ENERGY AUDIT REPORT

of

SAPTHAGIRI COLLEGE OF ENGINEERING

#14/5, Chikkasandra, Hesarghatta Main Road, Bangalore 560057

SAPTHAGIRI
College of Engineering
Creating Tomorrow

Year: 2022-23

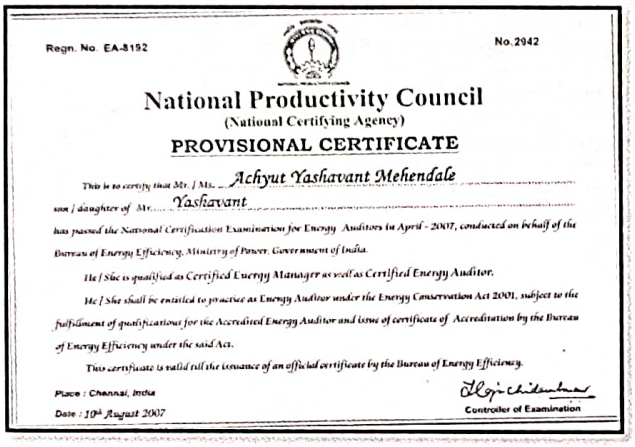
Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: engress123@gmail.com

Principal
Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main Road
Bangaluru - 560 057

REGISTRATION CERTIFICATES



Regn. No. EA-8192 No.2942

National Productivity Council
(National Certifying Agency)
PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms. Achyut Yashavant Mehendale
son / daughter of Mr. Yashavant
has passed the National Certification Examination for Energy Auditors in April - 2007, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfilment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India
Date : 10th August 2007
Controller of Examination

AUDITOR CERTIFICATE

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary, Aundh, Pune, Maharashtra 411067
Ph No: 020-35090450
Email: eec@mahaurja.com, Web: www.mahaurja.com

EC/N/2022-23/CR-43/1709 10th May, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with *MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)* under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Engress Services
Yashshree, 26, Nirmal Bag Society,
Near Muktangan English School,
Parvati, Pune - 411 009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

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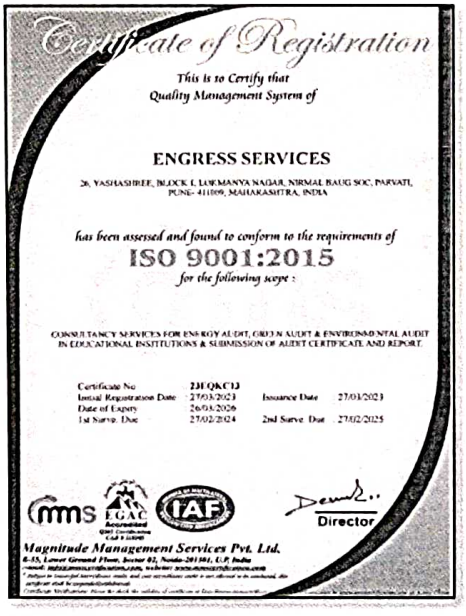
General Manager (EC)

MEDA Registration Certificate



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Quality Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK I, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

has been assessed and found to conform to the requirements of
ISO 9001:2015
for the following scope :

CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT.

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Date of Expiry : 26/03/2026
1st Surve. Due : 27/02/2024 2nd Surve. Due : 27/02/2025

Director

Magnitude Management Services Pvt. Ltd.

ISO: 9001-2015 Certificate

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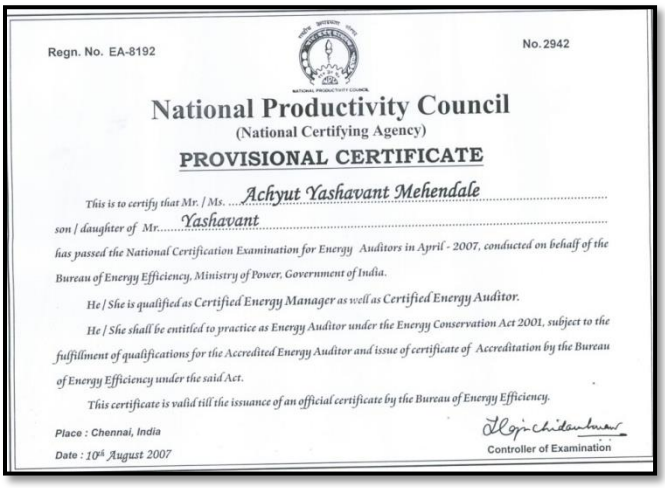

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ACKNOWLEDGEMENT

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We are thankful to:

- Dr. H. Ramakrishna, Principal
- Dr. R G Deshpande and Dr. Harish, Dept. of Mechanical Engineering

We are also thankful to all Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. Sapthagiri College of Engineering, Bangalore consumes Energy in the form of **Electrical Energy and Diesel** used for various day to day activities.

2. Present Consumption of Electrical Energy, Diesel & CO_2 Emission:

No	Parameter/ Variation	Energy Purchased, kWh	Diesel Consumed, Liters	CO_2 Emissions, MT
1	Total	462466	2364	410
2	Maximum	52300	249	47
3	Minimum	28823	126	23
4	Average	38455	198	34.2

3. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment
- Maximum Usage of Day Lighting
- Installation of **40 kWp** Roof Top Solar PV Plant

4. Usage of Alternate Energy:

- The College has installed **40 kWp** Capacity Solar Roof Top Solar Plant.
- Energy generated by Solar PV Plant **48098 kWh.**
- Energy purchased is **462466 kWh.**
- Total Annual Energy Requirement of College is **510564 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **9.3 %.**

5. Usage of LED Lighting:

- The Total LED Lighting Load of the College is **20.4 kW.**
- The Total Lighting Load of the College is **50 kW.**
- The percentage of LED Lighting to Total Lighting Load is **41 %.**

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of **CO_2**into atmosphere
2. **1 Kg of Diesel** releases **2.63 Kg of CO_2**into atmosphere.
3. Energy Generated by 1 kWp Solar PV Plant is: **4 kWh/kWp**
4. Annual Solar Energy Generation Days: **300 Nos**

7. References:

- For CO_2 Emissions: www.tatapower.com
- For Energy generated by Roof Top Solar PV Plant: www.solarrooftop.gov.in

ABBREVIATIONS

LED	:	Light Emitting Diode
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
CFL	:	Compact Fluorescent Light
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton
LPD	:	Liters per Day

CHAPTER-I
INTRODUCTION

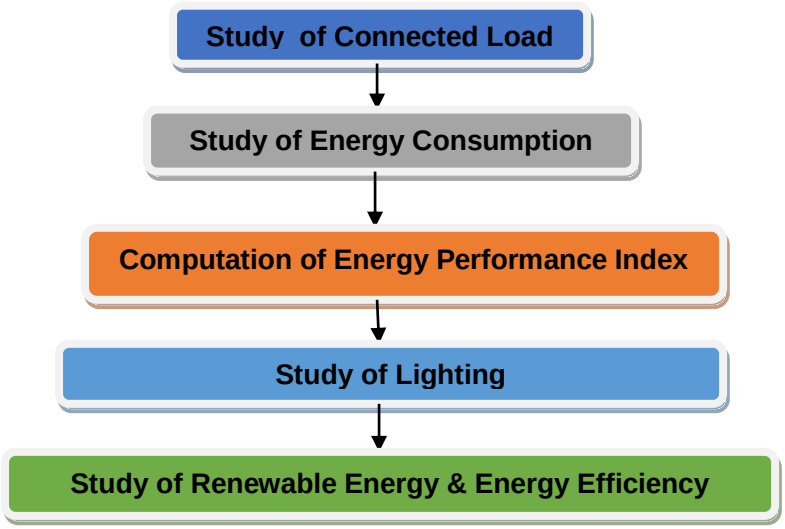
1.1 Introduction:

An Energy Audit is conducted at Sapthagiri College of Engineering, Bangalore.

