



NAAC ACCREDITED (B++ GRADE)
SHRI CHHATRAPATI SAMBHAJI SHIKSHAN SANSTHA'S

SITABAI THITE COLLEGE OF PHARMACY

Approved by, PCI, DTE,

Affiliated to Savitribai Phule Pune University (ID No. PU/PN/Pharma/174/2001)



Dr. Rajendra N. Thite
MA (Sociology, Indology),
MBA, Ph.D.
President

Dhananjay N. Thite
B.E. (Computer)
Secretary

Dwarkadas Baheti
M.Pharm, Ph.D.
Principal

Late Bapusaheb Thite
Ex. State Home Minister (Mah.)
Ex. Member of Parliament (Baramati)
Founder President

7.1.6 - Quality audits on environment and energy are regularly undertaken by the institution

**Report
On
Energy Audit
At
Sitabai Thite College of Pharmacy, Shirur
(Year 2023-24)**



Prepared by
Nutan Urja Solutions
A 703, Balaji Whitefield, Near Sunni's World,
Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Contents

Acknowledgement	2
Executive Summary	3
Abbreviations	5
1. Introduction.....	6
1.1 Objectives.....	6
1.2 Audit Methodology:	6
1.3 General Details of College	6
2. Study of connected load.....	7
3. Study of Electrical Energy Consumption	10
4. Carbon Foot printing.....	12
5. Study of utilities.....	14
5.1 Study of Lighting	14
5.2 Ceiling Fans.....	14
5.3 Water Pumps	14
6. Study of usage of alternate energy.....	15
7. Study of usage of LED lighting	16
8. Energy conservation proposals	17
8.1 Replacement of old fans with STAR Rated fans.....	17
8.2 Installation of Solar PV panel	18
8.3 Summary of Savings	19

Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Sitabai Thite College of Pharmacy, Shirur 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	12,402	9.92
2	Minimum	7,234	5.79
3	Average	10,232	8.19
4	Total	122,779	98.22

2. Energy Conservation Projects already installed

1. Usage of LED lights at indoor locations
2. Usage of LED Lights for outdoor lighting.

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 Alternate Energy

The College has installed Solar Thermal Hot Water System.

5. Percentage of Usage of LED Lighting

The College has various Types of Light fittings. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 100 %.

6. 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 83 Nos Old Ceiling Fans with STAR rating fans	4,150	45,650	1,80,442	47
2	Installation of 50kW grid connected PV panel	75,000	8,25,000	25,00,000	36
	Total	79,150	8,70,650	26,80,442	37

7 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

The Sitabai Thite College of Pharmacy was established in the year 1995 with the aim to impart quality education with value based system which would empower the upcoming generation. The college offers Diploma (1995) & Degree (2001) in Pharmacy. In near future College is coming up with Post Graduate & Ph.D. Research Centre.

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	Sitabai Thite College of Pharmacy, Shirur
2	Address	Shri Chhatrapati Sambhaji Shikshan Sanstha's, Sitabai Thite College of Pharmacy, Shirur, Pune-412210 Maharashtra.
3	Affiliation	Savitribai Phule Pune University

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)	LED bulb (12W)	Computers (65W)	Fans
	Ground Floor				
1	Passage	8			
2	Pharmaceuticals Department	13			4
3	Toilet	3	5		
4	Pharma Analysis Lab	10			
5	Pharma Analysis Department	15			
6	Pharma Analysis HOD	1			1
7	Industrial Pharma Lab	9	4		5
	First Floor				
8	Passage	9			
9	Toilet	3	3		
10	Pharmacology Lab	6			2
11	Pharmacognocyc Lab	6			2
12	Staff Room	2			2
13	Computer Lab	7		33	4
14	Pharmacetic HOD	1			1
15	Library	17		13	8
16	Pharmacolony HOD	1			1
17	Digital Clock Room	6			6
18	Principal Office	2	15		7
19	Store	3			2
20	Girls Comman Room	2			2

21	Sick Room	1			1
	Second Floor				
22	Passage	6			
23	Toilet	3	5		
24	Pharma Chemistry Dept	13			3
25	Pharma Chemistry HOD	1			1
26	Auditorium	13			14
27	Classrooms	18			15
28	Exam Room	2			2
	Total	181	32	46	83

