ENERGY AUDIT REPORT
(2023-2024)

at

EMMANUEL COLLEGE

VAZHICHAL

(Affiliated to the University of Kerala)

Vazhichal, Kudappanamoodu PO, Thiruvanathapuram – 695 505, Kerala

Submitted by,

Energy Management Cell,

St.Xavier's Catholic College of Engineering

ACKNOWLEDGEMENT

Emmanuel College, Vazhichal evinced interest to do an energy audit to find out the possibility of energy savings in their campus. It is an excellent move by the management to find the possible areas of energy wastage and come out with the solutions.

We thank the Manager of the institution **Msgr. G. Christudas** for his commitment and focus given to the energy conservation towards improving economy. We thank him for giving the permission to visit various places inside the campus to conduct the audit.

We would like to place our sincere thanks to the Principal **Dr. Vijayakumar** for entrusting the Energy Audit work with us and for the continuous support given by him throughout the audit.

We also thank all the HoDs, Faculty and staffs of various departments who have supported us during the campus inspection for data collection, network study & measurement for accomplishing successful Energy audit.

We also thank for the co-operation & hard work extended by the faculty members and technicians of the institution who have involved in this audit.

We are pleased to submit this Energy Audit Report to the Principal and the Correspondent and wish them all the best for implementation of identified Energy Conservation Opportunity as well as recommendations after sincere study & observations.

Energy Management Cell, SXCCE

ENERGY AUDIT TEAM

The energy audit comprises of the following members.

Sl.No	Name of the Person	Designation
1	Dr. M. Marsaline Beno	BEE Certified Energy Manager, Head – Energy Management Cell, Professor & Dean – Research, SXCCE
2	Dr. Jain B. Marshel	Assistant Professor / EEE, SXCCE
3	Dr. V. Jesus Bobin	Assistant Professor / EEE, SXCCE
4	Mr. M. Abragam Siyon Sing	BEE Certified Energy Manager, Assistant Professor / EEE, SXCCE
5	Mr. S. Benziher	Skilled Assistant, SXCCE

St. XAVIER'S CATHOLIC COLLEGE OF ENGINEERING

(Autonomous)

CHUNKANKADAI, NAGERCOIL-629003, KANYAKUMARI DISTRICT, TAMILNADU

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Ref. No.: SXCCE/EMC/2023-24/02 **Date: 19/12/2023**

Audit Certificate

This is to certify that the Energy Management Cell of St. Xavier's Catholic College of Engineering have done an Energy Audit at Emmanuel College, Vazhichal, Thiruvananthapuram during the academic year 2023- 2024.

15/12/23

Mr. M. Abragam Siyon Sing
BEE Certified Energy Manager,
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St. Xavier's Catholic College of Engineering.
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19/12/23

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EXECUTIVE SUMMARY

The energy management cell of St.Xavier's Catholic College of Engineering(SXCCE) conducted a Detailed Energy Audit at Emmanuel College, Vazhichal on 24th November 2023 to 25th November 2023.

The methodology adopted for conducting the detailed energy audit are basic data collection, measurement at major electrical energy consuming equipment and analysis of data collected and identification of specific energy saving proposals.

The energy audit team from SXCCE have identified an annual energy saving potential of **Rs. 2,09,757.00-** based on present energy cost.

The summary of annual savings identified is as below:

a) Total Annual Savings (3 proposals) : **Rs. 2,09,757/-**

b) Investment Required : **Rs. 16,33,740/-**

c) Average payback period for capital proposals : **7.8 Years**

SPECIFIC ACTION PLAN

a) Emmanuel College, Vazhichal, should identify specific person or department to implement the above proposals.

b) Specific target date for implementation of proposals should be made after the submission of this report.

c) The institution should prioritize the above proposals and implement them in a phased manner.

d) In our opinion all the proposals can be implemented within one year, straightaway and should be on top priority.

e) The institution should form an energy committee. The Secretary should head the committee. The committee should meet once in Three months and review the progress of implementation activity and identify new areas for energy conservation.

ENERGY AUDIT METHODOLOGY

The methodology adopted for conducting the Energy Audit at Emmanuel College, Vazhichal is as follows:

- Observation of various areas inside the campus with the team.
- Discussion with the energy audit team to execute the data collection plan.
- Basic data collection on list of power consuming equipment and operating parameters.
- Analysis of data collected and measurements to develop specific energy saving proposals.
- Discussion with the Energy audit team on the identified proposals.
- Preparation of the Energy Audit report with recommendations to reduce the energy wastage.
- Presentation on the findings of the energy audit to the management

SCOPE OF ENERGY AUDIT

The task of energy audit undertaken has the objective of identifying the energy saving opportunity through the visit, equipment study with measurements & to recommend the action plan with energy saving & financial calculation for implementation of proposed energy saving measures. This audit will help the management to save the energy and electricity bill.

