ENERGY AUDIT REPORT

ST. JOSEPH'S COLLEGE OF PHARMACY

CHERTHALA

Executed by

OTTOTRACTIONS
Energy-Engineering-Environment

2024

Accredited Energy Auditor: AEA-33
Empanelled Accredited Energy Auditor: EmAEA-33
Bureau of Energy Efficiency,
Government of India.

Empanelled Energy Auditor: EMCEEA-0211F,
EMC (Energy Management Centre-Kerala)

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Energy Audit Report
St. Joseph's College of Pharmacy, Cherthala
Report No: EA 1143
2024 May

Empaneled Accredited Energy Auditor, AEA 33
Bureau of Energy Efficiency
Government of India

Empaneled Energy Auditor, EMCEEA-0211F,
Energy Management Centre
Government of Kerala.

Authorized Energy Auditor, GEDA/ENC/EAC: Autho/2014/8/103/2316,
Gujarat Energy Development Agency
Government of Gujarat

Empaneled Energy Auditor, India SME Technology Services Ltd
A joint Venture of SIDBI, SBI, Indian Bank, Oriental Bank of Commerce
& Indian Overseas Bank

About OTTOTRACTIONS

Established in 2005, OTTOTRACTIONS is a renowned organization with extensive expertise in energy, engineering, and environmental services. We hold the distinction of being the first Accredited Energy Auditor from Kerala authorized to conduct Mandatory Energy Audits for Designated Consumers under the Energy Conservation Act of 2001. Our excellence in energy auditing was recognized by the Government of Kerala with the prestigious "Kerala State Energy Conservation Award 2009."

OTTOTRACTIONS is an ISO 9001:2015, ISO 17020:2012, and ISO 14001:2015 certified organization, underscoring our commitment to quality and excellence in service delivery. With a proven track record, we have successfully completed over 3,000 audits across various domains including Energy Audit, PAT, Electrical Safety Audit, Green Audit, Environmental Audit, Biodiversity Audit, Water Audit, and Air Audit.

Acknowledgment

We were privileged to work together with the administration and staff of St. Joseph's College of Pharmacy, Cherthala. We are grateful to them for the timely help extended to complete the audit and bringing out this report.

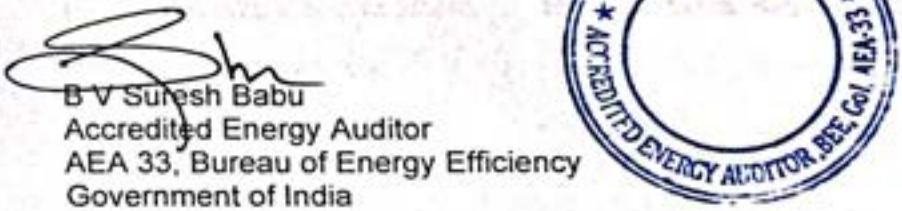
With gratitude, we acknowledge the diligent effort and commitments of all those who have helped to bring out this report.

We also take this opportunity to thank the bona-fide efforts of audit team for unstinted support in carrying out this audit.

We thank our consultants, engineers and backup staff for their dedication to bring this report.

Thank you.

For OTTOTRACTIONS



B V Suresh Babu
Accredited Energy Auditor
AEA 33, Bureau of Energy Efficiency
Government of India

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Certification

This is to certify that

The data collection has been carried out diligently and truthfully;

All data monitoring devices are in good working condition and have been calibrated or certified by approved agencies authorised and no tampering of such devices has occurred;

All reasonable professional skill, care and diligence had been taken in preparing the energy audit report and the contents thereof are a true representation of the facts;

Adequate training provided to personnel involved in daily operations after implementation of recommendations; and

The energy audit has been carried out in accordance with the Bureau of Energy Efficiency (Manner and Intervals of Time for the Conduct of Energy Audit) Regulations, 2010.

SURESH BABU B V
ACCREDITED ENERGY AUDITOR (AEA 33)
BUREAU OF ENERGY EFFICIENCY
GOVERNMENT OF INDIA

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
St. Joseph's College of Pharmacy					
Sl No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 50 No's T8 (40W) Lamps to 18W LED Tube	0.15	0.15	12	1320
2	Energy Saving by replacing existing 600 No's in-efficient ceiling fans with Energy Efficient Five star fans	18.00	2.44	88	21312
	Total	**18.15**	**2.60**	**50.12**	**22632.00**
(The saving are projected as per the assumed operation time observed based in the discussions with the plant officials. The data of saving percentages are taken from BEE guide books and field measurements.)					