Apart from above load, the college has pumps, street lights. Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	LED Tube-20W	181	20	3.6
2	LED bulb	32	12	0.4
3	Computers	46	65	3.0
4	Ceiling Fan	83	65	5.4
5	LED focus Street light	22	35	0.8
6	Pumps (2 nos 2HP,7HP)			6.7
	Total			12.9

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

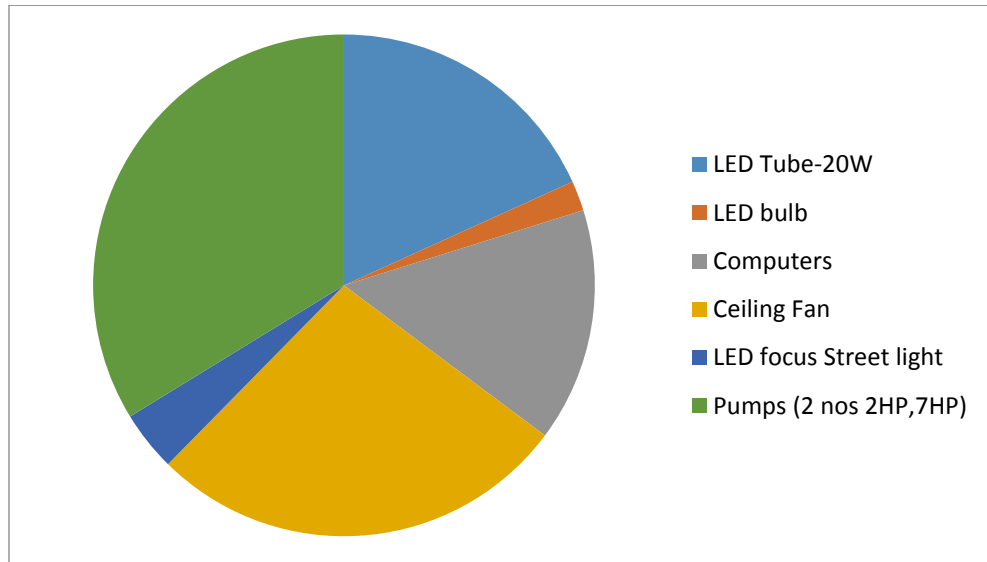


Figure 2.1: Distribution of connected load.

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	Jul-24	11,167	230,190
2	Jun-24	10,356	217,101
3	May-24	12,402	246,374
4	Apr-24	12,209	243,849
5	Mar-24	11,053	207,176
6	Feb-24	7,234	153,677
7	Jan-24	7,432	156,451
8	Dec-23	9,036	178,954
9	Nov-23	8,678	173,633
10	Oct-23	11,806	214,428
11	Sep-23	10,497	196,426
12	Aug-23	10,909	199,056
	Total	122,779	2,417,315

