7.1.6 The institution regularly undertakes quality audits on environment and energy

The Institute is conscious of environmental issues. Green and energy audits are conducted regularly. The year-wise description of the ***Energy Audit, Green Audit and Environmental Audit from 2016-17 to 2020-21*** are as given below.

Sr. No.	**Description**	**Dates**	**Page Nos.**
1.	Energy Audit	2020-21	1-15
2.	Green Audit	2020-21	16-18
3.	Environmental Audit	2020-21	34-53
4.	Energy Audit	2019-20	54-68
5	Green Audit	2019-20	69-85
6	Environmental Audit	2019-20	86-100
7	Energy Audit	2018-19	101-115
8	Green Audit	2018-19	116-131
9.	Energy Audit	2017-18	132-146
10	Green Audit	2017-18	147-162
11.	Energy Audit	2016-17	163-177
12.	Green Audit	2016-17	178-193

ENERGY AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2020-21

Prepared by:

Enrich Consultants

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

MAHARASHTRA ENERGY DEVELOPMENT AGENCY
An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

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: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2021-22/CR-14/1577 — 22nd April, 2021

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 Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

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

Registration Number : *MEDA/ECN/2021-22/Class A/EA-03*

- 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 canceling the registration, if the information is found incorrect.
- This empanelment is valid till **21st April, 2023** 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)

ENRICH CONSULTANTS * Pune *

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/20-21/01 Date: 25/8/2021

CERTIFICATE

This is to certify that we have conducted Energy Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2020-21.

.The College has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting
- Installation of 25000 LPD Solar Water Heating System at Hostel block.

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Energy Audit of their Campus for the Academic Year: 20-21.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	163019	146.72
2	Maximum	16842	15.16
3	Minimum	10857	9.77
4	Average	13526	12.17

3. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System.

4. Usage of Alternate Energy:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Energy purchased from MSEDCL is **163019 kWh.**
- Equivalent Energy Saved Solar Thermal Plant is **41096 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **20.13 %.**

5. Usage of LED Lighting:

- The Total Annual Lighting Demand of the College is **34752 kWh.**
- The Total Annual LED Lighting Demand is **192 kWh.**
- The percentage of Annual LED Lighting to Annual Lighting Demand is **0.55 %.**

6. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.
3. Daily working hours-**4 Nos** (For Lighting Calculations)
4. Annual working Days-**120 Nos** (For Lighting Calculations)
5. Annual Hostel Operation Days in 20-21: **40 Nos**

7. References:

- For CO_2 Emissions: www.tatapower.com
- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

STES	:	Sinhgad Technical Education Society
LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study Connected Load
2. To study present Energy Consumption
3. To compute Carbon Foot Print
4. To study usage of Alternate Energy
5. To study usage of LED Lighting

Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

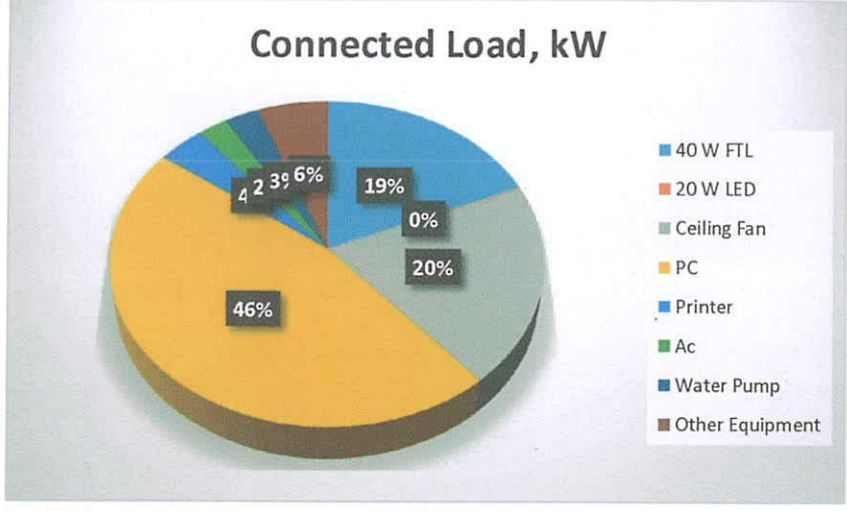
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	1800	40	72
2	20 W LED	20	20	0.4
3	Ceiling Fan	1200	65	78
4	PC	1200	150	180
5	Printer	100	150	15
6	Ac	5	1875	9.375
7	Water Pump	5	2238	11.19
8	Other Equipment	150	150	22.5
9	**Total**			**388**

