



ST. PAUL'S COLLEGE KALAMASSERY

Re-accredited with 'A' Grade (Third Cycle) by NAAC

(Affiliated to Mahatma Gandhi University, Kottayam)

HMT Colony P.O., Kalamassery, Ernakulam, Kerala, India

ENERGY AUDIT REPORT (2018 - 2019)



ENERGY AUDIT REPORT

2018-19



St. Albert's College (Autonomous)

An initiative of Educational and Charitable Trust of Archdiocese of Verapoly

Accredited by National Assessment and Accreditation Council (NAAC) at 'A' Grade, ISO 9001:2015 certified
Affiliated to Mahatma Gandhi University, Kottayam, Kerala

Energy Audit- St.Paul's College,kalamassery

Certificate

This is to certify that the energy audit report of St.Paul's College, Kalamassery is based on original data collected during the period of study. Further it is certified that the baseline data has been prepared by the Internal Energy Audit Team of St.Paul's College, Kalamassery and submitted to us. The content of the baseline data of the study has been personally verified by me for reliability and validity. The data used in the study are original in nature and have not been presented or published elsewhere.



Dr. Sajeesh T H

05-04-2019
Ernakulam

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INTRODUCTION

1. ENERGY AUDIT

An Energy Audit, or Review, is an investigation of all facets of an organisation's historical and current energy use with the objective of identifying and quantifying areas of energy wastage within the organisation's activities. It establishes the baseline for any improvements in an organisation's energy use. It provides a comprehensive and systematic method for targeting cost effective efficiency gains. Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility. It quantifies energy usage according to its discrete functions .As per the Energy Conservation Act, 2001, Energy Audit is defined as "the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption" .Efficient energy use, sometimes simply called energy efficiency, is the goal to reduce the amount of energy required to provide products and services. Decreasing energy use reduces energy costs and may result in a financial cost saving to consumers if the energy savings offset any additional costs of implementing an energy-efficient technology.

1.1 OBJECTIVES OF ENERGY AUDIT

The Energy Audit provides the vital information base for the overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures.

It aims at:

- Assessing the present pattern of energy consumption in different operations.
- Relating energy inputs and production output.
- Highlighting wastage in major areas.
- Identifying the quality and cost of various energy inputs.
- Implementation of measures for energy conservation & realization of savings.

1.2 NEED FOR ENERGY AUDIT

In an organization like college, one of the top operating expenses is often found to be the cost of electricity. Energy audit constitutes a strategic area for cost reduction. A

well-done energy audit will always help owners to understand more about the ways energy is used in their organizations, and help to identify the areas where wastage of energy can occur and where scope for improvement exist. The energy audit would give a positive orientation to the energy cost reduction, preventive maintenance and quality control programs which are vital for production and utility activities. Such an audit program will help to keep focus on variations that occur in the energy cost, variability and reliability of supply of energy, help decide on the appropriate energy mix, identify energy conservation technologies, retrofit for energy conservation equipment etc. In general, the energy audit is the translation of conservation ideas and hopes into reality, by lending technically feasible solutions with economic and other organizational considerations within a specified time frame. The primary objective of the energy audit is to determine the ways to reduce the energy consumption per unit of product output or to lower operating cost. The energy audit provides a benchmark, or a reference point, for managing and accessing the energy use across the organization and provided the basis for ensuring more effective use of energy.

AUDITING FOR ENERGY MANGEMENT

1. List ways that you use energy in your college. (Electricity, electric stove, kettle, microwave, LPG, firewood, Petrol, diesel and others).
2. Electricity bill amount for the last year
3. Amount paid for LPG cylinders for last one year
4. Weight of firewood used per month and amount of money spent? Also mention the amount spent for petrol/diesel/ others for generators?
5. Are there any energy saving methods employed in your college? If yes, please specify. If no, suggest some.
6. How much money does your college spend on energy such as electricity, gas, firewood, etc. in a month? (Record monthly for the year 2019).
7. How many CFL bulbs has your college installed? Mention use (Hours used/day for how many days in a month)
8. Energy used by each bulb per month (For example- 60-watt bulb x 4hours x number of bulbs = kWh).
9. How many LED bulbs are used in your college? Mention the use (Hours used/day for how many days in a month).
10. Energy used by each bulb per month (kWh).