CHAPTER I

INTRODUCTION

Emmanuel College, Vazhichal was founded by a group of daring young priests who had lofty dreams on behalf of the common people of this region. They took a great leap into the unknown hoping to obtain for their brothers and sisters, the knowledge of the most advanced developments in modern science and technology, which was once considered beyond their reach. They aimed at rapid and qualitative growth of human resources of this part of the State and so to enable an ever increasing number of young people of rural and urban Kerala to excel themselves in the most highly advanced and ultra-modern high-tech fields of education. The college is managed by Catholic Educational and Charitable Society.

The College is affiliated to the University of Kerala and recognised by the Government and empowered to conduct Graduate and Post Graduate Degree programmes.

The College has a huge and beautiful building with sufficient infrastructure. All the class rooms are well furnished with separate table and chair for individual students. The college has a well-equipped library.

Our college provides well-furnished lab facility with all sophisticated most modern instruments. Auditorium is furnished with sufficient facilities. We have an outdoor stadium, Canteen, stationery and other necessary arrangements are provided within the campus itself.

Emmanuel College is situated on a hill-top amid thick lush green plantations far and near along deep and fertile valleys surrounded by endless mountain ranges on one side and imposing gigantic granite rocks across the valleys on the other. This most beautiful serene and charming atmosphere, the enchanting surroundings of the college are suitable for any serious intellectual activity and academic pursuits. Vazhichal lies 33 kms, east of Thiruvananthapuram, Kerala State.

Some of the important infrastructural facilities include

Sl.No	Particulars	Count / area
1	Land area	12 acre
2	Building area	120475 Sq.Ft
3	Total no of classrooms	69
4	No of department rooms	12
5	Total no of labs	15
6	No of generator	1
7	Seminar hall	2
8	Conference hall	2
9	Auditorium	2
10	Chapel	1
11	No of store	5
12	Electrical room	2
13	Security room	2

CHAPTER II

AUDIT OBSERVATIONS

The audit team have visited all the blocks including hostels, canteen, outdoors, security offices inside the campus. The team have collected the no of equipment in each room of the block, operating hours, wattages, etc. The electrical distributed system, lighting system, air conditioning system, implemented energy saving measures are observed.

Details of Equipment in the campus

NAME OF EQUIPMENTS	NOS	OPERATING HOURS	Power Rating / Other Remarks
TUBELIGHT	262	4 hrs, 6 hrs,	40 Watts
CEILING FAN	435	4 hrs, 6 hrs,	65 Watts
AIR CONDITIONER	15	6 hrs	No star – 5 star
LED	115	5 min	
CFL	40	6 hrs	18 watts
PC	33	15 hrs/week	
UPS	2	6 hrs	5kVA
PHOTO COPYING MACHINE	1	-	1450 watts
EXHAUST FAN	2	6 hrs	

OTHER OBSERVATIONS

- Conventional tube lights are installed at most places.
- No efficient energy savers in lighting system.
- All the installed ceiling fans are conventional Induction motor ceiling fans.
- No regular cleaning of filters in air conditioners.
- Almost all the air conditioners are low star rated.
- No marking of switches.
- No awareness posters displayed near the electrical switch boards.
- Fan and Air conditioners are operated simultaneously in few places.

- Fan and lights are not turned off while leaving the places.

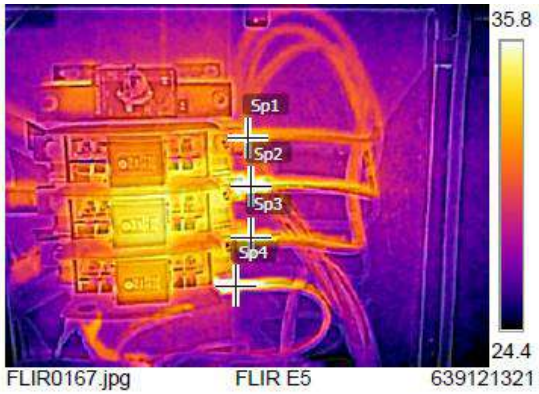
ENERGY SAVING MEASURES IMPLEMENTED

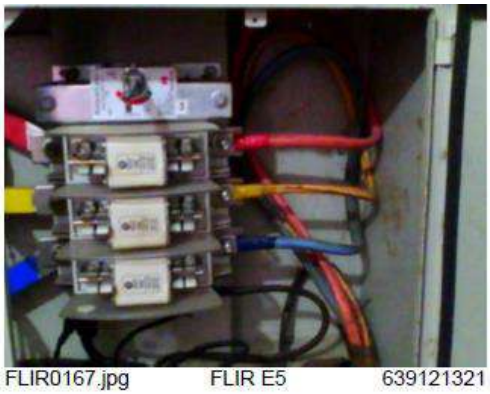
- It is observed that the illumination system for some places has been done by using energy efficient LED lights. Also the failure conventional lights have been replaced with LED lights.
- All the CRT desktop monitors are replaced with LED monitors.
- It is also observed a 50 kW Solar PV System installed in the campus(30kW in Arts building, 10 kW in B.Ed building and 10 kW in Hostel). As Energy audit team, we appreciate the initiative taken by the institution to install 50 kW PV panel. It is because of the PV system, the tariff is reduced from its installation.