Variation in energy consumption is as follows,

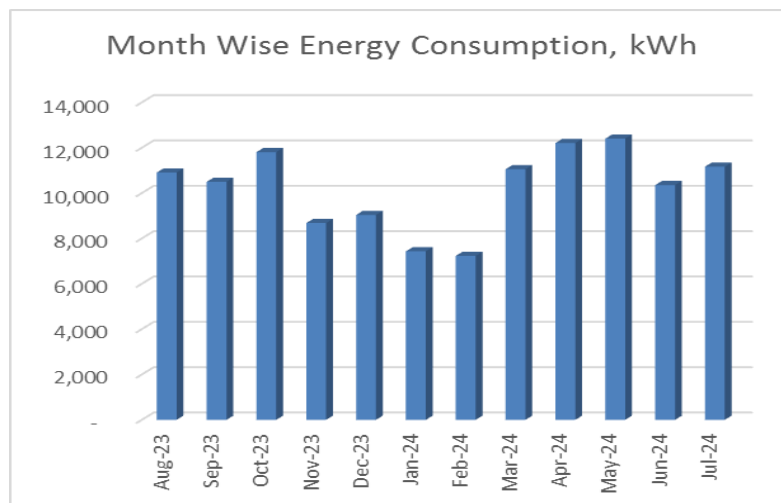


Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

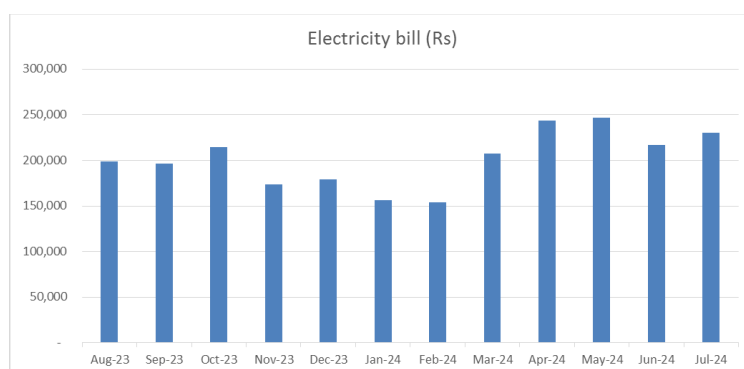


Figure 3.2: Month wise electricity bill

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	12,402	9.92
2	Minimum	7,234	5.79
3	Average	10,232	8.19
4	Total	122,779	98.22

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	Jul-24	11,167	8.93
2	Jun-24	10,356	8.28
3	May-24	12,402	9.92
4	Apr-24	12,209	9.77
5	Mar-24	11,053	8.84
6	Feb-24	7,234	5.79
7	Jan-24	7,432	5.95
8	Dec-23	9,036	7.23
9	Nov-23	8,678	6.94
10	Oct-23	11,806	9.44
11	Sep-23	10,497	8.40
12	Aug-23	10,909	8.73
	Total	122,779	98.22

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

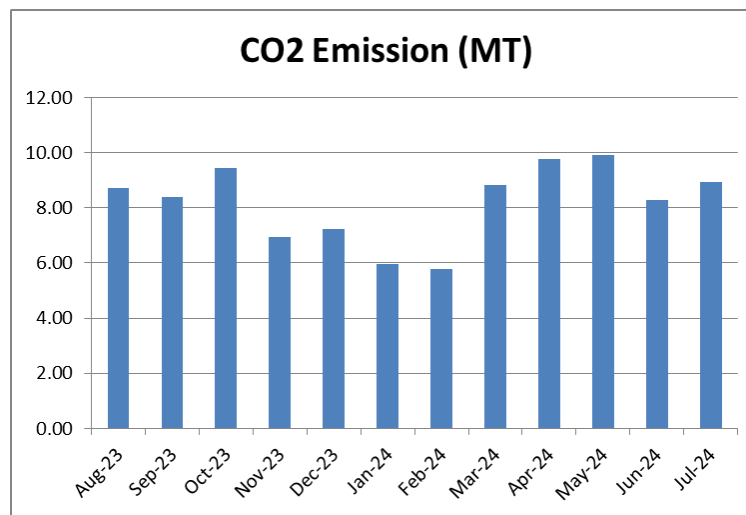


Figure 4.1: Month wise CO2 Emission

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 181 nos of LED tubes and 32 nos of LED bulbs. There are 22 No of LED street lights.

5.2 Ceiling Fans

At building facility, there are about 83 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 tota 2 Water pumps with 2HP and 7HP capacities respectively.

6. Study of usage of alternate energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Roof Top Solar Thermal Hot Water System at hostel terrace of 3000 liters capacity.

Photograph of Solar Thermal Hot Water System



7. 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	181	20	3.6
2	LED bulbs	32	12	0.4
3	LED street lights	22	35	0.8
	Total LED lighting load			4.8
	Total Lighting load			4.8

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

8. Energy conservation proposals

8.1 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 83 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	83	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	40	W/Unit
4	Reduction in demad	25	W/Unit
5	Average Daily Usage period	8	Hrs/Day
6	Daily saving in Energy	16.6	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	4150	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	45650	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	180442	Rs lump sum
13	Simple Payback period	47	Months

8.2 Installation of Solar PV panel

It is recommended to install 50 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of 50kW PV unit	50	kW
2	Energy saving	75000	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetary savings	825000	Rs/ Annum
5	Investment required	2500000	Rs lump sum
6	Simple payback period	36	Months

8.3 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 83 Nos Old Ceiling Fans with STAR rating fans	4,150	45,650	1,80,442	47
2	Installation of 50kW grid connected PV panel	75,000	8,25,000	25,00,000	36
	Total	79,150	8,70,650	26,80,442	37

Report
On
Environmental Audit
At
Sitabai Thite College of Pharmacy, Shirur
(Year 2023-24)



Prepared by
Nutan Urja Solutions
A 703, Balaji Witefield, Near Sunni's World,
Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Table of Contents

