

# ENERGY AUDIT - 2022



**SREE SANKARA COLLEGE**

**KALADY, ERNAKULAM**

*EXECUTED BY*



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May 2022

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## **PREFACE**

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Every institution should be imparting knowledge about the campus environment and its surroundings through activities that follows the principles of sustainability. An energy audit is essential first step to reduce energy cost and greenhouse emissions. Audit is defined as a systematic and implement examination of data statements, records, operations and performance of an enterprise for a purpose. Energy audits is a systematic study or survey to identify how energy being used in its own facility. And identifying the energy savings opportunities in the building Behavioural Change through the student education can provide greatest benefit at least cost. Even small savings in each house holds make dramatic change in the society and for nation. The idea of energy conservation and sustainability will be percolated to society through students will have long standing effect and successful too.

This report is compiled by the BEE certified energy auditor along with the project engineers who are experienced in the field of energy, environment and management.



## ACKNOWLEDGEMENTS

We express our sincere gratitude to Sree Sankara College, Kalady for giving us an opportunity to carry out the project of Energy Audit. We are extremely thankful to all the staffs for their support to carry out the studies and for input data, and measurements related to the project of Energy Audit.

- |   |                  |                   |
|---|------------------|-------------------|
| 1 | Dr. Suresh A     | Principal         |
| 2 | Dr. Preethi Nair | IQAC Co-ordinator |

Also mentioning our Energy audit team members for successfully completing the assignment in time and making their best efforts to add value.

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Yours faithfully

Managing Director  
Athul Energy Consultants Pvt Ltd



## EXECUTIVE SUMMARY

### I. ENERGY SAVING PROPOSALS

TABLE 1: ENERGY SAVING PROPOSALS

Sl. no	Energy conservation measures	Annual Energy Savings	Annual Financial Savings	Investment	Simple payback period
		kWh	Rs	Rs	Months
1	Power Factor Improvement by installing 16 kVAr capacitor.		36053	16000	5
2	Replacement of (250 nos) ceiling fan (75W) with BLDC (28W)	10575	71022	875000	148
3	Replacement of T8(36W)-130 nos and T12(40W)-49 nos with LED Tube light (20W)	2203	14806	53700	44
4	Replacement of 3-star AC (1.5 Ton) with 5-star AC (1 Ton)	1337	8985	38000	51
<b>Total</b>		<b>14115</b>	<b>130865</b>	<b>982700</b>	<b>90</b>
5	Installation of 50 kW Solar PV system		372000	2250000	6

### II. ENERGY AUDIT SUMMARY & RECOMMENDATIONS

The summary of the report with respect to each section is as follows.

#### 1. Baseline energy performance:

##### Electricity consumption analysis

- **Demand analysis:** The demand analysis was done for the last 12 months. It is found that the recorded maximum demand was 111.34 kVA which is 93% of the contract demand. The percentage of recorded maximum demand in the normal, Peak and off-peak period registered with respect to the contract demand (120 kVA) is 93%, 43%, and 39% respectively.
- **Power factor:** The PF in the last 12 months was found to be 0.94 (average) and penalties were levied for several months. Rs 3845 was paid as penalties for low PF during the May 2021– Sep 2021. Installing 16kVar inline capacitor across the incomer (LT side) would help to maintain the power factor above the prescribed limit.



- **Renewable energy integration:** College is benefitted with space in its roof top hence they can go for solar installations in their facility and go for zero billing and claimed as solar powered college or self-sustainable College.
- **Sub metering of panels:** Sub metering of panels suggested to know the separate energy consumption of each building.

## 2. Equipment and utility description

- **Voltage:** The maximum and minimum supply voltage during the normal operational period, excluding the power failure, is 424.9V and 399.8V respectively with an average voltage of 413.7V. Voltage unbalance comes in the range of 1.3 to 2.4%.
- **Current imbalance:** The maximum current occurred during the period and measured at 58.5A. The current imbalance varies between 1 to 25.5%.
- **Load factor:** The present average load factor in 24 hours' period is 53%.
- **Capacitors:** Capacitors are not installed in the college.
- **Harmonics:** The present Harmonics values ( $THD_v = 1.17$  &  $THD_i = 5.66\%$ ) both the current and voltage harmonics are satisfactory.
- **Light loads:** By replacing the fluorescent lighting fixtures (T12, T8) with LED light will reduce the overall power consumption. Detailed analysis given in the energy conservation measures section.
- **Ceiling fan loads:** Ceiling fans are installed in majority of the areas by replacing it with Brushless DC fans which consumes in the range of 25 to 30W at full speed, instead of 75W in normal fans, will reduce the power consumption considerably. Also, while purchasing new fans priority should be given for BLDC.





### III. ENERGY PERFORMANCE INDEX (EPI)

EPI was based on the energy consumption in May 2021 to April 2022. The projected energy consumption after the implementation of energy saving proposals is given in the table below.

**TABLE 2: ENERGY PERFORMANCE INDEX**

Energy Performance	Unit	Present Consumption	Projection
Annual Electricity Consumption *	kWh	123352	109236
Annual Diesel Consumption	Litre	800	800
Annual LPG Consumption	kg	328	328
Energy Performance Index	TOE/m <sup>2</sup>	0.00061	0.00055
Specific Energy Consumption	TOE/Head	0.00459	0.00411
Annual Energy Cost	Rs.	945170	850362
Carbon Footprint - Electricity	Ton CO <sub>2</sub>	97.45	86.30
Carbon Footprint - Diesel	Ton CO <sub>2</sub>	1.92	1.92
Carbon Footprint - LPG	Ton CO <sub>2</sub>	0.98	0.98
Annual Carbon Footprint	Ton CO <sub>2</sub>	100.35	89.20
Specific Carbon Footprint - Annual	Ton CO <sub>2</sub> /Head	0.0393	0.0349

\* Only sixty percentage of the total electricity consumption is taken into consideration since the electric connection is common for all other institution in the campus premises.

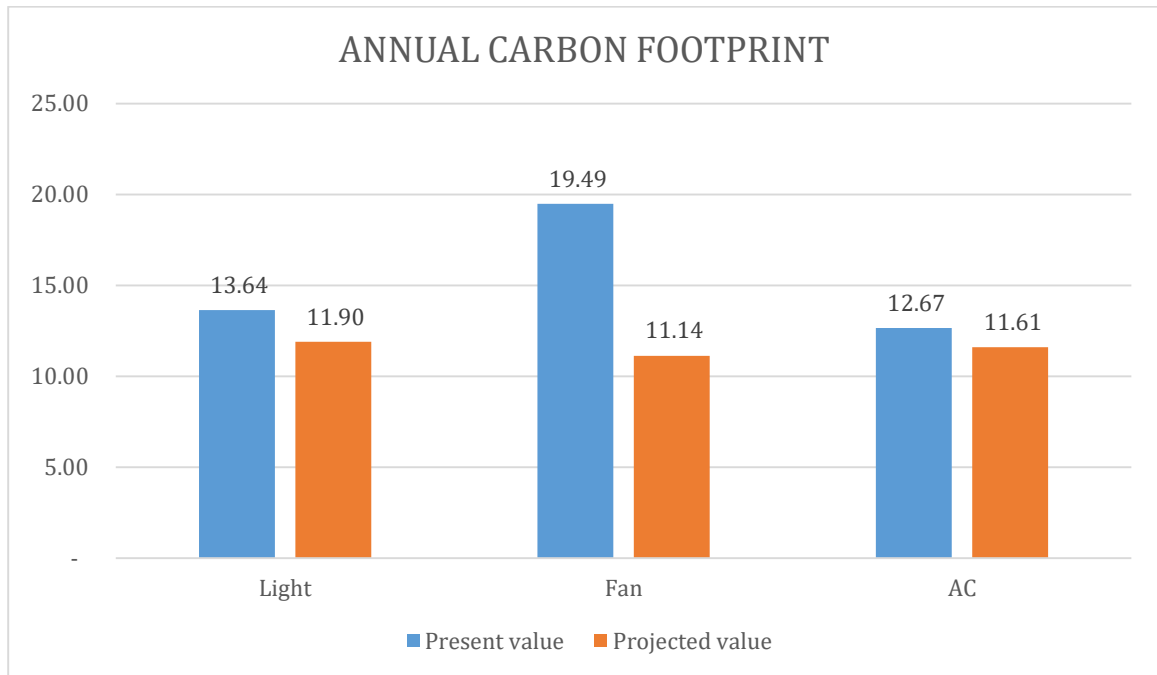
**Note: Unit conversions:**

TOE	=	10 million kCal (BEE energy audit manual)
MWh of electricity	=	0.79 Ton of CO <sub>2</sub> (www.cea.gov.in)
Ton of LPG	=	2.99 Ton of CO <sub>2</sub> (www.cea.gov.in)
Ton of Diesel	=	2.4 Ton of CO <sub>2</sub> (www.cea.gov.in)
kWh of electricity	=	860 kCal (BEE energy audit manual)
Kilogram of LPG	=	10500 kCal (BEE energy audit manual)
Liters of Diesel	=	9500 kCal (BEE energy audit manual)



#### IV. ANNUAL CARBON FOOTPRINT OF APPLIANCES

The present carbon dioxide generation by appliances in the college and the projected value after the implementation of the energy conservation measures is given in the figure below



**FIGURE 1: ANNUAL CO<sub>2</sub> EMISSION**



## V. CARBON FOOT PRINT

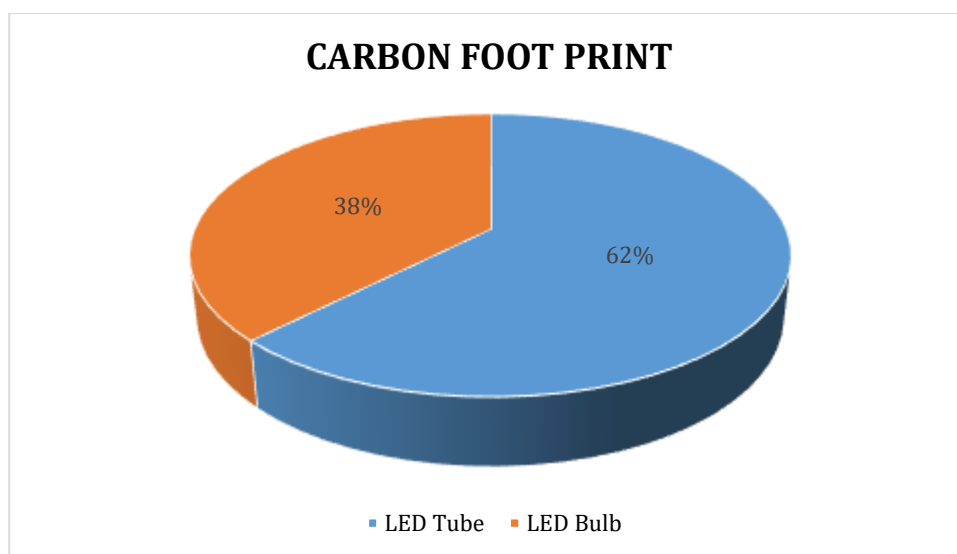
Carbon foot print is often used as short hand for the amount of carbon emission (usually in Tonnes) being emitted by an activity or by organization this is an important component in ecological foot print or the depicting the biological space reduction in the earth. Various environment protection and energy conservation connected with carbon footprint. Institution took its accountability to protect nature and taken few steps for the carbon neutral campus

1. Protecting and conserving trees inside and outside the campus through various students' activities
2. Replacement of old CFLs and tubes with energy efficient LED lights
3. Sustainable construction of buildings for natural ventilation and light in the classrooms and laboratories.

**TABLE 3 CARBON FOOT PRINT**

Particulars	Energy consumption reduction (kWh)	Carbon Emission reduction (Ton CO <sub>2</sub> )	% of total
Replacement of 281numbers of T8 Tube (36W) with LED tube light	3237	2.56	62
Replacement of 301 numbers of CFL with (9W )LED	1950	1.54	38
<b>Total</b>	<b>5187.6</b>	<b>4.10</b>	<b>100</b>

**FIGURE 2: CARBON FOOT PRINT**





## INTRODUCTION

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### I. ENERGY AUDIT

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An energy audit is a key to assessing the energy performance of an energy consuming facility and for developing an energy management program. The typical steps of an energy audit are:

- Preparation and planning
- Data collection and review
- Plant surveys and system measurements
- Observation and review of operating practices
- Data documentation and analysis
- Reporting of the results and recommendations

#### 1.1. Definition of energy auditing

In the Indian Energy Conservation Act of 2001 (**BEE 2008**), an energy audit is defined as: "**The verification, monitoring and analysis of the use of energy and submission of technical report containing recommendations for improving energy efficiency with cost-benefit analysis and an action plan to reduce energy consumption.**"

#### 1.2. Objectives of Energy Auditing

The objectives of an energy audit can vary from one plant to another. However, an energy audit is usually conducted to understand how energy issued within the plant and to find opportunities for improvement and energy saving. Sometimes, energy audits are conducted to evaluate the effectiveness of an energy efficiency project or program. In Jawaharlal College as per the request from the institution, we have assessed the energy consumption and saving opportunities at present scenario.

#### Methodology for the study

The methodology adopted for energy audit starts from historical energy data analysis, power quality analysis, monitoring of operational practices, system evaluation, cost benefit analysis of the energy conservation opportunities, and prepare plan for implementation. The proposals given in the report includes economical energy efficiency measures to reduce facilities unnecessary energy consumption and cost. The energy conservation options, recommendations and cost benefit ratio, indicating payback period are included in this report.

#### Scope of Work

The Scope of Work includes:

1. Historical energy data analysis.
2. Electrical, Mechanical and Thermal energy analysis.
3. Power Quality Analysis.
4. Identification of Energy saving opportunities.
5. Cost Benefit Analysis.



## II. SREE SANKARA COLLEGE, KALADY

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Sree Sankara College, Kalady was founded in the year 1954 by Swami Agamananda, a social reformer and a foresighted scholar of Sri Ramakrishna Advaita Ashram. The institution was established with a view to perpetuating the memory and doctrines of the great saint and philosopher, Adi Sankaracharya and to nurture his birth place as a cultural citadel. The foundation stone was laid on 28 August, 1953 by His Highness the Maharaja of Travancore in the presence of The Maharaja of Cochin and several other distinguished personalities. The Sree Sankara College Association was formed in July 1954.

The vision & mission of the organization was to establish a Centre of Higher Learning with two major objectives —dissemination of knowledge in tune with a university curriculum and fostering community development.

The institution was raised to the status of a First Grade College in 1956. It is affiliated to the Mahatma Gandhi University and is included under sec.2 (f) and 12 (B) of the UGC act, 1956.

In June 1960, the patronage of the college became vested in His Holiness the Jagadguru Sri Sri Sankaracharya Swamigal of Dakshinamnaya. Currently, Sri Sri Bharathi Theertha Mahaswamigal, of Sringeri Mutt, steers the administration through a Board of Directors with Sri. K. Anand as the Managing Director.

The college has done consistently well in Curricular and Cocurricular activities. The National Assessment and Accreditation Council (NAAC), accredited the college by B++ Grade with 2.80 CGPA on a four-point scale. The Departments of Economics, Commerce, Sanskrit and Microbiology are approved Research Centres under the Mahatma Gandhi University.

### **VISION**

To achieve excellence in higher Education, with a stress on, creativity, skill development, employability, personal values with social

### **MISSION**

To mould good citizens with ingenuity, adaptability, social commitment and ethical values who can provide innovative leadership in all walks of life.



### III. GENERAL DETAILS

The general details of the College are given below in table.

**TABLE 4: GENERAL DETAILS**

Sl. No:	Particulars	Details
1	Name of the College	Sree Sankara College, Kalady
2	Address	Sree Sankara College Sankar Nagar, Mattoor, Kalady P.O., Ernakulam – 683 574
3	Contact Person	Dr. Mini K D, Ph: 9605055445
4	Contact Number & E mail	0484-2462341
		info@ssc.edu.in
5	Web site	www.ssc.edu.in
6	Type of Building	Educational Institution
7	Annual Working Days	180
8	No: of Shifts	Day Shift (One) (9:30AM -3:30PM)
9	No: of students enrolled	2421
10	No: of teaching & non-teaching staff	133
12	No: of departments	21
13	Total Built Up area	19078 Sq. m
14	Total land area	18 acres
15	Average power consumption per month.	17132 kWh
16	Average electricity charges per month.	Rs. 107360/-



#### IV. LOAD BALANCE- ELECTRICAL

The details of the loads installed in the college are given below:

TABLE 5: CONNECTED LOAD

Sl. No:	Particulars	Total Load (kW)	Percentage
1	Light & Fan	76.90	34
2	Computer and other electronic loads	55.46	25
3	Air Conditioner Load	29.60	13
4	Other Loads	62.66	28
	<b>Total Power (kW)</b>	<b>224.61</b>	<b>100</b>

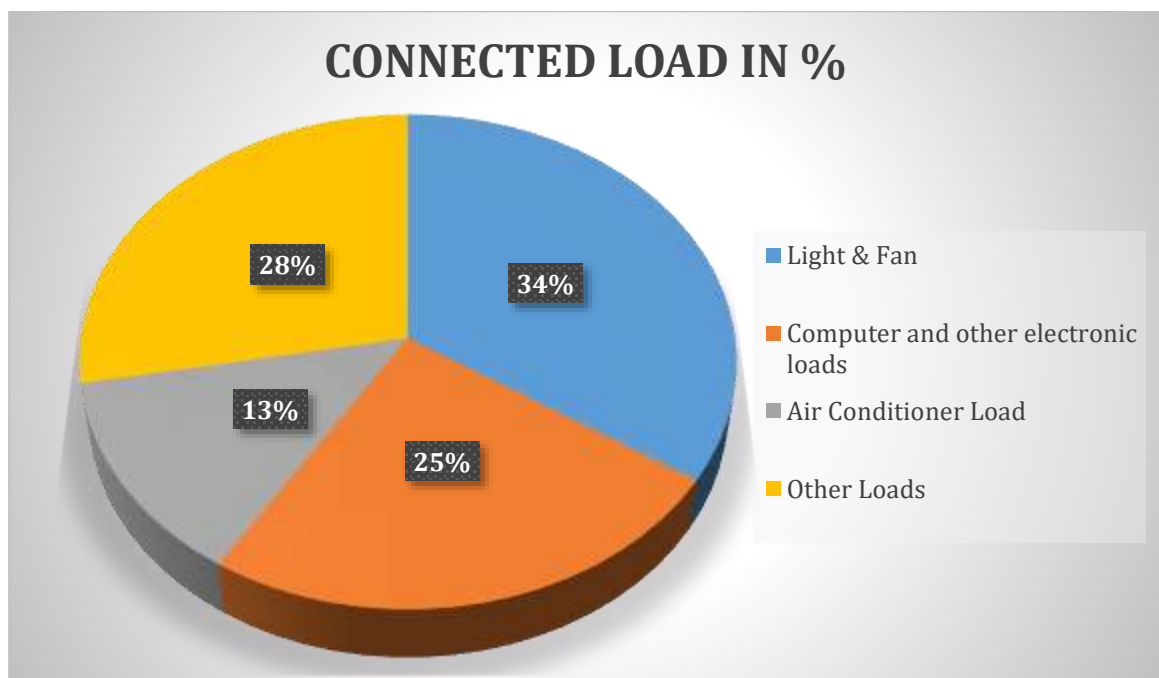


FIGURE 3: LOAD BALANCE – ELECTRICAL



## ENERGY & UTILITY DESCRIPTION

In this section the single line diagrams of electricity and water are given which provides an overview of the energy flow in the building.

