

Report
On
Energy Audit
At
G B Murarka Arts and Commerce College, Shegaon
(Year 2022-23)



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Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of G B Murarka Arts and Commerce College, Shegaon for awarding us the assignment of Energy Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures through energy savings. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO₂ emissions. College consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table no 2.1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	592	0.47
2	Minimum	242	0.19
3	Average	411	0.33
4	Total	4,926	3.94

2. Energy Conservation Projects already installed

1. Usage of LED lights at some indoor locations
2. Usage of LED Lights for outdoor lighting.
3. Usage of STAR rated fans at new installations

3. Key Observations

1. Usage of LED lights.
2. Usage of star rated equipment.
3. Maintained a good power factor.

4. Percentage of Usage of LED Lighting

The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 100%.

5. Recommendations

Table no 1: Recommendations for energy savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 37 Nos Old Ceiling Fans with STAR rating fans	481	5,291	80,438	182
2	Installation of 2.5kW grid connected PV panel	3,750	41,250	125,000	36
	Total	4,231	46,541	205,438	53

6. Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

Abbreviations

CFL : Compact Fluorescent Lamp

FTL : Fluorescent Tube Light

LED : Light Emitting Diode

V : Voltage

I : Current

kW : Kilo- Watt

kWh : kilo-Watt Hour

kVA : Active Power

1. Introduction

Seth G.B. Murarka Arts and Commerce College, Shegaon is a very popular college in the state of Maharashtra. Seth G.B. Murarka Arts and Commerce College, Shegaon was established in 1964. It is one of the leading college in Arts, Humanities and Social Sciences and Business Finance and Commerce. It is located in Shegaon, Maharashtra.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

1.3 General Details of College

Table No-1.1: Details of college

No	Head	Particulars
1	Name of Institution	G B Murarka Arts and Commerce College, Shegaon.
2	Address	Anand Sagar, Rokadiya Nagar, Shegaon, Maharashtra 444203
3	Affiliation	Sant Gadge Baba Amravati University, Amravati.

2. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

Table No-2.1: Location wise study of Electrical fittings in various buildings

No	Location	LED tube (20W)	Computers (65W)	Fan
1	Room no 4	1		2
2	Room no 5	1		2
3	Seminar hall	5		6
4	Room no 6	1		2
5	Room no 7	1		2
6	NCC	1		1
7	Sports room	2		
8	Room no 9	1		2
9	Library	6	3	5
10	Principal room	4	1	2
11	Staff room	2		2
12	Office	3	2	3
13	Room no 3	2		3
14	Computer lab	2	5	1
15	Girls common room	2		2
16	Gym	2		2
	Total	36	11	37

Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	Ceiling Fan	37	65	2.4
2	LED-20W	36	20	0.7
3	Computers	11	65	0.7
4	Pumps (1HP)			0.8
	Total			4.6

Data can be represented in terms of PIE chart as under,

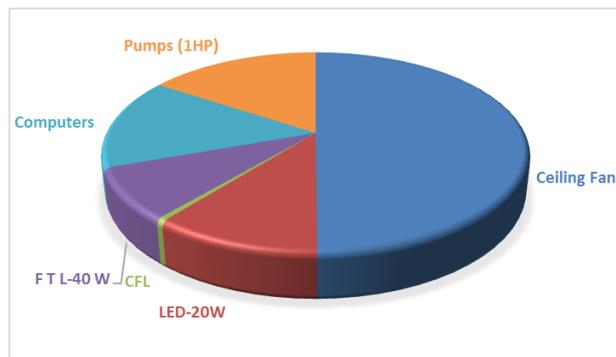


Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-23	478	4,510
2	May-23	493	4,572
3	Apr-23	490	4,303
4	Mar-23	344	3,083
5	Feb-23	320	2,971
6	Jan-23	294	2,750
7	Dec-22	326	3,068
8	Nov-22	242	2,249
9	Oct-22	510	4,771
10	Sep-22	592	4,967
11	Aug-22	412	3,828
12	Jul-22	425	3,976
	Total	4,926	45,048