Acknowledgement	2
Executive Summary	3
Abbreviations.....	4
1. Introduction.....	5
1.1 Important Definitions:	5
1.2 Objectives.....	6
1.3 Audit Methodology:	6
1.4 General Details of College	6
2. Study of Consumption of Various Resources	7
2.1 Variation of Monthly Electrical Energy Consumption	8
2.2 Key Inference drawn	9
3. Study of Environmental Pollution	10
3.1 Air Pollution.....	10
3.2 Study of Solid Waste Generation	11
3.3 Study of Liquid Waste Generation.....	11
3.4 Study of e-Waste Management	12
4. Study of Rain Water Harvesting	13
5. Recommendations.....	14

Acknowledgement

We at Nutan Urja Solutions, Pune wish to express our sincere gratitude to the management of Sitabai Thite College of Pharmacy, Shirur for assigning the work of Environmental Audit of college campus.

We appreciate the co-operation and support extended to our team members during the entire tenure of field study.

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

We are also thankful to all other staff members who helped us during the Measurements at the field and for giving us the necessary inputs to carry out this vital exercise.

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the dependency on Natural resources & reduce the pollution.

Sitabai Thite College of Pharmacy, Shirur consumes various resources for day to day operations, namely: Air, Water, Electrical Energy & LPG.

1. Various Pollution due to College Activities:

- Air pollution: Mainly CO₂ on account of Electricity & LPG Consumption
- Solid Waste: Bio degradable Kitchen Waste, Garden Waste
- Liquid Waste: Human liquid waste

2. Present Level of CO₂ Emissions:

Sr no	Parameter	Energy consumed, (Units)	CO ₂ Emission (MT)
1	Maximum	12,402	9.92
2	Minimum	7,234	5.79
3	Average	10,232	8.19
4	Total	122,779	98.22

3. The various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
- Usage of Natural Day light in corridors
- Implementation of Bio Composting pit for disposal of Bio degradable waste
- Implementation of Rain Water Harvesting
- Installation of Solar Thermal Hot Water Systemm
- Installation of Sewage Treatment Plant

4. Recommendations:

1. Installation of Bio Gas Generator Plant instead of Bio composting Plant.

5. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere
2. 1 kWp Solar PV plant generates 5 kWh/day Electrical Energy for 300 days in an year.

Abbreviations

AC	: Air conditioner
PES	: Progressive Education Society
CFL	: Compact Fluorescent Lamp
FTL	: Fluorescent Tube Light
LED	: Light Emitting Diode
kWh	: kilo-Watt Hour
Qty	: Quantity
W	: Watt
kW	: Kilo Watt
PF	: Power Factor
M D	: Maximum Demand
PC	: Personal Computer
MSEDCL	: Maharashtra State Electricity Distribution Company Ltd

1. Introduction

1.1 Important Definitions:

1.1.1 Environment: Definition as per environment Protection Act: 1986

Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

1.1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and preservation

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment"

1.1.3. Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

1.1.4. Relevant Environmental Laws in India: Table No-1:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
1980	The Forest (Conservation) Act
1981	The Air (Prevention and Control of Pollution) Act
1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Some Important Environmental Rules in India: Table No-2:

1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules

2011	E-waste (Management and Handling) Rules
2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules

1.1.6 National Environmental Plans & Policy Documents: Table No-3:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency)
10.	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives

1. To study present usage of Natural resources the College is consuming
2. To Study the present pollution sources
3. To study various measures to make the campus Self sustainable in respect of Natural resources
4. To suggest the various measures to reduce the pollution: Air, Water, Noise

1.3 Audit Methodology:

1. Study of College as System
2. Study of Electrical Energy Consumption
3. Study of CO₂ emissions
4. Suggestions on usage of Renewable Energy

1.4 General Details of College

No	Head	Particulars
1	Name of Institution	Sitabai Thite College of Pharmacy, Shirur
2	Address	Shri Chhatrapati Sambhaji Shikshan Sanstha's, Sitabai Thite College of Pharmacy, Shirur, Pune-412210 Maharashtra.
3	Affiliation	Savitribai Phule Pune University