1 Introduction

A detailed energy audit has been carried out at St. Joseph's College of Pharmacy, Cherthala by OTTOTRACTIONS in May 2024. During the energy audit energy saving opportunities has been identified to help improving energy efficiency of the facility. OTTOTRACTIONS is an Accredited Energy Auditor of Bureau of Energy Efficiency and Empaneled Energy Auditor of Energy Management Centre, Government of Kerala.

This energy audit report complies with the clauses in *Energy Conservation Act, 2001* on mandatory energy audit (**Form 4** [refer regulation 6(2)] guidelines for preparation of energy audit report) and complies with the G.O (Rt) No.2/2011/PD dated 01.01.2011 issued by Government of Kerala on mandatory energy audit.

1.1. General Building details and descriptions

St. Joseph's College of Pharmacy is situated in Cherthala, the land of back waters amidst panoramic beauty in close proximity to Kumarakom, the renowned tourist spot and National Aquatic Bird Sanctuary. It is a unit of the Nirmala Province of the Medical Sisters of St. Joseph (MSJ Dharmagiri) Aluva, Kerala. The congregation of the Medical Sisters of St. Joseph is dedicated to the healing ministry and allied medical education, aiming to uplift the suffering humanity devoid of profit motive.

The College offers B.Pharm, M.Pharm, Pharm.D and D.Pharm programmes and is pledged to provide advanced facilities to comply with technological advancements in pharmaceutical sciences. The institute is highly research oriented and enjoys great Academic - Industrial interactions.

Occupancy Details	
Particulars	2023-24
Total Students	413
Staffs	63
Total Occupancy of the college	476

For calculating specific energy consumption, the total built-up area is considered.

Energy audit team

The Energy Audit team is listed below. Besides this list various domine experts also participated in this project.

1. Suresh Babu B V, Accredited Energy Auditor, AEA 33
2. B. Zachariah, Chief Technical Consultant
3. Abin Baby, Project Engineer
4. Jomon J S, Project Engineer
5. Vishnu S S, Project Engineer
6. Reshma S P, Data Analyst
7. Anjana B S, Project Assistant

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Building description

The energy audit has been carried out at St. Joseph's College of Pharmacy, Cherthala.The following is the baseline data of this building.

Form-A											
BASELINE DATA SHEET FOR GREEN AUDIT											
1	Name of the Organisation	St. Joseph's College of Pharmacy									
2	Address (include telephone, fax & e-mail)	Dharmagiri College Campus Naipunnya Road, Cherthala Alappuzha, Kerala, India Pin - 688 524									
2	Year of Establishment	1944									
3	Name of building and Total No. of Electrical Connections/building	St. Joseph's College of Pharmacy(7)									
4	Total Number of Students	Boys	-	Girls	-	Total	413				
5	Total Number of Staff	63									
6	Total Occupancy	476									
7	Total area of green cover	60%									
8	Type of Electrical Connection	HT	0	LT	7						
9	Total Connected Load (kW)	85									
11	Total built up area of the building (M^2)	7964									
12	Number of Buildings	7									
13	Average system Power Factor	0.98									
14	Details of capacitors connected	-									
15	Transformer Details (Nos., kVA, Voltage ratio)	TR 1	TR 2								
		-	-								
16	DG Set Details (kVA)	DG1	DG2	DG3	DG4	DG5	Remarks				
		62.5	-								
17	Details of motors	Rating		Nos.		Remarks					
		5 to 10		2							

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Energy and utility system description

3.1.1 Electricity

The institution procures electricity from Kerala State Electricity Board (KSEB) through Seven LT feeder. Details regarding this connection are provided below. Additionally, the campus utilizes a diesel generator of 62.5kVA, and a grid-tied solar power plant with a capacity of 140 kWp.

