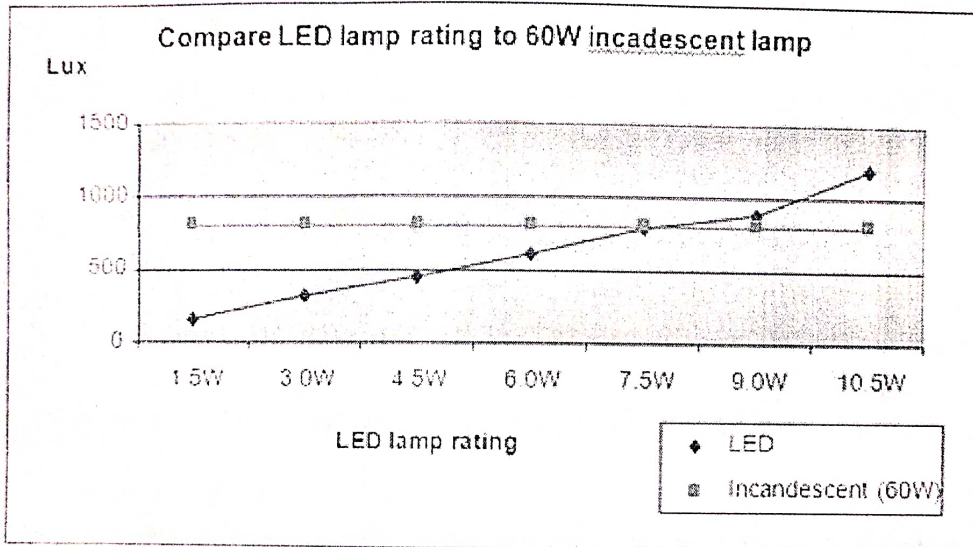
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DATA COLLECTION: FOR "LIGHT EMITTING DIODE (LED)" IS OUR BEST LIGHTING CHOICES"

Observation: It was observed that the 60W incandescent lamp provided the same brightness as a 7.5W LED lamp, showing that LED lamps provide the same brightness at a lower wattage and power consumption compared to the incandescent lamps.

Lamp type	LED wattage and luminous intensity (lux)						
	1.5W	3.0W	4.5W	6.0W	7.5W	9.0W	10.5W
LED	163	327	458	610	785	883	1187
Incandescent (60W)	812	812	812	812	812	812	812




Conclusion: OUR LIGHTING CHOICES IS "LED"

LED lamps consume less power compared to an incandescent lamp in order to provide the same level of brightness.

References (Secondary sources) :

1. <https://energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money>
2. Incandescent light bulb - http://en.wikipedia.org/wiki/Incandescent_light_bulb
3. LED lamp - http://en.wikipedia.org/wiki/LED_lamp
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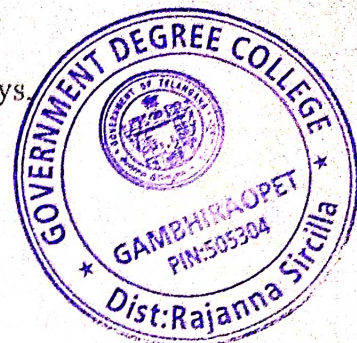
Primary sources: Different lamps used in institutions located in Gambhiraopet for estimation of monthly electric current bills.


1. Government Degree college, 2. Government Junior College, 3. ZPHS Boys,
4. ZPHS Girls, 5. MPPS T/M, 6. MPPS U/M, 7. Socail welfare Hostel

METHOD : Data collection by Questionnaire.

Questions that are asked related to this project are

1. How many rooms(principal, Headmaster, staffroom and office rooms any other)are there in your institution.
2. How many incandescent lamps(60watt) are used in your institution and what are their wattage
3. How many tubelamps(tublights)are used in your institution and what are their wattage.
4. How many CFL lamps are used in your institution and what are their wattage.
5. How many LED lamps are used in your institution and what are their wattage.
6. How many hours per day the lamps are used. Approximately.
7. How many days in a month your institution consumes electrical power.
(Approximately)
8. How much your institution consumes Average Electrical power (in KWH or units) in a month.(please check current bills).
9. How much you paying monthly Electrical power bill?
10. If you are not using LED lamps in your institution, What is the reason?




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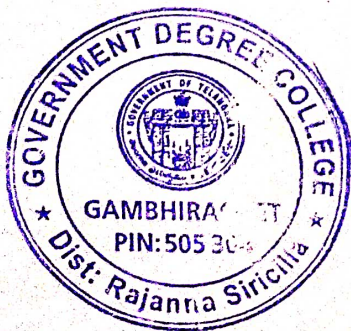
DATA ANALYSIS

Comparison of current bill: LED V/s Other Lamps

Sl. no	Name of the institution	No. of 60 W bulbs	Total Watts	Consumption In hours per day	Watt Hour	Kilo Watt Hour	KWH Per year	Bill Per Year IN RS
1	GDC	60	3600	08	450	3.6	8640	43200
2	GJC	25	1500	10	150	1.5	4500	22500
3	ZPHS (Boys)	23	1380	10	138	1.38	4140	20700
4	ZPHS (Girls)	25	1500	10	150	1.5	4500	22500
5	MPPS U/M	20	1200	10	120	1.2	3600	18000

WITH LEDS

Sl. no	Name of the institution	No. of LEDS REQ 9W	Total Watts	Consumption In hours per day	Watt Hour	Kilo Watt Hour	KWH Per year	Bill Per Year IN RS
1	GDC	60	540	08	67.5	0.54	1296	6480
2	GJC	25	225	10	22.5	0.225	675	3375
3	ZPHS (Boys)	23	207	10	20.7	0.207	621	3105
4	ZPHS (Girls)	25	225	10	22.5	0.225	675	3375
5	MPPS U/M	20	180	10	18.0	0.18	540	2700




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RESULT: From the above table we observe that Electrical power bill is less for LEDs


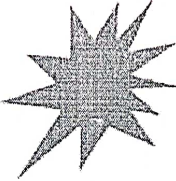
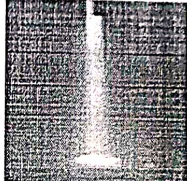

CONCLUSION: "LIGHT EMITTING DIODE (LED)" IS OUR BEST LIGHTING CHOICES TO SAVE OUR MONEY

SUGGESTION: It is better to buy LED of a good brand or buy one that comes with a longer warranty.

LED BULBS BUYING GUIDE



While buying look for:

 <p>Watts</p> <p>Watts is a measure of electricity consumption. Lower the watts lesser the electricity consumption.</p>	 <p>Lumens</p> <p>Lumens is a measure of brightness or light output. More the lumens per watt, better it is. Lumens per watt varies with beam angle.</p>	 <p>Beam Angle</p> <p>Typical LED bulbs have a beam angle of 120 degrees, but down-lighters have different beam angles. Choose the right beam angle.</p>	 <p>Color</p> <p>LEDs are available in various colors from white (daylight) to yellow (warm white). Choose the right color as per your preference.</p>
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Benefits of using LEDs →

- * Energy Efficient
- * Long Life
- * Compact Size
- * Low Temperature

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Because smart electricity saves money

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