THERMAL OBSERVATIONS

The thermal images of input Bus Bar terminals, equipment such as fan, exhaust fan are taken to observe any abnormalities. Increase in temperature will increase the resistance of the equipment and hence consumes more energy. Hence care should be taken for increased operating temperature.

1. Thermal Image of input bus bar – The temperature at the three phase terminals is found to be almost same. It indicates the load is balanced and hence no abnormalities.

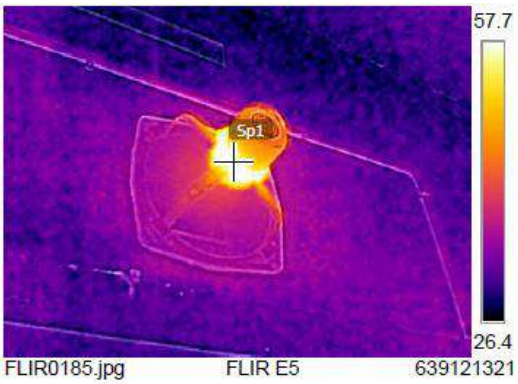




Measurements

Sp1	30.4 °C
Sp2	35.9 °C
Sp3	32.5 °C
Sp4	55.1 °C

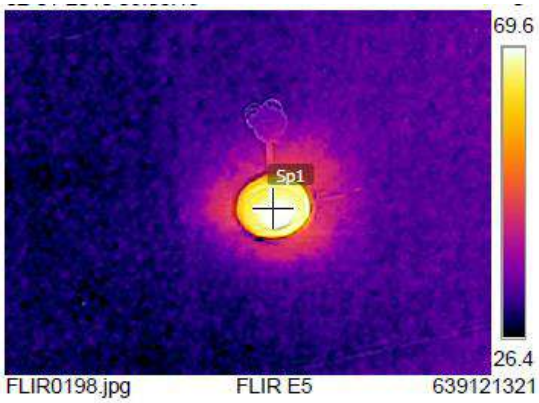
2. Thermal image of exhaust fan – The temperature of the exhaust fan is found to be 58.6 ^{0}C. This will not make any harm to the fan and hence no abnormalities in this observation.



Measurements

Sp1	58.6 °C

3. Thermal image of ceiling fan – The temperature of the ceiling fan is found to be 70.1 ^{0}C. The high temperature might be because of its life period. It is recommended to replace such oldest fan to save considerable amount of energy.