11. How many incandescent (tungsten) bulbs have your college installed? Mention use (Hours used/day for how many days in a month).
12. Energy used by each bulb per month (kWh).
13. How many fans are installed in your college? Mention use (Hours used/day for how many days in a month).
14. Energy used by each fan per month (kWh)
15. How many air conditioners are installed in your college? Mention use (Hours used/day, for how many days in a month).
16. Energy used by each air conditioner per month(kWh).
17. How many electrical equipment including weighing balance are installed your college? Mention the use (Hours used/day for how many days in a month).
18. Energy used by each electrical equipment per month(kWh).
19. How many computers are there in your college? Mention the use (Hours used/day for how many days in a month).
20. Energy used by each computer per month(kWh).
21. How many photocopiers are installed by your college? Mention use (Hours used/day for how many days in a month).
22. How many cooling apparatuses are in installed in your college? Mention use (Hours used/day for how many days in a month).
23. Energy used by each cooling apparatus per month (kWh) Mention use (Hours used/day for how many days in a month).
24. Energy used by each photocopier per month (kWh) Mention the use (Hours used/day for how many days in a month) how many inverters your college installed? Mentions use (Hours used/day for how many days in a month).
25. Energy used by each inverter per month(kWh).
26. How many electrical equipment are used in different labs of your college? Mention the use (Hours used/day for how many days in a month).
27. Energy used by each equipment per month(kWh).
28. How many heaters are used in the canteen of your college? Mention the use (Hours used/day for how many days in a month).
29. Energy used by each heater per month(kWh).
30. No: of street lights in your college?

31. Energy used by each streetlight per month (kWh)
32. No: of TV in your college and hostels?
33. Energy used by each TV per month (kWh).
34. Any other item that uses energy (Please write the energy used per month) Mention the use (Hours used/day for how many days in a month).
35. Are any alternative energy sources/nonconventional energy sources employed / installed in your college? (photovoltaic cells for solar energy, windmill, energy efficient stoves, etc.,) Specify.
36. Do you run "switch off" drills at college?
37. Are your computers and other equipment put on power-saving mode?
38. Does your machinery (TV, AC, Computer, weighing balance, printers, etc.) run on standby mode most of the time? If yes, how many hours?
39. What are the energy conservation methods adapted by your college?
40. How many boards displayed for saving energy awareness?
41. How much ash is collected after burning firewood per day in the canteen?
42. Write a note on the methods/practices/adaptations by which you can reduce the energy use in your college campus in future.

CALCULATION OF ENERGY FOR ELECTRICAL APPLIANCES

APPLIANCE	POWER USED IN (WATT)	USAGE PER DAY (HOURS)	AVERAGE kWh PER DAY (WATT X HOURS X NUMBERS /1000)	AVERAGE kWh PER MONTH (WATT X HOURS X NUMBERS /1000) X NO. OF DAYS
Incandescent bulb	60W			
CFL	18 W			
Microwave	1000W			
Stove	3000W			
Kettle	2500W			

ENERGY MANAGEMENT

FACULTY IN CHARGE	Mrs. JIXY JOSEPH ASSISTANT PROFESSOR DEPT.OF PHYSICS
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SL.NO.	STUDENT NAME	CLASS
1.	ABHIRAMI U	II B.Sc. PHYSICS
2.	ANNA ROSE NELSON	II B.Sc. PHYSICS
3.	FATHIMA THASLI	II B.Sc. PHYSICS
4.	JAYALAKSHMI PRAKASH	II B.Sc. PHYSICS
5.	SIYA KURIYAN	II B.Sc. PHYSICS
6.	SNEHA PEOUS P	II B.Sc. PHYSICS
7.	ARDRA A M	I B.Sc. PHYSICS
8	DEVIKA R NAIR	I B.Sc. PHYSICS
9	VARSHA ANTONY	I B.Sc. PHYSICS
10	JEBIN PETER	I B.Sc. PHYSICS
11	ANIRUDHAN S	I B.Sc. PHYSICS
12	SAJNA MARIA DAS	I B.Sc. PHYSICS

UTILIZATION OF ENERGY IN THE COLLEGE

- ❖ Electricity charges- Rs.80000/month
- ❖ Number of gas cylinders used – 170/year

- ❖ Cost of Gas cylinders used Rs. 98600/year (Rs.580/cylinders)
- ❖ Monthly amount paid for electricity and gas – Rs. 95000
- ❖ Cost of generator fuel – Rs.15000/month
- ❖ Energy generated by the biogas plant equivalent to 1.5 LPG cylinders