Chart No 1: Study of Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 3: Electrical Bill Analysis- 2020-21:

No	Month	Energy Purchased, kWh
1	Jul-20	14228
2	Aug-20	13708
3	Sep-20	15309
4	Oct-20	13800
5	Nov-20	11036
6	Dec-20	12618
7	Jan-21	15184
8	Feb-21	14826
9	Mar-21	16842
10	Apr-21	12630
11	May-21	10857
12	Jun-21	11983
13	Total	163019
14	Maximum	16842
15	Minimum	10857
16	Average	13526

Chart No 2: Variation in Monthly Energy Consumption:

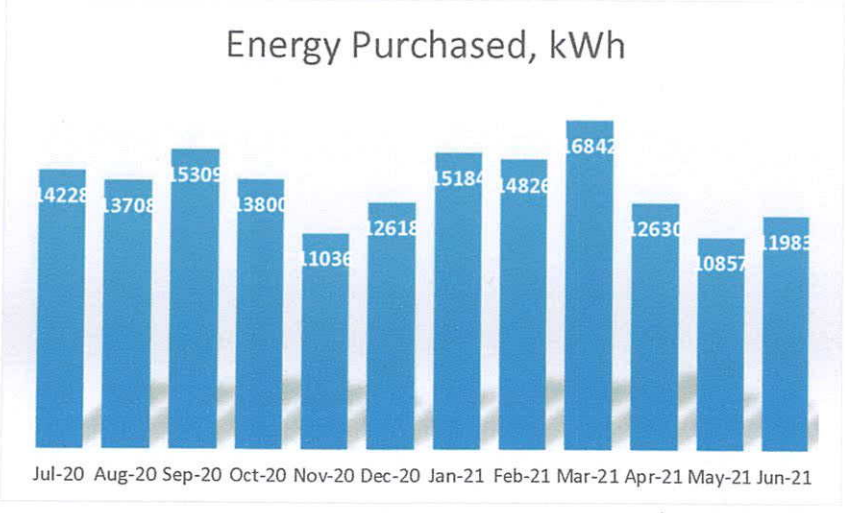


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Table No 4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	163019
2	Maximum	16842
3	Minimum	10857
4	Average	13526

CHAPTER-IV
COMPUTATION OF CARBON FOOTPRINT

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 taking into account the usage of the Electrical Energy.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.9 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 5: Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jul-20	14228	12.81
2	Aug-20	13708	12.34
3	Sep-20	15309	13.78
4	Oct-20	13800	12.42
5	Nov-20	11036	9.93
6	Dec-20	12618	11.36
7	Jan-21	15184	13.67
8	Feb-21	14826	13.34
9	Mar-21	16842	15.16
10	Apr-21	12630	11.37
11	May-21	10857	9.77
12	Jun-21	11983	10.78
13	Total	163019	146.72
14	Maximum	16842	15.16
15	Minimum	10857	9.77
16	Average	13526	12.17

Chart No 3: Month wise CO_2 Emissions:

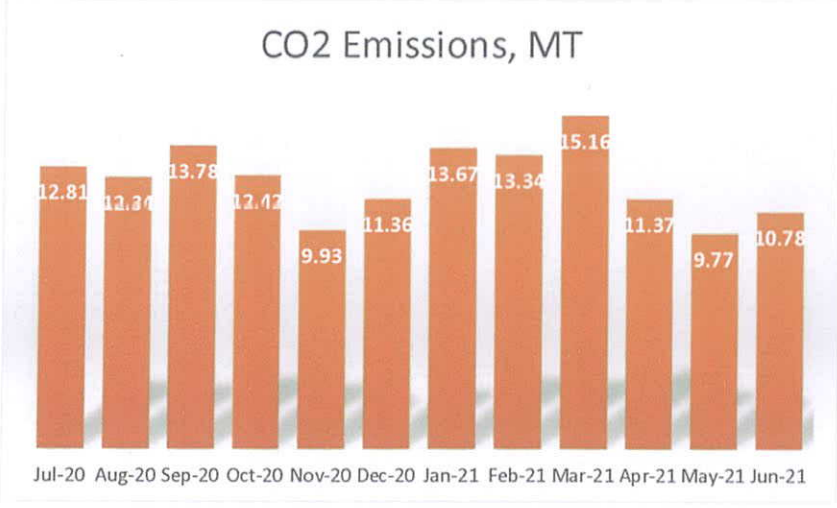


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	163019	146.72
2	Maximum	16842	15.16
3	Minimum	10857	9.77
4	Average	13526	12.17