Measurements

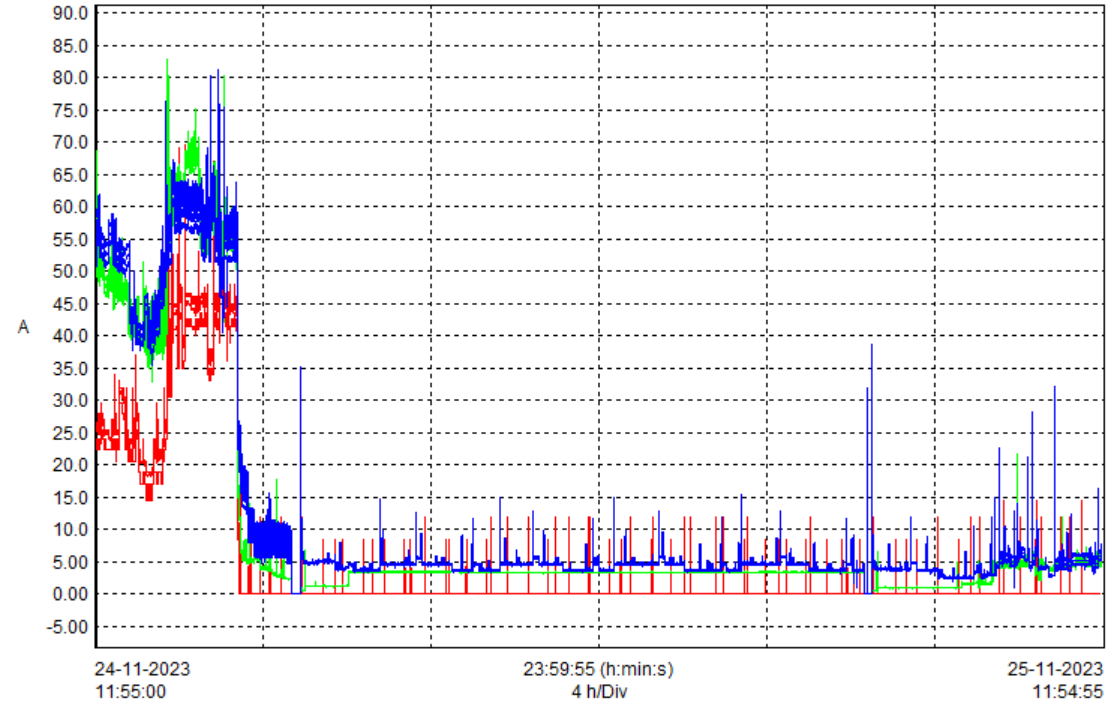
Sp1	70.1 °C

POWER QUALITY OBSERVATIONS

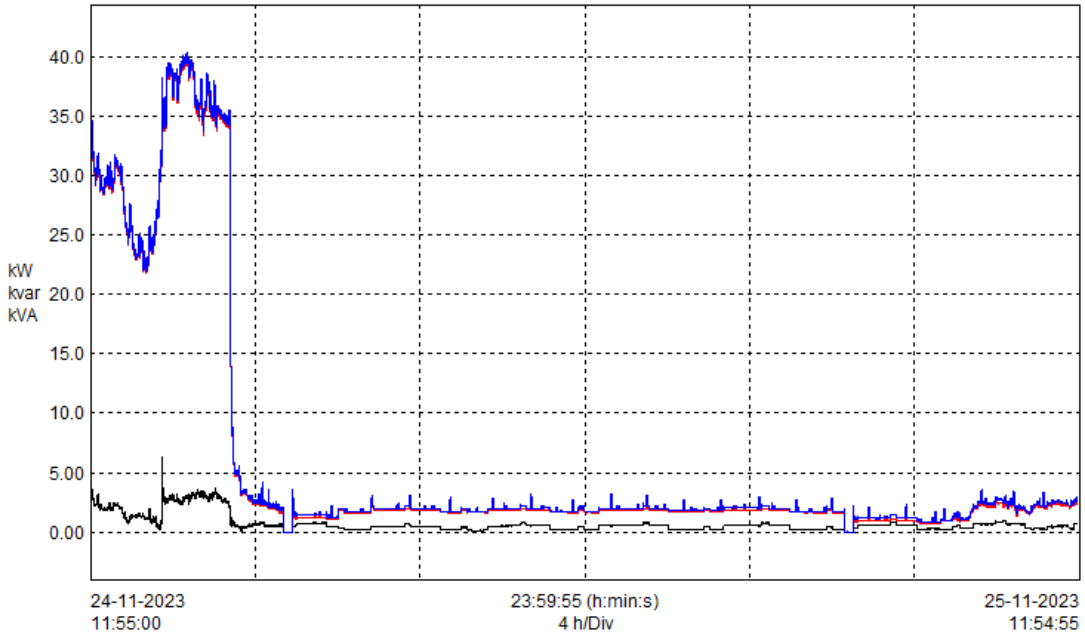
The power consumed by the institution is measured for 24 hours to analyse the power quality issues using Atandra ALM 31 power quality analyser. The various electrical parameters such as Grid Frequency, Supply Voltage, Line Current, Neutral Current, Power demand, Power Factor are recorded for 24 hours in a day. All the electrical parameters are

within the permissible variation in limit. The variation of the electrical parameters with respect to the time is plotted and shown in diagrams below.

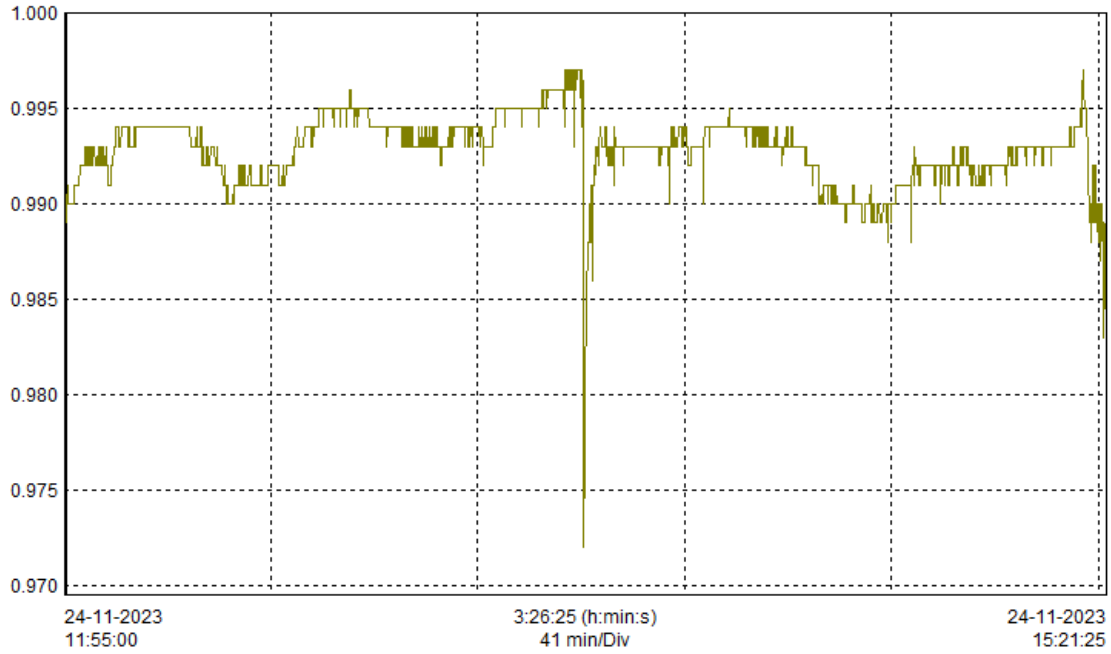
1. Power quality analyser – Measured current