### I. SINGLE LINE DIAGRAM – ELECTRICAL

The electrical single line diagram of the college is given below:

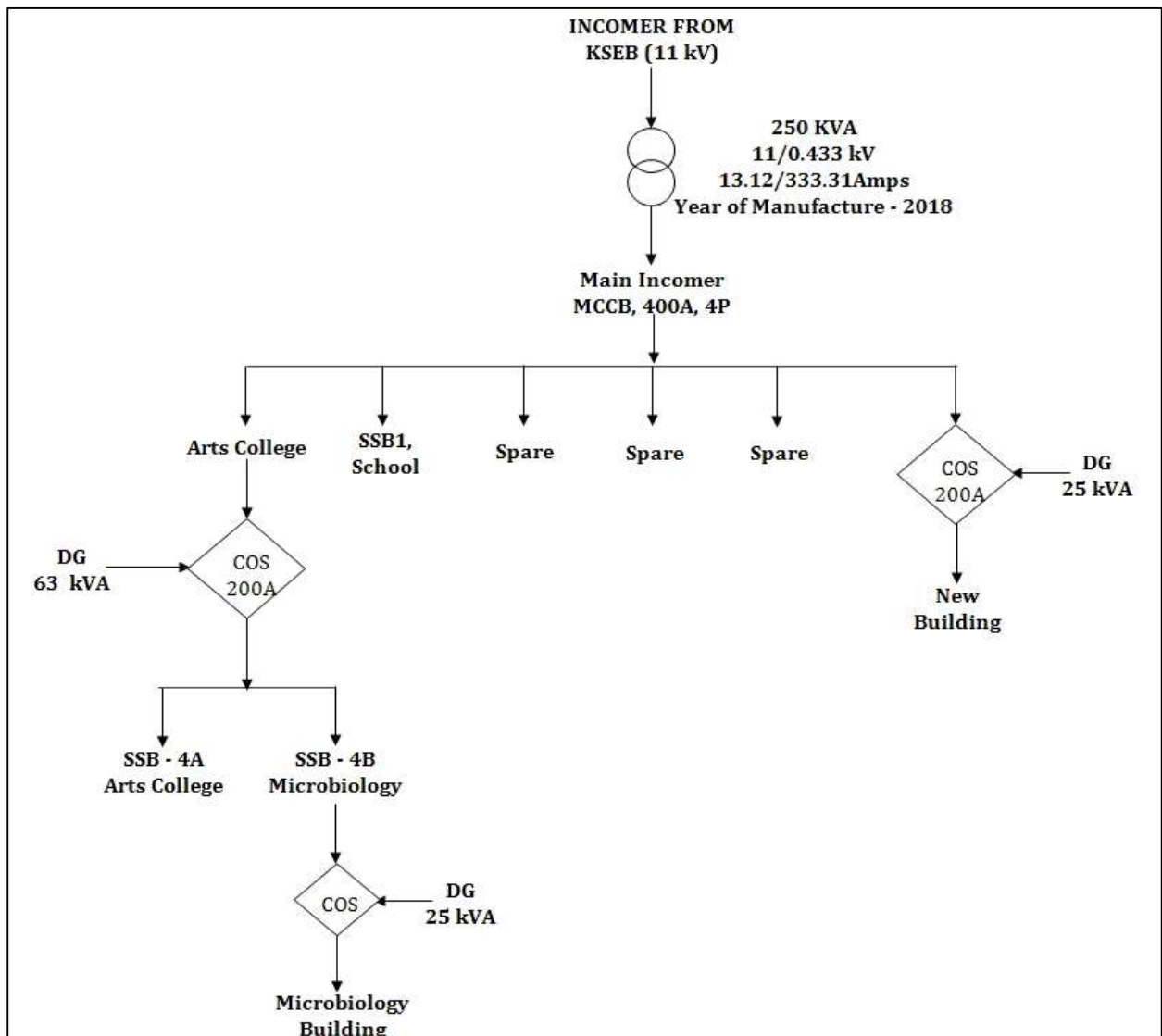


FIGURE 4: SINGLE LINE DIAGRAM – ELECTRICAL



## II. SINGLE LINE DIAGRAM – WATER

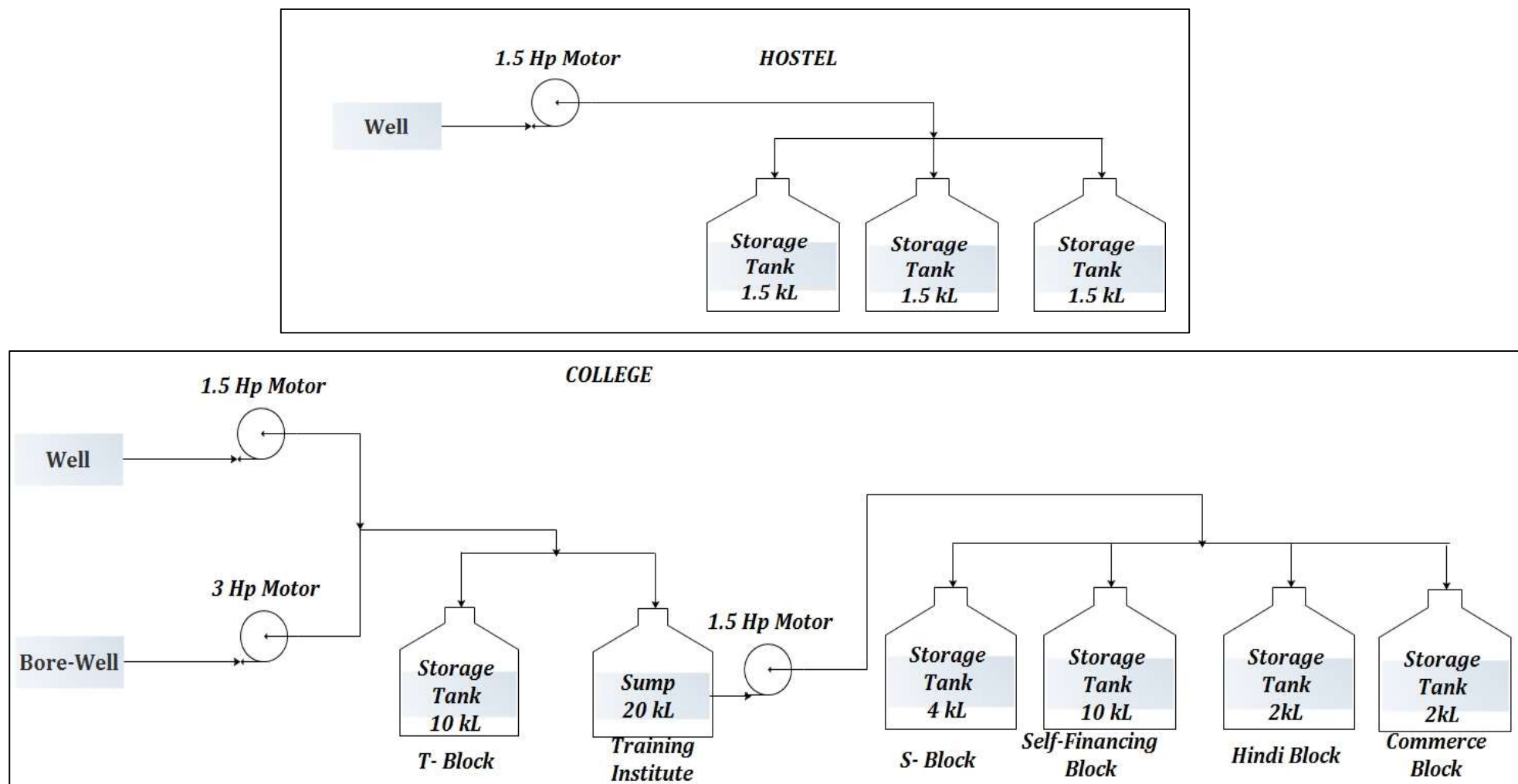


FIGURE 5: SINGLE LINE DIAGRAM - WATER



## ENERGY ANALYSIS

The different type's energy usage is given in this section. The major source of energy to the college is electricity. Other forms come in the form of diesel and LPG.

### ELECTRICITY CONSUMPTION ANALYSIS

The major source of electricity to the college and hostel is the electrical connection from the KSEBL. Three diesel generators are provided in the college, but it is only used during the power failures in critical days like examinations or college events.

#### I. DESCRIPTION OF ELECTRICITY BILL

Base line data given below is based on the Electricity bill provided by the supplier of electricity to the College. Details obtained from the KSEBL bill for the month of May 2021 to April 2022 is as follows in the Table.

**TABLE 6: KSEBL BILL ANALYSIS**

Particulars	Details
Consumer No	LCN: 4/9247
Contract Demand (kVA)	120 kVA
Connected Load (kW)	288.476 kW
Tariff	HT II (B) General
Recorded maximum demand (kVA)	111.34
Average monthly electricity consumption (kWh/month)	17132
Average Power factor	0.94
Average Demand charges (Rs/month)	41,873
Annual power factor penalty & Incentive (Rs/year)	Penalty – Rs. 3845/- Incentives – Rs. 5065/-
Demand charge (Rs / kVA)	440
Energy charge (Rs/kWh)	Normal-6.2 Peak-9.3 Off Peak-4.65
Average electricity cost (Rs/month)	1,60,362

**Inference & Suggestions**

- i. Average Power factor is found to be 0.94. The college was levied PF penalties during several months since the PF was below the prescribed limit of 0.95.
- ii. 16kVAR inline capacitor can be connected at the transformer secondary side to improve the PF to unity.
- iii. Recorded maximum demand (RMD) during past 12 month was 111.34 kVA. It was recorded during the month of March 2022.

**II. DEMAND ANALYSIS**

This section analyses the trend for the maximum demand versus the Contract Demand (CD) over a 12-month period (May 2021 to April 2022).

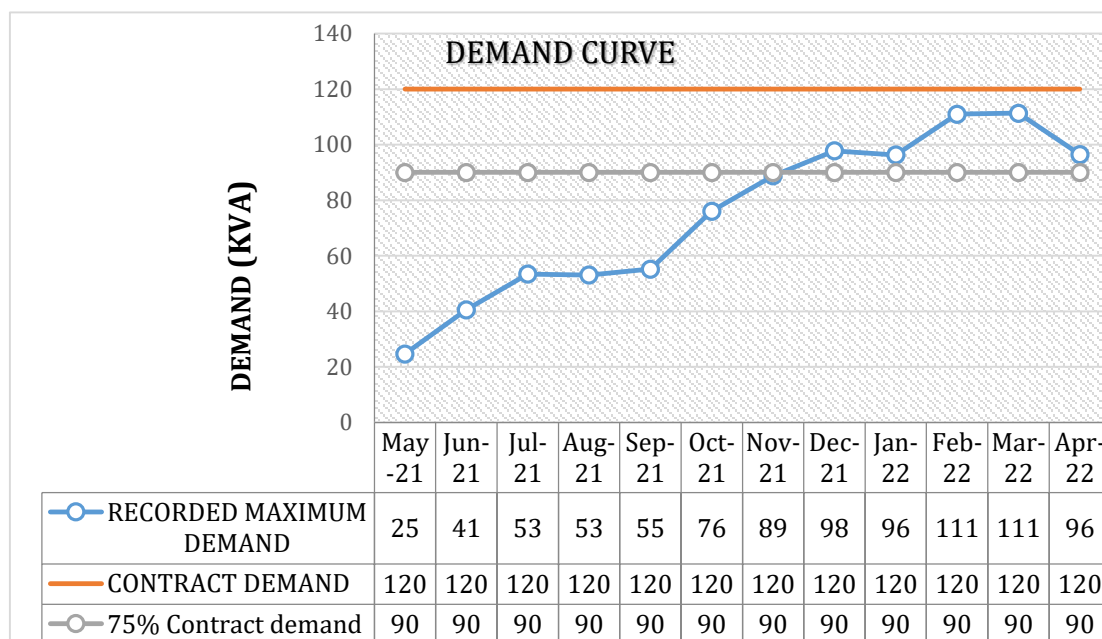


FIGURE 6: DEMAND IN VARIOUS TIME ZONE

**Inference**

- i. Annual demand charges came as **Rs. 5,02,480/-**
- ii. The recorded maximum demand came in the range of 10% to 93% with respect to the contract demand with an average of 39%.

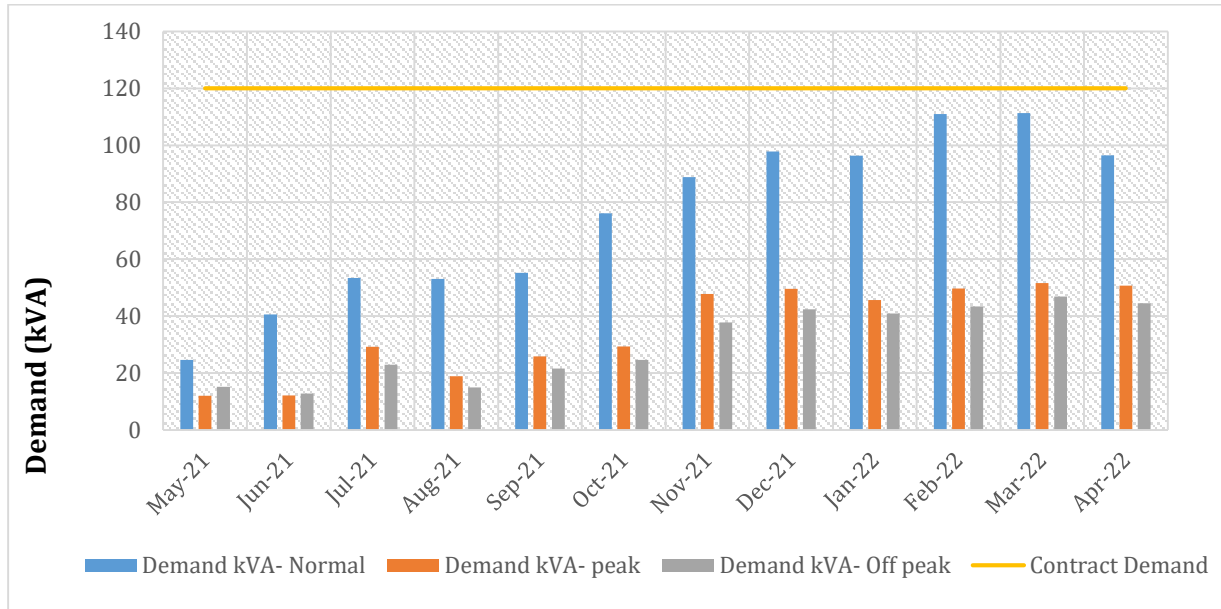
**Suggestion**

- i. Maintaining the power factor to near unity in lagging mode yields dual benefits, the demand will further reduce and the incentives for the power factor will rise.
- ii. Installing capacitor will help to maintain the power factor to near unity.



### III. ELECTRICITY DEMAND IN VARIOUS TIME ZONES

The variations of demands in the time zones are given below in figure.



**FIGURE 7: ELECTRICITY DEMAND IN VARIOUS TIME ZONE**

#### ***Inference***

- i. The average demand registered during the normal, Peak and off-peak period at college with respect to the contract demand (120 kVA) were 75%, 35% and 31% respectively.
- ii. The percentage of maximum demand during the normal, Peak and off-peak period registered at institution with respect to the Contract demand (120 kVA) were 93%, 43% and 39% respectively.

#### IV. POWER FACTOR ANALYSIS IN KSEBL BILL

The Power factor is the ratio of Active power (kW) and apparent power (kVA).

$$PF = \frac{\text{Active energy kWh}}{\text{Apparent energy (kVAh)}}$$

The power factor variations in past one year is given below in figure.

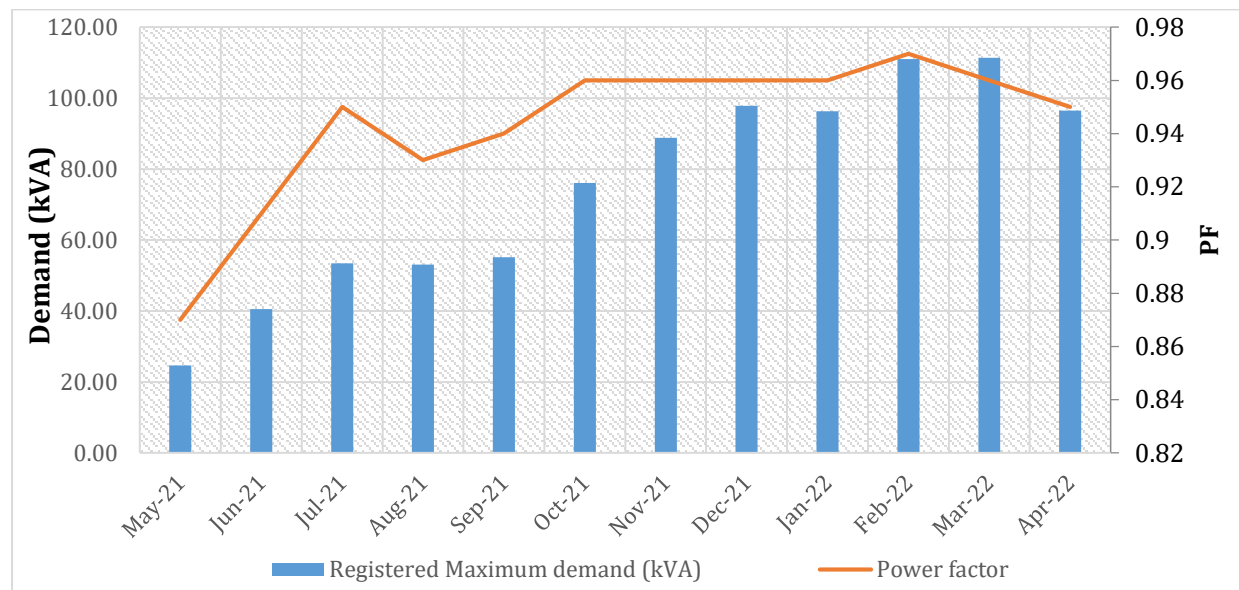


FIGURE 8: POWER FACTOR ANALYSIS

#### Inference

- i. Average power factor during the past one year is found to be 0.94
- ii. Power factor penalty was paid by college for May 2021 – September 2021. If the power factor is maintained close to unity, penalty incurred can be avoided.
- iii. Capacitors are not installed.
- iv. Capacitors can be installed so as to improve the PF and gain incentives. Detailed explanation is given in the section Energy Conservation Measures ECM 01.