NUMBER OF EQUIPMENTS IN THE COLLEGE

- ❖ No. of CFL bulbs – 132
- ❖ No. of LED bulbs -140
- ❖ No. of Tube lights – 375
- ❖ No. of Fan – 261
- ❖ No. of Air Conditioners – 8
- ❖ No. of Computers – 110
- ❖ No. of Water pumps-1
- ❖ No. of Photocopier – 6
- ❖ No. of Printers – 20
- ❖ No. of Water purifiers – 7
- ❖ No. of Projectors – 30
- ❖ No. of Television –4
- ❖ No of Inverters/UPS – 30
- ❖ No. of CCTV cameras- 75
- ❖ No. of Fridge - 3
- ❖ No. of Freezers - 1
- ❖ No. of Grinders – 1

ENERGY USAGE OF TUBE LIGHTS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF TUBE LIGHTS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
CHEMISTRY	79	40	0.04	5	347.6
ENGLISH	10	40	0.04	3	26.4
ECONOMICS	10	55	0.055	3	36.3
MATHEMATICS	12	55	0.055	3	43.56
BVOC	14	40	0.04	3	36.96
BBA	9	40	0.04	3	23.76
COMMERCE	13	55	0.055	3	47.19
COMPUTER SCIENCE	9	40	0.04	3	23.76
PHYSICS	29	55	0.055	3	105.27
AUDITORIUM	41	40	0.04	3	108.24
CANTEEN	16	40	0.04	5	64
DIGITAL LIBRARY	60	40	0.04	4	96
OFFICE ROOM	15	40	0.04	4	60
PRINCIPAL'S ROOM	4	40	0.04	4	16
NCC ROOM	1	40	0.04	2	1.2
NSS ROOM	4	40	0.04	2	4.8
HOSTEL	31	40	0.04	4	148.8
WATCHMAN'S ROOM	1	40	0.04	8	9.6
TOILET	12	40	0.04	5	21.12
OTHERS	5	40	0.04	3	13.2
TOTAL	375				1233.76

ENERGY USAGE OF CFL LAMPS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF CFL LIGHTS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
DIGITAL LIBRARY	105	15	0.015	3	103.95
DIGITAL LIBRARY (DOUBLE TUBE SET)	3	22	0.022	2	4.95
SEMINAR HALL	16	22	0.022	3	23.232
OTHERS	8	15	0.015	6	15.84
TOTAL	132				147.972

ENERGY USAGE OF LED BULBS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF BULBS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
OFFICE	1	80	0.080	8	16
CANTEEN	3	18	0.018	1	2.7
HOSTEL	24	18	0.018	5	64.8
BA ENGLISH	1	18	0.018	2	0.792
ACOUSTIC THEATRE	52	6	0.006	2	3.12
ACOUSTIC THEATRE	51	3	0.003	2	1.53
OTHERS	8	12	0.012	3	6.336
TOTAL	140				95.278

ENERGY USAGE OF INCANDESCENT BULBS IN THE COLLEGE

DEPARTMENT	NO: OF BULBS	POWER CONSUMED IN (WATTS)	POWER IN (KW)	WORKING TIME (HOUR PER DAY)	ENERGY USAGE PER MONTH(kWh)
TOILET	2	60	0.060	4	10.08
ECONOMICS	2	60	0.060	1	2.64
COMMERCE	1	60	0.060	1	1.32
PHYSICS	2	60	0.060	1	2.64
MATHS	1	60	0.60	1	1.32
OFFICE	1	100	0.100	1	2.1
TOTAL	9				20.1

ENERGY USAGE OF WATER PURIFIERS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF PURIFIERS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME (HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
HOSTEL	1	25	0.025	4	3.0
BA ENGLISH	1	25	0.025	2	1.1
BSc COMPUTER SCIENCE	1	25	0.025	2	1.1
BVOC	1	25	0.025	2	1.1
ECONOMICS	1	25	0.025	2	1.1
PHYSICS	1	25	0.025	2	1.1
CHEMISTRY	1	25	0.025	2	1.1
TOTAL	7				9.6