Variation in energy consumption is as follows,

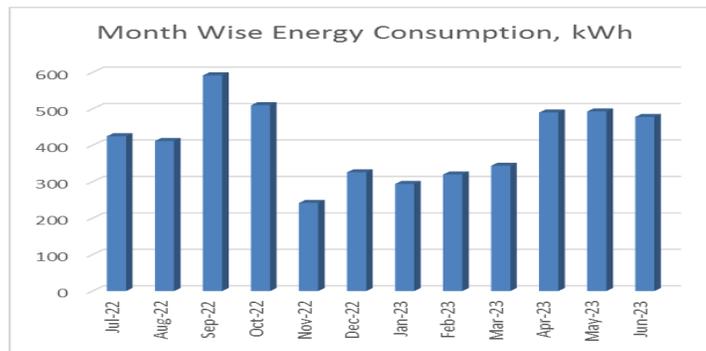


Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

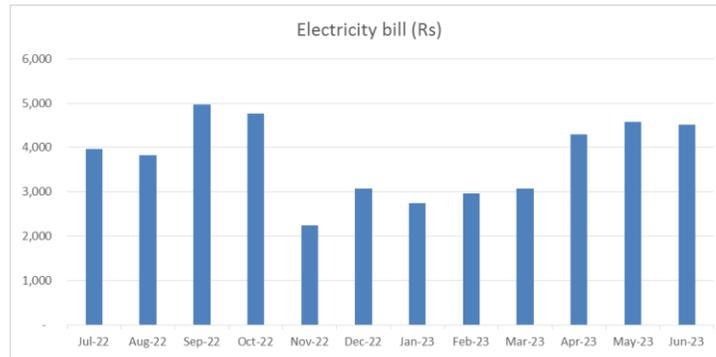


Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	592	0.47
2	Minimum	242	0.19
3	Average	411	0.33
4	Total	4,926	3.94

4. Carbon Foot printing

1. A **Carbon Foot print** is defined as the Total Greenhouse Gas emissions (CO₂ emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO₂ Emissions:

The basis of Calculation for CO₂ emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere.

Based on the above Data we compute the CO₂ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

Table 4.1: Month wise Consumption of Electrical Energy & CO₂ Emissions

No	Month	Energy Consumed, kWh	CO ₂ Emissions, MT
1	Jun-23	478	0.38
2	May-23	493	0.39
3	Apr-23	490	0.39
4	Mar-23	344	0.28
5	Feb-23	320	0.26
6	Jan-23	294	0.24
7	Dec-22	326	0.26
8	Nov-22	242	0.19
9	Oct-22	510	0.41
10	Sep-22	592	0.47
11	Aug-22	412	0.33
12	Jul-22	425	0.34
	Total	4,926	3.94

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

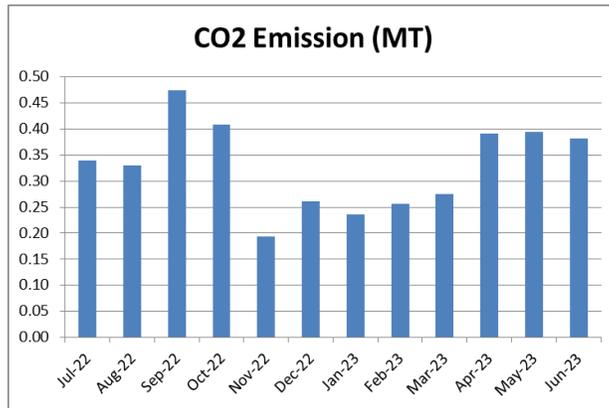


Figure 4.1: Month wise CO2 Emission

5. Study of utilities

5.1 Study of Lighting

In the facility, the lighting system can be divided mainly in to parts, indoor lighting and outdoor lighting. There are 36 LED tubes.

5.2 Ceiling Fans

At building facility, there are about 37 Nos Old Ceiling Fans, which consumed about 65 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans.

5.3 Water Pumps

There are in total 1 Water pumps with 1HP capacity.

6. Study of usage of LED lighting

In this chapter we study the lighting system of college and compute the percentage of total load catered by LED lighting.

Table 7.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
	LED lighting load			
1	LED tube	36	20	0.72
	Total LED lighting load			0.72
	Total Lighting load			0.72

It can be seen that out of total lighting load 100% load is LED lighting load.

7. Energy conservation proposals

7.1 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 37 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	37	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	52	W/Unit
4	Reduction in demad	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	1.924	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	481	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	5291	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	80438	Rs lump sum
13	Simple Payback period	182	Months

7.2 Installation of Solar PV panel

It is recommended to install 2.5 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of 2.5kW PV unit	2.5	kW
2	Energy saving	3750	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetary savings	41250	Rs/ Annum
5	Investment required	125000	Rs lump sum
6	Simple payback period	36	Months

7.3 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 37 Nos Old Ceiling Fans with STAR rating fans	481	5,291	80,438	182
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