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

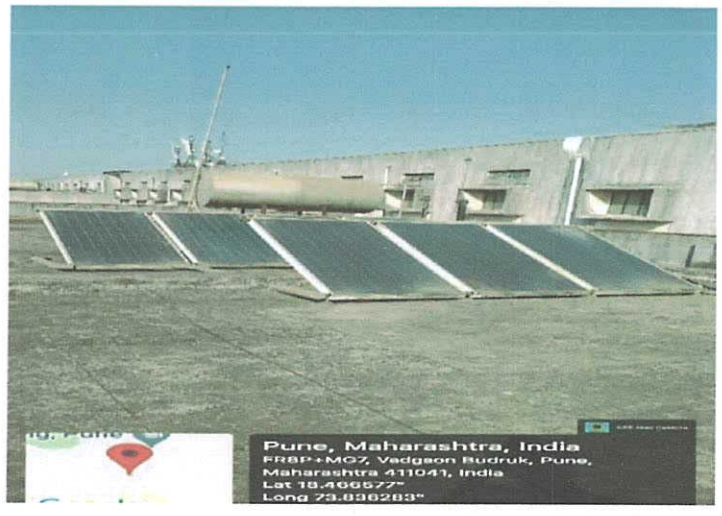
The College has installed Roof Top Solar PV Plant of Capacity **25000 LPD.**

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy

No	Particulars	Value	Unit
1	Energy Purchased from MSEDCL	**163019**	**kWh**
2	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
3	100 LPD Solar Water Heating System saves	1500	kWh/Annum
4	Energy Saved by 25000 LPD System =(25000) * (1500) / (100)	375000	kWh
5	Usage Period in 2020-21	40	Nos
6	Energy Saved for 40 days of System operation in 20-21 =(4)*(5)/365	**41096**	**kWh**
7	Total Energy Demand of College = **(1) + (6)**	**204115**	**kWh**
9	% of Usage of Alternate Energy to Total Annual Energy Demand= **(6)*100/ (7)**	**20.13**	%

Photograph of Solar Thermal Water Heating Plant



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CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In this chapter, we compute the percentage of usage of LED Lighting to Annual Lighting power requirement.

Table No 8: Percentage of Usage of LED Lighting to Annual Lighting Load

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings	1800	Nos
2	Demand of 40 W FTL Fitting	40	W/Unit
3	Total Electrical Load of 40 W FTL Fittings	**72**	kW
4	No of 20 W LED Tube Lights	20	Nos
5	Demand of 20 W LED Tube Light	20	W/Unit
6	Total Electrical Load of 20 W LED Fittings	**0.4**	kW
7	Total Lighting Load=3+6	**72.4**	kW
8	Total LED Lighting Load= 6	**0.4**	kW
9	Average Daily Usage Period	4	Hours
10	Annual Working Days	120	Nos
11	Annual Total Lighting Load = 7*9*10	**34752**	kWh
12	Annual LED Lighting Load = 8*9*10	**192**	kWh
13	**Annual Lighting Requirement met by LED= 12*100/11**	**0.55**	%

GREEN AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2020-21

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS * Pune *

MAHARASHTRA ENERGY DEVELOPMENT AGENCY
An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

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: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2021-22/CR-14/1577 — 22nd April, 2021

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 Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

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

Registration Number : *MEDA/ECN/2021-22/Class A/EA-03*

- 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.
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- This empanelment is valid till **21st April, 2023** 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)

ENRICH CONSULTANTS * Pune *

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/20-21/02 Date: 25/8/2021

CERTIFICATE

This is to certify that we have conducted Green Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2020-21.