ENERGY USAGE OF FANS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF FANS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
CHEMISTRY	20	60	0.06	6	158.4
ENGLISH	10	60	0.06	6	79.2
ECONOMICS	8	8	0.08	6	84.48
MATHEMATICS	12	80	0.08	6	126.72
BVOC	11	60	0.06	6	87.12
BBA	7	60	0.06	6	55.44
COMMERCE	10	80	0.08	6	105.6
COMPUTER SCIENCE	7	60	0.06	6	55.44
PHYSICS	30	80	0.08	6	259.2
AUDITORIUM	30	60	0.06	3	81
CANTEEN	7	60	0.06	2	21
DIGITAL LIBRARY	57	60	0.06	2	68.4
OFFICE ROOM	10	60	0.06	8	120
PRINCIPAL'S ROOM	2	60	0.06	8	24
NCC ROOM	1	60	0.06	2	1.8
NSS ROOM	3	60	0.06	2	5.4
HOSTEL	28	60	0.06	10	504
SEMINAR HALL	8	80	0.08	3	38.4
TOTAL	261				1875.6

ENERGY USAGE OF COMPUTERS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF COMPUTERS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
COMPUTER SCIENCE	11	150	0.15	3	108.9
ENGLISH	1	150	0.15	4	13.2
CHEMISTRY	7	150	0.15	2	46.2
PHYSICS	8	200	0.2	4	105.6
ECONOMICS	2	200	0.2	4	35.2
MATHEMATICS	2	200	0.2	3	26.4
DIGITAL LIBRARY	37	150	0.15	2	166.5
BVOC	1	150	0.15	4	13.2
BBA	1	150	0.15	4	13.2
COMMERCE	1	200	0.2	4	17.6
OFFICE	10	150	0.15	7	262.5
PRINCIPAL'S ROOM	2	150	0.15	7	52.5
B COM LAB	24	150	0.15	3	237.60
OTHERS	3	150	0.15	3	45
TOTAL	110				1143.60

ENERGY USAGE OF PRINTERS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF PRINTERS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
ENGLISH	2	50	0.05	1	2.2
CHEMISTRY	1	50	0.05	1	1.1

ECONOMICS	3	50	0.50	1	3.3
COMMERCE	2	250	0.250	1	11
PHYSICS	2	250	0.250	1	8
OFFICE	8	250	0.250	1	50
DIGITAL LIBRARY	3	250	0.250	1	7.5
COMPUTER SCIENCE	1	50	0.05	1	1.1
BBA	1	50	0.05	1	1.1
BVOC	1	50	0.05	1	1.1
OTHERS	3	50	0.05	1	3.3
TOTAL	27				89.7

ENERGY USAGE OF PROJECTORS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF PROJECTORS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
ENGLISH	1	300	0.3	1	6.6
CHEMISTRY	1	300	0.3	1	6.6
ECONOMICS	1	300	0.300	1	13.2
COMMERCE	1	300	0.300	1	13.2
PHYSICS	1	300	0.300	1	6.6
ACOUSTIC THEATRE	1	300	0.300	2	6
DIGITAL LIBRARY	3	600	0.600	1	18
SEMINAR HALL	1	300	0.300	2	9
OTHERS	20	300	0.300	1	99
TOTAL	30				178.2

ENERGY USAGE OF UPS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF PROJECTORS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
ECONOMICS	2	160	0.160	4	28.16
COMMERCE	1	160	0.160	4	14.08
PHYSICS	8	160	0.160	4	84.48
MATHEMATICS	1	160	0.160	4	14.08
OFFICE	1	1000	1	7	175
DIGITAL LIBRARY 10KVA	1	8000	8	2	240
COMPUTER SCIENCE	1	50	0.05	4	3.3
BBA	1	50	0.05	2	4.4
BVOC	1	50	0.05	2	2.2
COMPUTER SCIENCE LAB	1	3000	3	4	198
ENGLISH	1	160	0.160	4	14.08
CHEMISTRY	7	160	0.160	4	49.28
B COM LAB	1	3000	3	3	198
OTHERS	3	160	0.160	3	36
TOTAL	30				1061.06

ENERGY USAGE OF TV IN THE COLLEGE

DEPARTMENT/AREA	NO. OF PROJECTORS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
PRINCIPAL'S ROOM	1	250	0.25	7	43.75
HOSTEL	1	160	0.16	1	4.8
OTHERS	1	250	0.25	1	5.5
CANTEEN	1	250	0.25	1	6.25
TOTAL	4				60.3

ENERGY USAGE OF AIR CONDITIONERS IN THE COLLEGE

DEPARTMENT/AREA	NO. OF PROJECTORS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOUR PER DAY)	ENERGY USAGE PER MONTH (kWh)
ACCOUSTIC THEATRE	2	2000	2.00	2	40
ACCOUSTIC THEATRE	3	1200	1.20	2	36
CONFERENCE ROOM	1	1500	1.50	2	60
DIGITAL LIBRARY	1	1200	1.200	4	96
OTHERS	1	1200	1.20	2	48
TOTAL	8				280