The guidelines followed for conducting the Energy Audit are:

- BEE India's Energy Conservation Building Code: ECBC-2017
- Maharashtra Energy Development Agency (www.mahaurja.com)
- Tata Power: www.tatapower.com

1.2 Audit Procedural Steps:



1.3 Institute Location Image:

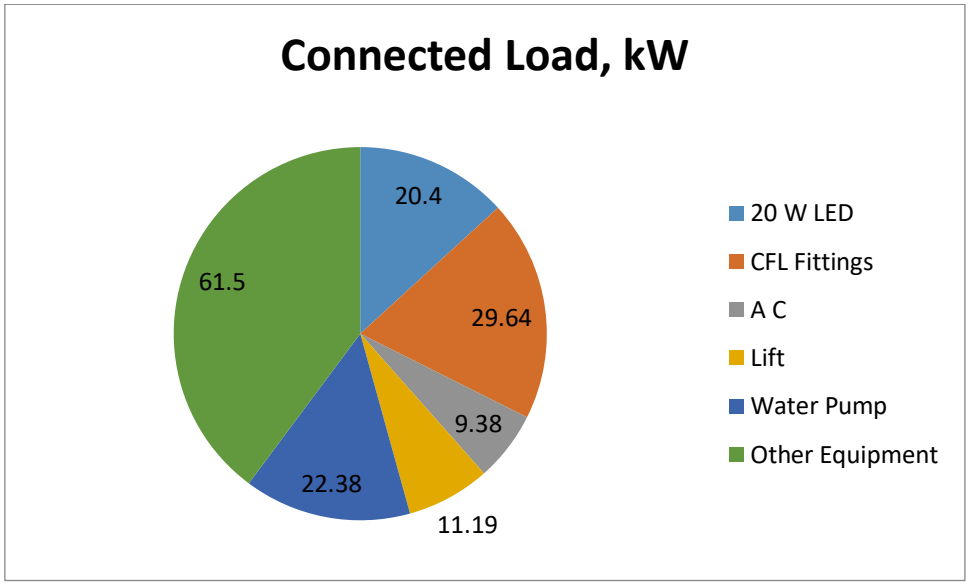
CHAPTER-II
STUDY OF CONNECTED LOAD

The major contributors to the connected load of the College include:

Table No 1: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	20 W LED	1030	20	20.6
2	CFL Fittings	750	40	30.00
3	A C	5	1875	9.375
4	Lift	2	5595	11.19
5	Water Pump	1	22380	22.38
6	Other Equipment	410	150	61.5
7	**Total**			**154**

Chart No 1: Study of Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Energy Consumption.

Table No 2: Consumption of Electrical Energy & Diesel:2021-22:

No	Month	Energy Purchased, kWh	Diesel Consumed, Liters
1	JUL-23	51875	215
2	JUN-23	32325	240
3	MAY-23	28823	243
4	APR-23	33535	190
5	MAR-23	45905	219
6	FEB-23	26665	205
7	JAN-23	43185	263
8	DEC-22	30134	136
9	NOV-22	36695	221
10	OCT-22	34739	188
11	SEP-22	45285	136
12	AUG-22	52300	184
13	Total	462466	2399
14	Maximum	52300	249
15	Minimum	28823	126
16	Average	38455	198

Chart No 2: Variation in Monthly Energy Purchased:

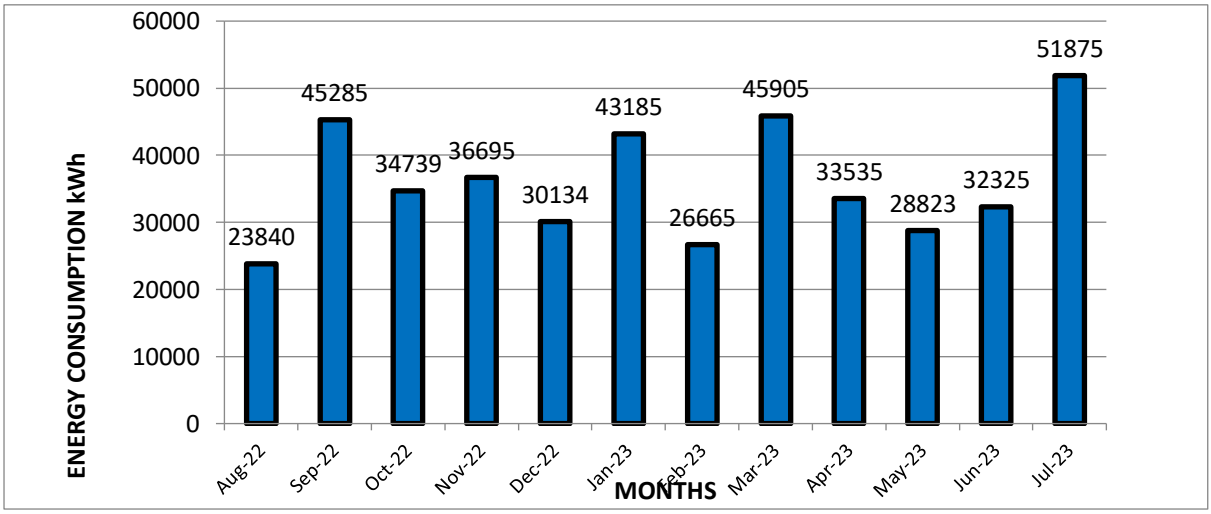
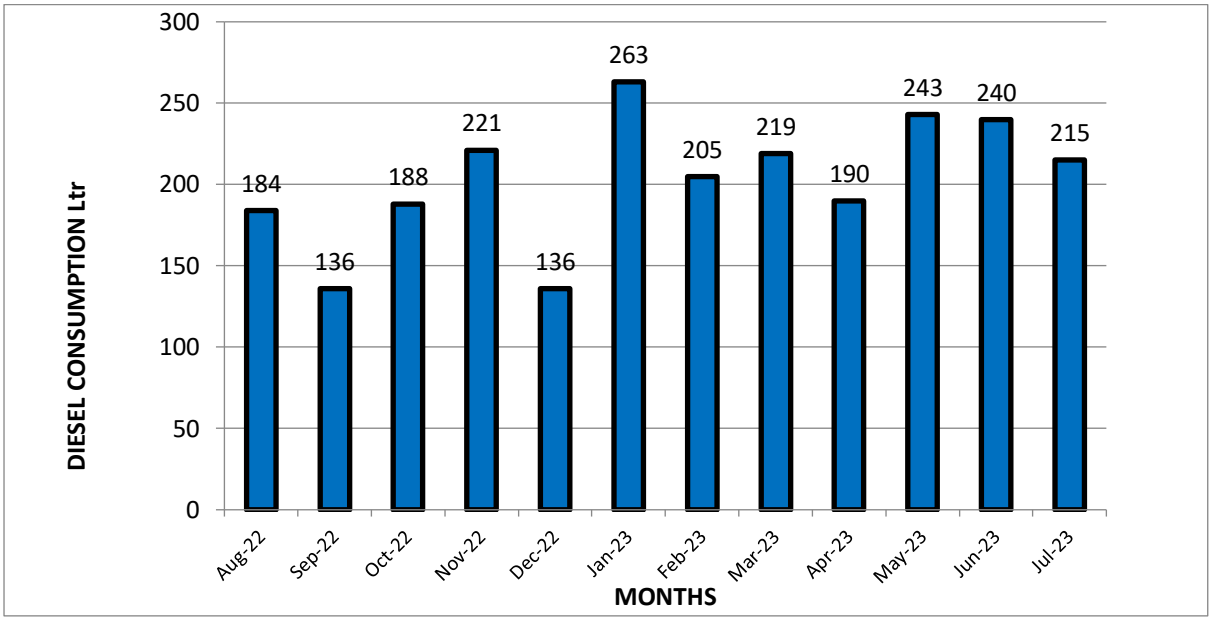