2. Study of Consumption of Various Resources

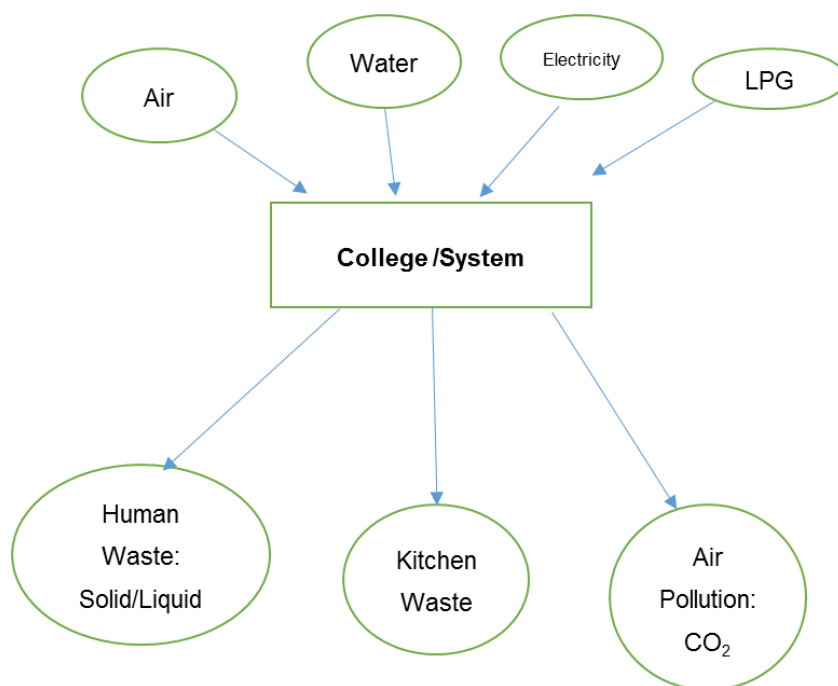
The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

Also, college emits following pollutants to environment

1. Human Waste: Solid/ Liquid
2. Kitchen waste
3. Air pollution

We try to draw a schematic diagram for the College System & Environment as under.



Now we compute the Generation of CO₂ on account of consumption of Electrical Energy & LPG as under.

The calculation of electrical energy consumption by college can be given as,

Table 2.1: Electrical Energy Consumption

No	Month	Energy (kWh)
1	Jul-24	11,167
2	Jun-24	10,356
3	May-24	12,402
4	Apr-24	12,209
5	Mar-24	11,053
6	Feb-24	7,234
7	Jan-24	7,432
8	Dec-23	9,036
9	Nov-23	8,678
10	Oct-23	11,806
11	Sep-23	10,497
12	Aug-23	10,909
	Total	122,779
	Maximum	12,402
	Minimum	7,234
	Average	10,232

2.1 Variation of Monthly Electrical Energy Consumption

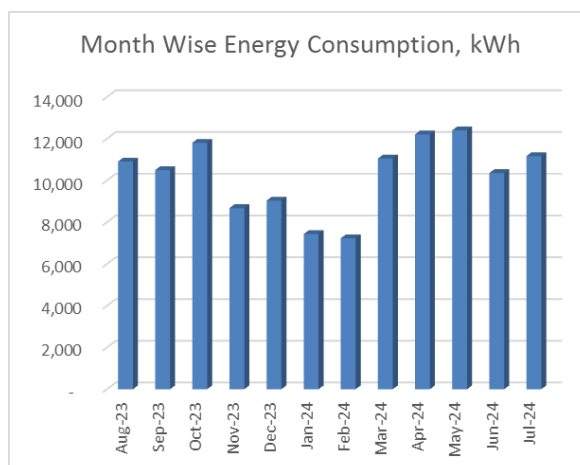


Figure 2.1 : Monthly Electrical Energy Consumption

2.2 Key Inference drawn

From the above analysis, we present following important parameters:

Table 2.2: Variation in Important Parameters

No	Parameter/ Value	Energy Consumed, kWh
1	Total	122,779
2	Maximum	12,402
3	Minimum	7,234
4	Average	10,232

3. Study of Environmental Pollution

In this Chapter, we present the various types of Pollution as under:

3.1 Air Pollution

The College is using two forms of Energies, namely: Thermal in the form of LPG and Electrical Energy used for day to day operations of the College. The major pollutant on account of above Energy forms is the Carbon Di Oxide.

- 1 unit (kWh) of Electrical Energy emits 0.8 Kg of CO₂ in the atmosphere
- 1 Kg of LPG emits 3 Kg of CO₂ in the atmosphere

In the following Table, we present the CO₂ emissions.