## V. TARIFF RATES ANALYSIS

The average monthly energy and demand charges for the period May 2021 to April 2022 is represented in Fig.

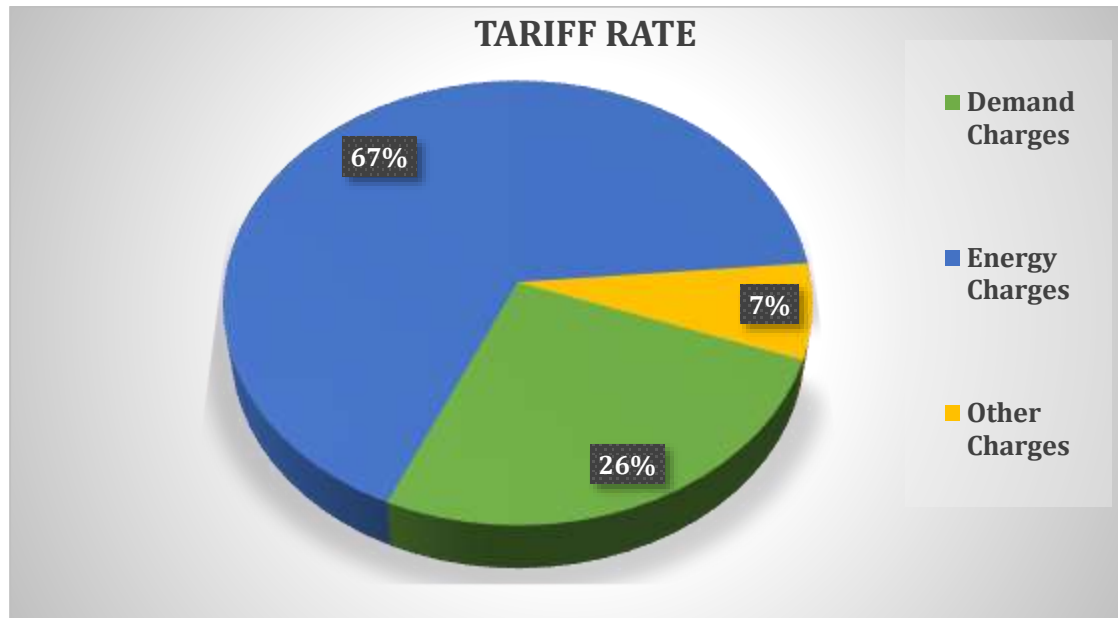


FIGURE 9: TARIFF RATE ANALYSIS

### *Inference*

- i. Average demand charges for the past one year were **Rs 41,873/-** per month and energy charges was **Rs 1,07,360/-** per month.
- ii. The energy charges come about 67% of the total bill.



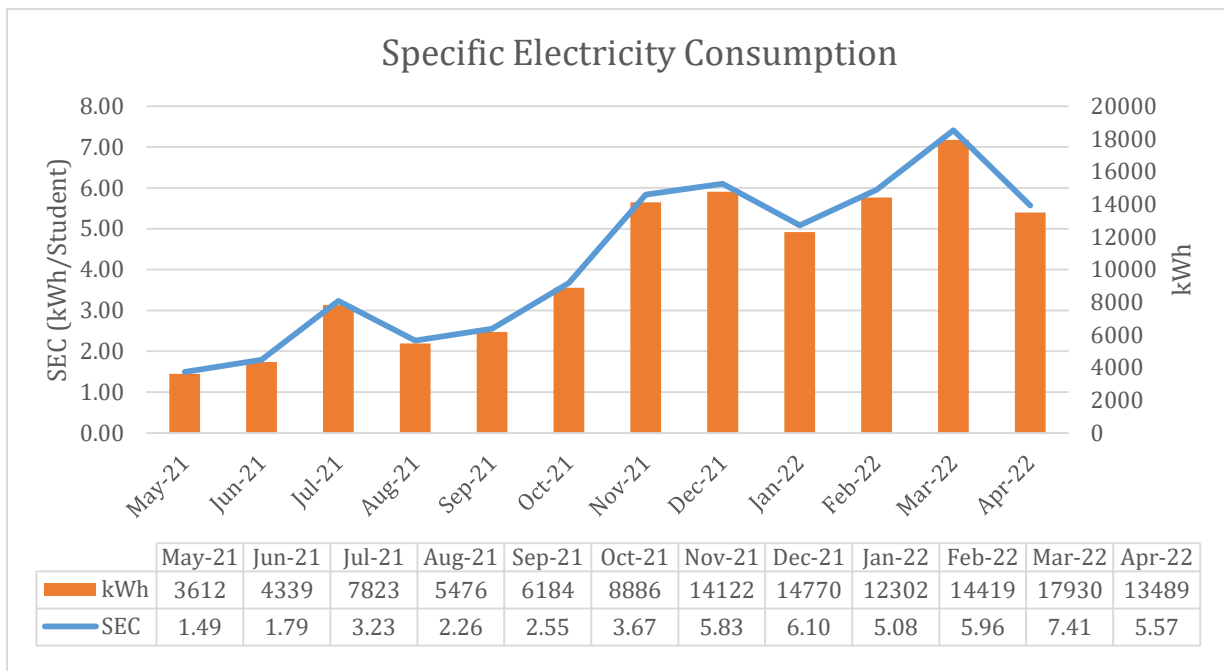
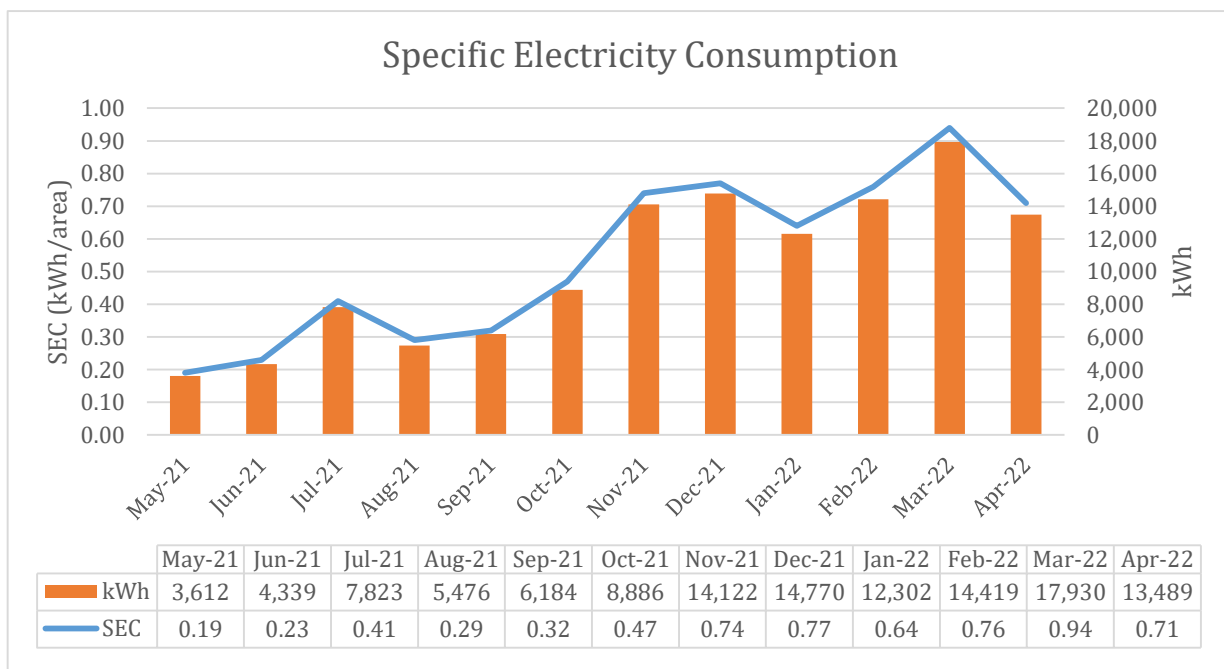
## VI. SPECIFIC ELECTRICITY CONSUMPTION (KWH/M2)

The electricity consumption from the May 2021 to April 2022 has been taken for the benchmarking. Here the comparison is done with electricity consumption and the Building area and number of students. The below table shows the specific electricity consumption of the college.

TABLE 7: SPECIFIC ELECTRICITY CONSUMPTION

Month	Electricity Consumption*	Number of Students	Building Area	SEC	SEC
	kWh	Number	m <sup>2</sup>	kWh/Student	kWh/ m <sup>2</sup>
May-21	3612	2421	19,078	1.5	0.19
Jun-21	4339	2421	19,078	1.8	0.23
Jul-21	7823	2421	19,078	3.2	0.41
Aug-21	5476	2421	19,078	2.3	0.29
Sep-21	6184	2421	19,078	2.6	0.32
Oct-21	8886	2421	19,078	3.7	0.47
Nov-21	14122	2421	19,078	5.8	0.74
Dec-21	14770	2421	19,078	6.1	0.77
Jan-22	12302	2421	19,078	5.1	0.64
Feb-22	14419	2421	19,078	6.0	0.76
Mar-22	17930	2421	19,078	7.4	0.94
Apr-22	13489	2421	19,078	5.6	0.71
Average	10279.3	2421	19078	4.25	0.54
Annual Specific Electricity consumption				51.0	6.47
Annual Electricity Consumption(kWh)*				123352	

\* Only sixty percentage of the total electricity consumption is taken into consideration since the electric connection is common for all other institution in the campus premises.

**FIGURE 10: SPECIFIC ELECTRICITY CONSUMPTION (KWH/STUDENTS)****FIGURE 11: SPECIFIC ELECTRICITY CONSUMPTION (KWH/AREA)**





## DIESEL CONSUMPTION ANALYSIS

The Diesel is the fuel which is used for the DGs. The details of the diesel consumption in the last academic year and the generator details are given in the table below.

**TABLE 8: DIESEL CONSUMPTION**

Particulars	Annual Diesel consumption (Lt)	Calorific value (TOE)
Generator	800	0.76

Calorific value of Diesel is 9500 Kcal and 1 TOE means 10000000 Kcal.

**TABLE 9: GENERATOR DETAILS**

Particulars	Make	kVA	Fuel
New Building	-	25	Diesel
Microbiology Block	Kriloskar	25	Diesel
Main Block	KOEL	62.5	Diesel

## LPG CONSUMPTION ANALYSIS

The details of the LPG consumption in the last academic year is given in the table below.

**TABLE 10: LPG CONSUMPTION**

Particulars	Annual LPG consumption (Kg)	Calorific value (TOE)
Microbiology Lab	193	0.20
Biotechnology Lab	77.2	0.08
Biochemistry Lab	19.3	0.02
Zoology Lab	38.6	0.04
<b>Total</b>	<b>328</b>	<b>0.34</b>

Calorific value of LPG is 10500 Kcal and 1 TOE means 10000000 Kcal.



## ELECTRICAL MEASUREMENT ANALYSIS

### TRANSFORMER SECONDARY LOGGING

The main incomer at the college was logged using power quality analyser Krykard ALM-31 for 1 hour and given in following table the measurement-averaging period was 20 seconds.

**TABLE 11: TRANSFORMER LOGGING**

Measurement values				
Actual Energy for 1 Hrs	kWh	31.21		
Apparent Energy for 1 Hrs	kVAh	33.96		
Power Factor	0.92			
Particulars	Units	Minimum	Maximum	Average
Active Power	kW	28.2	34.9	31.2
Apparent Power	kVA	30.8	37.8	33.9
Reactive Power	kVAr	11.3	14.4	12.9
Voltage phase	Volts	399.8	424.9	413.7
Current	Amps	33.3	58.5	47.3
THD V	%	0.7	1.9	1.17
TDD A	%	2.4	11.3	5.68
Voltage Imbalance	%	0.7	1.6	1.2
Current Imbalance	%	1	25.5	10.34

#### ***Inference***

- i. The maximum demand registered during the period of measurement is 37.8 kVA, in 20 seconds interval, and the corresponding PF was 0.92.
- ii. The variation of voltages found at the time of audit. (399.8 V to 424.9 V)
- iii. Current imbalances were found to be higher.



## I. ANALYSIS: VOLTAGE VARIATION

The Voltage profile at the main incomer of college is plotted below in figure.

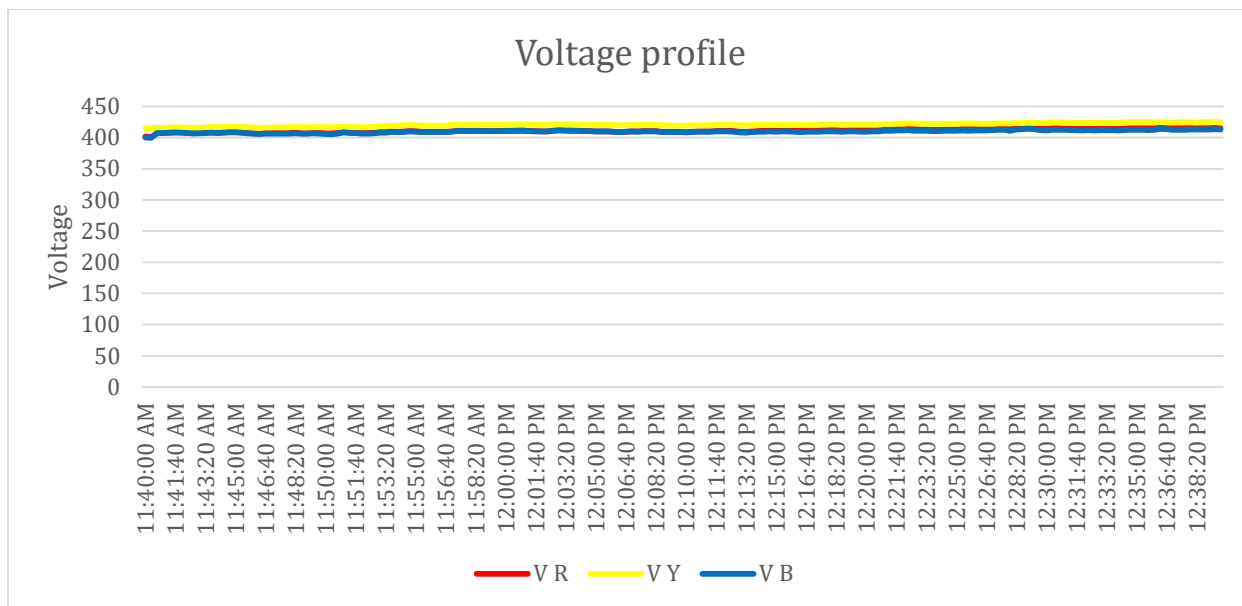


FIGURE 12: VOLTAGE PROFILE

### Inference

- The figure shows the minimum voltage imbalance and supply voltage variation.
- The maximum and minimum supply voltage were during the normal operational period, excluding the power failure, is 424.9V and 399.8V respectively with an average voltage of 413.7 V.
- Voltage imbalance comes about the maximum value of 1.6%.



## II. ANALYSIS: CURRENT VARIATIONS

This section carries the current variations during the 1-hour measurement period with the power analyzer. The figure below gives the current profile of the phases.

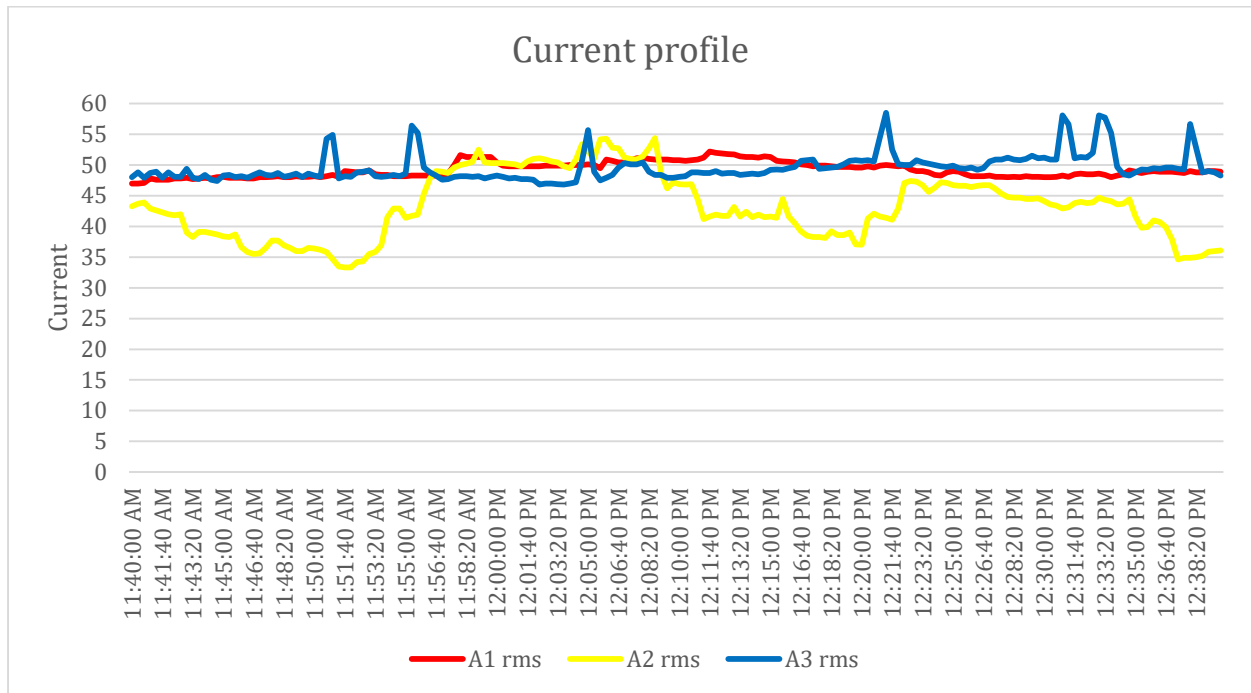


FIGURE 13: CURRENT VARIATIONS

### Inference

- The maximum current occurred during the period was at 58.5A.
- The current unbalance varies between 1 to 26%.