Chart No 3: Variation in Monthly Diesel Consumption:



CHAPTER-IV
STUDY OF CARBON FOOTPRINTING

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets& Diesel.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Liter** of Diesel releases **2.63 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Table No 3: Computation of Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	Diesel Consumed, Liters	Month wise CO2Emissions MT
1	JUL-23	51875	215	46
2	JUN-23	32325	240	29
3	MAY-23	28823	243	25
4	APR-23	33535	190	30
5	MAR-23	45905	219	41
6	FEB-23	26665	205	23
7	JAN-23	43185	263	38
8	DEC-22	30134	136	27
9	NOV-22	36695	221	33
10	OCT-22	34739	188	31
11	SEP-22	45285	136	40
12	AUG-22	52300	184	47
13	Total	462466	2399	410
14	Maximum	52300	249	47
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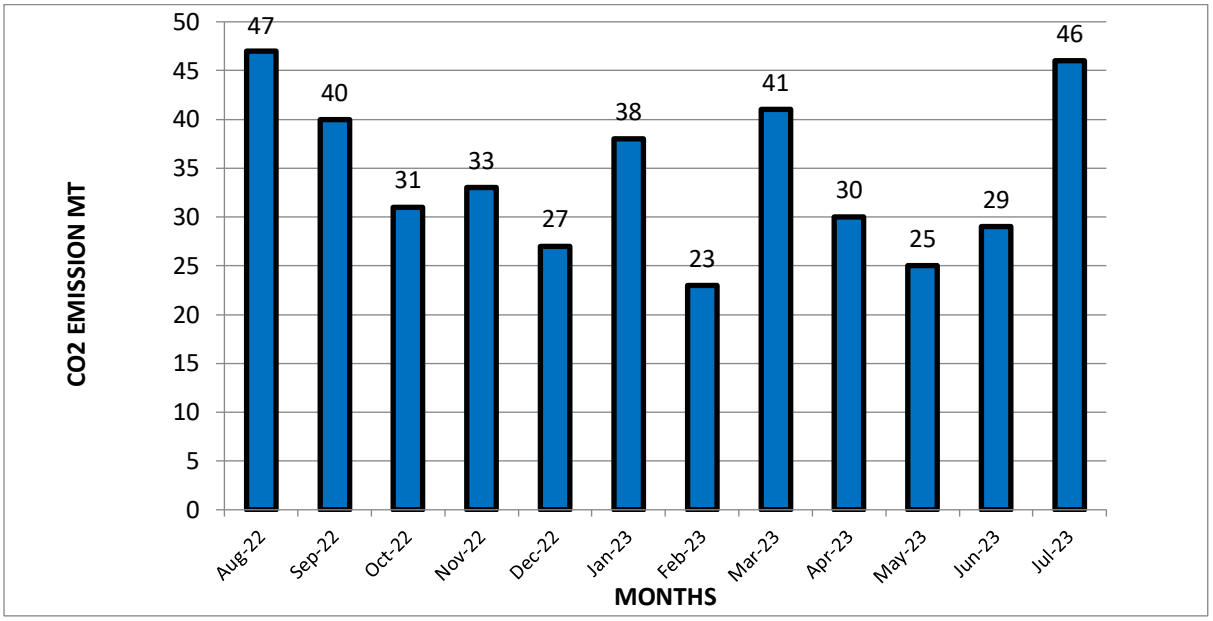
Chart No 4: Month wise CO_2Emissions:



CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **40kWp.**

In the following Table, we compute the Electrical Energy generated by Solar PV Plantand the percentage of Alternate Energy to Annual Energy Demand.

Table No 4: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Plant	40	kWp
2	Energy generated per kWp by Rooftop Solar PV Plant	4	kWh/kWp
3	Generation Days in 2022-23.	300	Nos
4	Solar Energy generated in 2022-23.=**1*2*3**	48098	kWh
5	Electrical Energy purchased from Electricity Board	462466	kWh
6	Total Annual Electrical Energy Demand = **4 + 5**	510564	kWh
7	**% Annual Energy Demand met by Alternate Energy= 4*100/6**	**9.3**	%

Photograph of Roof Top Solar PV Plant:

CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In this chapter, we compute the percentage of usage of LED Lighting to Total Lighting Load.

Table No 5: Percentage of Usage of LED Lighting to Annual Lighting Load:

No	Particulars	Value	Unit
1	No of 20 W LED Tube Lights	1020	Nos
2	Demand of 20 W LED Tube Light	20	W/Unit
3	Total Electrical Load of 20 W LED Fittings	**20.4**	kW
4	No of CFL Fittings	741	Nos
5	Demand of CFL Fitting	40	W/Unit
6	Total Electrical Load of CFL Fittings	**29.64**	kW
7	Total LED Lighting Load= 3	**20.4**	kW
8	Total Lighting Load=3+6	**50.04**	kW
9	**Total Lighting Load met by LED Lighting= 7*100/8**	**41**	**%**

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General Manager (TC)

MEDA REGISTRATION CERTIFICATE

ASSOCHAM

GEM Certificate

ASSOCHAM hereby certifies that

Mr. A Y Mehendale

has successfully passed the

Green and Eco-friendly Movement Certified Professional Test (GEM CP)

with

"Excellent Performance"

on

06 June, 2022

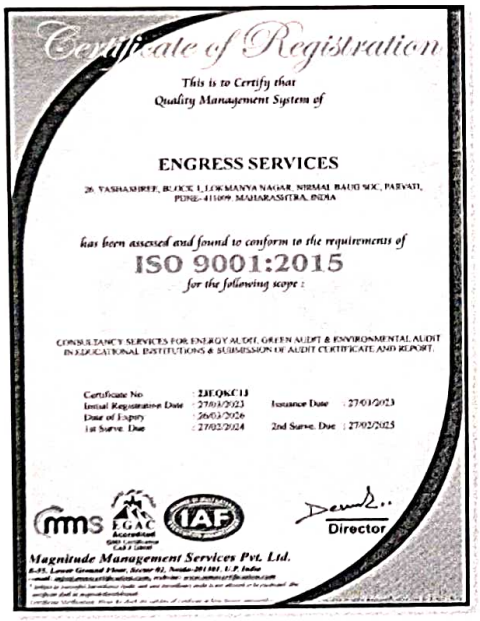
He/she is now eligible to execute the GEM Sustainability Certification Projects.
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.

Pankaj R. Dharkar
Chairman, GEM

GEM CP 22/788

Deepak Sood
Secretary General, ASSOCHAM

ASSOCHAM GEM CP CERTIFICATE



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EXECUTIVE SUMMARY

1. Sapthagiri College of Engineering, Bangalore consumes Energy in the form of **Electrical Energy and Diesel** used for various day to day activities.

2. Pollution due to College Activities:

- **Air pollution:** Mainly CO_2 on account of Electricity Consumption
- **Solid Waste:** Recyclable Waste and Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO_2 Emissions:

No	Parameter/ Variation	Energy Purchased, kWh	Diesel Consumed, Liters	CO_2 Emissions, MT
1	Total	462466	2364	410
2	Maximum	52300	249	47
3	Minimum	28823	126	23
4	Average	38455	198	34.2

4. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient BEE STAR Rated Equipment
- Usage of Energy Efficient LED Lighting
- Installation of 40 kWp Roof Top Solar PV Plant

5. Usage of Renewable Energy:

- The College has installed Solar Thermal Water Heating System of Capacity **40 kWp**.
- The Electrical Energy generated in 2022-23 is **48098 kWh.**
- Reduction in CO_2 Emissions in 2022-23 works out to be **43.3 MT.**

5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	83	35	43
2	Minimum	23	11	38

6. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	29	45	2450	56
2	Minimum	26	19	118	46

7. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Arrangement of Bio Composting Bed
3	Sanitary Waste	Installed Sanitary Waste Incinerator
4	E Waste Management	Disposed of through Authorized Agency

8. Rain Water Management:

The College has installed the Rainwater harvesting project, the rain water falling on the terrace is collected and is used for increasing the underground water level.