Table 3.1: Month wise Consumption of Electrical Energy & CO₂ Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jul-24	11,167	8.93
2	Jun-24	10,356	8.28
3	May-24	12,402	9.92
4	Apr-24	12,209	9.77
5	Mar-24	11,053	8.84
6	Feb-24	7,234	5.79
7	Jan-24	7,432	5.95
8	Dec-23	9,036	7.23
9	Nov-23	8,678	6.94
10	Oct-23	11,806	9.44
11	Sep-23	10,497	8.40
12	Aug-23	10,909	8.73
	Total	122,779	98.22

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

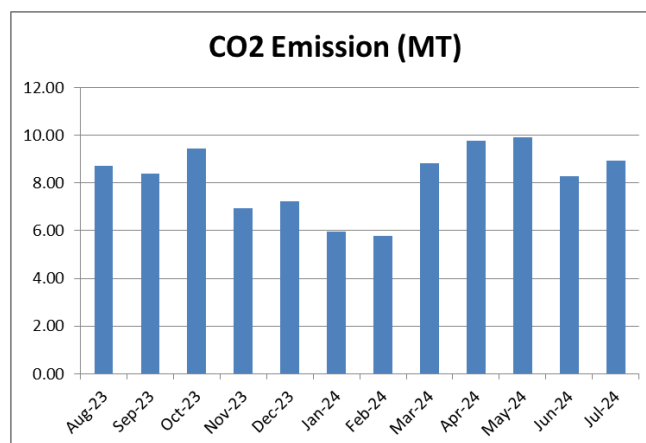


Figure 2.1: CO2 emission due to usage of electrical energy.

3.2 Study of Solid Waste Generation

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

3.2.1 Photograph of Bio Composting Processing Tanks



3.3 Study of Liquid Waste Generation

The waste water generated in college campus is treated in Sewage Water Treatment Plant. This plant aims to remove contaminants from sewage to produce an effluent that is suitable for reuse application. The plant is having water storage tank with having 1 lakhs liters capacity.

Photos of Sewage Water Treatment Plant



3.4 Study of e-Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting:



5. Recommendations

In order to reduce the dependency on Natural resources and also in order to reduce the various pollutions arising due to the day to day operations of the College we herewith recommend following recommendations.

- Installation of Bio Gas Generator Plant instead of Bio composting Plant.

**Report
On
Green Audit
At
Sitabai Thite College of Pharmacy, Shirur
(Year 2023-24)**



Prepared by
Nutan Urja Solutions
A 703, Balaji Witefield, Near Sunni's World,
Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Contents

Acknowledgement	2
Executive Summary	3
Abbreviations	5
1. Introduction.....	6
1.1 Objectives.....	6
1.2 Audit methodology.....	6
2. Study of Electrical Energy Consumption	7
3. Carbon Foot printing.....	9
4. Study of Usage of Alternate Energy	11
5. Study of Rain Water Harvesting.....	12
6. Study of Waste Management	13
6.1 Solid Waste Management.....	13
6.2 Study of Liquid Waste Generation.....	13
6.3 e-Waste Management.....	14
7. Study of Green Practices.....	15
7.1 No of students who don't use own Vehicle for coming to Institute.....	15
7.2 Usage of Public Transport.....	15
7.3 Pedestrian Friendly Roads.....	15
7.4 Plastic Free Campus	15
7.5 Paperless Office.....	16
8. Green Landscaping with Trees and Plants.....	17

Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Sitabai Thite College of Pharmacy, Shirur for awarding us the assignment of Green 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 and green practices. 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

Green Audit of Sitabai Thite College of Pharmacy, Shirur is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

1. Present Energy Consumption

Sitabai Thite College of Pharmacy, Shirur uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

Table no 1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	12,402	9.92
2	Minimum	7,234	5.79
3	Average	10,232	8.19
4	Total	122,779	98.22

2. Various Measures Adopted for Energy Conservation

1. Usage of LED lights at indoor locations
2. Usage of LED Lights for outdoor lighting.

3. Usage of Renewable Energy

The collage has installed Solar Thermal Hot Water System of 3000 liters capacity.

4. Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

5. Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden. The college has installed Sewage Treatment Plant.