### III. LOAD FACTOR

---

The load factor is the ratio of the energy consumed during a given period (in the audit period or in last 12 months) to the energy, which would have been consumed if maximum demand had been maintained throughout the period.

$$\text{Load factor (\%)} = \frac{\text{Energy used during the period (kWh)} \times 100}{\text{Maximum demand (kW)} \times \text{Time under consideration (hr)}}$$

Load factor calculated from the 24-hour logging at the LT side during the period of audit is given in table below:

TABLE 12: LOAD FACTOR – TRANSFORMER

Total kWh*	Max kW*	Time (Hrs)	Load factor (%)
1088	85	24	53

*\*Energy used and maximum demand considered is based on the overall load on transformer i.e.: all the institution in the campus premises is considered.*

#### ***Inference***

- i. Here the load factor comes about 53% during the 24-hour logging period.



#### IV. ANALYSIS: POWER FACTOR

The section provides an overview of the power factor variations. The below figure shows the kW and PF variations.

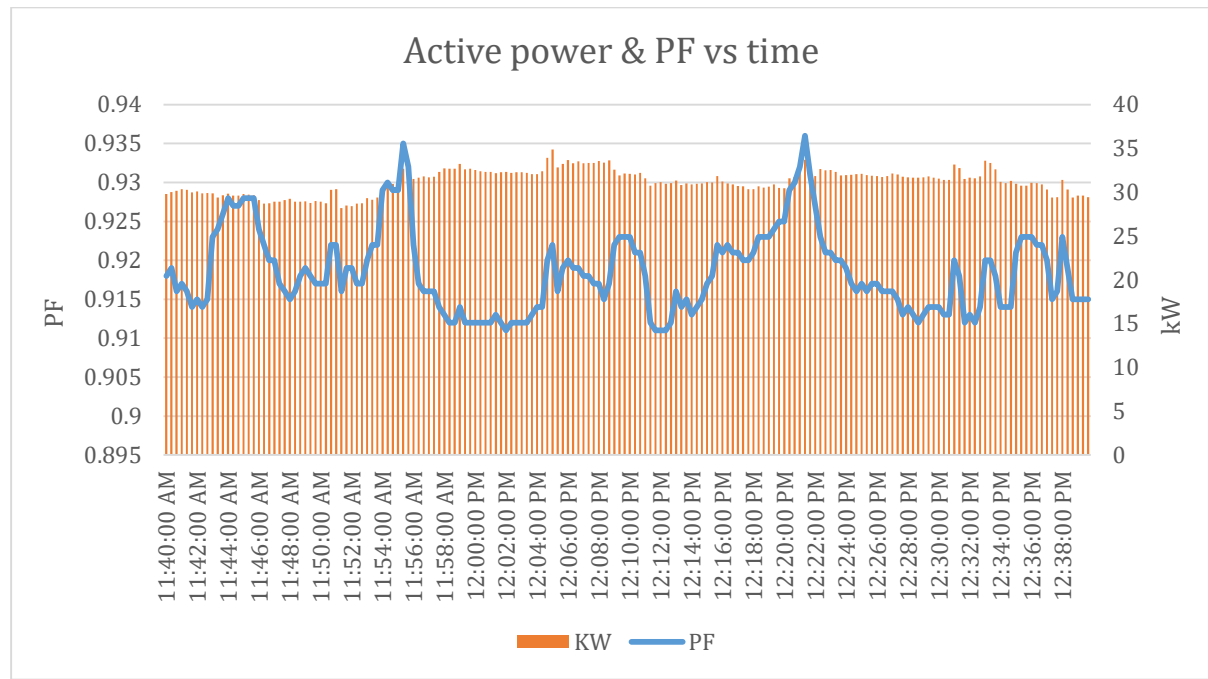


FIGURE 14: KW, & PF VARIATIONS

#### Inference

- The PF is found to be very low in some intervals.
- The active power was analysed during the working period of building and it varies between 28 to 35 kW.



## V. ANALYSIS: CURRENT IMBALANCE

This section carries out the current imbalance during the logging period. The current imbalance at the main incomer of the college are given below:

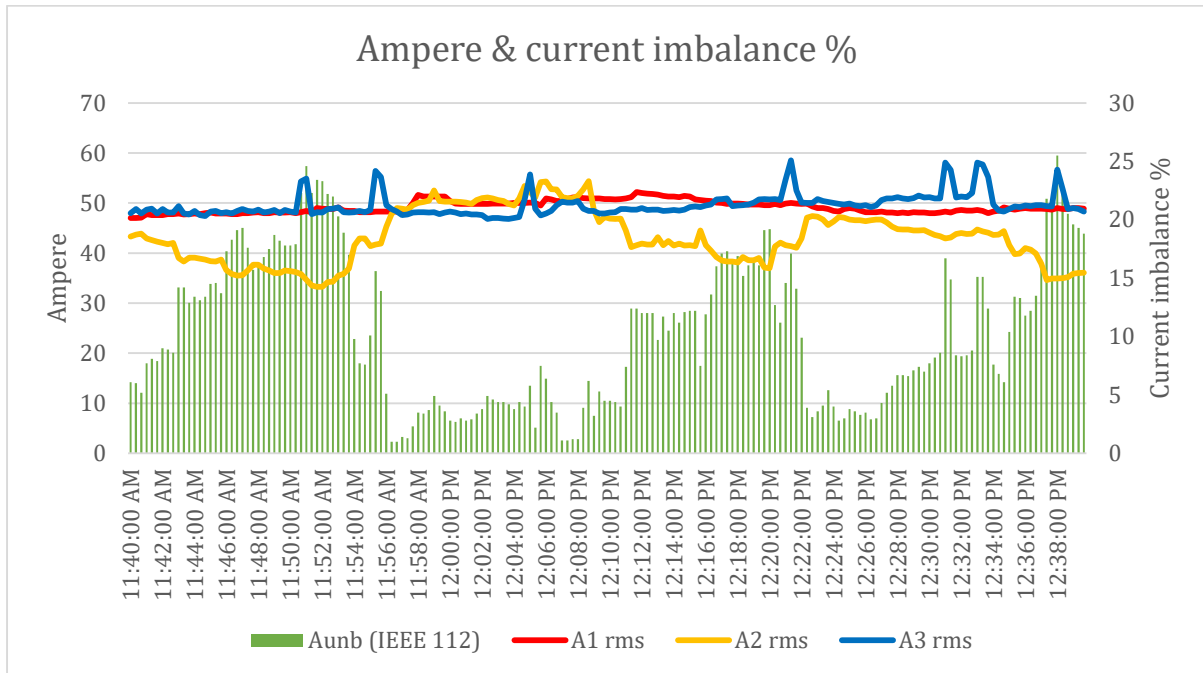


FIGURE 15: AMPERE VS IMBALANCE GRAPH

**Inference** | i. The average current unbalance was 10.34%.



## VI. HARMONIC STUDY

Harmonics study revolves around the use of non-linear loads that are connected to electric power systems including static power converters, arc discharge devices, saturated magnetic devices and to a lesser degree, rotating machines. Static power converters of electric power are the largest non-linear loads and are used in industry for a variety of purposes such as electro- chemical power supplies, adjustable speed drives, and uninterruptible power supplies. These devices are useful because they can convert ac to dc, dc to dc, dc to ac, and ac to ac. Non-linear loads change the sinusoidal (a succession of waves or curves) nature of the ac power current (and consequently the ac voltage drop) thereby resulting in the flow of harmonic currents in the ac power system that can cause interference with communication circuits and other types of equipment. Classification, effects and standards are given below:

**TABLE 13: HARMONICS CLASSIFICATION**

	1st order	2nd order	3rd order	3rd order	4th order	5th order	6th order
<b>Frequency Hz</b>	50	100	150	200	250	300	350
<b>Sequence</b>	+	-	0	+	-	0	+

**TABLE 14: EFFECTS OF HARMONICS (IEEE 519)**

<b>Effect on - Motor &amp; generator</b>	<b>-Transformers</b>	<b>- Cables</b>	<b>- Electronic equipment</b>	<b>- Metering</b>
<b>Rotor heating, causes Reverse rotating magnetic field, causes pulsating torque output, Mechanical oscillations, increases Cogging &amp; Crawling</b>	Increase in copper & stray losses, increase in iron losses, transformer heating	Voltage stress & corona, $I^2R$ losses increases	Voltage notching, Electromagnetic interference, Shifting of the voltage zero crossing	Erroneous reading





Maximum harmonic current distortion in percent of $I_L$						
Individual harmonic order (odd harmonics) <sup>a, b</sup>						
$I_{sc}/I_L$	$3 \leq h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h \leq 50$	TDD
$< 20^c$	4.0	2.0	1.5	0.6	0.3	5.0
$20 < 50$	7.0	3.5	2.5	1.0	0.5	8.0
$50 < 100$	10.0	4.5	4.0	1.5	0.7	12.0
$100 < 1000$	12.0	5.5	5.0	2.0	1.0	15.0
$> 1000$	15.0	7.0	6.0	2.5	1.4	20.0

<sup>a</sup>Even harmonics are limited to 25% of the odd harmonic limits above.

<sup>b</sup>Current distortions that result in a dc offset, e.g., half-wave converters, are not allowed.

<sup>c</sup>All power generation equipment is limited to these values of current distortion, regardless of actual  $I_{sc}/I_L$ .

where

$I_{sc}$  = maximum short-circuit current at PCC

$I_L$  = maximum demand load current (fundamental frequency component)  
at the PCC under normal load operating conditions

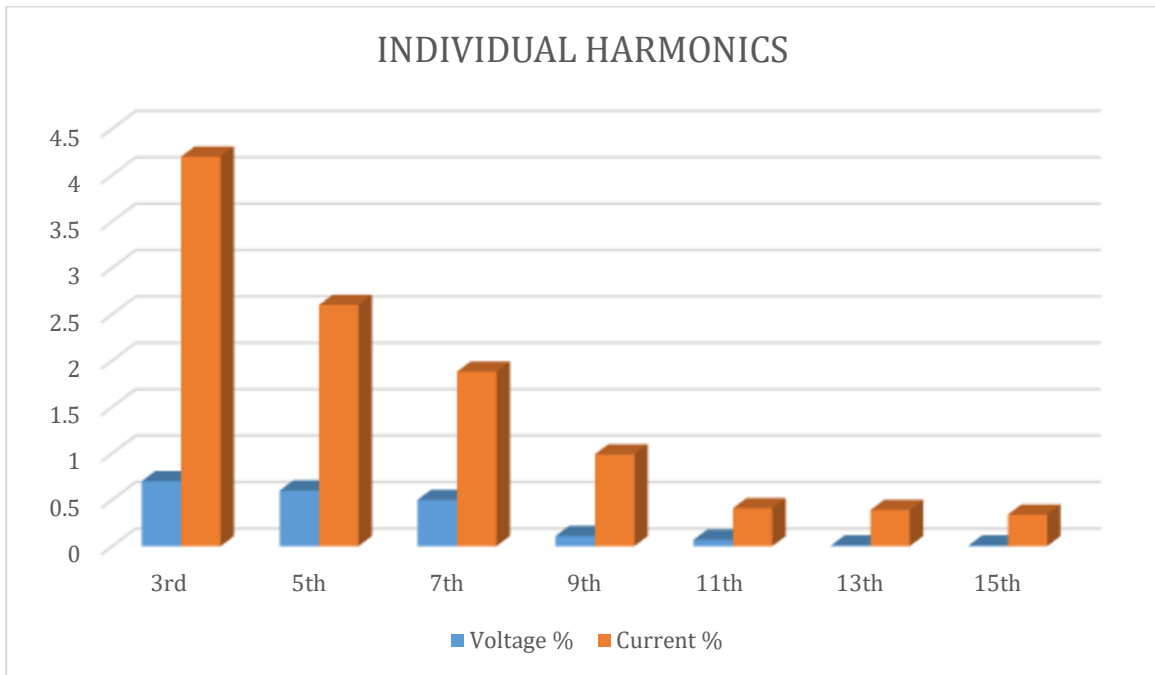
TABLE 15: VOLTAGE HARMONICS LIMIT (IEEE 519-2014)

Voltage distortion limits		
Bus voltage at PCC	Individual voltage distortion %	Total voltage harmonics distortion %
$V < 0.1$ kV	5.0	8.0
$0.1$ kV $< V < 69$ kV	3.0	5.0
$69.001$ kV $< V < 161$ kV	1.5	2.5
$161.001$ kV and above	1.0	1.5

## HARMONICS DATA SHEET

TABLE 16: HARMONICS ANALYSIS

Location: College Main Incomer							
Total harmonic distortion as per CEA standard TDDi limit is 8% and THDv limit is 8% at 400V level as per Short circuit analysis							
Total Harmonic Distortion - TDD %		Voltage %	Current %	Remarks			
		1.12	5.68	Voltage and current harmonics are within limit			
Individual Harmonic%							
Particulars	3rd	5th	7th	9th	11th	13th	15th
Voltage %	0.7	0.6	0.5	0.11	0.07	0.01	0.009
Current %	4.2	2.6	1.88	0.99	0.41	0.39	0.34

**FIGURE 16: HARMONICS ANALYSIS*****Inference***

- i. The table gives the input that the individual and total current harmonics are within the specified limit of 8%.

***Suggestions***

- i. While purchasing nonlinear controlling devices such as UPS and loads such as LED, DC fans, more care should take to ensure the output harmonics values and specification should contain the IEEE/CEA standard limit which mentioned in the above table.
- ii. This will reduce the overall effect of harmonics in the equipment and supply system.

## ANNEXURE – 1

### I. ENERGY SAVING PROPOSALS - 1

#### PF IMPROVEMENT IN ELECTRICAL SYSTEM

##### Background

By referring the last year bills, it is clear that the power factor was below the prescribed limit for several months. As per the KSEBL tariff structure, if the PF is maintained above 0.95(lag), the consumer is entitled to receive incentives.

##### Proposal

- Provide inline capacitor of 16kVAr at the transformer secondary side to improve the PF to unity and gain incentives.

Calculations for the energy saving proposal is given in the table below.

TABLE 17: EC PROPOSAL 1

Particulars	Units	Values
Present PF		0.94
Proposed PF		0.99
Present average energy consumption/month	kWh/month	17,132
Present average energy charge/month	Rs/month	107,360
Incentives for improving the PF/month	Rs/month	2,684
Annual incentive	Rs/annum	32,208
Present penalty for the plant	Rs/annum	3,845
<b>Annual Savings</b>	<b>Rs/annum</b>	<b>36,053</b>
<b>Investment @Rs.1000 per kVAr</b>	<b>Rs</b>	<b>16,000</b>
<b>Payback period</b>	<b>Months</b>	<b>5</b>

## II. ENERGY SAVING PROPOSALS – 2

### REPLACEMENT OF CEILING FANS IN THE OFFICE WITH ENERGY EFFICIENT BLDC FANS

#### BACKGROUND

A BLDC fan takes in AC voltage and internally converts it into DC using SMPS. The main difference between BLDC and ordinary DC fans is the commutation method. A commutation is basically the technique of changing the direction of current in the motor for the rotational movement. In a BLDC motor, as there are no brushes, so the commutation is done by the driving algorithm in the Electronics. The main advantage is that over a period, due to mechanical contact in a brushed motor the commutators can undergo wear and tear, this thing is eliminated in BLDC Motor making the motor more rugged for long-term use. To explain, BLDC technology in simpler terms, BLDC uses a combination of Permanent Magnets and Electronics to achieve the kind of efficiency and performance, it delivers. A BLDC fan composes of 3 main components: - 1. Stator 2. Rotor 3. Electronics

#### PROPOSAL

Replace the ceiling fans with BLDC in the as per preference of operating hours as office areas. Staff rooms and in class rooms and in hostels the calculation for the savings is given in the table.

TABLE 18: EC PROPOSAL 2

Particulars	Units	BLDC fan
Present Power Consumption	Watts	75
Proposed Power Consumption	Watts	28
Reduction in power	Watts	47
Operating hours per day	Hr/day	5
No: of working days per year (Average)	Nos	180
No: of fans operating	Nos	250
<b>Annual energy savings</b>	<b>kWh/year</b>	<b>10575</b>
Cost per kWh	Rs	6.72
<b>Annual Financial Saving</b>	<b>Rs/year</b>	<b>71022</b>
Cost of BLDC fan	Rs	3500
<b>Investment</b>	<b>Rs</b>	<b>875000</b>
<b>pay back</b>	<b>Month</b>	<b>148</b>



### III. ENERGY SAVING PROPOSALS – 3

#### REPLACEMENT OF FLUORESCENT TUBES WITH ENERGY EFFICIENT LED LIGHTS

##### BACKGROUND

The present light fittings are mainly been the LED and fluorescent light of different ratings. Replacement of Fluorescent lights to be done in phase manner with LED lights.

##### PROPOSAL

By replacing the light fitting with LEDs of appropriate ratings the power consumption will reduce considerably by approximate 50% with the present operating hours. The calculation for the savings, approximate investment cost and payback period is given in the table below.

**TABLE 19: EC PROPOSAL 3**

Particulars	Units	T8	T12
Power of Fluorescent lights	Watts	40	36
Power of proposed LED tube	Watts	20	20
Difference in Wattage	Watts	20	16
Operating hours per day	Hrs/day	4	4
No: of working days per year (Average)	Nos	180	180
Number of Lights operating	Nos	49	130
<b>kWh Saving per Annum</b>	<b>kWh/year</b>	<b>706</b>	<b>1498</b>
Cost per kWh (Average)	Rs	6.72	6.72
<b>Annual Financial Savings</b>	<b>Rs/year</b>	<b>4742</b>	<b>10064</b>
Cost of LED tube	Rs	300	300
<b>Investment for LED lights</b>	<b>Rs</b>	<b>14700</b>	<b>39000</b>
<b>Simple Payback period</b>	<b>Months</b>	<b>37</b>	<b>47</b>

##### SUMMARY

Annual unit savings	kWh	2203
Total savings	Rs	14806
Total investment	Rs	53700
Payback period	months	44

#### IV. ENERGY SAVING PROPOSAL – 4

##### REPLACEMENT OF 3 STAR AC WITH ENERGY EFFICIENT 5 STAR AC

##### BACKGROUND

The present Air conditioners in the server room are having high power consumption as they having low star AC. This is the sample calculation for replacement of AC at PG block server room (Room No:T38) the operating hours are 24 Hrs. and with low star value.

##### PROPOSAL

Replace the 1.5 Tr 3-star with new 1 ton 5 star rated one will provide sufficient energy savings. The calculation for savings is given in the tables below.