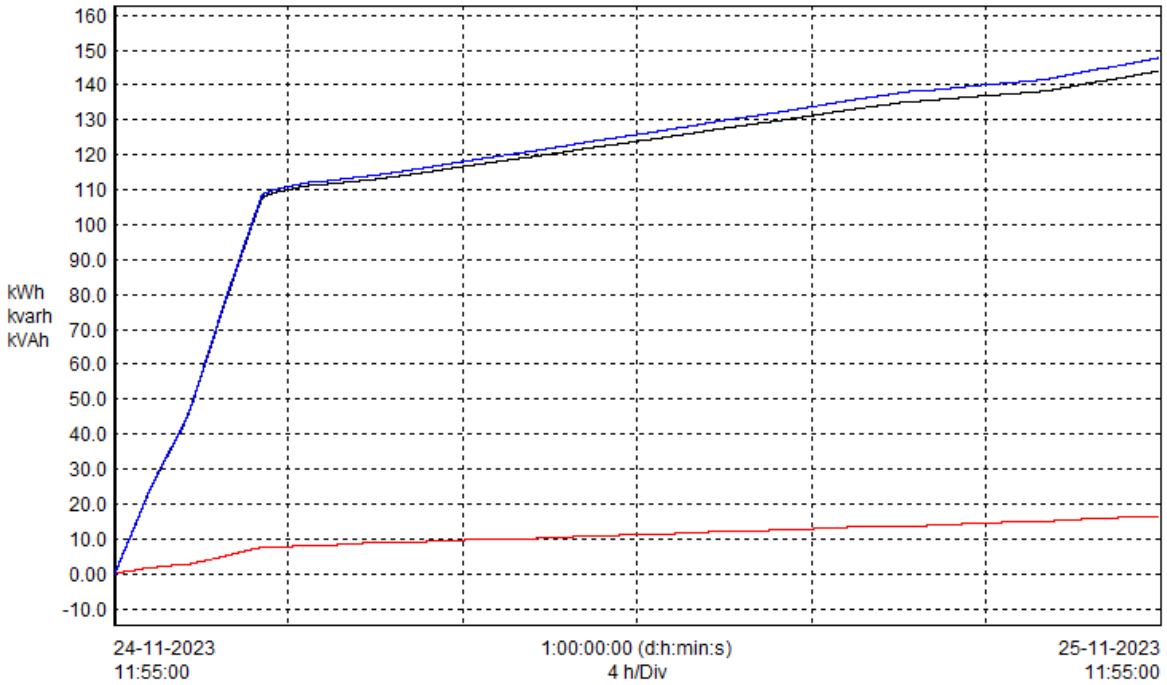
2. Power quality analyser – Measured power



3. Power quality analyser – Measured power factor



4. Power quality analyser – Measured energy



CHAPTER III

ENERGY SAVING PROPOSALS

Summary of Energy saving proposals.

Sl No	Energy Saving Proposals	Annual Savings (Rs,)	Investment (Rs.)	Payback (Period In Years)
1	Replace the fluorescent Tube Lights with Energy efficient LED lights	34512	70740	2
2	Replace the conventional ceiling fan with BLDC Fan	129365	1167000	9
3	Replace low star rated AC to high star rated AC	45880	396000	8.6
	Total	**2,09,757**	**16,33,740**	**7.8**

ENERGY SAVING RECOMMENDATIONS

From the findings and observations, the energy audit team suggest the following recommendations at Emmanuel College, Vazhichal.

RECOMMENDATION 01

Replace the fluorescent Tube Lights with Energy efficient LED lights

Fluorescent tube lights are seen around the campus occupying most part of lighting. Considerable amount of energy can be saved by replacing the remaining fluorescent tube lights with LED tube lights.

The comparison of power consumption for conventional tube light and the energy efficient LED Tube Light is given below:

Power	Conventional	Energy Efficient

Consumption	Tube Light	LED Tube Light
Tube light	40 Watts	20 Watts
Choke Loss	10 Watts	Nil
Saving in Watts		30 Watts

We strongly recommend replacing the Conventional Tube Lights chokes with Energy efficient LED Tube Lights in a phased manner. Currently, there are around 262 tube lights are found inside the campus.

Benefits

The estimated annual savings is **Rs.34,512/-** with an investment of **Rs.70,740/-** which will be paid back in **2 years**.