9. Eco Friendly Initiatives:

- Maintenance of Internal Garden
- Provision of Sanitary Waste Incinerator
- Display of Posters on Plastic Ban

10. Assumptions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Kg of Diesel** releases **2.63 Kg of CO_2**into atmosphere

11. References:

- For CO_2 Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI Quality Standards: www.cpcb.com

ABBREVIATIONS

Kg	:	Kilo Gram
MT	:	Metric Ton
kWh	:	kilo-Watt Hour
LPD	:	Liters per Day
LED	:	Light Emitting Diode
AQI	:	Air Quality Index
PM-2.5	:	Particulate Matter of Size 2.5 Micron
PM-10	:	Particulate Matter of Size 10 Micron
CPCB	:	Central Pollution Control Board
ISHRAE	:	The Indian Society of Heating & Refrigerating & Air Conditioning Engineers

CHAPTER-I
INTRODUCTION

1. Important Definitions:

1.1. Environment: Definition as per environment Protection Act: 1986

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

1.2. Environmental Audit: Definition:

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

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

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

1.4 Audit Procedural Steps:

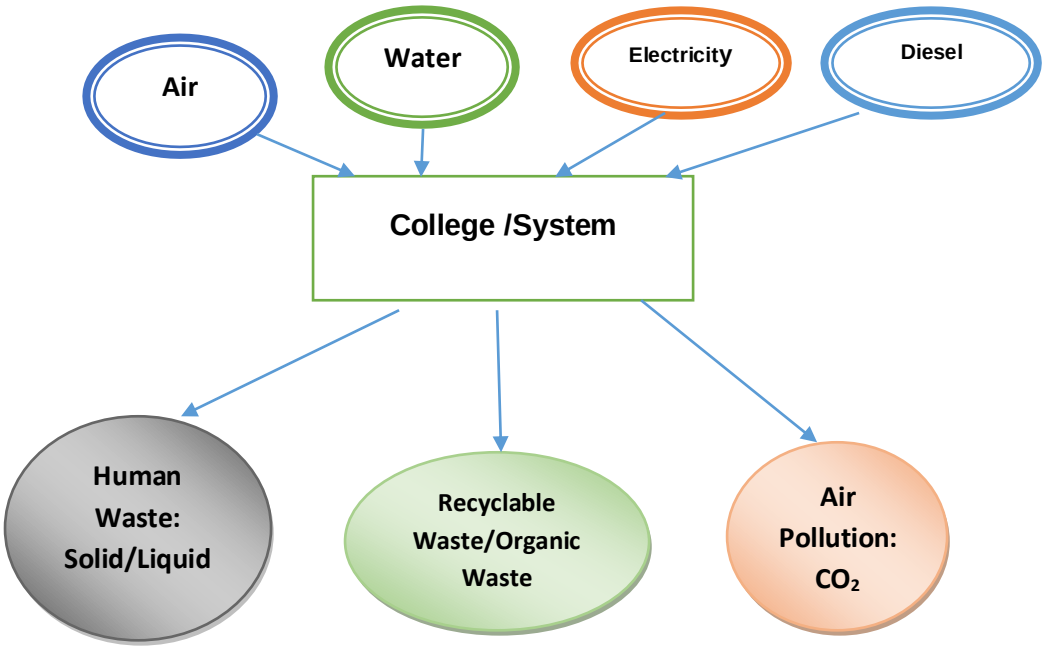
1.5 Google Earth Image:

CHAPTER-II
STUDY OF CONSUMPTION OF RECOURCES & CO_2 EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Diesel

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



Now we compute the Generation of CO_2 on account of consumption of Electrical Energy& Diesel.
The basis of Calculation for CO_2 emissions due to Electrical Energy & Diesel are as under

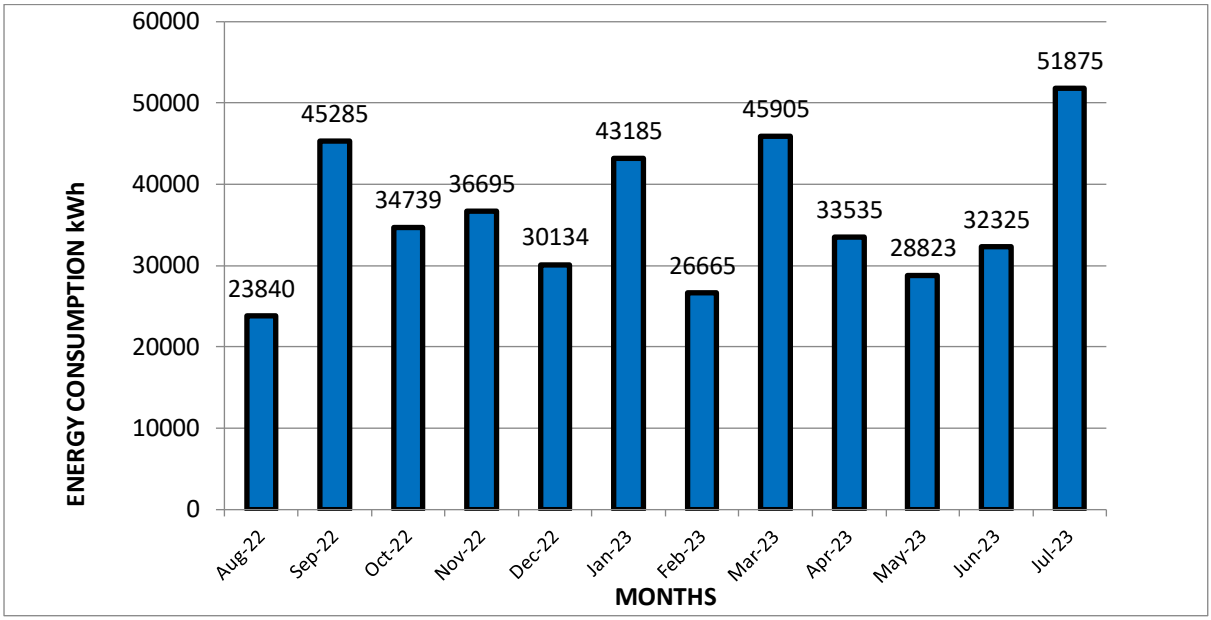
- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Liter** of Diesel releases **2.63 Kg of CO_2** into atmosphere.

Table No 1: Computation of Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	Diesel Consumed, Liters
1	JUL-23	51875	215
2	JUN-23	32325	240
3	MAY-23	28823	243
4	APR-23	33535	190
5	MAR-23	45905	219

6	FEB-23	26665	205
7	JAN-23	43185	263
8	DEC-22	30134	136
9	NOV-22	36695	221
10	OCT-22	34739	188
11	SEP-22	45285	136
12	AUG-22	52300	184
13	Total	462466	2399
14	Maximum	52300	249
15	Minimum	28823	126
16	Average	38455	198

Chart No 2: Month wise CO_2Emissions:



CHAPTER III
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **40 kWp.**

In the following Table, we compute the Electrical Energy generated by Solar PV Plant and reduction in CO_2 emissions due to usage of Solar Energy.