TABLE 20: EC PROPOSAL 4

Particulars	Units	Value
Present power consumption of AC	Watts	1334
Power of proposed 5 Star AC	Watts	715
Difference in Wattage	Watts	619
Avg No: of working hours/day	Hrs/day	12
No: of working days per year (Average)	Nos/year	180
No: of working hours per annum	Hrs/year	2160
Number of AC operating	Nos	1
<b>kWh Saving per Annum</b>	<b>kWh/year</b>	<b>1337</b>
Cost per kWh (Average)	Rs	6.72
<b>Annual Financial Savings</b>	<b>Rs/year</b>	<b>8985</b>
Cost of 5 Star AC	Rs	38000
<b>Investment for AC</b>	<b>Rs</b>	<b>38000</b>
<b>Simple Payback period</b>	<b>Months</b>	<b>51</b>



## RENEWABLE ENERGY INTEGRATION

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The Sun is an inexhaustible, reliable and non-polluting source of power. Since the inception of life on earth, the only energy that was available came from the sun. The time is now approaching when humankind will again depend upon the sun as dominant energy source. We are aware that fossil fuels are not going to last forever. Of the numerous renewable sources of energy known to mankind, Solar Photo Voltaic or SPV is one that has the potential to supply power for our future needs. The advantages of solar power are:

- 1) The solar energy is more evenly distributed in the world than wind or biomass.
- 2) It is well proven and demonstrated technology.
- 3) It promises to be most cost-effective renewable power at high volumes.

### I. GENERAL REQUIREMENT FOR ROOF TOP SOLAR PV PLANT INSTALLATION

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#### **Space Requirement for Panel Mounting:**

A minimum shadow free space of 10 m<sup>2</sup> is required for the solar panel mounting for the capacity of 1KW. The panel must be mounted facing south with appropriate inclination for maximum output from installation. Suitable structure according to wind speed and roof structure must be used without shading the panel surface.

#### **Solar PV modules and Inverter:**

Solar PV panels of 300W or above must be selected for the rooftop installation above 10KW. The efficiency of individual panel must not be less than 16%.

String inverter with MPPT charge controllers is more suitable for the solar power plant installation in roof top. Equipment and installation must be complied with CEA grid regulations-2013.

#### **Location:**

Open terrace on roof top is available in the indoor stadium 1323 m<sup>2</sup> approximately.



## II. CALCULATION

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The area available for solar installation is 1323 m<sup>2</sup> in the Roof top area at indoor stadium. On grid system of 50 kW can be installed in this location without any shades.

**TABLE 21: RENEWABLE ENERGY INTEGRATION**

Particular	Unit	Value
Proposed system	kW	50
Average Energy Generation	kWh/day	200
Average Energy Generation	kWh/year	60000
Present annual unit consumption	kWh/year	122134
Average utility electricity cost	Rs	6.20
Present annual electricity cost	Rs/year	757231
<b>Annual Financial Savings</b>	<b>Rs/year</b>	<b>372000</b>
Subsidised rate of solar powerplant/Kw	Rs/kW	45000
<b>Investment (subsidized &amp; in grid tied mode)</b>	<b>Rs</b>	<b>2250000</b>
<b>Simple payback period</b>	<b>Years</b>	<b>6</b>



## ANNEXURE-2

### I. CONNECTED ELECTRICAL LOADS

#### i. LIGHT & FAN LOADS

TABLE 22: LIGHT & FAN LOADS

Particular	T12	T8	LED Tube Light	LED	CFL	LED Spot Light	Sodium Vapour lamp	Mercury Vapour Lamp	Ceiling Fan	Pedestal Fan	Wall Fan	Exhaust Fan	Exhaust Fan
<b>Block/Watts</b>	<b>40</b>	<b>36</b>	<b>20</b>	<b>9</b>	<b>18</b>	<b>40</b>	<b>50</b>	<b>60</b>	<b>75</b>	<b>60</b>	<b>60</b>	<b>80</b>	<b>120</b>
Commercial Block	14	22	39	2					56	1			
PG Block	3	3	15						5				
Microbiology Block	45	7	28	1	6				34			6	
Ladies Hostel		12	25	31			1		34			1	
Canteen			55	4					42			3	
New Block		219	15	58					130	3			
S - Block	12	16	16	22					53				
Office block		6	6	12					10				
Common Toilet (Girls Toilet)	5	3	6	7								1	
Stadium		23									16		
Library Block				79					37				
Auditorium		8		72					25				
Main Block	103	118	76	13	7	1	1	1	134	1	7	4	2
<b>Total Number</b>	<b>182</b>	<b>437</b>	<b>281</b>	<b>301</b>	<b>13</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>560</b>	<b>5</b>	<b>23</b>	<b>15</b>	<b>2</b>
<b>Total Watts</b>	<b>7280</b>	<b>15732</b>	<b>5620</b>	<b>2709</b>	<b>234</b>	<b>40</b>	<b>100</b>	<b>60</b>	<b>42000</b>	<b>300</b>	<b>1380</b>	<b>1200</b>	<b>240</b>
<b>Net Total Watts</b>	<b>7690</b>												

**ii. OTHER LOADS****Table 23: OTHER LOADS**

Particular	PC	Printer	Projector	Amp lifier	Water Filter	Water Dispenser	Xerox	Printer 3 in 1	Scanner	Kettle	Coffee Maker	Incinerator	Vending M/C	TV	Induction Cooker	Motor	Motor
<b>Block/Watts</b>	<b>200</b>	<b>120</b>	<b>150</b>	<b>250</b>	<b>120</b>	<b>920</b>	<b>750</b>	<b>400</b>	<b>80</b>	<b>1500</b>	<b>750</b>	<b>250</b>	<b>40</b>	<b>120</b>	<b>2000</b>	<b>1119</b>	<b>2237</b>
Commercial Block	4	32	2			1						1					
PG Block	16		1					1									
Microbiology Block	16	1	2														
Ladies Hostel					1									1	1		
Canteen	1		1		1						1						
New Block	4	2	7			4	1	1		2							
S - Block	3	2	2			1		1		1		1					
Office block	3		1				4										
Common Toilet (Girls Toilet)												1	1				
Stadium																	
Library Block	15	1			1		1										
Auditorium																	
Main Block	24	10	7	1	1	1	2		2	2							
Others																1	1
<b>Total Number</b>	<b>86</b>	<b>48</b>	<b>23</b>	<b>1</b>	<b>4</b>	<b>7</b>	<b>8</b>	<b>3</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>Total Watts</b>	<b>17200</b>	<b>5760</b>	<b>3450</b>	<b>250</b>	<b>480</b>	<b>6440</b>	<b>6000</b>	<b>1200</b>	<b>160</b>	<b>7500</b>	<b>750</b>	<b>750</b>	<b>40</b>	<b>120</b>	<b>2000</b>	<b>1119</b>	<b>2237</b>
<b>Total Watts</b>	<b>55456</b>																

**iii. LAB EQUIPMENT****Table 24: LAB EQUIPMENT**

Particular	Block/Watts	Microbiology Block	Canteen	New Block	Main Block
Centrifuge	350	2			
Water bath	200	3			
Water Bath	500	2		1	
Water Bath	2000			1	
Water Bath	1200			1	
Distillation Unit	350	1		2	
Distillation Unit	2500			1	
Hot Air Oven	2000	1			
Hot Air Oven	1000	1		3	2
Hot Air Oven	1500			2	
Freezer	800	2	3		
Incubator	2000	1			
Hot Plate	200			1	
Incubator	1500	1		2	
Fridge	160	10		6	4
Colorimeter	20	2		6	
Weighing M/C	20	2			
Incubator	500	2		2	
Incubator	800	3			
Incubator	1200			1	
Centrifuge	1650	1			
Laminar Air Flow	400	4		3	
Microwave oven	1100	2		1	
Ice M/C	750	1			
Centrifuge	500	1		1	
Shaker	110	1		1	
Auto Clave	2000	3			
Auto Clave	3000			2	
Auto Clave	500			1	
Vaccum Oven	187				1
<b>Total Watts</b>		<b>28640</b>	<b>2400</b>	<b>28790</b>	<b>2827</b>
<b>Net Total (W)</b>		<b>62657</b>			

**iv. AIR CONDITIONER LOADS****Table 25: AIR CONDITIONER LOADS**

Block	Floor	Location	Make	Type	Capacity	EER	Star rating	Working condition	Rated power
					Tr				Watts
Commercial Block	First Floor	FF11	Voltas	Split	1.5	2.95	3	Good	1695
	Second Floor	SF19	Voltas	Split	1	3.15	3	Good	1015
			Voltas	Split	1	3.15	3	Good	1015
		SF15	Lloyd	Split	1.5	3.59	3	Good	1875
PG Block	First Floor	T37	Voltas	Split	1	3.16	3	Good	1013
		T38 Server Room	Godrej	Split	1.5	3.7	3	Good	1334
Microbiology Block	Ground Floor	M2	Voltas	Split	1.5	3.16	3	Good	1656
	First Floor	Research Lab Micro Biology	LG	Split	1.5	3.19	3	Good	1900
		M9	Godrej	Split	1	3.11	3	Good	1061
Main Block	First Floor	Seminar Hall	Voltas	Split	2		3	Good	2071
			Voltas	Split	2		3	Good	2071
			Voltas	Split	2		3	Good	2071
			Voltas	Split	2		3	Good	2071
			Voltas	Split	2		3	Good	2071
		T3, Research Lab	Haier	Split	1	3.11	3	Good	1076
Office Block	Ground Floor	Front Office	Godrej	Split	1.5		3	Good	1334
			Godrej	Split	1.5		3	Good	1334
		G1, Manager Office	Voltas	Split	1.5			Good	1695
		Principal Office	Bluestar	Split				Good	1250
<b>Total (W)</b>									<b>29604.63</b>



## ANNEXURE-3

### I. LIST OF INSTRUMENTS

SL.NO	EQUIPMENT DESCRIPTION	MAKE & MODEL
1	POWER ENERGY & HARMONIC ANALYZER	KRYKARD ALM 31

### II. ABBREVIATIONS

AVG	:	Average
BEE	:	Bureau of energy efficiency
CO <sub>2</sub>	:	Carbon dioxide
KSEB	:	Kerala State Electricity Board.
DB	:	Distribution Board
EC	:	Energy Conservation
IEEE	:	The Institute of electrical and electronics engineers
IS	:	Indian Standard
kL	:	kilo Litre
KVA	:	kilo Volt Ampere
kVAh	:	kilo volt Ampere Hour
kVA <sub>r</sub>	:	kilo volt ampere
kW	:	kilo Watts
kWh	:	kilo watt hour
LT	:	Low tension
MAX	:	Maximum
NSS	:	National Service Scheme
SLD	:	Single Line Diagram


### III. REFERENCES:

- Handbook on energy audit and environment management by TERI.
- Bureau of Energy Efficiency (BEE) books for certification of Energy Auditors & Managers.



## IV. CERTIFICATES


### I. BEE Accreditation Certificate



**BUREAU OF ENERGY EFFICIENCY**

Examination Registration No.: **EA- 7597**

Accreditation Registration No.: **AEA-0275**



**Certificate of Accreditation**

This is to certify that Mr./Ms. **Santhosh. A** having its trade/registered office at **Kerala** has been given accreditation as accredited energy auditor. The certificate shall be effective from **2<sup>nd</sup>** day of **November, 2017**.


The certificate is subject to the provisions of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

This certificate shall be valid until it is cancelled under regulation 9 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

On cancellation, the certificate of accreditation shall be surrendered to the Bureau within fifteen days from the date of receipt of order of cancellation.

Your name has been entered at AEA No. **0275** in the register of list of accredited energy auditors. Your name shall be liable to be struck out on the grounds specified in regulation 8 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

Given under the seal of the Bureau of Energy Efficiency, Ministry of Power, this **12<sup>th</sup>** day of **February, 2018**

  
Secretary,  
Bureau of Energy Efficiency  
New Delhi



## II. EMC Empanelment certificate



### Energy Management Centre - Kerala (Department of Power, Govt of Kerala)

#### CERTIFICATE OF EMPANELMENT

This is to certify that **M/s.Athul Energy Consultants Pvt Ltd**(4/2, Capital Legend Building, Korapath Lane, Rouund North, Thrissur)is empanelled as Energy Audit firm in Energy Management Centre Kerala to conduct mandatory energy audit as per Government of Kerala G.O (Rt) No.2/2011/PD dated 01.01.2011.

**Empanelment No:**  
**EMCEEA-0811F-3**

Scope/Area	Building	Industry -Electrical	Industry Thermal
	Yes	Yes	Yes

This empanelment is valid up to 01/02/2024

Issuing Date: 02/02/2021

Place: Thiruvananthapuram

Director,  
Energy Management Centre - Kerala

# ENVIRONMENT AUDIT -2022



## **SREE SANKARA COLLEGE** **KALADY, ERNAKULAM**

*EXECUTED BY*



### **ATHUL ENERGY CONSULTANTS PVT LTD**

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May 2022





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## PREFACE

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Every institution should be imparting knowledge about the campus environment and its surroundings through activities that follows the principles of sustainability and waste management. Hence an evaluation is needed to understand where it stands in the path to be an environment friendly, and in talent nurturing educational institution.

This Environment Audit was done with the aim to assess mainly on waste management of the campus. The college vision is “To become a center of learning par excellence, where the best in humans is unveiled, based on human values, focused on life enhancement and constructive in adapting to the needs of the world”. The mission of college is “to mold individuals into successful and vibrant professionals facilitating comprehensive and rounded formation, to function as effective and empathetic human beings, grounded with courage of conviction, personal integrity, professional ingenuity and social commitment “and it was we observed by us from the students’ participation during the environmental audit.

This report is compiled by the BEE certified energy auditor and ISO 140001 (Environment Management) person who are experienced in the field of energy, environment and management. The student volunteers made a mammoth contribution with data collection and in preparing an initial skeleton for the report.



## ACKNOWLEDGEMENTS

---

We express our sincere gratitude to the M/s Sree Sankara College Kaladi for giving us an opportunity to carry out the project of Environment Audit. We are extremely thankful to all the staff for their support to carry out the studies and for input data, and measurements related to the project of Environment audit.

- |   |                  |                   |
|---|------------------|-------------------|
| 1 | Dr. Suresh A     | Principal         |
| 2 | Dr. Preethi Nair | IQAC Co-ordinator |

Also congratulating our Environment audit team members for successfully completing the assignment in time and making their best efforts to add value.

### ENVIRONMENT AUDIT TEAM

**1. Mr. Santhosh A**

Registered Energy Auditor of Bureau of Energy Efficiency (BEE – Govt. of India)  
Accredited Energy Auditor No – EA 7597

**2. Mr. G. Krishnakumar, Energy auditor Lead auditor ISO 140001**



Yours faithfully

Managing Director  
Athul Energy Consultants Pvt Ltd



## ENVIRONMENT AUDIT SUMMARY

---

- ❖ College segregated the waste from college, canteen, and hostels and treated in a scientific manner.
- ❖ Separate storage provisions are done for metal and plastics in college.
- ❖ Biodegradable wastes are treated in a biogas plant installed in the hostel.
- ❖ Vermi compost plant is working well in the campus.
- ❖ Laboratory waste are well treated and connected to as separate pit
- ❖ E-wastes are collected and stored separately in the college

### **Suggestions for improvement**

- ❖ Internal inspection team to be formed which comprises staff and students for internal auditing of the waste management in the campus
- ❖ Separate incinerators are to be provided in the college to avoid the open incineration of wastes. One for general wastes and another one for incineration medical wastes such as sanitary napkins.
- ❖ Display the weight of segregated wastes that collected from the canteen, hostels and college in prominent locations which will be an eye-opener for all and it will help in reduce the waste generation.
- ❖ Monthly Records should be kept for segregated wastes which will help the administration to pinpoint the source and take necessary steps to reduce it.



## GENERAL DETAILS

The general details of the M/s Sree Sankara College Kaladi are given below in table.

Table 1: **GENERAL DETAILS**

Sl. No:	Particulars	Details
1	Name of the College	Sree Sankara College, Kaladi
2	Address	Sree Sankara College Sankar Nagar, Mattoor, Kalady P.O., Ernakulam – 683 574048
3	Contact Person	Dr. Mini K D, Ph: 9605055445
4	E-mail ID	info@ssc.edu.in
5	Web site	www.ssc.edu.in
6	Type of Building	Educational Institution
7	Annual Working Days	180
8	No: of Shifts	Day Shift (One) (9AM -4PM)
9	No: of students enrolled	2421
10	No : of teaching staff	133
11	No: of non-teaching staff	21
12	Total campus area	18 acres
13	Total Built Up area ( M <sup>2</sup> )	19078
14	Bio gas	Yes
15	Vermicomposting Unit	No
16	Incinerator	Yes
17	Segregation of Waste	Yes



## ABOUT SACRED HEART COLLEGE

Sree Sankara College, Kalady was founded in the year 1954 by Swami Agamananda, a social reformer and a foresighted scholar of Sri Ramakrishna Advaita Ashram. The institution was established with a view to perpetuating the memory and doctrines of the great saint and philosopher, Adi Sankaracharya and to nurture his birth place as a cultural citadel. The foundation stone was laid on 28 August, 1953 by His Highness the Maharaja of Travancore in the presence of The Maharaja of Cochin and several other distinguished personalities. The Sree Sankara College Association was formed in July 1954.

The vision & mission of the organization was to establish a Centre of Higher Learning with two major objectives —dissemination of knowledge in tune with a university curriculum and fostering community development.

The institution was raised to the status of a First Grade College in 1956. It is affiliated to the Mahatma Gandhi University and is included under sec.2 (f) and 12 (B) of the UGC act, 1956.

In June 1960, the patronage of the college became vested in His Holiness the Jagadguru Sri Sri Sankaracharya Swamigal of Dakshinamnaya. Currently, Sri Sri Bharathi Theertha Mahaswamigal, of Sringeri Mutt, steers the administration through a Board of Directors with Sri. K. Anand as the Managing Director.

The college has done consistently well in Curricular and Cocurricular activities. The National Assessment and Accreditation Council (NAAC), a statutory body of the UGC has accredited the college B Grade with 2.82 CGPA on a four-point scale. The Departments of Economics, Commerce, Sanskrit and Microbiology are approved Research Centres under the Mahatma Gandhi University.

### VISION

To achieve excellence in higher Education, with a stress on, creativity, skill development, employability, personal values with social

### MISSION

To mold good citizens with ingenuity, adaptability, social commitment and ethical values who can provide innovative leadership in all walks of life.