The Breakup for Energy Saving opportunities with LED Tube light

Locations	Tube light Operating Hours	No. Of Days	No. Of Tube light	Energy Cost Saving Potential in Rupees	Investment in Rupees	Payback Period in Years
Main Office, staff room	6 Hours	310 Days	13 Nos	4,473.3	3,510	0.9
Class Rooms	6 Hours	180 Days	140 Nos	27,972	37,800	1.4
Computer Labs, Laboratory	4 Hours / week	180 Days	109 Nos	2,066.64	29,430	14.25
Total			262 Nos	34,511.94	70,740	2

We recommend replacing the Conventional Tubelight with LED Tubelight, on top priority, where the No. of burning hours is more. Whenever the burning hours is less, the replacement may be done based on the failure basis.

Calculations to work out the Annual Cost Saving and Payback period :

- **If a Conventional Tube lights burns for 6 Hours daily and operates for 310 days for Main Office, staff room**

  Annual Energy for Conventional Tube light = 40Watts X 6Hours X 310days

	= 74.4 kWh
Annual Energy Cost for Conventional	= 74.4 kWh X Rs.9.25/kWh
Tubelight	= Rs.688.2/-
Annual Energy for LED Tubelight	= 20Watts X 6Hours X 310days
	= 37.2kWh
Annual Energy Cost for LED Tubelight	= 37.2kWh X Rs.9.25/kWh = Rs.344.1/-
Saving in Annual Energy Cost with LED Tubelight	= Rs.688.2 – Rs.344.1 = Rs.344.1/-
Investment required for New LED Tubelight	= Rs. 270/-
Payback period in month for the LED	= (Investment/ Annual cost Saving) X 12
Tubelight	= (Rs.270 / Rs.344.1) X 12
	= 9.41 ≅ 9.4 Months

- **If a Conventional Tube lights burns for 6 Hours daily and operates for 180 days for Class Rooms.**

Annual Energy for Conventional Tube light	= 40Watts X 6Hours X 180days
	= 43.2 kWh
Annual Energy Cost for Conventional	= 43.2 kWh X Rs.9.25/kWh
Tubelight	= Rs.399.6/-
Annual Energy for LED Tubelight	= 20Watts X 6Hours X 180days
	= 21.6kWh
Annual Energy Cost for LED Tubelight	= 21.6kWh X Rs.9.25/kWh = Rs.199.8/-
Saving in Annual Energy Cost with LED Tubelight	= Rs.399.6 – Rs.199.8 = Rs.199.8/-
Investment required for New LED Tubelight	= Rs. 270/-
Payback period in month for the LED	= (Investment/Annual cost Saving) X 12
Tubelight	= (Rs.270 / Rs.199.8) X 12
	= 16.21 ≅ 1.4 years

- **If a Conventional Tube lights burns for 4 Hours per week and operates for 180 days for lighting purpose at Computer Labs, Laboratory.**

Annual Energy for Conventional Tube light	= 40Watts X 4Hours X 25.72 weeks
	= 4.11 kWh

Annual Energy Cost for Conventional Tubelight	= 4.11 kWh X Rs.9.25/kWh =Rs.38.02/-
Annual Energy for LED Tubelight	= 20Watts X 4Hours X 25.72 weeks = 2.05 kWh
Annual Energy Cost for LED Tubelight	= 2.05kWh X Rs.9.25/kWh =Rs.18.96 /-
Saving in Annual Energy Cost with LED Tubelight	= Rs.38.02 – Rs. 18.96 = Rs.18.96 /-
Investment required for New LED Tubelight	= Rs. 270/-
Payback period in month for the LED Tubelight	= (Investment/Energy Saving) X 12 = (Rs.270 / Rs.18.96) X 12 = 170.88 ≅ 14.25 years

RECOMMENDATION 02

Replace the conventional ceiling fan with BLDC Fan

Presently conventional single phase induction motor based Ceiling fans are commonly used for ventilation in Classrooms, Laboratory and Staff rooms. The conventional ceiling fan consumes 65Watts, whereas the BLDC type Ceiling fan consumes 35Watts for the same sweep area. There is a potential to save 30 Watts power per ceiling fan, if the conventional ceiling fan is replaced with BLDC type ceiling fan.

Benefits

There are around 435 fans are found inside the campus. The estimated annual savings is **Rs.1,29,365/-** with an investment of **Rs.11,67,000/-** which will be paid back in **9 Years**.

The Breakup for Energy Saving opportunities with BLDC fan

Locations	No. Of Fan	Operating Hours	No. Of Days	Energy Cost Saving Potential in Rupees	Investment in Rupees	Payback Period in Years
Class Rooms, Main Office, staff room	313 Nos	6 Hours	200 Days	1,12,915	9,39,000	8.3
Computer Labs, Laboratory	76 Nos	4 Hours	180 Days	16,450	2,28,000	13.9
Other(seminar	46 Nos	2 hours /	180	-	-	-

hall, auditorium, etc)		month	Days			
Total No. Of Fan in College	435 Nos			1,29,365	11,67,000	9

Whenever, the institution has a plan to buy ceiling fans for new building or expansion or modernization activities, it is recommended to buy BLDC fan.