The College has adopted following Green Initiatives:

- Usage of Energy Efficient LED Light Fitting
- Maximum Usage of Day Lighting
- Installation of Solar Thermal Water Heating System of Capacity 25000 LPD.
- Provision of Separate bins for Dry & Wet Waste
- Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.
- Installation of Sewage Treatment Plant of Capacity 275 m^3/Day
- Maintenance of good Internal Road
- Tree Plantation in the campus
- Provision of Ramp for Divyangajan
- Creation of awareness by Display of Posters on Resource Conservation

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

ENRICH CONSULTANTS * Pune *

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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Green Audit of their Campus for the Academic Year: 20-21.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	163019	146.72
2	Maximum	16842	15.16
3	Minimum	10857	9.77
4	Average	13526	12.17

3. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Equivalent Energy Saved by Solar Water Heating System is **41096 kWh.**
- Reduction in CO_2 Emissions in 2020-21 works out to be **37 MT.**

5. Waste Management:

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

5.2 Organic Waste Management:

Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.

5.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m^3/Day.** The treated Water is used for gardening purpose.

5.4 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

6. Green & Sustainable Initiatives

- Maintenance of good Internal Road
- Maintenance of Internal Garden
- Provision of Ramp for Divyangajan
- Creation of Awareness by Display of Posters on Resource Conservation

7. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg** of **CO_2** into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.

8. References:

- For CO_2 Emissions: www.tatapower.com
- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
STES	Sinhgad Technical Education Society
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 Objectives:

1. To study present Energy Consumption
2. To compute Carbon Foot Print
3. To study usage of Renewable Energy
4. Study of Waste Management
5. Study of Rain Water Harvesting
6. Study of Green & Sustainable Practices

Table No 1: General Details of College

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

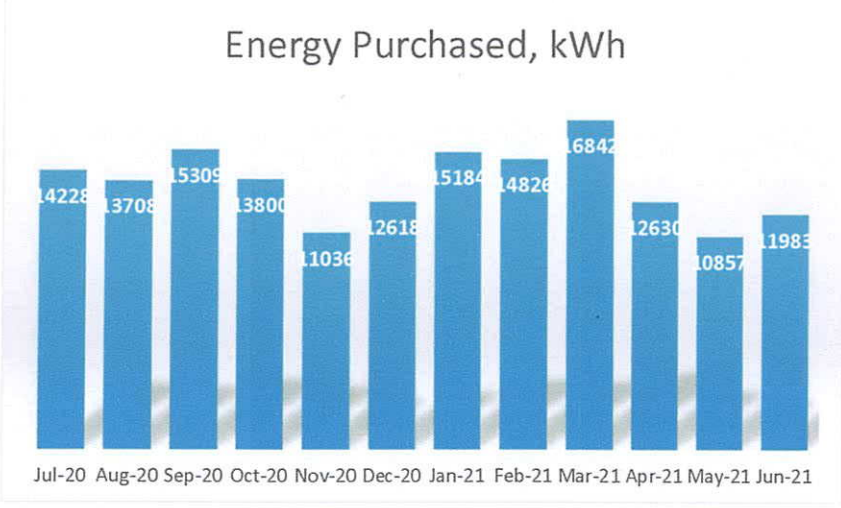
CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills

Table No 2: Electrical Bill Analysis- 2020-21:

No	Month	Energy Purchased, kWh
1	Jul-20	14228
2	Aug-20	13708
3	Sep-20	15309
4	Oct-20	13800
5	Nov-20	11036
6	Dec-20	12618
7	Jan-21	15184
8	Feb-21	14826
9	Mar-21	16842
10	Apr-21	12630
11	May-21	10857
12	Jun-21	11983
13	Total	163019
14	Maximum	16842
15	Minimum	10857
16	Average	13526

Chart No 1: Variation in Monthly Energy Consumption:



ENRICH CONSULTANTS Pune

Table No 3: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	163019
2	Maximum	16842
3	Minimum	10857
4	Average	13526

CHAPTER III
COMPUTATION OF CARBON FOOT PRINT

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.

Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions is as under.