Electricity Connection Details		
St. Joseph's College of Pharmacy		
1	Name of the Consumer	St. Joseph's College of Pharmacy
2	Tariff	LT 6B Ndom
3	Consumer Numbers	1155127001836 1155127020395 1155127024177 1155121023494 1155127001759 1155120024402 1155126023569
4	Contract Demand (kVA)	85
5	Annual Electricity Consumption (kWh)	33499

3.2. Thermal Energy / Transportation

The college maintains buses for student transportation. Exploring alternative fuel options for these buses and the on-site diesel generator could enhance the college's power input redundancy.

Diesel Consumption Details				
Year	Transportation in L	Generator in L	Total in L	cost in Rs
2023-24	7690	224	7914	767658

LPG Consumption Details	
	2023-24
No Cylinders	28
Canteen/Lab LPG Consumption in kg	532.0
Total in kg	532.0

Biogas Consumption				
	m3	kcal/m3	Daily production kCal	Annual production (kCal)
Biogas plant 1	6	3500	21000	4620000
Biogas plant 2	2	3500	7000	1540000
	8			4620000

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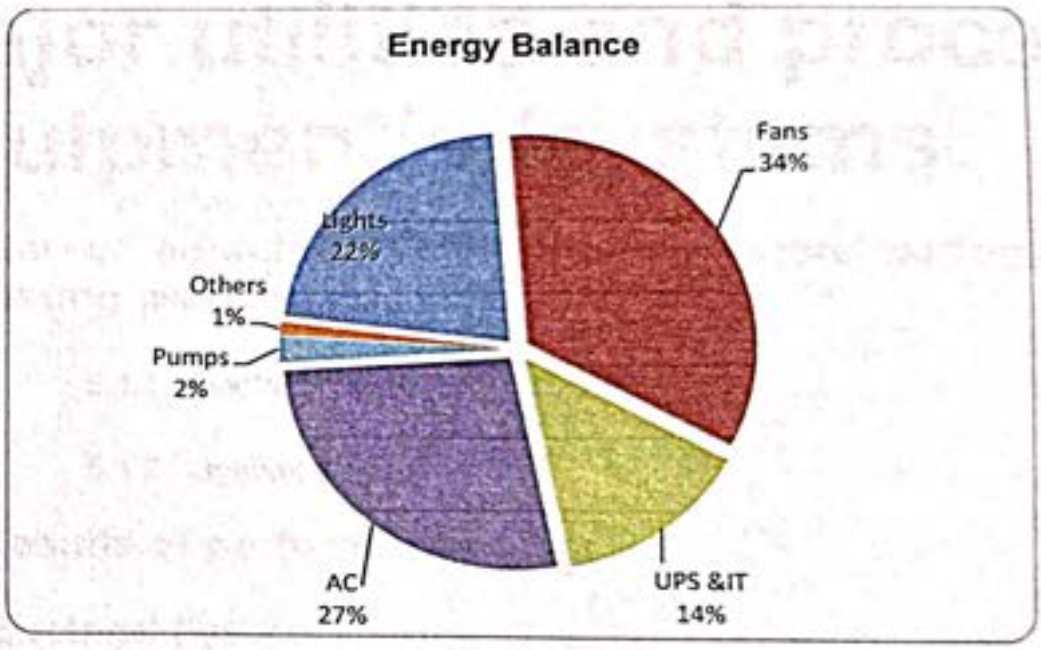
Energy Balance



Fans account for 34% of the overall energy consumption in this facility, while lighting utilizes 22%, UPS and IT contribute 14%, and other miscellaneous uses constitute 1%. Additionally, 26% of the total energy is consumed by air conditioning systems.

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Performance evaluation of major utilities and process equipment's /systems.

5.1. List of equipment and process where performance testing was done.

5.1.1. Electrical System

5.1.2. Lighting & Fans

5.2. Results of performance tests

5.2.1. Electrical System

The average unit cost of electricity is **11.48 Rs/kWh**. This is taken as the basis for the financial analysis of electrical energy efficiency projects. The information on average energy consumption is taken from the historical electricity bill analysis.

Annual Electricity Consumption (kWh)		
Sl No	Consumer No	Annual Electricity Consumption (kWh)
1	1155127001836	792
2	1155127020395	8226
3	1155127024177	10000
4	1155121023494	11544
5	1155127001759	1262
6	1155120024402	940
7	1155126023569	364
8	1155127027553	371
Total		33499

Diesel

The college operates a diesel generator of 62.5kVA. The details of Diesel consumption are given below.