Calculations to work out the Annual Cost Saving and Payback period :

- **If a Conventional Fan operates for 6 Hours daily for 200 days,**

Annual Energy for Conventional fan = 65Watts X 6Hours X 200days
= 78 kWh

Annual Energy Cost for Conventional fan = 78 kWh X Rs.9.25/kWh
= Rs.721.5/-

Annual Energy for BLDC fan = 35Watts X 6 Hours X 200 days
= 39 kWh

Annual Energy Cost for BLDC fan = 39 kWh X Rs.9.25/kWh
= Rs.360.75/-

Saving in Annual Energy Cost with BLDC fan = Rs.721.5– Rs.360.75= Rs.360.75/-

Investment required for New BLDC fan = Rs. 3000/-

Payback period in month for the BLDC fan = (Investment/Energy Saving) X 12
= (Rs.3000 / Rs.360.75) X 12
= 99.93 ≅ 8.3 Years

- **If a Conventional Fan operates for 4 Hours daily for 180 days,**

Annual Energy for Conventional fan = 65Watts X 4Hours X 180days
= 46.8 kWh

Annual Energy Cost for Conventional fan = 46.8 kWh X Rs.9.25 /kWh
= Rs.432.9/-

Annual Energy for BLDC fan = 35Watts X 4Hours X 180 days
= 23.4 kWh

Annual Energy Cost for BLDC fan = 23.4kWh X Rs.9.25/kWh= Rs.216.45 /-

Saving in Annual Energy Cost with BLDC fan = Rs.432.9 – Rs.216.45 = Rs.216.45 /-

Investment required for New BLDC fan = Rs. 3000/-

Payback period in month for the BLDC fan = (Investment/Energy Saving) X 12

= (Rs.3000 / Rs.216.45) X 12

= 166.32 ≅ 13.9 Years

RECOMMENDATION 03

Replace low star rated AC to high star rated AC

Presently air conditioners used in the institutions are with different star rated. Low star rated ACs consume more power. But five star rated ACs consume less power and need less maintenance.

2 star rated ACs consume 1100 watts whereas 5 star rated consume only 700 watts.

Benefits

Currently there are 15 Nos of air conditioners installed inside the campus. But only 11 ACs are low star rated ACs. If all those are replaced with 5 star rated ACs, then the estimated annual savings is **Rs.45,880 /-** with an investment of **Rs.3,96,000 /-,** which will be paid back in **8.6 years.** The replacement priority can be given to the locations where the AC is utilized more.

No. Of AC	Operating Hours	No. Of Days	Energy Cost Saving Potential in Rupees	Investment in Rupees	Payback Period in Years
4 Nos (No star)	4 Hours	200	23680	144000	6
3 Nos (2 star)	4 Hours	200	13320	108000	8.1
4 Nos (3 star)	6 Hours	200	8880	144000	16.2
2 Nos (4 star)	6 Hours	-	-	-	-
2 Nos (5 star)	6 Hours	-	-	-	-
			45880	396000	8.6

Calculations to work out the Annual Cost Saving and Payback period :

For No star rated ACs

Annual Energy for 2 star AC = 1500Watts X 4Hours X 200 days

= 1200 kWh

Annual Energy Cost for 2 star AC = 1200kWh X Rs.9.25/kWh = Rs.11100/-

Annual Energy for 5 star AC = 700Watts X 4Hours X 200 days

= 560 kWh

Annual Energy Cost for 5 star AC = 560 kWh X Rs.9.25/kWh= Rs.5180/-

Saving in Annual Energy Cost with 5 star AC	= Rs.11100 – Rs.5180 = Rs.5920 /-
Investment required for New 5 star AC	= Rs. 36000/-
Payback period in month for the 5 star AC	= (Investment/Energy Saving) X 12 = (Rs.36000 / Rs.5920) X 12 = 72.97 ≅ 6 years

For 2 star rated ACs

Annual Energy for 2 star AC	= 1100Watts X 6Hours X 200 days = 1320 kWh
Annual Energy Cost for 2 star AC	= 1320kWh X Rs.9.25/kWh = Rs.12210/-
Annual Energy for 5 star AC	= 700Watts X 6Hours X 200 days = 840 kWh
Annual Energy Cost for 5 star AC	= 840 kWh X Rs.9.25/kWh= Rs.7770/-
Saving in Annual Energy Cost with 5 star AC	= Rs.12210 – Rs.7770 = Rs.4440 /-
Investment required for New 5 star AC	= Rs. 36000/-
Payback period in month for the 5 star AC	= (Investment/Energy Saving) X 12 = (Rs.36000 / Rs.4440) X 12 = 97.29 ≅ 8.1 years