- **1 kWh** of Electrical Energy releases **0.9 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 4: Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jul-20	14228	12.81
2	Aug-20	13708	12.34
3	Sep-20	15309	13.78
4	Oct-20	13800	12.42
5	Nov-20	11036	9.93
6	Dec-20	12618	11.36
7	Jan-21	15184	13.67
8	Feb-21	14826	13.34
9	Mar-21	16842	15.16
10	Apr-21	12630	11.37
11	May-21	10857	9.77
12	Jun-21	11983	10.78
13	Total	163019	146.72
14	Maximum	16842	15.16
15	Minimum	10857	9.77
16	Average	13526	12.17

Chart No 2: Month wise CO_2 Emissions:

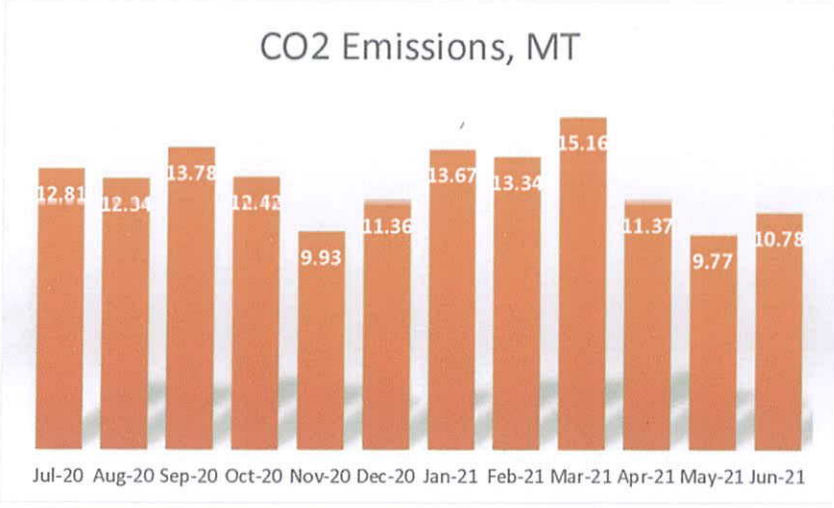


Table No 5: Variation in Important Parameters:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	163019	146.72
2	Maximum	16842	15.16
3	Minimum	10857	9.77
4	Average	13526	12.17

CHAPTER IV
STUDY OF USAGE OF RENEWABLE ENERGY

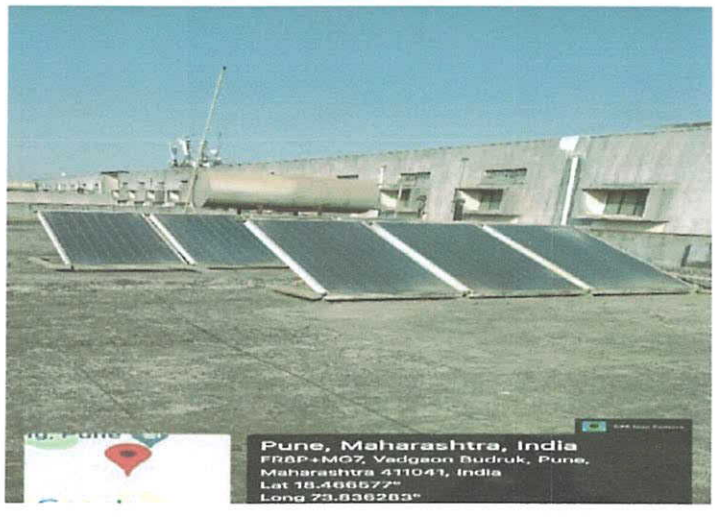
The College has installed Solar Water Heating System of Capacity **25000 LPD**.

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Solar Water Heating System.

Table No 6: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
2	100 LPD Solar Water Heating System saves	1500	kWh/Annum
3	Energy Saved by 25000 LPD System =(25000) * (1500) / (100)	375000	kWh
4	Usage Period in 2020-21	40	Days
5	Energy Saved for 40 days of System operation in 20-21=(4)*(5)/365	**41096**	**kWh**
6	1 kWh of Electrical Energy is equivalent to	**0.9**	**Kg of CO_2**
7	Annual Reduction in CO_2 Emission = (5) * (6) /1000	**37**	**MT**

Photograph of Solar Thermal Water Heating System:

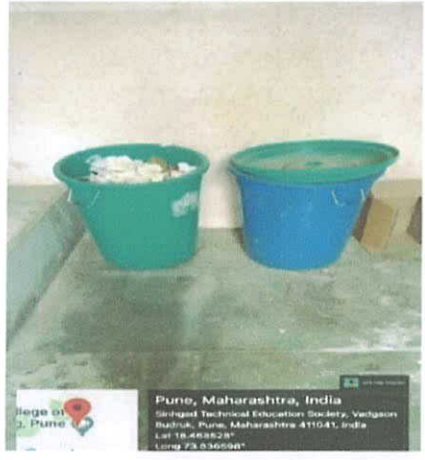


CHAPTER V
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

Photograph of Waste Collection Bins:



5.2 Organic Waste Management:

Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.