ELECTRICAL EQUIPMENTS AND THEIR ENERGY CONSUMPTION

DEPARTMENT/ AREA	EQUIPMENTS	NO. OF EQUIPMENTS	POWER CONSUMED IN (WATTS)	POWER IN (kW)	WORKING TIME(HOU R PER DAY)	ENERGY USAGE PER MONTH (kWh)
PHYSICS LAB	CRO	5	90	.090	4	39.6
	RF OSCILLATOR	1	10	.010	2	0.44
	SIGNAL GENERATOR	4	25	.025	4	8.8
	FOUR PROBE SETUP	1	25	.025	2	1.1
	HALL EFFECT	2	500	0.500	2	44
	TRANSFORMER	10	5	.005	4	4.4
	INVERTER	2	500	0.500	3	66
	MERCURY LAMP	1	400	0.400	3	26.4
	SODIUM VAPOUR LAMP	1	162	0.162	2	7.128
	BATTERY ELIMINATOR	10	4	0.004	2	1.76
CHEMISTRY LAB	EXHAUST FAN	9	40	0.04	5	39.6
	CENTRIFUGE	4	40	0.04	1	3.52
	WEIGHING MACHINE	2	110	0.11	1	4.84
	FLASK SHAKER	1	40	0.04	1	0.88
	WATER BATH	1	1500	1.5	1	33
	BURNER	13	300	0.3	1	85.8
	MAGNETIC STIRRER	1	720	0.72	1	15.84

	INFRARED BULB	3	100	0.1	1	6.6
	ION EXCHANGE	1	360	0.36	5	39.5
	HOT AIR OVEN	3	2000	2	2	264
	OVEN	1	1000	1	2	44
	FRIDGE	1	150	0.15	24	79.2
	DEEP FREEZER	1	365	0.365	24	192.7.2
	HEAT MANTLE	2	100	0.1	1	4.4
	STEAM GENERATOR	1	1000	1	2	44
	MICRO OVEN	1	900	0.9	2	39.6
	MUFFLE FURNACE	1	1520	1.52	2	66.88
	MELTING POINT APPARATUS	1	100	0.1	1	2.2
	ELECTRONIC BALANCE	1	2	0.002	1	0.044
	MOTOR	1	7460	7.46	4	895.2
CANTEEN	MIXER GRINDER	1	750	0.75	1	18.75
	EXHAUST FAN	1	40	0.04	7	7
	COFFEE MAKER	1	1100	1.1	2	55
	FRIDGE	1	150	0.150	24	108
OFFICE	TABLE FAN	1	80	0.080	8	13.44
	FRIDGE	1	150	0.150	24	108
	SCANNER	2	20	0.02	3	3.0
DIGITAL LIBRRY	SERVER	2	1000	1	7	252
	HIGH SPEED SCANNER	1	150	0.15	3	9.9
	PHOTOSTAT MACHINE	6	1000	1.0	2	264
SEMINAR HALL	INTERACTIVE BOARD	1	250	0.25	2	10
	AMPLIFIERS	3	250	0.25	1	16.5

	SPEAKERS	2	150	0.150	1	6.6
COLLEGE CAMPUS	BRIGHT LIGHT	1	90	0.090	5	4.5
	CAMERA	75	4	0.004	24	216
	TOTAL	185				2961.422

TOTAL ENERGY CONSUMPTION

ENERGY CONSUMPTION PER MONTH = 9156.592 kWh

Renewable energy produced per month = 900 kWh

Percentage of renewable energy usage = 9.83%

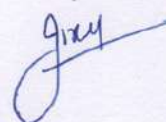
SUGGESTIONS FOR REDUCING ENERGY USAGE

- Solar panels should be properly maintained and use other renewable energy sources also.
- Conduct more save energy awareness programs for students and staff.
- More energy efficient fans should be installed.
- Observe a power saving day every year.
- In campus premises electricity should be shut down from main building supply after occupancy time, to prevent power loss due to eddy current.
- Installation of LED lamps instead of CFL and replacing the old tube lights with the new LED tubes.
- 5–star rated Air Conditioners, Fans and CFLs should be used.
- Cleaning of tube-lights/bulbs to be done periodically, to remove dust over it.

AUDITING MEMBERS

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2. Dr Rajeshmon V G

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ST. PAUL'S COLLEGE

KALAMASSERY

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