Figure 1 COLLEGE CAMPUS

## ABOUT ENVIRONMENT AUDIT

---

The ICC defines Environmental Auditing as: **“A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of safeguarding the environment and natural resources in its operations/projects.”**

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Environmental conditions may be monitored from angles that are relevant to Indian requirements, without stress on legal issues or compliance. This innovative scheme is user friendly and totally voluntary. The environmental awareness helps the institution to set environmental examples for the community and to educate young learners.

Here we can mainly divide this report of waste management initiatives and installations of systems such as bio gas plant, vermin compost, incinerator and collection and segregation of waste in the campus etc and student's initiatives in waste management as a social cause.

## ABOUT ENVIRONMENT POLICY OF COLLEGE

---

Sree Sankara College Kaladi is a quality conscious college. It protects its own environment with its green campus initiatives and keeps the premises pollution free. Environment development is in tune with the educational policies implemented on the campus.

Environmental conscious administration, the management and the students of the college look after the environment carefully. Every year, during rainy season, we do tree plantation and carefully look after it. It's our own responsibility to preserve the work done on the campus related to the

Environment. They regularly undertake plantation programme through NSS and Bhumithrasena, Birds Club International Units every year as per schedules. On World Environment Day (June 5), every year students from all departments encouraged to plant saplings in their own backyards at home to enhance environmental consciousness.

College already conducting course like environmental Science and Renewable energy management in its campus.

## WASTE MANAGEMENT

---

Waste is generally termed as 'a resource at the wrong place'. The college authorities are aware of the possible methods and have installed waste management measures like biogas systems. The waste clearance measures associated with different types of wastes are briefly given below. In this college normally three types of wastes are generated and we can divide the same as,



1. Bio degradable
2. Non bio degradable and
3. E-waste

## 1. BIODEGRADABLE WASTES

**Biodegradable waste** includes any organic matter in waste which can be broken down into carbon dioxide, water, methane or simple organic molecules by micro-organisms and other living things by composting, aerobic digestion, anaerobic digestion or similar processes also includes some inorganic materials which can be decomposed by bacteria. These materials are non-toxic to the environment and mainly include the natural substances like Plants and animals waste, even the dead plants and animals, fruits, paper, vegetables, etc. get convert into the simpler units, which further get into the soil and are used as manures, biogas, fertilizers, compost, etc.

The biodegradable wastes are mainly from the college canteen and pushed it to the Biogas plant. The bio-slurry is used as manure to the plantation.

### I. BIO GAS PLANT

Biogas is the mixture of gases produced by the breakdown of organic matter in the absence of oxygen (anaerobically), primarily consisting of methane and carbon dioxide. Biogas is a renewable energy source Biogas is produced by anaerobic digestion with methanogen or anaerobic organisms, which digest material inside a closed system, or fermentation of biodegradable materials. This closed system is called an anaerobic digester, bio digester or a bioreactor.

Biogas is a renewable, as well as a clean, source of energy. Gas generated through biodigestion is non-polluting; it actually reduces greenhouse emissions. No combustion takes place in the process, meaning there is zero emission of greenhouse gasses to the atmosphere; therefore, using gas from waste as a form of energy is actually a great way to combat global warming. Another biogas advantage is that, unlike other types of renewable energies, the process is natural, not requiring energy for the generation process. In addition, the raw materials used in the production of biogas are renewable.

Bio gas plant reduces soil and water pollution. Consequently, yet another advantage of biogas is that biogas generation may improve water quality. Moreover, anaerobic digestion deactivates pathogens and parasites; thus, it's also quite effective in reducing the incidence of waterborne diseases.

Bio gas generation produces organic fertiliser. The by-product of the biogas generation process is enriched organic (digestive), which is a perfect supplement to, or substitute for, chemical fertilizers. The fertilizer discharge from the digester can accelerate plant growth and resilience to diseases, whereas commercial fertilizers contain chemicals that have toxic effects and can cause food poisoning, among other things. The biogas plant converts food wastes into methane gas and usable bio fertilizers which will be used for plants. The methane gas from the biogas plant is used in the canteen for cooking purpose and for



heating drinking water hot water. Approximately 10 kg of LPG /month is saved by using biogas Plant. The bio manure from the biogas plant is used for gardening, agriculture and for trees. This bio waste also acts as best bio insecticide and thus the college avoided the usage of environmentally toxic pesticides for environment. Here college is using fixed dome permanent structure biogas plant of size 1M<sup>3</sup> for treating bio waste. The slurry coming from the plant is collected in drums and reused after diluting with water for agriculture and for gardens. The methane gas is used in the canteen for hot water generation which is used for drinking and tea making.

Sree Sankara College installed 1M<sup>3</sup> FRP bio gas plant in its CANTEEN for catering food wastes generated from college hostel and canteen. At presently this FRP water sealed plant is not functioning which needs to be repaired.



*figure 2 FRP BIO GAS PLANT*

## II. VERMI-COMPOST

It is the product of the decomposition process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a mixture of decomposing vegetable or food waste, bedding materials, and vermicast. Vermi compost contains water-soluble nutrients and is an excellent, nutrient-rich organic fertilizer and soil conditioner. It is used in farming and small scale sustainable, organic farming.

The major source of raw material for vermi-compost is the leaves in the college campus and also the wastes generated which are not fed into biogas such as Chicken bones etc. The vermi-compost plants installed near to the scrap yard in the college campus

### Benefits of Vermi-compost

#### a. For Soil

- ❖ Improves soil aeration
- ❖ Enriches soil with micro-organisms (adding enzymes such as phosphatase and cellulose)
- ❖ Microbial activity in worm castings is 10 to 20 times higher than in the soil and organic matter that the worm ingests
- ❖ Attracts deep-burrowing earthworms already present in the soil
- ❖ Improves water holding capacity

#### b. For Plant growth

- ❖ Enhances germination, plant growth, and crop yield.
- ❖ Improves root growth, Enriches soil with micro-organisms, adding plant hormones such as auxins and gibberellin acid.

#### c. For Economic

- ❖ Bio wastes conversion reduces waste dumping in landfills.
- ❖ Elimination of bio wastes from the waste stream reduces contamination of other recyclables collected in a single bin (a common problem in communities practicing is single-stream recycling)
- ❖ Creates low-skill jobs at local level.
- ❖ Low capital investment and relatively simple technologies make vermicomposting practical for less-developed agricultural regions.

#### d. For Environmental

- ❖ Helps to close the "metabolic gap" through recycling waste on-site.
- ❖ Large systems often use temperature control and mechanized harvesting, however other equipment is relatively simple and does not wear out quickly
- ❖ Production reduces greenhouse gas emissions such as methane and nitric oxide (produced in

landfills or incinerators when not composted).

### Recommendation

Suggested to install vermicompost plant for composting plant leaves and bio degradable wastes which are not treated in bio gas plant.

## 2. NON-BIODEGRADABLE WASTE

Materials that remain for a long time in the environment, without getting decomposed by any natural agents, also causing harm to the environment are called non-biodegradable substances. These materials are metals, plastics, bottles, glass, poly bags, chemicals, batteries, etc. But as these are readily available, convenient to use, and are of low cost, the non-biodegradable substances are more often used. But instead of returning to the environment, they become solid waste which cannot be broken down and become hazardous to the health and the environment. Hence are regarded as toxic, pollution causing and are not considered as eco-friendly.

Many measures are taken these days, concerning the use of non-biodegradable materials. The **three 'R'** concept which says **Reduce-Recycle -Reuse** is in trend, which explains the use of the non-biodegradable materials. As we already discuss that these substances do not decompose, or dissolve easily so can be recycled and reuse. And one can help in reducing this waste by instead of throwing the plastics and poly bags in the garbage; it can be put in the recycling bags to use again.

Non-recyclable wastes are collected and burned once in a month using incinerator places inside the campus itself. The recyclable wastes are sorted out into categories and supplied it to the collecting units.

### I. INCINERATOR

The objective of waste incineration, in common with most waste treatments, is to treat waste to reduce its volume and hazard, whilst capturing (and thus concentrating) or destroying potentially harmful substances. Incineration processes can also provide a means to enable recovery of the energy, mineral and/or chemical content from waste. Basically, waste incineration is the oxidation of the combustible materials contained in the waste. Waste is generally a highly heterogeneous material, consisting essentially of organic substances, minerals, metals and water. During incineration, flue-gases are created that will contain most of the available fuel energy as heat. The organic substances in the waste will burn when they have reached the necessary ignition temperature and come into contact with oxygen.

The actual combustion process takes place in the gas phase in fractions of seconds and simultaneously releases energy. Where the calorific value of the waste and oxygen supply is enough, this can lead to a thermal chain reaction and self-supporting combustion, i.e. there is no need for the addition of other fuels. The incinerator is used for incinerating non-biodegradable wastes such as paper, plastic, sanitary napkins etc. The ash generated is used as manure after mixing with cow dung

for plants. The ash generated from plastic will be treated separately. The ash generated from canteen where wood is used as a fuel is used as manure for plants. The college campus is promoting biodegradable packaging and reducing the consumption of plastic to a large extent.



*Figure 3 OPEN TYPE INCINERATOR*

### **Recommendation**

We strongly recommend to provide one more incinerator for incinerating medical wastes such as sanitary napkins.

### **3. ELECTRONIC WASTE**

Electronic waste or e-waste describes discarded electrical or electronic devices. E-waste or electronic waste is created when an electronic product is discarded after the end of its useful life. The rapid expansion of technology and the consumption driven society results in the creation of a very large amount of e-waste in every minute. Used electronics which are destined for refurbishment, reuse, resale, salvage recycling through material recovery, or disposal are also considered e-waste. Informal processing of e-waste in developing countries can lead to adverse human health effects and environment pollution. Certain components of some electronic products contain materials that render them hazardous, depending on their condition and density. All the electronic wastes such as old computers, CPU, CDs etc are stored separately in the college



#### 4. LABORATORY WASTES

It is the clear responsibility of the lab users to ensure safe and correct disposal of all wastes produced in the course of their work. Laboratory wastes can be divided into multiple ways such as wastes as of

- ❖ controlled wastes such as dirty paper, plastic, rubber, wood etc which can be collected in a bin and incinerated in an incinerator
- ❖ Special control wastes such as Broken glass wares of lab, sharp edge items, needles etc which needs to collected in a separate bin or container and dispose in a safer way. While collecting in these materials should not have any chemicals in it.

Wastes generated from laboratory experiments which is required multiple disposable mechanisms. (Acid, alkalis, salts of inorganic compounds)

The acids alkalis are to be disposed by wash down procedure by using excess water after maintaining its PH value. The material which is in the RED LIST should not be washed down it should be collected and treated separately (Heavy metals, mineral oils, hydrocarbons, cyanides, fluorides, nitrites etc. The solvents, mineral oils are to separately incinerate in an incinerator.

In Sree Sankara college ample ventilation is given in all laboratory. The natural illumination is also good.

#### Hazardous waste Management in College

**Chemical waste** that is generated in the laboratories such as acids/ bases is neutralized before disposal. Alternative protocols are followed to bypass carcinogenic, cytotoxic and heavy metal-containing chemicals, heavy metal-containing chemicals are reduced, concentrated, solidified and disposed of as solid waste. Non-hazardous liquid chemical waste is then disposed of in sinks and hazardous liquid chemical waste (very minimal) is stored

#### Suggestions for waste management

- ❖ Provide waste flow chart in the laboratory
- ❖ At present all the chemicals wastes are drained off into main drain.
- ❖ Do s and Don'ts in the laboratory while conducting experiments
- ❖ Standard disposal procedure in the laboratory for all chemicals used in the lab
- ❖ Separate bins and containers for control wastes and special control wastes, reusable items etc. in laboratory

## FACILITIES PROVIDED BY COLLEGE FOR WASTE MANAGEMENT COLLECTION

- Toilets in every buildings separately for girls, boys and staff.
- There is separate toilet facility for department heads, staff rooms, administrative department and common facility.
- Certain toilets are facilitated for the disabled. The campus is disabled-friendly with suitable hand rails and supports
- Bins are provided in various areas of Campus for segregated collection of bio degradable (food,) and non-bio degradable wastes (Plastic, bottles)
- Every day cleaning and sanitisation is done at each and every toilet by cleaning personnel which is checked by housekeeping supervisor.
- Separate team is maintained by college to maintain the clean campus, removal of wastes from pets, collection wastes from bins, which is supervised by maintenance supervisor.



Figure 4 COLLECTION BINS

## CONCLUSION

---


Environment audit is the best way to analyze and solve the critical issues of waste management. Environment audit can add value to management approach being taken by college for identifying, collecting, segregating and processing of waste generated in the college campus. By analyzing the waste generation in each segment such as biodegradable, non-degradable, R waste etc. gave an indication of waste generation and thus put control for the same to reduce the environmental impacts in due course.

The findings in the report shows that college perform fairly well in waste management issues and taken considerable efforts in a responsible manner. During audit and the conversations with the college team, we observed that M/s Sree Sankara College Kaladi had done various approaches in the past few years to ensure sustainable environment. Even though there is space for further improvement as mentioned in the executive summary, the college is a good example for the minimisation of environment issues in the existing conditions.



## ANNEXURE

### ISO 140001 Certificate

<div></div>	
<b>G KRISHNAKUMAR</b>	<b>CERTIFICATE NUMBER</b> 2020260507
has attended the following live virtual classroom course:	<b>TRAINING DATE:</b> 25th & 26th May, 2020
<b>Transition training for Environment Management System as per ISO 14001:2015</b>	
Course is designed to explain:	
<ul style="list-style-type: none"><li>• Requirements of ISO 14001:2015 in context of audit.</li><li>• Key changes from ISO 14001: 2004 to 14001:2015</li></ul>	
Session Duration: 16 Hours	
	 <b>Authorising Signature:</b>
	Intertek India Private Limited

# **GREEN AUDIT - 2022**



**SREE SANKARA COLLEGE**

**KALADY, ERNAKULAM**

**KERALA**

*EXECUTED BY*



**ATHUL ENERGY CONSULTANTS PVT LTD**

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Ph: +91 735611199/0-6 Web: [www.athulenergy.com](http://www.athulenergy.com) E-Mail: [info@athulenergy.com](mailto:info@athulenergy.com)

May 2022



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## PREFACE

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Every institution should be imparting knowledge about the campus environment and its surroundings through activities that follows the principles of sustainability. Hence an evaluation is needed to understand where it stands in the path to be an environment friendly, talent nurturing educational institution. This Green Audit was done with the aim to assess and rate the sustainable nature of the campus. The college vision is “to enlighten and empower women in rural and suburban society and enable them to act as agents of social transformation and acquire knowledge of self and surroundings and to make the world a better place”. And in the **social goals**, it is written as **“to make the students aware of the pressing global issues and the moral responsibility to handover to the coming generation an eco-friendly life style and an earth free from pollution, filth, bigotry and corruption”**. It was observed by us from the students’ participation during the green audit.

This report is compiled by the BEE certified energy auditor and GRIHA Certified auditor along with the project engineers who are experienced in the field of energy, environment and management. The student volunteers made a mammoth contribution with data collection and preparing an initial skeleton for the report.

## ACKNOWLEDGEMENTS

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We express our sincere gratitude to the M/s Sree Sankara College Kaladi for giving us an opportunity to carry out the project of Green Audit. We are extremely thankful to all the staffs for their support to carry out the studies and for input data, and measurements related to the project of Green audit.

- |   |                  |                  |
|---|------------------|------------------|
| 1 | Dr. Suresh       | Principal        |
| 2 | Dr. Preethi Nair | IQAC Coordinator |

Also congratulating our Green audit team members for successfully completing the assignment in time and making their best efforts to add value.

### GREEN AUDIT TEAM

**1. Mr. Santhosh A**

Registered Energy Auditor of Bureau of Energy Efficiency (BEE – Govt. of India)  
Accredited Energy Auditor No – EA 7597

**2. Mr. Ashok KMP Energy Manager, GRIHA Certified Professional**



Yours faithfully

Managing Director  
Athul Energy Consultants Pvt Ltd

## GREEN AUDIT SUMMARY

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- ❖ Sree Sankara College taken considerable effort for maintaining the green and sustainable campus.
- ❖ All the varieties of living eco systems such as trees of varies varieties of gardens (Zodiac Garden, Oxygen park, Herbal Garden Birds Club area, etc.). 103 species of tree of 742 numbers are in the college.
- ❖ College is well maintaining Oxygen Park, Silent places in colleges which will reduce the academic stresses.
  - ❖ Display boards are placed in the Oxygen Park, Silent zone, Zodiac garden area, etc to be done.
- ❖ Staff and student's collaboration of NSS , Bhoomithrasena is held responsible for maintenance of greenery inculcating a sustainable culture among the student's community.
- ❖ By recognizing the importance of making youth compassionate towards students and hence maintaining open play ground in college?
- ❖ Well placed rainwater collection tanks is provided in the college

### **Suggestions for improvement**

- ❖ Sub metering system for water consumption to be done in each areas of main usage
- ❖ Garden library can be set in the college nearer to the entrance of existing library with rain canopy. Periodicals and newspapers can be kept in this rotating type garden library.
- ❖ Vegetable garden to be created in the college

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## GENERAL DETAILS



The general details of the M/s Sree Sankara College Kalady given below in table.

**Table 1 GENERAL DETAILS**

Sl. No:	Particulars	Details
1	Name of the College	Sree Sankara College, Kalady
2	Address	Sree Sankara College Sankar Nagar, Mattoor, Kalady P.O., Ernakulam – 683 574
3	Contact Person	Dr. Mini K D, Ph: 9605055445
4	E-mail ID	info@ssc.edu.in
5	Web site	www.ssc.edu.in
6	Type of Building	Educational Institution
7	Annual Working Days	180
8	No: of Shifts	Day Shift (One) (9AM -4PM)
9	No: of students enrolled	2421
10	No : of teaching staff	133
11	No: of non-teaching staff	21
12	Total campus area	18 acres
13	Total Built Up area ( M <sup>2</sup> )	19078 Sq. m
14	No: of courses	Aided College UG 17 AND Self finance 02, PG Aided- 07 and Self finance -02, PHD -05
	No: of Departments	22
15	Herbal Garden	Yes
16	Vegetable garden	No
18	Birds club	Yes
19	Star Garden	Yes
20	Silent Area	Yes
21	Oxygen park	Yes
24	Play Grounds	Foot ball ground ,Basketball court,
25	Auditorium	01 numbers
26	Rain water harvesting	Yes



## ABOUT COLLEGE

Sree Sankara College, Kalady was founded in the year 1954 by Swami Agamananda, a social reformer and a foresighted scholar of Sri Ramakrishna Advaita Ashram. The institution was established with a view to perpetuating the memory and doctrines of the great saint and philosopher, Adi Sankaracharya and to nurture his birth place as a cultural citadel. The foundation stone was laid on 28 August, 1953 by His Highness the Maharaja of Travancore in the presence of The Maharaja of Cochin and several other distinguished personalities. The Sree Sankara College Association was formed in July 1954.