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 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

The Sitabai Thite College of Pharmacy was established in the year 1995 with the aim to impart quality education with value based system which would empower the upcoming generation. The college offers Diploma (1995) & Degree (2001) in Pharmacy. In near future College is coming up with Post Graduate & Ph.D. Research Centre.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present CO₂ emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. 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

2. Study of Electrical Energy Consumption

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

Table no 2.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jul-24	11,167	230,190
2	Jun-24	10,356	217,101
3	May-24	12,402	246,374
4	Apr-24	12,209	243,849
5	Mar-24	11,053	207,176
6	Feb-24	7,234	153,677
7	Jan-24	7,432	156,451
8	Dec-23	9,036	178,954
9	Nov-23	8,678	173,633
10	Oct-23	11,806	214,428
11	Sep-23	10,497	196,426
12	Aug-23	10,909	199,056
	Total	122,779	2,417,315

Variation in energy consumption is as follows,

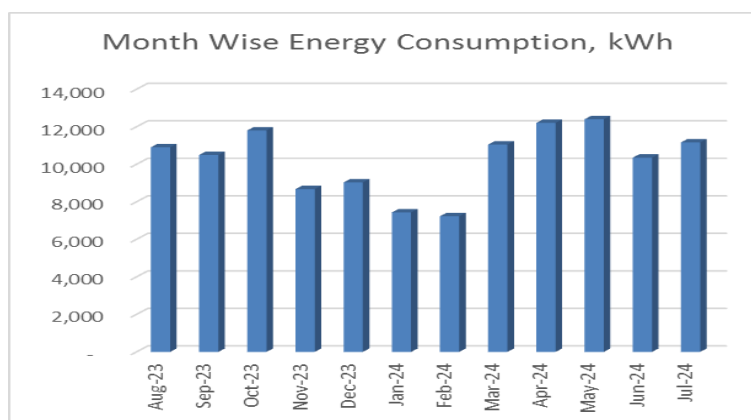


Figure 2.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

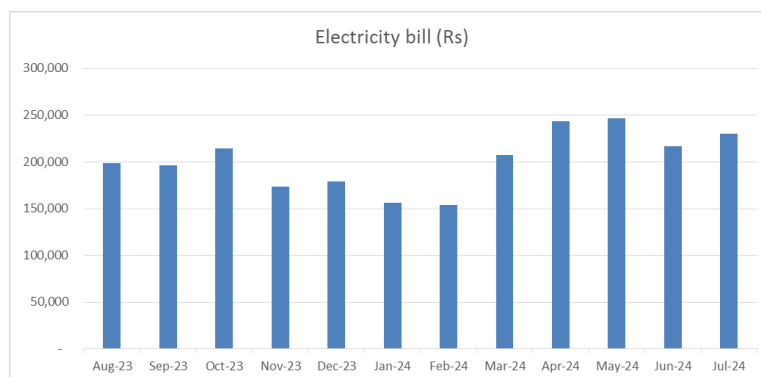


Figure 2.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 2.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	12,402	9.92
2	Minimum	7,234	5.79
3	Average	10,232	8.19
4	Total	122,779	98.22

3. 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 3.1: Month wise Consumption of Electrical Energy & CO₂ Emissions

No	Month	Energy Consumed, kWh	CO ₂ Emissions, MT
1	Jul-24	11,167	8.93
2	Jun-24	10,356	8.28
3	May-24	12,402	9.92
4	Apr-24	12,209	9.77
5	Mar-24	11,053	8.84
6	Feb-24	7,234	5.79
7	Jan-24	7,432	5.95
8	Dec-23	9,036	7.23
9	Nov-23	8,678	6.94
10	Oct-23	11,806	9.44
11	Sep-23	10,497	8.40
12	Aug-23	10,909	8.73
	Total	122,779	98.22