Table No 2: Computation of Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Plant	40	kWp
2	Energy generated per kWp by Rooftop Solar PV Plant	4	kWh/kWp
3	Generation Days in 2022-23	300	Nos
4	Solar Energy generated in 2022-23= 1*2*3	48098	kWh
5	1 kWh of Electrical Energy is equivalent to	0.9	Kg of CO_2
6	Reduction in CO2 Emission in 2022-23 = 4*5/1000	43288	MT

Photograph of Roof Top Solar PV Plant:

CHAPTER IV
STUDY OF INDOOR AIR QUALITY

4.1 Importance of Air Quality:

Air: The common name given to the atmospheric gases used in breathing and photosynthesis.

By volume, Dry Air contains 78.09% Nitrogen, 20.95% Oxygen, 0.93% Argon, 0.039% carbon dioxide, and small amounts of other gases.

On average, a person inhales about **14,000 liters** of air every day. Therefore, poor air quality may affect the quality of life now and for future generations by affecting the health, the environment, the economy and the city's livability.

Rapid urbanization and industrialization has added other elements/compounds to the pure air and thus caused the increase in pollution. In order to prevent, control and abate air pollution, the Air (Prevention and Control of Pollution) Act was enacted in 1981.

Air quality is a measure of the suitability of air for breathing by people, plants and animals.

According to Section 2(b) of Air (Prevention and control of pollution) Act, 1981 '**air pollution**' has been defined as **'the presence in the atmosphere of any air pollutant**.'

As per Section 2(a) of Air (Prevention and control of pollution) Act, 1981 '**air pollutant**' has been defined as **'any solid, liquid or gaseous substance [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment**

4.2 Air Quality Index:

An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population.

We present herewith following important Parameters.

1. AQI- Air Quality Index
2. PM-2.5- Particulate Matter of Size 2.5 micron
3. PM-10- Particulate Matter of Size 10 micron

Table No 3: Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	83	35	43
2	Minimum	23	11	38

CHAPTER V
STUDY OF INDOOR COMFORT CONDITION PARAMETERS

In this Chapter, we present the various Indoor Comfort Parameters measured during the Audit.

The Parameters include:

1. Temperature
2. Humidity
3. Lux Level
4. Noise Level.

Table No 4: Study of Indoor Comfort Condition Parameters:

No	Parameter/Value	Temperature, ^{0}C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	29	45	2450	56
2	Minimum	26	19	118	46

CHAPTER VI
STUDY OF WASTE MANAGEMENT

6.1 Solid Waste Management:

The Waste is segregated at source and is further disposed of through Authorized vendors.

Photograph of Waste Collection Bins:

6.2 Organic Waste Management:

The Bio degradable waste like leafy waste is composted in a Bio composting Unit.

Photograph of Bio Composting Unit:

6.3 Sanitary Waste Management:

For disposal of Sanitary Waste, a Sanitary Waste Incinerator is installed in the campus.

Photograph of Sanitary Waste Incinerator:

6.4 E-Waste Management:

The E-Waste is disposed of through Authorized Agency.

CHAPTER-VII
STUDY OF RAIN WATER MANAGEMENT

The College has implemented the Rain Water Management Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is used to increase the underground water level.

Photograph of Rain Water Management Pipe:

Photograph of Rain Water Management Recharge Well:

CHAPTER-VIII
STUDY OF ECO FRIENDLY PRACTICES

8.1 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:

8.2 Creation of Awareness about Green Campus:

The College has displayed posters emphasizing on importance of Plastic Free Campus.

Photograph of Poster on Plastic Free Campus:

ANNEXURE-I:
AIR QUALITY, NOISE & INDOOR COMFORT STANDARDS:

1. Category Wise Air Quality Index Values & Concentration of PM 2.5 & PM10:

No	Category	AQI Value	Concentration Range, PM 2.5	Concentration Range, PM 10
1	Good	0 to 50	0 to 30	0 to 50
2	Satisfactory	51 to 100	31 to 60	51 to 100
3	Moderately Polluted	101 to 200	61 to 90	101 to 250
4	Poor	201 to 300	91 to 120	251 to 350
5	Very Poor	301 to 400	121 to 250	351 to 430
6	Severe	401 to 500	250 +	430 +

2. Recommended Noise Level Standards:

No	Location	Noise Level dB
1	Auditoriums	20-25
2	Outdoor Playground	55
3	Occupied Class Room	40-45
4	Un occupied Class Room	35
5	Apartment, Homes	35-40
6	Offices	45-50
7	Libraries	35-40
8	Restaurants	50-55

3. Thermal Comfort Conditions: For Non-conditioned Buildings:

No	Parameter	Value
1	Temperature	Less Than 33^{0}C
2	Humidity	Less Than 70%

Principal
Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main R...
Bengaluru - 560 057

GREEN AUDIT REPORT

of

SAPTHAGIRI COLLEGE OF ENGINEERING

#14/5, Chikkasandra, Hesarghatta Main Road, Bangalore 560057

SAPTHAGIRI
College of Engineering
Creating Tomorrow

Year: 2022-23

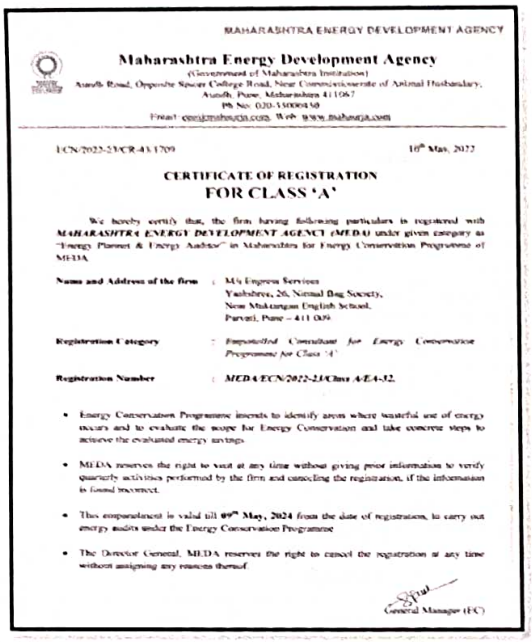
Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: engress123@gmail.com

Principal
Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main Road
Bengaluru - 560 057

REGISTRATION CERTIFICATES



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Ansuh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary, Aundh, Pune, Maharashtra 411067
Ph. No: 020-15000430
Email: ceo@mahaurja.com, Web: www.mahaurja.com

ECN/2022-23/CR-43/1709 — 10th May, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with *MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)* under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Engress Services
Yashshree, 26, Nirmal Bag Society,
New Mukteswar English School,
Parvati, Pune – 411 009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : *MEDA/ECN/2022-23/Class A/EA-32.*

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and cancelling the registration, if the information is found incorrect.
- This empanelment is valid till **09th May, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

MEDA REGISTRATION CERTIFICATE

ASSOCHAM

GEM Certificate

ASSOCHAM hereby certifies that

Mr. A Y Mehendale

has successfully passed the
Green and Eco-friendly Movement Certified Professional Test (GEM CP)
with
"Excellent Performance"
on
06 June, 2022

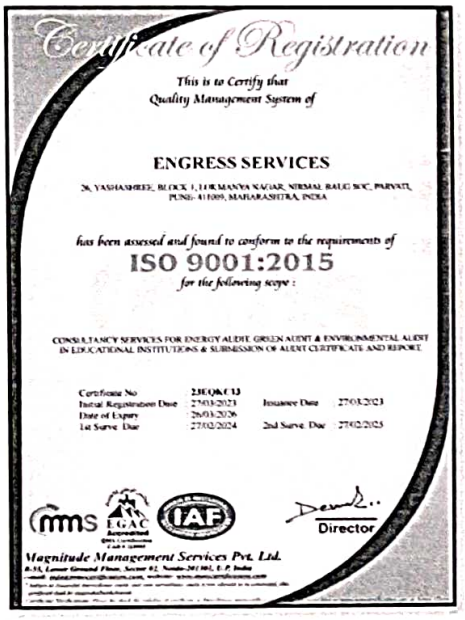
He/she is now eligible to execute the GEM Sustainability Certification Projects
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.