The vision & mission of the organization was to establish a Centre of Higher Learning with two major objectives —dissemination of knowledge in tune with a university curriculum and fostering community development.

The institution was raised to the status of a First Grade College in 1956. It is affiliated to the Mahatma Gandhi University and is included under sec.2 (f) and 12 (B) of the UGC act, 1956.

In June 1960, the patronage of the college became vested in His Holiness the Jagadguru Sri Sri Sankaracharya Swamigal of Dakshinamnaya. Currently, Sri Sri Bharathi Theertha Mahaswamigal, of Sringeri Mutt, steers the administration through a Board of Directors with Sri. K. Anand as the Managing Director.

The college has done consistently well in Curricular and Cocurricular activities. The National Assessment and Accreditation Council (NAAC), a statutory body of the UGC has accredited the college B Grade with 2.82 CGPA on a four-point scale. The Departments of Economics, Commerce, Sanskrit and Microbiology are approved Research Centres under the Mahatma Gandhi University.

### VISION

To achieve excellence in higher Education, with a stress on, creativity, skill development, employability, personal values with social

### MISSION

To mould good citizens with ingenuity, adaptability, social commitment and ethical values who can provide innovative leadership in all walks of life.



Figure 1 COLLEGE MAIN ENTRANCE



## GREEN AUDIT

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The whole world is on the road to a sustainable development, and the environment conservation is the top priority among the list as every human activity has its effect on their surroundings, which is the environment. Hence be it a house, a commercial building, an industrial building, or any other construction will disturb the balance of the environment. It is very important to do a detailed study about the effects on the environment. This is conducted under the name of *Green Audit*, which can be defined as *the official examination of the effects a company or other organization has on the environment, especially the damage that it causes*. The objectives of the green audit can be listed as follows:

- Including participants from every section of the organization in the auditing process.
- Understanding the environment by drawing a simple sketch of the total area.
- Identifying the activities in the premises and listing them.
- Calculating the resource consumption like the land and water.
- Assessing the waste management and disposal.
- Study the energy usage pattern.
- Identify the good practices.
- Suggest the viable solutions to improve the sustainable nature of the organization.
- Compile the report with the above-mentioned details.
- Conduct a walkthrough audit to check the suggestions implemented by the institution and suggest for further improvements
- Verify all the points with actual measurements is it is meeting the performance and gave suggestions for improvement

## CAMPUS ENVIRONMENT

The environment in and around the college campus plays an important part in maintaining a healthy atmosphere in nurturing talents. Trees are the major source of the oxygen we breathe, and receiver of the carbon dioxide we exhale. The sustainability of an ecosystem depends on the number of plants and trees in and around the surroundings. The open space in the college is used for gardening and maintain a Butterfly garden , Zodiac Garden fish pond, large open garden, peace garden etc. Ultimately the campus is maintaining natural equilibrium with trees, birds and cattle's and water bodies along with human interactions.



**FIGURE 2: COLLEGE CAMPUS**

Scientific studies are proved that the nature can able to cure any diseases and this will reduce the stress among students during theirs studies and also increase the compassion among them and to nature. Ultimately the campus is maintaining natural equilibrium trees, birds and water bodies with human beings. Gardens and landscape are an aesthetic delight and it promotes attentiveness of students. Persons exposed to plants have higher level of positive feelings (pleasant, calm) as opposed to negative feelings (anger, fear).



## SUSTAINABLE CONSTRUCTION OF BUILDINGS

Energy consuming devices installed to achieve the comfort levels for the occupants of the building gives rise to heat generation which adversely affects the environment within the building and in the surrounding. Buildings are thus the major pollutants that affect the urban air quality and contribute to climate change. Buildings are the major consumers of energy during their construction, operation and maintenance.

Sree Sankara College Kaladi has developed an ecological design in their buildings and adopted minimum negative impact on ecosystem. Their approach to the constructional activities consciously is to conserve energy and ecology and avoid the adverse effects of ecological damage.

Sree Sankara College constructed the building to optimum utilisation of land and classrooms and with abundant light and natural ventilation. Maximum day light ingress and natural ventilation increases the indoor air quality and avoid the sick building syndrome.

### Major Courses in the College

Programmes	Courses
<b>Aided College</b>	
UG	BA- Sanskrit, English, Hindi, Economics, History, Bsc- Mathematics, Statistics, Physics, Chemistry, Botany, Zoology, Bcom, -Finance, Taxation and Computer applications Bvoc: Renewable energy Management ,Broad casting and Journalism, Tourism and Hospitality
PG	Sanskrit -Vadantha, Economics, English-Literature, Mcom –Taxation, Msc- Microbiology, Applied Chemistry and Physics.
PhD	Economics, Microbiology, English, Chemistry and Sanskrit.
<b>Self-financing</b>	
UG	Bsc- Microbiology and Bio technology
PG	Msc- Bio Technology, and Environmental science

### Departments in the college

B-Voc, Bio chemistry, Sanskrit, English, Malayalam ,Hindi, Physics, Chemistry, Mathematics, Environmental Science, History, Economics, Botany, Zoology, Politics, Computer Science, Microbiology, Computer Science, Bio technology, and Physical Education.

## 1. HERBAL GARDEN

The literal meaning of Ayurveda is “science of life,” because ancient Indian system of health care focused on views of man and his illness. It has been pointed out that the positive health means metabolically well-balanced human beings. Ayurveda is also called the “science of longevity” because it offers a complete system to live a long healthy life. It is an interactive system that is user-friendly and educational. It teaches the patient to become responsible and self-empowered. It is a system for empowerment, a system of freedom, and long life. A significant part of knowledge and tradition is currently being eroded due to modernization, acculturation and availability of alternatives. Therefore, it is urgent to inculcate young minds to realize the fascinating knowledge and tradition associated with these resources, and help them understand the immense potentials the Kerala medicinal plants possess for the future.

The “Promoting Herbal Gardens in Schools and colleges” has been a fun-filled learning activity for the students where they got the opportunity to learn about the medicinal plants by actually planting the medicinal herbs and watching them grow in their gardens, and by exploring information about them from various sources.

The task of making the garden itself has been enriching in terms of making students realize the importance of teamwork such as detailed planning, and allocation of tasks within a team. For the teachers, herbal garden project has been useful in terms of ease with which they could integrate the concept with other subject matter activities, such as writing essays, poems and stories, making posters, drawing and painting, making herbariums, and even preparing food recipe using some of the culinary herbs students have planted in their gardens. Kerala Government is also making lot of initiatives to developing and inculcating the herbal gardens in schools and colleges.

In Sacred Heart management planted, nurtured varieties of herbs in its college campus in all possible areas without any specified location. Hence the college in total is herbal garden.

## 2. VEGETABLE GARDEN

Gardens are a wonderful way to use the college campus as a classroom, reconnect students with the natural world and the true source of their food, and teach them valuable gardening and agriculture concepts and skills that integrate with several subjects, such as math, science, art, health and physical education, and social studies, as well as several educational goals, including personal and social responsibility. They gain self-confidence and a sense of “capableness” along with new skills and knowledge in food growing — soon-to-be-vital for the 21st century students become more fit and healthy as they spend more time active in the outdoors and start choosing healthy foods over junk food.

### Recommendation

<b>Sree Sankara College is to initiate a vegetable garden in its premises</b>
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### 3. SILENT PLACE OR KUTTIVANAM

Sree Sankara College developed an untouched and protected version of forest in their premises. This is maintained in the form of old tradition such as Kavu, the small untouched forest which we can see in most parts Kerala. Kavu is maintained as forest areas that human beings are mostly prohibited and considered a sacred place in the Kerala.



**Figure 3 KUTTIVANAM**

### 4. BUTTERFLY GARDEN

Butterflies are important because they are in their own right but also quality of life indicators. Butterflies are part of Life on Earth and an important component of its rich biodiversity. The following are the main reasons for conserving butterflies. They have an intrinsic value and it is the flagship of nature conservation. Have an Aesthetic value it portrays the essence of nature and beauty of peace. Butterflies have an educational value as the transformation from egg to caterpillar to chrysalis is one of the wonders of nature. This has a scientific value as the important indicator of climate change. Eco system value is Butterflies have been widely used by ecologists as model organisms to study the impact of habitat loss and fragmentation. People enjoy seeing butterflies both around their homes and in the countryside which improves the mental and social health of people. People enjoy seeing butterflies both around their homes and in the countryside.

### 5. OXYGEN PARK

Care taken by the college to have Plantation of oxygen rich plants .The greenery has remained useful in developing Oxygen Park in the college. Trees release oxygen when they use energy from sunlight to make glucose from carbon dioxide and water. Like all plants, trees also use oxygen when they split glucose back down to release energy to power their metabolisms. Averaged over a 24-hour period, they produce more oxygen than they use up; otherwise there would be no net gain in growth



**Figure 4 OXYGEN PARK**

The findings in the report shows that college perform fairly well in waste management issues and taken considerable efforts in a responsible manner. During audit and the conversations with the college team, we observed that Sree Sankara College done various approaches in the past few years to performing well to sustainable environment. Even though there is space for further improvement that mentioned in the executive summary, the college is a good example for the minimisation of environment issues in the existing conditions.

#### 6. ZODIAC FOREST (NAKSHRAVANAM)

In Vedic astrology, the zodiac is divided into 27 *nakshatras* or stars. An individual is born under a particular star, known as his or her birth star. From ancient times, particular trees have been associated with birth stars. The concept of a Nakshatra Vanam involves the planting of these trees in a grove and nurturing them, to help develop a place of sanctity. Gardening can provide students with hands-on learning opportunities while increasing environmental awareness and vital experience in problem-solving.

Sree Sankara College developed a star garden . Most of the star related trees are in developing stage in the garden. The details are given below.

Table 2 ZODIAC PLANTS





Sl No:	Star Name	Tree name	Botanical Name
1	Aswathy	Kanjiram	<i>Strychnos nux-vomica</i>
2	Bharani	Nelli	<i>Emblica officinalis</i>
3	Karthika	Aathi	<i>Ficus racemosa</i>
4	Rohini	Njaval	<i>Syzygium cumini</i>
5	Makayiram	Karngali	<i>Acacia catechu</i>
6	Thiruvathira	Karimaram	<i>Diospyros ebenum</i>
7	Punartham	Mula	<i>Bambusa bambos</i>
8	Pooyam	Arayal	<i>Ficus religiosa</i>
9	Ayilyam	Nangu	<i>Mesua ferrea</i>
10	Makam	Plassu	<i>Butea monosperma</i>
11	Uthram	Ithi	<i>Ficus tinctoria</i>
12	Atham	Ambazham	<i>Spondias pinnata</i>
13	Chithira	Koovalam	<i>Aegle marmelos</i>
14	Chothi	Nerr maruthu	<i>Terminalia arjuna</i>
15	Visakham	Vayam Kaitha	<i>Flacourtia jangomas</i>
16	Anizham	Elanji	<i>Mimusops elengi</i>
17	Triketta	Vetti	<i>Aporosa lindleyana</i>
18	Moolam	Vella Pine	<i>Vateria indica</i>
19	Pooradam	Vanchi	<i>Salix tetrasperma</i>
20	Uthradam	Plavu	<i>Artocarpus heterophyllus</i>
21	Thiruvonam	Erukku	<i>Calotropis gigantea</i>
22	Avittam	Vanni	<i>Prosopis juliflora</i>
23	Chathayam	Kadambu	<i>Anthocephalus cadamba</i>
24	Pooruttathy	Mavu	<i>Mangifera indica</i>
25	Uthrattathy	Karimbana	<i>Borassus flabellifer</i>
26	Revathi	Elippa	<i>Madhuca longifolia</i>

Every students and staffs are having a birth star which is related to a tree, animal and bird in nature. Gardens are a wonderful way to use the college campus as a classroom, reconnect students with the natural world



**Figure 5 ZODIAC GARDEN**



## 7. LIST OF TREES IN THE CAMPUS

Trees release oxygen when they use energy from sunlight to make glucose from carbon dioxide and water. Like all plants, trees also use oxygen when they split glucose back down to release energy to power their metabolisms. Averaged over a 24-hour period, they produce more oxygen than they use up; otherwise there would be no net gain in growth. Sree Sankara College Kaladi have 103 varieties plants. The Sree Sankara College Kaladi have 742 numbers of major trees are place in this campus.

TABLE 3: LIST OF TREES

### BIRDS CLUB

Sl.no.	Vernacular Name of Trees	Botanical Name	
1	Vaka maram	Delonix regia	1
2	Eeta	Dchlandra travancorica	
3	Rain Tree	Samanea saman	1
3	Aanapana	Caryota urens	3
4	Vayanna	Cinnamomum verum	1
5	Mahagani	Swietenia macrophygia	1
6	Thanni	Terminlia bellirica	2
7	Vatta	Macaranga peltata	3
8	Anjili	Artocarpus hirsutus	1
9	Kurumulaku	Piper nigram	
10	Kanjiram	Strychnos nuxvomica	1
11	Theghu	Cocos nucifera	2
12	Sarpagandhi	Rauwolfia serpentina	
13	Vatta	Macaranga peltata	3
14	Aanapana	Caryota urens	3
15	Anjili	Artocarpus hirsutus	1
16	Mullan Pazham	Ziiziphus oenoplia	1
17	Parom	Ficus racemosa	1
18	Unjal valli	Oonual valli	1
19	Mula	Bambusoidea	
20	Manjadi	Adenantha pavonina	1
21	Mavu	Mangifera indica	1
22	Mahagani	Swietenia macrophygia	50
23	Njaval	Syzigium cumini	3
24	Pappaya	Carica pappaya	1
	Total		82

**FRONT SIDE BIRD CLUB (NAKSHTHRAVANAM)**

Sl.no.	Name of Trees	Botanical Name	No: of
1	Peeli vaka	Albizia chinensis	22
2	Njaval	Syzigium cumini	1
3	Peral	Ficus benghalensis	1
3	Neermaruthu	Terminalia arjuna	2
4	Nelli	Phyllanthus emblica	1
5	Koovalam	Aegle marmelos	1
6	Mula	Bambusoidea	1
7	Arayal	Ficus religiosa	1
8	Ambazham	Spondias mombin	1
9	Ithi	Ficus benjamina	1
10	Peral	Ficus benghalensis	1
11	Erukku	Calotropis giganta	1
12	Vella Pine	Pinus strobus	1
13	Kadambu	Neolamackia cadamba	1
14	Karimaram	Diospyros ebenum	1
15	Nelli	Phyllanthus emblica	1
16	Mavu	Mangifera indica	1
17	Seethapazham	Annona squamosa	1
18	Anachuvadi	Elephantopus scabeb	1
19	Arayal	Ficus religiosa	1
20	Plavu	Artocarpus heterophyllus	1
21	vayamkadha	Lagerstroemia speciosa	1
22	Karimaram	Diospyros ebenum	1
23	Lubi	Flacourtia jangomas	1
24	Pappaya	Carica pappaya	1
25	Manimaruthu	Terminalia arjuna	1
26	Chara konna	Peltophorus pterocarpus	1
27	Poovaka	Deconix regia	1
28	Neermaruthu	Terminalia arjuna	2
29	Mavu	Mangifera indica	2
30	Koovalam	Aegle marmelos	1
31	Karinochi	Vitex trifolia	1
32	Pera	Psidium guajava	1
33	Ithi	Ficus benjamina	1
34	Punna	Calophyllum inophyllum	2
35	Mylandhi	Lawsonia inermis	2
36	Nelli	Phyllanthus emblica	2



37	Aryaveepu	Azadirachta indica	1
38	Ughu	Pongamia pinnata	1
39	Elipla	Madhuca longifolia	1
40	Rain Tree	Samanea saman	1
41	Chamba	Syzigium samarangense	1
42	Krimpana	Borassus flabellifer	1
43	Vazha	Musa paradisiaca	
	Total		70

**INDOOR SPORTS FRONT SIDE**

Sl.no.	Name of Trees	Botanical Name	No: of trees
1	Royal Palm	Roystonea regia	21
2	Mahagani	Swietenia macrophyca	1
3	Rambutan	Nephelium lappaceum	1
3	Tulsi	Ocimum tenuiflorum	Lumsum
4	Mula	Bambusoidea	1
5	Budha mula	Bamboosa ventricosa	1
6	Mutta Pazham	Pouteria campechisns	1
7	Kanikonna	Cassia fistula	1
8	Nelli	Phyllanthus emblica	1
9	Chara konna	Peltophorus pterocarpus	1
10	Njaval	Syzigium cumini	1
11	Nelli	Phyllanthus emblica	1
12	Madharam	Bauhinia acuminata	1
13	Madhura loobi	Flacourtia intermis	1
14	Ambazham	Spondias mombin	1
15	Royal Palm	Roystonea regia	21
16	Erukku	Swietenia macrophyca	1
	Total		35

**NAKSHATHRAVANAM FRONT SIDE**

Sl.no.	Name of Trees	Botanical Name	No: of trees
1	Ughu	Pongamia pinnata	1
2	Plavu	Artocarpus heterophyllus	3
3	Croton	Croton	1
3	Mahagani	Swietenia macrophyca	1
4	Madharam	Bauhinia acuminata	3



5	Chara konna	Peltophorus pterocarpus	1
6	Ashokam	Saraca asoka	1
7	Mavu	Mangifera indica	2
	Total		13

## INDOOR STADIUM AREA

Sl.no.	Name of Trees	Botanical Name	No: of trees
1	Royal Palm	Roystonea regia	3
2	Manimaruthu	Terminalia arjuna	3
3	Ezhilam pala	Alstonia scholaris	1
3	Njaval	Syzigium cumini	1
4	Veeti	Dalbergia catifolia	1
5	Peeli vaka	Albizia chinensis	1
6	Vatta	Macaranga peltata	1
7	Manjadi	Adenanthera pavonina	1
8	Pera	Psidium guajava	1
9	Royal Palm	Roystonea regia	1
10	Njaval	Syzigium cumini	2
11	Vatta	Macaranga peltata	1
16	Veeti	Roystonea regia	3
	Total		59

## LIBRARY FRONT SIDE

Sl.no.	Name of Trees	Botanical Name	No: of trees
1	Rain Tree	Samanea saman	1
2	Vatta	Macaranga peltata	1
3	Heliconia	Heliconia	Lumsum
3	Madharam	Bauhinia acuminata	Lumsum
4	Nandyarvattam	Tabernaemontana divaricata	Lumsum
5	Manikya	Duranta erecta	Lumsum
6	Vazha	Musa paradisiaca	Lumsum
7	Mahagani	Swietenia macrophylla	15
8	Vaka maram	Delonix regia	1
9	Puli	Tamarindus indica	1
10	Croton	Croton	Lumsum
11	Manja Mula	Bamboo	1
16	Mahagani	Swietenia macrophylla	14