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

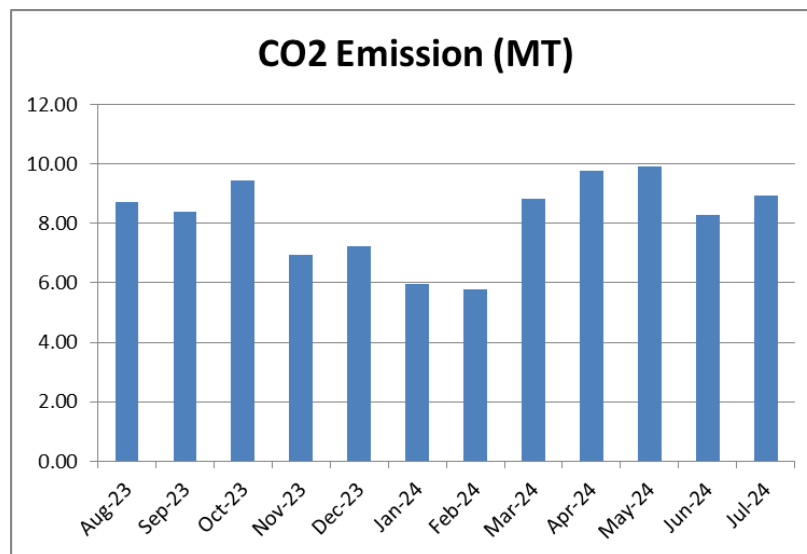


Figure 3.1: Month wise CO2 Emission

4. Study of Usage of Alternate Energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Roof Top Solar Thermal Hot Water System at hostel terrace of 3000 liters capacity.

Photograph of Solar Thermal Hot Water System



5. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting



6. Study of Waste Management

6.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

Photographs of Bio Composting Storage Tanks:



6.2 Study of Liquid Waste Generation

The waste water generated in college campus is treated in Sewage Water Treatment Plant. This plant aims to remove contaminants from sewage to produce an effluent that is suitable for reuse application. The plant is having water storage tank with having 1 lakhs liters capacity.

Photos of Sewage Water Treatment Plant



6.3 e-Waste Management

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

7. Study of Green Practices

7.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

7.2 Usage of Public Transport

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles. Institute encourages students to not to use automobiles.

7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of Road within campus



7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

8. Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.



Figure 8.1: Beautiful maintained Garden of college

List of medicinal trees in college camps are as follows.

Table 8.1: List of trees

Sr no	Name	Botanical Name
1	Adulasa	<i>Justicia adhatoda</i>
2	Pipali	<i>Piper longum</i>
3	Shetavari	<i>Asparagus racemosus</i>
4	Chitrek	<i>Plumbago zeylanica</i>
5	Bael	<i>Aegle marmelos</i>
6	Korphad	<i>Aloe vera</i>
7	Nirgudi	<i>Vitex negundo</i>
8	Mehendi	<i>Lawsonia inermis</i>
9	Sadaphuli	<i>Catharanthus roseus</i>
10	Astishunkla	<i>Cissus Quadrangularis</i>
11	Tulsi	<i>Ocimum tenuiflorum</i>
12	Palas	<i>Butea monosperma</i>
13	Jaswand	<i>Hibiscus rosa-sinensis</i>
14	Dalimb	<i>Punica granatum</i>
15	Gunj	<i>Abrus precatorius</i>
16	Erand	<i>Ricinus communis</i>
17	Arjuna	<i>Terminalia arjuna</i>
18	Baheda	<i>Terminalia bellirica</i>
19	Gavti Chaha	<i>Cymbopogon citratus</i>
20	Bahava	<i>Cassia fistula</i>
21	Guggul	<i>Commiphora wightii</i>
22	Anutha	<i>Bixa Orellana</i>
23	Sarpagandha	<i>Rauvolfia serpentina</i>
24	Hirda	<i>Terminalia chebula</i>
25	Bhulamala	<i>Phylanthus Niruri</i>
26	Sagargota	<i>Caesalpinia bonduca</i>
27	Parijatak	<i>Nyctanthes arbor-tristis</i>
28	Anantmul	<i>Hemidesmus indicus</i>
29	Kadhipatta	<i>Murraya Rutaceae</i>
30	Panphuti	<i>Kalanchoe pinnata</i>
31	Nagaphani	<i>Opuntia elatior Mill</i>
32	Ritha	<i>Sapindus mukorossi</i>
33	Rui	<i>Calotropis gigantea</i>
34	Raktarohida	<i>Tecomella undulata</i>
35	Bedki	<i>Gymnema sylvestre</i>
36	Kadhipatta	<i>Murraya Rutaceae</i>

37	Chandan	<i>genus Santalum</i>
38	Lemon	<i>Citrus limon</i>
39	Vekhanda	<i>Acorus calamus</i>
40	Bibhala	<i>Pterocarpus Marsuplum</i>
41	Safed Musali	<i>Chlorophytum borivilianum</i>
42	Anjira	<i>Ficus carica</i>
43	Amla	<i>Phyllanthus emblica</i>
44	Shevri	<i>Sesbania aculeata</i>
45	Vata	<i>Ficus benghalensis</i>
46	Ajowan	<i>Trachyspermum ammi</i>
47	Kavath	<i>Limonia acidissima</i>