Pankaj R. Dharkar
Chairman, GEM

GEM CP 22/788

Deepak Sood
Secretary General, ASSOCHAM

ASSOCHAM GEM CP CERTIFICATE



Certificate of Registration

This is to Certify that
Quality Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

has been assessed and found to conform to the requirements of
ISO 9001:2015
for the following scope :

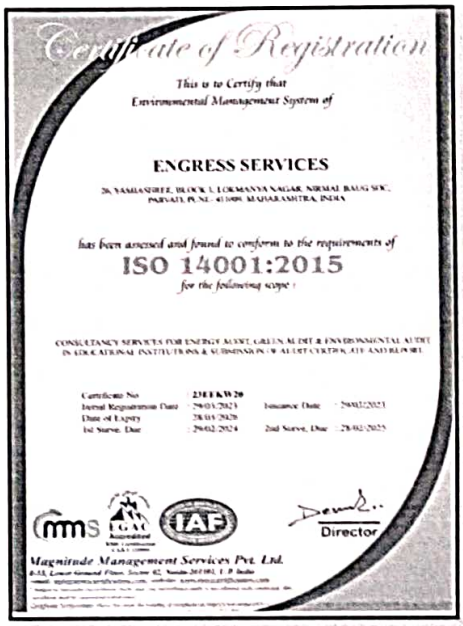
CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT.

Certificate No	23EQAC13		
Initial Registration Date	27/03/2023	Issuance Date	27/03/2023
Date of Expiry	26/03/2026		
1st Surve. Due	27/02/2024	2nd Surve. Due	27/02/2025

Director

Magnitude Management Services Pvt. Ltd.

ISO: 9001-2015 CERTIFICATE



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1st Surve. Due	29/02/2024	2nd Surve. Due	28/02/2025

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Bengaluru - 560 057

INDEX

ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Sapthagiri College of Engineering, Bangalore, for awarding us the assignment of Green Audit of their Campus for the Academic Year: 2022-23.

We are thankful to:

- Dr. H. Ramakrishna, Principal
- Dr. R G Deshpande and Dr. Harish, Dept. of Mechanical Engineering

We are also thankful to other Staff members for helping us during the field study.

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EXECUTIVE SUMMARY

1. Sapthagiri College of Engineering, Bangalore consumes Energy in the form of **Electrical Energy and Diesel** used for various day to day activities.

2. Present Consumption of Electrical Energy, Diesel & CO_2 Emission:

No	Parameter/ Variation	Energy Purchased, kWh	Diesel Consumed, Liters	CO_2 Emissions, MT
1	Total	462466	2364	410
2	Maximum	52300	249	47
3	Minimum	28823	126	23
4	Average	38455	198	34.2

3. Usage of Renewable Energy& CO_2 Emission Reduction:

- Energy generated by 40 kWp Roof Top Solar PV Plant **4800 kWh**.
- The Annual Reduction in CO2 Emissions in 22-23 is **34.68 MT.**

4. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Arrangement of Bio Composting Bed
3	Sanitary Waste	Installed Sanitary Waste Incinerator
4	E Waste Management	Disposed of through Authorized Agency

5. Rain Water Management:

The College has installed the Rainwater harvesting project, the rain water falling on the terrace is collected and is used for increasing the underground water level.

6. Green & Sustainable Initiatives

- Maintenance of good Internal Road & Tree Plantation
- Provision of Ramp for Divyangajan
- Display of Posters on Plastic Free Campus.

7. Assumptions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Kg of Diesel** releases **2.63 Kg of CO_2**into atmosphere.

9. References:

- For CO_2 Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in

ABBREVIATIONS

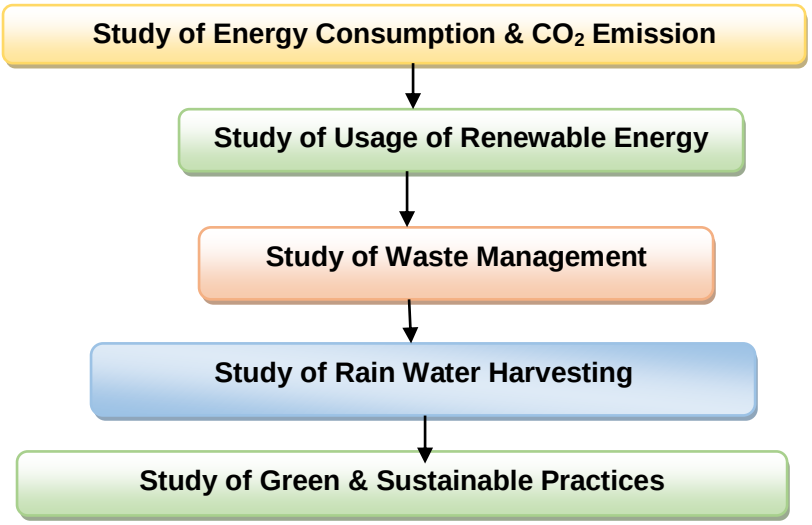
BEE	Bureau of Energy Efficiency
kWh	Kilo Watt Hour
LPD	Liters Per Day
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
Qty	Quantity

CHAPTER-I
INTRODUCTION

1.1 Introduction:

A Green Audit is conducted at Sapthagiri College of Engineering, Bangalore.

1.2 Audit Procedural Steps:



1.3 Institute Location Image:

CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Energy Consumption.

Table No 1: Consumption of Electrical Energy & Diesel: 2022-23:

No	Month	Energy Consumed, kWh	Diesel Consumed, Liters
1	JUL-23	51875	215
2	JUN-23	32325	240
3	MAY-23	28823	243
4	APR-23	33535	190
5	MAR-23	45905	219
6	FEB-23	26665	205
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Chart No 1: Variation in Monthly Energy Consumption:

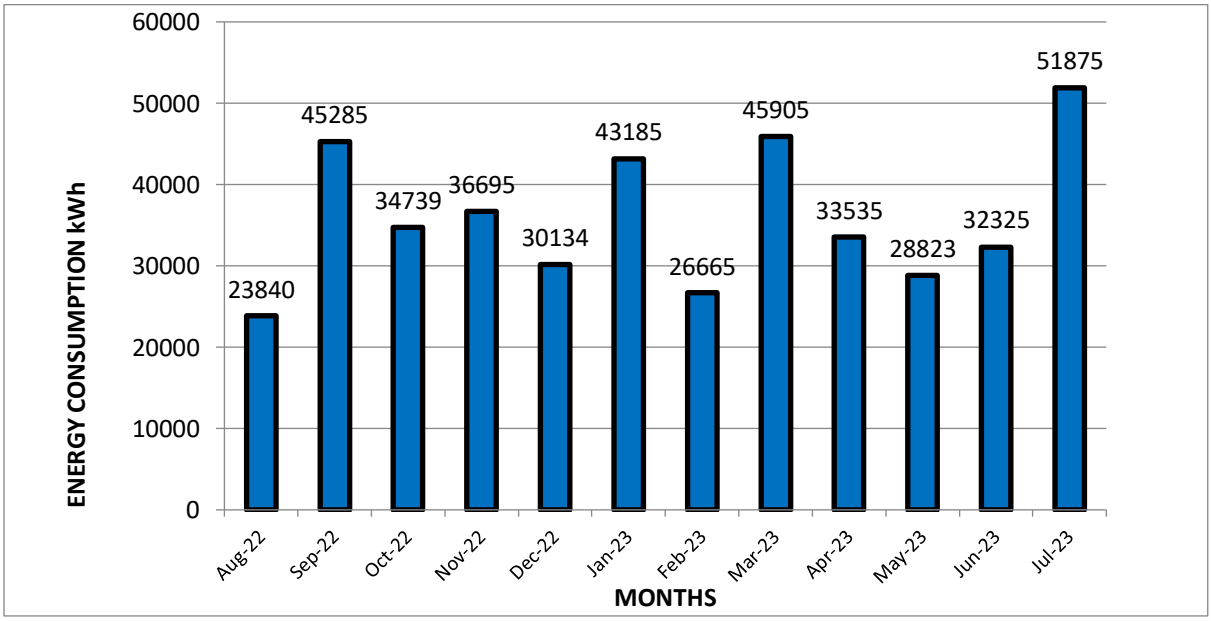
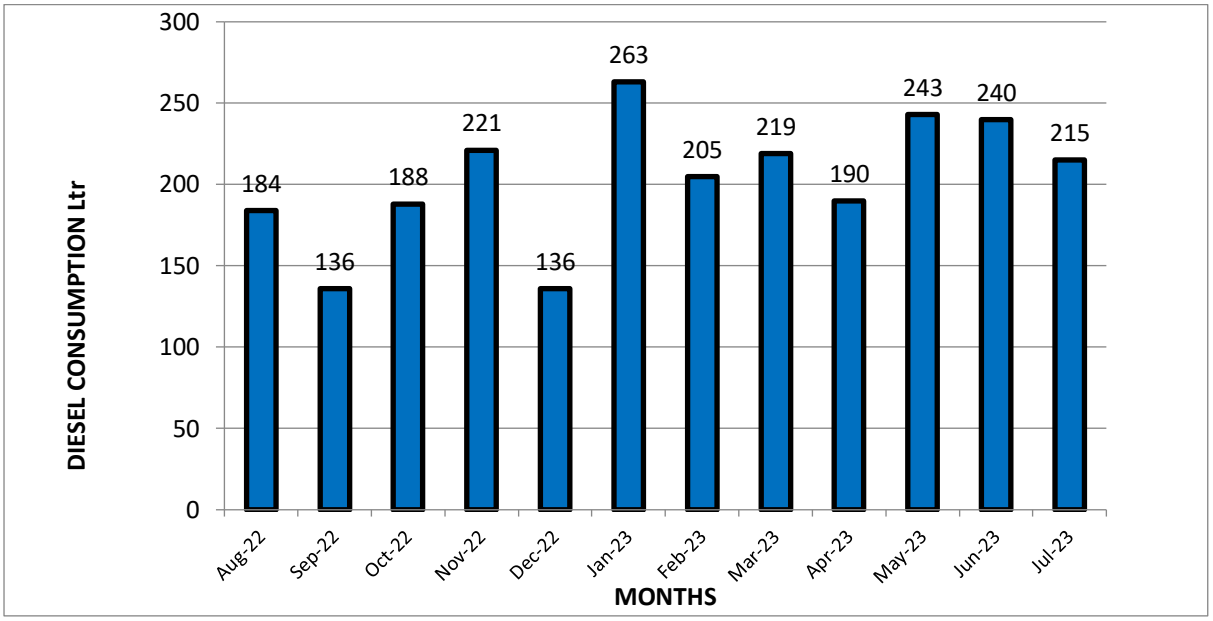


Chart No 2: Variation in Monthly Diesel Consumption:



CHAPTER III
STUDY OF CARBON FOOTPRINTING

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets& Diesel for vehicles.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Liter** of Diesel releases **2.63 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Table No 2: Computation of Month wise CO_2 Emissions:

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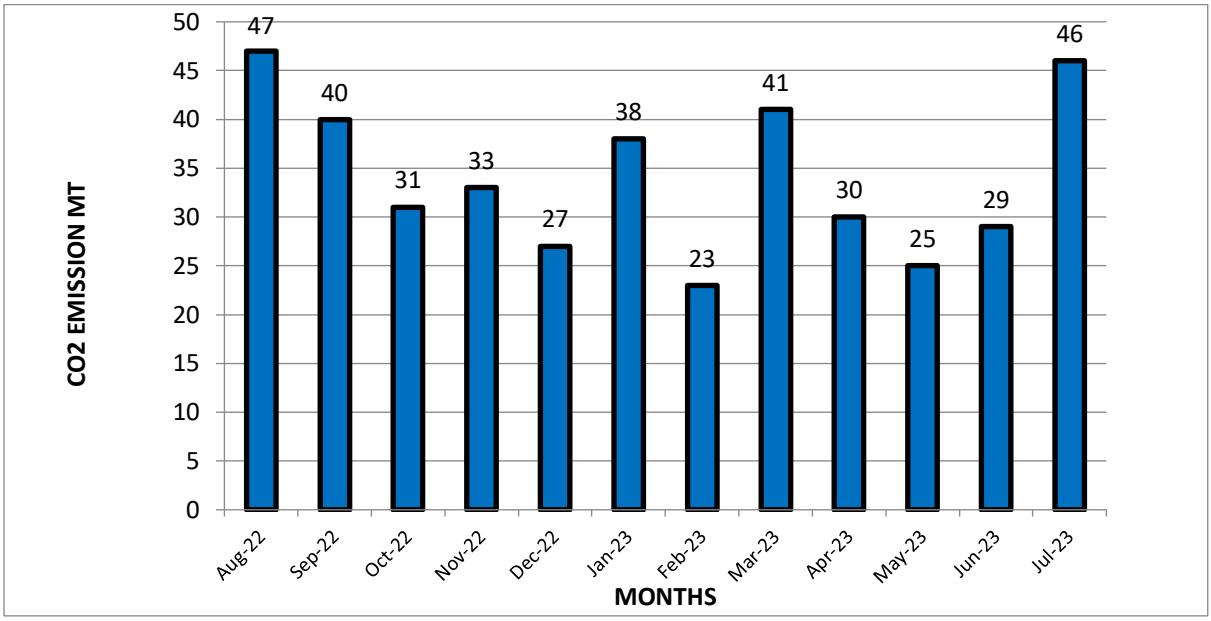
Chart No 3: Month wise CO_2Emissions:



CHAPTER IV
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **40 kWp.**

In the following Table, we compute the Electrical Energy generated by Solar PV Plant and reduction in CO2 emissions due to usage of Solar Energy.

Table No 3: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Plant	40	kWp
2	Energy generated per kWp by Rooftop Solar PV Plant	4	kWh/kWp
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5	1 kWh of Electrical Energy is equivalent to	0.9	Kg of CO_2
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Photograph of Roof Top Solar PV Plant:

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STUDY OF WASTE MANAGEMENT

5.1 Solid Waste Management:

The Waste is segregated at source and is further disposed of through Authorized vendors.

Photograph of Waste Collection Bins:

5.2 Organic Waste Management:

The Bio degradable waste like leafy waste is composted in a Bio composting Unit.

Photograph of Bio Composting Unit:

5.3 Sanitary Waste Management:

For disposal of Sanitary Waste, a Sanitary Waste Incinerator is installed in the campus.

Photograph of Sanitary Waste Incinerator:

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The E-Waste is disposed of through Authorized Agency.

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STUDY OF RAIN WATER MANAGEMENT

The College has implemented the Rain Water Management Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is used to increase the underground water level.