	Nagalinkam	Couroupita guianensis	1
	Aathi	Ficus benjamina	1
	Poovaka	Deconix regia	2
	Arana maram	Monoon longifolium	6
	Aryaveepu	Azadirachta indica	1
	Star apple	Chrysophyllum cainito	1
	Aanapana	Caryota urens	1
	Areca	Areca	1
	Chembarathi	Hibiscus rosa sinensis	1
	Kanikonna	Cassia fistula	1
	Total		49

## THEERTHA HALL

Sl.no.	Name of Trees	Botanical Name	No: of trees
1	Rain Tree	Samanea saman	1
2	Manjadi	Adenanthera pavonina	1
3	Star apple	Chrysophyllum cainito	1
3	Ambazham	Spondias mombin	1
4	Chara konna	Peltophorus pterocarpus	2
5	Thekku	Tectona grandis	1
6	Ezhilampala	Alstonia scholaris	1
7	Ficus	Ficus benjamina	1
8	Eeta	Dchlandra travancorica	Lumsum
	Total		10

## CANTEEN SIDE

Sl.no.	Name of Trees	Botanical Name	No: of trees
1	Njaval	Syzigium cumini	1
2	Vatta	Macaranga peltata	9
3	Aanapana	Caryota urens	6
3	Ashokam	Saraca asoka	1
4	Ficus	Ficus benjamina	1
	Total		18



## POOCHOLA

Sl.no.	Name of Trees	Botanical Name	No: of
1	Kashumavu	Anacardium occidentale	1
2	Heliconia	Heliconia	Lumsum
3	Njaval	Syzigium cumini	2
3	Plavu	Artocarpus heterophyllus	4
4	Mrooti	Hydnocarpus layrifolia	1
5	Kanjiram	Strychnos nuxvomica	1
6	Badham	Terminalia cattappa	1
7	Aanapana	Caryota urens	2
8	Vayanna	Cinnamomum verum	1
9	Plavu	Artocarpus heterophyllus	1
10	Poovaka	Deconix regia	1
11	Thanni	Terminlia bellirica	1
12	Manjadi	Adenanthera pavonina	1
13	Kashumavu	Anacardium occidentale	1
14	Vatta	Macaranga peltata	1
15	Mahagani	Swietenia macrophyca	1
16	Rain Tree	Samanea saman	1
17	Vayanna	Cinnamomum verum	1
18	Kurumulaku	Piper nigrum	Lumsum
19	Thanni	Terminlia bellirica	1
20	Aanapana	Caryota urens	3
21	Eeta	Dchlandra travancorica	Lumsum
22	Plavu	Artocarpus heterophyllus	1
23	Mula	Bambusoidea	Lumsum
	Total		28

## COLLEGE GATE

Sl.no.	Name of Trees	Botanical Name	No: of
1	Chethi	Ixora coccinia	
2	Chara konna	Peltophorus pterocarpus	1
3	Thanni	Terminlia bellirica	1
3	Njaval	Syzigium cumini	1
4	Anjili	Artocarpus heterophyllus	1
5	Puli	Tamarindus indica	1
6	Thanni	Terminlia bellirica	1
7	Poovaka	Deconix regia	2
8	Chempakam	Michelia champaca	1
9	Mahagani	Swietenia macrophyca	2





10	Njaval	Syzigium cumini	1
11	Peeli vaka	Albizia chinensis	1
12	Poovaka	Deconix regia	1
13	Chara konna	Peltophorus pterocarpus	2
14	Njaval	Syzigium cumini	1
15	Ashokam	Saraca asoka	1
16	Manimaruthu	Terminalia arjuna	1
17	Vatta	Macaranga peltata	1
18	Neermaruthu	Terminalia arjuna	1
19	Poovaka	Deconix regia	1
20	Thanni	Terminlia bellirica	1
21	Mahagani	Swietenia macrophygia	1
22	Ezhilampala	Alstonia scholaris	1
23	Badham	Terminalia cattappa	1
24	Thanni	Terminlia bellirica	1
25	Chara konna	Peltophorus pterocarpus	1
26	Mavu	Mangifera indica	1
27	Kashumavu	Anacardium occidentale	1
28	Madharam	Bauhinia acuminata	2
29	Kolambi	Allamanda cathartica	1
30	Peeli vaka	Albizia chinensis	1
31	Chethi	Ixora coccinia	1
32	Plavu	Artocarpus heterophyllus	1
33	Vatta	Macaranga peltata	2
34	Kashumavu	Anacardium occidentale	2
35	Mavu	Mangifera indica	2
36	Mrooti	Hydnocarpus layrifolia	1
37	Njaval	Syzigium cumini	5
38	Royal Palm	Roystonea regia	50
39	Eugenia	Eugenia tinifolia	80
40	Chethi	Ixora coccinia	30
41	Kashumavu	Anacardium occidentale	2
42	Thanni	Terminlia bellirica	1
43	Kanikonna	Cassia fistula	2
44	Peeli vaka	Albizia chinensis	2
45	Njaval	Syzigium cumini	2
46	Mavu	Mangifera indica	1
47			218

## WAY TO BASKET BALL COURT

Sl.no.	Name of Trees	Botanical Name	No: of
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1	Vatta	Macaranga peltata	1
2	Mavu	Mangifera indica	1
3	Aanapana	Caryota urens	1
3	Njaval	Syzigium cumini	1
4	Vatta	Macaranga peltata	1
5	Kashumavu	Anacardium occidentale	1
6	Thekku	Tectona grandis	1
7	Manjadi	Adenanthera pavonina	1
8	Mula	Bambusoidea	1
9	Kanjiram	Strychnos nuxvomica	1
10	Mahagani	Swietenia macrophyca	3
11	Kashumavu	Anacardium occidentale	1
12	Vatta	Macaranga peltata	1
13	Njaval	Syzigium cumini	1
14	Aanapana	Caryota urens	15
15	Vatta	Macaranga peltata	10
16	Peeli vaka	Albizia chinensis	50
	Total		89

## CANTEEN NEAR BASKET BALL COURT SIDE

Sl.no.	Name of Trees	Botanical Name	No: of
1	Vatta	Macaranga peltata	1
2	Aanapana	Caryota urens	1
3	Star apple	Chrysophyllum cainito	1
3	Plavu	Artocarpus heterophyllus	2
4	Vaka maram	Delonix regia	1
5	Rain Tree	Samanea saman	1
6	Aanapana	Caryota urens	10
7	Thekku	Tectona grandis	3
8	Mahagani	Swietenia macrophyca	1
9	Plavu	Artocarpus heterophyllus	1
10	Kashumavu	Anacardium occidentale	1
11	Manjadi	Adenanthera pavonina	1
12	Kurumulaku	Piper nigrum	Lumsum
13	Sheemakonna	Gliricidia sepium	Lumsum
14	Anjili	Artocarpus hirsutus	1
15	Vatta	Macaranga peltata	1
16	Kashumavu	Anacardium occidentale	1
17	Eeta	Dchlandra travancorica	1
18	Thekku	Tectona grandis	2



	Total	25
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## MICROBIOLOGY

Sl.no.	Name of Trees	Botanical Name	No: of
1	Theghu	Cocos nucifera	2
2	Plavu	Artocarpus heterophyllus	1
3	Mavu	Mangifera indica	1
3	Thanni	Terminalia bellirica	1
4	Plavu	Artocarpus heterophyllus	1
5	Mavu	Mangifera indica	1
6	Vazha	Musa paradisiaca	Lumsum
7	Madharam	Bauhinia acuminata	1
8	Nelli	Phyllanthus emblica	1
9	Lakshmi taru	Ludwigia octovalvis	1
10	Kanikonna	Cassia fistula	1
11	Pappaya	Carica pappaya	1
12	Ashokam	Saraca asoka	1
13	Mavu	Mangifera indica	1
	Total		14

## HERBAL GARDEN

Sl.no.	Name of Trees	Botanical Name	No: of
1	Ughu	Pongamia pinnata	1
2	Nithyakalyani	Catharanthus roseus	1
3	Heliconia	Heliconia	Lumsum
3	Njaval	Syzigium cumini	1
4	Poochaval	Acalypha wilkesiana	1
5	Kanikonna	Cassia fistula	1
6	Madharam	Bauhinia acuminata	1
7	Neermaruthu	Terminalia arjuna	1
8	Ambal	Nymphaea alba	1
9	Chethi	Ixora coccinea	1
10	Lilly	Lilium longiflorum	Lumsum
11	Snake Plant	Dracaena trifasciata	Lumsum
12	Budha mula	Bambusa ventricosa	Lumsum
13	Kolambi	Allamanda cathartica	Lumsum
14	Langhi	Cananga odorata	Lumsum
15	Pandanus(Ornamental)	Pandanus	Lumsum
16	Kavughu	Areca catechu	1
17	Veepila	Murraya koenigii	1
18	Bottle Brush Plant	Callistemon viminalis	1



19	Theghu	Cocos nucifera	1
20	Mavu	Mangifera indica	1
21	Neelayamari	Indigofera tinctoria	1
22	Manikya	Duranta erecta	Lumsum
23	Aranamaram	Monoon longifolium	2
24	Croton (Ornamental)	Croton	Lumsum
25	Musantha	Mussaenda erythrophylla	1
26	Pera	Psidium guajava	1
27	Chethi	Ixora coccinia	1
28	Nandyarvattam	Tabernaemontana divaricata	1
29	Madharam	Bauhinia acuminata	1
30	Theghu	Cocos nucifera	1
31	Dooja	Dooja(ornamental)	1
32	Red palm	Cyrtostachys renda	1
33	Vellilum	Mussaenda glabrata	1
34	Nelli	Phyllanthus emblica	1
35	Plash	Butea monosperma	1
36	Erukku	Calotropis gigantea	1
37	Croton (Ornamental)	Croton	Lumsum
38	Chamba	Syzigium samarangense	1
39	Mavu	Mangifera indica	1
40	Pera	Psidium guajava	1
41	Chamba	Syzigium samarangense	1
42	Madharam	Bauhinia acuminata	1
43	Cycas	Cycas revoluta	1
44	Areca (ornamental)	Areca	Lumsum
45	Kolambi	Allamanda cathartica	1
46	Nandyarvattam	Tabernaemontana divaricata	1
47	Elanji	Mimusops elenji	1
48	Ashokam	Saraca asoka	1
49	Neermaruthu	Terminalia arjuna	1
50	Kolambi	Allamanda cathartica	1
51	Nandyarvattam	Tabernaemontana divaricata	1
52	Elanji	Mimusops elenji	1
53	Ashokam	Saraca asoka	1
54	Neermaruthu	Terminalia arjuna	1
55	Chara konna	Peltophorus pterocarpus	1
56	Koovalam	Aegle marmelos	1
57	Chamba	Syzigium samarangense	1
58	Dooja	Platyclusus orientalis	5



59	Aathi	Ficus	1
60	Chethi	Ixora coccinia	1
61	Peeli vaka	Albizia chinensis	1
62	Nandyarvattam	Tabernaemontana divaricata	1
63	Tulsi	Ocimum tenuiflorum	Lumsum
64	Ughu	Pongamia pinnata	1
65	Pera	Psidium guajava	1
66	Kumizh	Gmelina arborea	1
67	Chittaratha	Alpinia calcarata	1
68	Koghini	Lantana camara	1
69	Broken heart money	Monstera adansonii	Lumsum
70	Mulla	Jasminum jasmin	Lumsum
	Total		62
	Grand Total		742



## 8. BIRDS AREA

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Sree Sankara College started a Bird Club International (BCI) which is started November 2020 onwards. BCI is promoting global interest in birds, conservation of nature and environment through public campaign and education. Birds play a number of roles in any ecosystem. They play a balancing role in the ecosystem and are part of cultural enhancement and part of tasks such as predation, pollination and seed dispersal. Birds serve as excellent flagships and vital environmental indicators of the climate and weather conditions of a place. By focusing on birds, and the sites and habitats on which they depend, the Birds Club in Sree Sankara College aims to improve the quality of life for birds, other wildlife (biodiversity), and for the people.



Figure 6 BIRDS CLUB AREA

## 9. AUDITORIUM

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There is one auditorium is maintained the college. This well-furnished air conditioned auditorium will giving special beauty to the college.



Figure 7 AUDITORIUM



## 10. GREEN PLAY GROUND

Education is incomplete without sports and games. Sports and games **are beneficial in teaching us punctuality, responsibility, patience, discipline, and dedication towards our goal.** The importance of games and sports in student's life is immense. It has proved to be very therapeutic in nature. Sports help improve social skills, such as dispute management and sport-based interaction. **Sports inculcate the feeling of fairness in a child and encourage them to be committed, taking defeat in a positive manner.** It teaches us to be joyful, united, and appreciative in life. Students are the youth of our nation, and they need to be energetic, physically active, and mentally fit. By understanding the responsibility to make its students healthy Sree Sankara College Kaladi has built and maintained Football Ground and Basketball court in green surroundings.



FIGURE 8 OPEN NATURAL GROUND

## WATER RESOURCES AND CONSERVATION

The requirement of water for the college, hostels and gardening etc are met by supply from well, bore well and from rain water storage tanks. . The water is collected in in different tanks main tanks each in block buildings. The water checked in an accredited laboratory in time to time to ensure its pot ability.

## 11. WATER RESOURCES

There are three wells in the college, one well is located near the chapel which is not use at present. Well located outside of campus is the main source of water for college and hostel

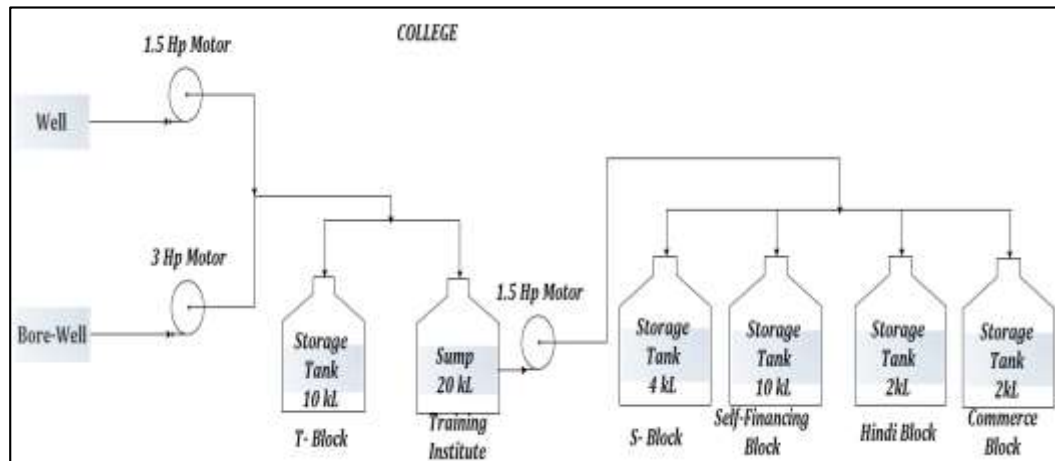
TABLE 4: WATER SOURCES

Location	Source
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Well	One in College and Another one in Hostel
Bore well	College
Rain water storage tanks	Concrete tank and Ground water Recharging

In College



In Hostel

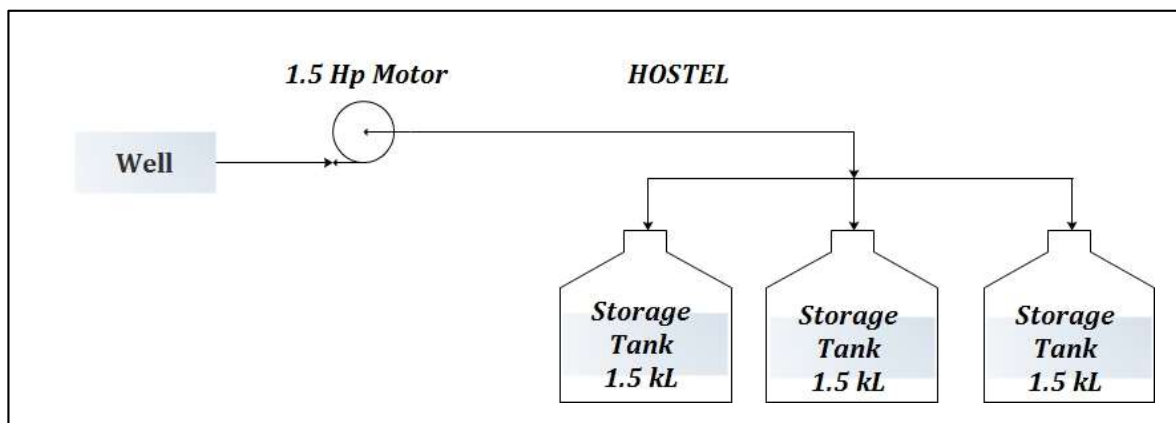


Figure 9 WATER LINE DIAGRAM

## 12. RAIN WATER HARVESTING

Rainwater harvesting (RWH) is a technique of collection and storage of rainwater into natural reservoirs or tanks, or the infiltration of surface water into subsurface aquifers (before it is lost as surface runoff). One method of rainwater harvesting is rooftop harvesting. With rooftop harvesting, most any surface — tiles, metal sheets, plastics, but not grass or palm leaf can be used to intercept the flow of rainwater and provide a household with high-quality drinking water and year-round storage. Other uses include water for gardens, livestock, and irrigation, etc.

### Rainwater harvesting for ground water recharge.

Aim and Objectives:





- Conservation of rainwater for future use
- To use rainwater for gardening Activity: Conservation of rainwater in soil or in a container is known as rainwater harvesting.

The rainwater from entire college campus and roof top of building is collected through PVC pipes and leading Rain water collection tank installed in the college campus



Figure 10RAIN WATER COLLECETION



## CONCLUSION:

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Green Audit is the most efficient & ecological way to solve such an environmental problem. Green Audit is one kind of professional care which is the responsibility of each individual who are the part of economic, financial, social, environmental factor. Green audits can “add value” to the management approaches being taken by the college and is a way of identifying, evaluating and managing environmental risks (known and unknown). The green audit reports assist in the process of attaining an eco-friendly approach to the development of the college.

The auditors observed during the campus visit and after the conversation with the staff and students of Sree Sankara College Kaladi that they have taken continuous and considerable effort in several years for nurturing and maintaining the green coverage over the campus which is being well appreciated by us. There is still opportunity to attain the perfection some of the identified suggestions are listed in the executive summary.



## ANNEXURE-1