Electricity Generated through DGs			
Year	Generator in L	kWh /yr	cost in Rs
2023-24	224	672.0	21728

Biogas

Biogas Consumption				
	m3	kcal/m3	Daily production kCal	Annual production (kCal)
Biogas plant 1	6	3500	21000	4620000
Biogas plant 2	2	3500	7000	1540000
	8			4620000

Biogas Plant

LPG

LPG is consumed in the Canteen.

LPG Consumption Details	
	2023-24
No Cylinders	28
Canteen/Lab LPG Consumption in kg	532.0
Total in kg	532.0

Transportation

The campus has three vehicles in Operation. The details of Diesel consumption is given below

Diesel Consumption Details			
Year	Transportation in L	Total in L	cost in Rs
2023-24	7690	7690	745930

Base Line Energy Data St. Joseph's College of Pharmacy		
		2023-24
1	Electricity KSEB (kWh)	33499
2	Electricity DG (kWh)	672
3	Electricity Solar , Off grid (kWh)	108588
4	Electricity (KSEB + DG + Off grid) kWh	142759
5	Electricity Solar Grid Tied (kWh)	70263
6	Diesel (L)	7914.0
7	LPG (kg)	532.00
8	Biogas generated/year (kg)	1320

Energy Consumption Profile		
Sl No	Fuel	2023-24
1	Electricity	122772310
2	Diesel	83097000
3	LPG	6384000
4	Biogas	4620000
Total		216873310

SOLAR SYSTEM

A 140kWp on grid solar power plant installed in the campus.

Solar Power Plant Details					
Particulars	Plant 1	Plant 2	Plant 3	Plant 4	Total
Capacity kWp	10	5	15	80	110
Type	On-Grid	Off-Grid	On-Grid	off-Grid	On-Grid
Annual generation (kWh)	12775	6388	19163	102200	140525
Total kWh Exported	843	0	14360	0	15203
Total kWh Consumed	11932	6388	4803	102200	125322

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Energy efficiency in utility and process system

The specific energy consumption or Energy Performance Index (EPI) is normally taken as the ratio of total energy consumed to the total are of building.

OTTOTRACTIONS- ENERGY AUDIT		
St. Joseph's College of Pharmacy		
Energy Performance Index (EPI)		
Sl No	**Particulars**	2023-24
1	Total building area (m^2)	7964
2	Annual Energy Consumption (kCal)	216873310
3	Annual Energy Consumption (kWh)	252178
4	Total Energy in Toe	21.69
5	Specific Energy Consumption kWh/m^2	31.66

The Energy Performance Index (EPI) is

31.66 kWh/m^2

The EPI of 2023-24 may be taken as benchmark.

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Evaluation of energy management system

Energy management policy

There is no written energy policy available, but environment policy is available which includes energy conservation also. A draft energy management policy is given below. The management may constitute an energy management policy and display the same in the plant to motivate the staff.

St. Joseph's College of Pharmacy, Cherthala

ENERGY POLICY

(Draft)

We are committed to optimally utilize various forms of energy in a cost-effective manner to effect conservation of energy resources. We are committed to conserve the energy which is a scarce resource with the requisite consistency in the efficiency, effectiveness in the cost involved in the operations and ensuring that service quality and quantity, environment, safety, health of people are maintained. We are also committed to increase the renewable energy share of the total energy we use.

We are also committed to monitoring continuously the saving achieved and reduce its specific energy consumption by minimum of 2% every year.

Date ----------

Head of the Institution

7.1. Energy management monitoring system

- **Energy Management Cell** has to be constituted with an objective to revise action plan for energy conservation thereby reducing the production cost.
- Energy conservation tips/ posters are displayed in crucial points.
- Use of renewable energy has to be encouraged.

7.2. Training to staff responsible for operational and Documentation.

- The staff and students need to be made more aware of the importance of energy saving and management.
- Log books shall be maintained to record Electricity Consumption and Diesel consumption.
- Meter reading shall be taken and compared with KSEBL regularly.
- Better operating practices regarding appliances and fixtures should be taught to the staff.