Photograph of Rain Water Management Pipe:

Photograph of Rain Water Management Recharge Well:

CHAPTER-VII
STUDY OF GREEN & SUSTAINABLE PRACTICES

7.1 Pedestrian Friendly Roads:

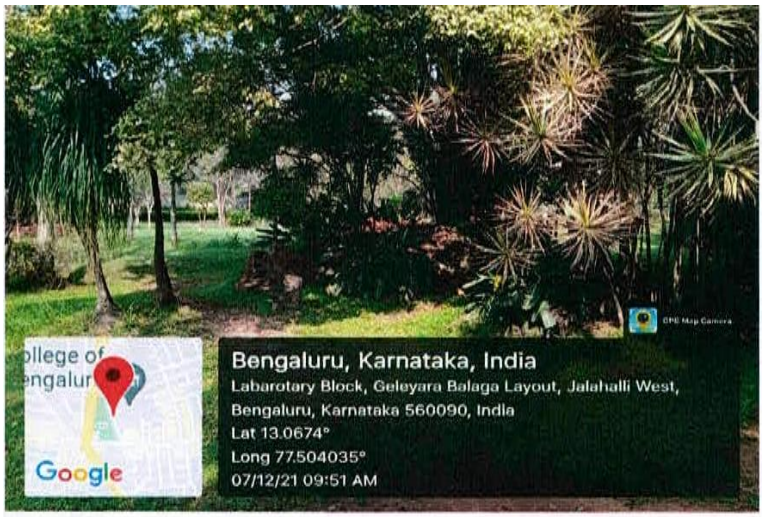
The College has well maintained internal road to facilitate the easy movement of the students within the campus.

Photograph of Internal Road:

7.2 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:



7.3 Provision of Ramp:

For easy movement of Divyangajan, the College has made provision of Ramp at the main entrance.

Photograph of Ramp:

7.4 Creation of Awareness about Green Campus:

The College has displayed posters emphasizing on importance of Plastic Free Campus.

Photograph of Poster on Plastic Free Campus:

ANNEXURE-1:
LIST OF TREES & PLANTS IN THE CAMPUS:

No	Common Name of Tree	Botanical Name	Family Name
1	Beteinut palm	Areca catechu	Arecaceae
2	Silver oak tree	Timber value	
3	Snadel tree	Santalum album	Snatalceae
4	Whistling pine	Casuarina equisetifolia	Casuarinaceae
5	Indian date plam	Phoenix aylvestris	Arecaeae
6	Jackfruit tree	Artocarpus heterophyllus	moraceae
7	Butter fruit tree		
8	Mango		
9	Pomegranate	puncia granatum	Lythraceae
10	Fish tail palm		
11	Star gooseberry	Phyllanthus acidus	phyllanthaceae
12	Guava	psidium guajava	myrtaceae
13	Lemon	Citrus x limon	Rutaceae
14	Chaste tree	Video negundo	Lamiaceae
15	Nilagiri tree	Avenue tree,oil from leaf medicinal	
16	crown flower	calotropis gigantea	apocynaceae
17	peepal	ficus religiosa	moraceae
18	Singapore cherry	MuntingiaCalabura	Muntingiaceae
19	Caribbean trumpet tree	Tabebuia argentea	bignoniaceae
20	pink trumpet tree	Tabebuia rosea	Bignoniaceae
21	Fern tree	Filiciumdecipiens	sapindaceae
22	Royal plam	Royatinedreiga	Arecaeae
23	Copper pod tree		
24	Jacaranda		
25	periwinkle	capharanthus roseus	apocynaceae
26	Lantana	Lantana camara	Verbenaceae
27	Broadleaf lady palm	Rhapisexcelsa	Arecaceae
28	Joy weed	Alternancherabrasiliana	Amaranthaceae
29	Ixora	Bora coccinea	Rubiaceae
30	Lesser bougainvillea		

31	Schefflera		
32	Dracaena	Dracenaellenbeckiana	Asparagaceae
33	Areca palm		
34	Christmas tree	vitex negundo	Lamiaceae
35	Blue agave	Agave tequilana	Asparagaceae
36	henna	lawsoniainermisl	lythraceae
37	yellow bells	tecoma stans	bignoniaceae
38	croton gold	codiaeumvaritgatum	euphorbiaceae
39	red leea	leeaguineense	vitaceae
40	barbados lily	hippeastrumpuniceum	amaryllidaceae
41	allamanda	allamanda cathartiva	apocynaceae
42	apocynaceae	durantaerecta	verbenaceae
43	pink rain ily	zephyranthes rosea	amaryllidaceae
44	plumeria	plumeria pudica	apocynaceae
45	mediterranean cypress	cupressus sempervirens	cupressaceae
46	Canna	canna indicia	cannaceae
47	peacock flower	caesalpinia pulcherrima	Fabaceae
48	Garden croton	codiaeum variegatum	Euphorblaceae
49	Jacob's coat	Acalypha wilkesiana	Euphorbiaceae
50	Fox tail asparagus	Asparagus densiflorus	Asparagaceae
51	Buddha belly	Jatropha Podagrica	Euphorbiaceae
52	Gazania	Gazania rigens	Asteraceae
53	Juhu/amburu	Jasmine auriculatum	Oleaceae
54	Mexican oleander	Casabelathevetia	Apocynaceae
55	morpankhi	platycladusorientalis	cupressaceae
56	weeping bottle brush	callistemon viminalis	myrtaceae
57	crape	tabernaemontanadivaricata	apocynaceae
58	Arabian jasmine	Jasminum sambac	Oleacee
59	cape honeysuckle	Tacoma capenis	Bignoniaceae
60	Ponytail palm	Beaucarnearecurvata	Bignoniaceae
61	China rose	Hibiscus rosa-sinensis	Malvaceae
62	climbing fig	ficus pumila	Moraceae
63	spider plant	chlophytumcomosum	asparagacelae
64	Bougainvillea	Bougainvillea spectabilis	Nyctaginaceae
65	Croton	Codiaeum variegatum	Euphorbiaceae

66	Persian lilac	Melia azedarach	Meliacea
67	Champa	Magnolia champaca	Magnoliaceae
68	Pride of India	Lagerstroemia speiosa	lythraceae
69	Cycas	Cycas Revoluta	cycadaceae
70	octopus tree	schefflera actinophyll	araliaceae
71	weeping fig	ficusbenjamina	moraceae
72	white frangipani	plumeria obtusa	apocynaceae
73	triangle palm	dypsisdecaryi	arecaceae
74	pygmy date palm	phoenix roebelenii	arecaceae
75	bird of paradise	strelitzia reginae	strelitziaceae
76	agave	agave americana	asparagaceae
77	firebush	hamelia patens	rubiaceae
78	glory bower	volamariainermis	lamiaceae
79	Bengal Clockvine	Thunbergia grandiflora	Acanthaceae
80	Bower vine	Pandora jasminoides	Bignoniaceae
81	ashoka	polyalthia longifolia	annonaceae
82	African tulip tree	Spathodeacampanulata	Bignoniaceae
83	Indian cork tree	Millingtonia	Bignoniaceae
84	Neem	Azadirachta indica	Meliaceae
85	Pongam tree	Pongamia pinnata	favaceae
86	Jamun tree	Syzygiumcumini	myrtaceae
87	Amla	Phyllanthus embnica	Phyllanthaceae
88	Pithraj tree	Aphanamixispolystachya	Meliaceae
89	sapota	Achras sapota	Sapotaceae
90	Tamarind	Tamarindus indica	Fabaceae
91	Lime	Citrus x aurantiifolia	Rutaceae
92	Banana	Musa x paradisiaca	Musaceae
93	Rose Apple	syzygiumjambos	Myrtaceae
94	Creeping foxglove	Asystasiagangetica	Acanthacea
95	Crown of throns	Euphorbia milii	Euphoriaceae
96	Aloe vera	Aloe vera	xanthorrhoeaceae
97	Betel vine	Piper betle	Piperaceae
98	Black pepper	Piper nigrum	piperaceae
99	Sacred basil	Ocimumtenuiflorum	Lamiaceae
100	Paper mulberry	Broussonetia papyrifera	Moraceae

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