For 3 star rated ACs

Annual Energy for 2 star AC	= 1000Watts X 4Hours X 200 days = 800 kWh
Annual Energy Cost for 2 star AC	= 800 kWh X Rs.9.25/kWh = Rs.7400/-
Annual Energy for 5 star AC	= 700Watts X 4Hours X 200 days = 560 kWh
Annual Energy Cost for 5 star AC	= 560 kWh X Rs.9.25/kWh= Rs.5180/-
Saving in Annual Energy Cost with 5 star AC	= Rs.7400 – Rs.5180 = Rs.2220 /-
Investment required for New 5 star AC	= Rs. 36000/-
Payback period in month for the 5 star AC	= (Investment/Energy Saving) X 12 = (Rs.36000 / Rs.2220) X 12 = 194.6 ≅ 16.2 years

CHAPTER IV

SCOPE FOR IMPROVEMENT

During the Detailed Energy Audit at the institution, the team have identified some of the areas possible to improve further, which also gives energy saving but it won't payback within three years of time and also difficult to quantify in some cases. But, it increases the reliability of the equipment in a great extent.

IMPROVEMENT OPPORTUNITIES

1. Marking of Switch Control for Lights, Fans & Air-Conditioners

Presently the students find difficulties to identify the switch for a tube light / fan in Classrooms & laboratories. Hence, they switch ON all the switches and do the work even one or two student sitting in the classroom/Laboratories.

Number the Light, Fan & Air conditioner and Marking should be done on Switch point as well as near the Tube light, Fan & Air conditioners. This will helpful to the students to switch ON the required Tube light, Fan & Air conditioner alone.

2. Placing the display boards on saving electricity

Even though awareness on saving electricity is given to the students and staff members, there is still tremendous scope to create awareness among them about efficient & optimum use of electricity to save. Instruction cum awareness board shall be displayed near each switch-board, toilet block & bathrooms to influence & guide all the users to arrest misuse & wastage of power.

3. Use of Master Switch outside each class room

In many cases, the students forget to switch off the lights and fan when they are leaving to laboratories or staffrooms. So all the equipment are in turn on condition when no one is there in the classroom. Installation of master switch outside of each classroom can make it easy for anyone to switch off all the appliances of the rooms. This can help in saving the energy wastage.

4. Regular cleaning of air filters and cooling pins at regular intervals

Improper cleaning of air filters in air conditioners may leads to deposition of dust in the cooling pins of the air conditioners and the filters are choked. The performance of the air conditioners should be reviewed only after cleaning the filters and removing the dirt's in the cooling pins.

The cleaning of Air filters plays a major role on power consumption on the blower of the Air conditioners. This needs to be done once in a month. Non-maintenance of air filter leads to excess power consumption in the air conditioners blowers. The cleaning frequency should be reviewed with respect to the dust settled on the air filters. Hence it is recommended to regularly clean the filters and cooling pins of air conditioners.

5. Install Sleep Mode Facility for all the Computer System

The computer system running in idle mode consumes 90 – 200Watts of power. There is a provision available in the system to set the computer to sleep mode. In the sleep mode of operation the monitor power consumption is nil & system will consume a little bit of power to restore the earlier status.

The recommended time for going to sleep mode should be set to 3 Minutes. Whenever the system is idle for more than 3 minutes, the system automatically goes to sleep mode.

6. Turn off lights and fan when not in use

During a energy audit visit, it was observed that lights and fans are often left on even in areas where there are no students or staff present. This not only contributes to unnecessary energy consumption but also increases our carbon footprint.

To address this issue and promote a more sustainable and eco-friendly environment, we kindly request everyone to adhere to the practice of turning Off Lights and fans when leaving their place.

By adopting these simple habits, we can collectively make a significant impact on our energy usage and contribute to a greener future.

CHAPTER V

MANAGEMENT ASPECTS & CONCLUSIONS

The Objectives of Emmanuel College should be

- To make energy conservation a permanent activity inside the campus.
- To achieve lowest energy cost without compromising quality of Educational services.
- To make one of the Best institutions on the aspect of energy utilization and sustainable power generation in India.
- To achieve this objective, a firm top management commitment is required at the highest level that the institution wants to conserve energy on a time bound basis.
- To give top priority to implement the recommended proposals and reap benefits.

APPROACH TO AN ENERGY CONSERVATION IDEA

Each energy conservation idea should be seen as an opportunity for improvement. The approach must be on how to implement each proposal and overcome the problems, if any.

It is easier to say a proposal is not possible or not implementable but the benefit comes from the actual implementation, which needs lot of courage, conviction, will power and perseverance to implement.

CONCLUSIONS

- The energy audit team have jointly identified proposals for implementation.
- An annual savings potential of **Rs.2,09,757/-** can be realised by implementing the recommended proposals.
- The annual savings can be achieved with an investment of **Rs. 16,33,740**/- which will be paid back in **7.8 Years**.
- Implementation of identified proposals should be given top priority and should be done step-by-step.