7.3. Best Practices

- Have solid Waste management program.
- Have different social and environmental clubs
- E-waste on campus is managed by an external agency.
- Conducted Energy Conservation Training Programs.
- Conducted Green Audit
- Installed 140kWp Solar power plant
- Biogas plants are installed for cooking.

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Energy Conservation Measures and Recommendations

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code	
Energy Saving in Lighting by replacing existing 50 No's T8 (40W) Lamps to 18W LED Tube	
Existing Scenario	
50 numbers of T8(40 W) lamps were identified during the energy audit field survey in the facility. During discussion with officers it is observed that the average utility of these fittings are of 30%.	
Proposed System	
The existing T8 may be replaced to LED Tube of 18W in phased manner and the savings will be of 55% (inclusive of improved light output and reduced energy consumption)	
Financial Analysis	
Annual working hours (hr)	2400
No of fittings	50
Total load (kW)	2.00
Annual Energy Consumption (kWh)	2400
Expected Annual Energy saving for replacing all fittings (kWh)	1320
Cost of Power	11.48
Annual saving in Lakhs Rs (1st year)	0.15
Investment required for complete replacements [@Rs 300 per fittings](Lakhs Rs)	0.15
Simple Pay Back (in Months)	11.88

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal	
Energy Saving by replacing existing 600 No's in-efficient ceiling fans with Energy Efficient Five star fans	
Existing Scenario	
There are 600 numbers of ceiling fans installed in the facility with minimum 8 hrs a day operation. All are conventional type and most of them are very old.	
Proposed System	
There is an energy saving opportunity in replace the existing fans with new five star labelled fans. The five star labelled fans give a savings up to 30% with higher service value (air delivery/watt).	
Financial Analysis	
Annual working hours (hrs)	2400
Total numbers of ordinary fans	600
Total load (kW)	48.00
Annual Energy Consumption (kWh)	57600
Expected Annual Energy saving, for total replacement(kWh)	21312
Cost of Power (Rs)	11.48
Annual saving in Lakhs Rs (1st year)	2.45
Investment required for a total replacement (Lakhs Rs)[@3000 Rs per Fan with 50W at full speed]	18.00
Simple Pay Back (in Months)	88.29

Technical Supplements

1155127027553	
2023-24	
Month	kWh
Apr-23	38
May-23	13
Jun-23	29
Jul-23	17
Aug-23	43
Sep-23	58
Oct-23	46
Nov-23	31
Dec-23	28
Jan-24	19
Feb-24	31
Mar-24	18
Total	**371**

B-Pharm (1155127020395)	
2023-24	
Month	kWh
Apr-23	469
May-23	726
Jun-23	637
Jul-23	820
Aug-23	855
Sep-23	689
Oct-23	544
Nov-23	422
Dec-23	695
Jan-24	870
Feb-24	647
Mar-24	852
Total	**8226**

Hostel (1155127024177)	
2023-24	
Month	kWh
Apr-23	898
May-23	1066
Jun-23	756
Jul-23	298
Aug-23	987
Sep-23	1027
Oct-23	921
Nov-23	726
Dec-23	637
Jan-24	820
Feb-24	1019
Mar-24	845
Total	**10000**

M-Pharm (1155121023494)	
2023-24	
Month	kWh
Apr-23	1298
May-23	984
Jun-23	789
Jul-23	957
Aug-23	847
Sep-23	983
Oct-23	687
Nov-23	1209
Dec-23	1190
Jan-24	1023
Feb-24	879
Mar-24	698
Total	**11544**

Animal House(1155127001836)	
2023-24	
Month	kWh
Apr-23	127
Jun-23	121
Aug-23	154
Oct-23	134
Dec-23	135
Feb-24	121
Total	792

Mess Hall (1155127001759)	
2023-24	
Month	kWh
Apr-23	205
Jun-23	222
Aug-23	213
Oct-23	198
Dec-23	170
Feb-24	254
Total	1262

Convent (1155120024402)	
2023-24	
Month	kWh
Apr-23	126
Jun-23	167
Aug-23	154
Oct-23	157
Dec-23	145
Feb-24	191
Total	940

Security Room (1155126023569)	
2023-24	
Month	kWh
Apr-23	65
Jun-23	68
Aug-23	49
Oct-23	68
Dec-23	45
Feb-24	69
Total	364