5.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m3/Day**. The treated Water is used for gardening purpose.

Photograph of Sewage Treatment Plant:

5.4 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

CHAPTER-VI
STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 Pedestrian Friendly Roads:

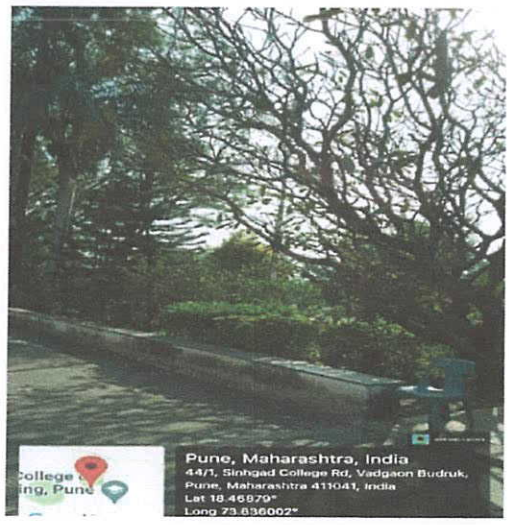
The College has well maintained internal road to facilitate the easy movement of the students within the campus.

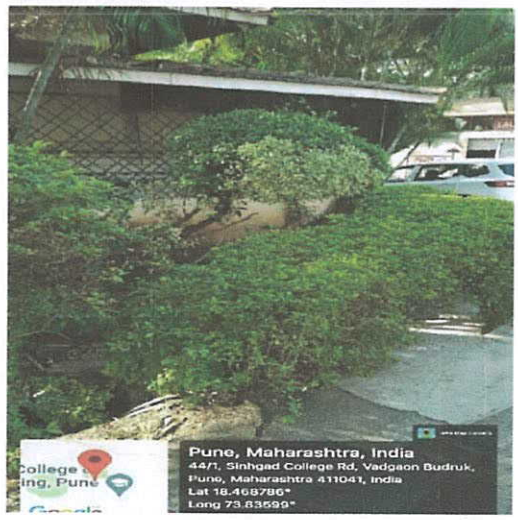
Photograph of Internal Road:

6.2 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:

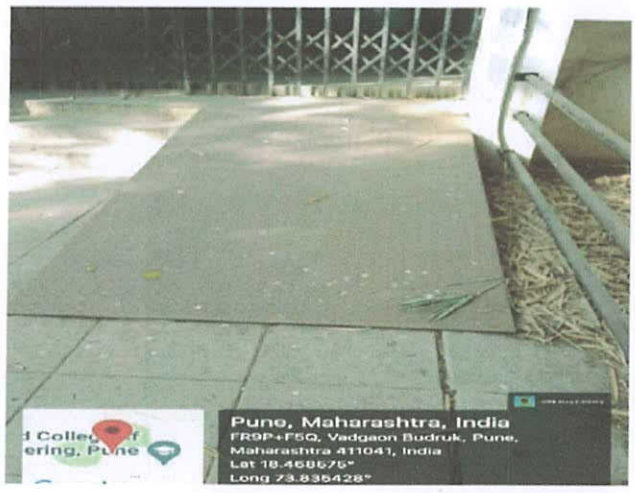




6.3 Provision of Ramp:

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

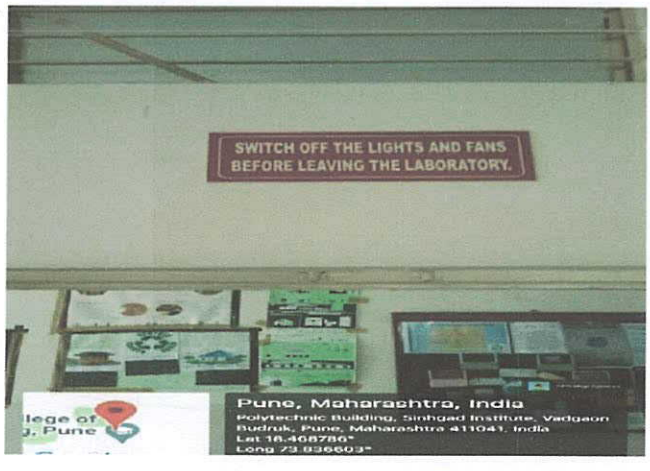
Photograph of Ramp:



6.4 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation.

Photograph of Poster on Energy Conservation:



ANNEXURE-1:
DETAILS OF TREES & PLANTS:

No	Name Of Tree	Qty
1	Palm	250
2	Vad	1
3	Shevari	5
4	Kadunim	10
5	Phycus	59
6	Chrismas	5
7	Ashoka	5
8	Champa	5
9	Kanchan	25
10	Audumbar	1
11	Saptaparni	2
12	Ticoma	7
13	Bouganvelia	4
14	**Total**	**379**

Ornamental Plants:

No	Name of Plant
1	Hibiscus
2	Duranto
3	Dreccina

ENVIRONMENTAL AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2020-21

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS * Pune *

MAHARASHTRA ENERGY DEVELOPMENT AGENCY
An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

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: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2021-22/CR-14/1577 — 22nd April, 2021

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 Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

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

Registration Number : ***MEDA/ECN/2021-22/Class A/EA-03***

- 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 canceling the registration, if the information is found incorrect.
- This empanelment is valid till **21st April, 2023** 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)

ENRICH CONSULTANTS * PUNE *

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/20-21/03 Date: 25/8/2021

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2020-21.

The College has adopted following Environment Friendly Practices:

- Usage of Energy Efficient LED Light Fitting
- Maximum Usage of Day Lighting
- Installation of Solar Thermal Water Heating Plant of Capacity 25000 LPD.
- Provision of Separate bins for Dry & Wet Waste
- Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.
- Installation of Sewage Treatment Plant of Capacity 275 m^3/Day
- Tree Plantation in the campus
- Creation of awareness by Display of Posters on Resource Conservation

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

ENRICH CONSULTANTS * Pune *

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Environmental Audit of their Campus for the Academic Year: 20-21.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Various Pollution due to College Activities:

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

3. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	163019	146.72
2	Maximum	16842	15.16
3	Minimum	10857	9.77
4	Average	13526	12.17

4. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System

5. Usage of Renewable Energy & Reduction in CO_2 Emission:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Equivalent Energy Saved by the Solar Thermal System is **41096 kWh.**
- Reduction in CO_2 Emissions in 2020-21 works out to be **37 MT.**

6. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	95	56	78
2	Minimum	81	48	62

7. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	29.2	41	245	64
2	Minimum	28.9	40	136	41

ENRICH CONSULTANTS Pune

8. Waste Management:

8.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

8.2 Organic Waste Management:

Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.

8.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m3/Day.** The treated Water is used for gardening purpose.

8.4 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

9 Environment Friendly Initiatives:

- Tree Plantation in the campus.
- Display of Posters on Resource Conservation

10. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg** of **CO_2** into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.

11. References:

- For CO_2 Emissions: www.tatapower.com
- For Energy Saved by Solar Thermal Water Heating System: www.mahaurja.com
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI & Water Quality Standards: www.cpcb.com

ABBREVIATIONS

Kg	:	Kilo Gram
STES	:	Sinhgad Technical Education Society
MSEDCL	:	Maharashtra State Distribution Company Limited
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

1.1 Important Definitions:

1.1.1 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

1.1.2. 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

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

1.1.4. Table No-1: Relevant Environmental Laws in India:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
1980	The Forest (Conservation) Act
1981	The Air (Prevention and Control of Pollution) Act
1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Table No-2: Some Important Environmental Rules in India:

1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules
2011	E-waste (Management and Handling) Rules

2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules

1.1.6 Table No-3: National Environmental Plans & Policy Documents:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency
10	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives:

1. Study Resource Consumption & CO_2 Emissions
2. Study of CO_2 Emission Reduction
3. Study of Indoor Air Quality Parameters
4. Study of Indoor Comfort Condition Parameters
5. Study of Waste Management
6. Study of Rain Water Harvesting
7. Study of Environment Friendly Initiatives

1.3 General Details of College: Table No 4:

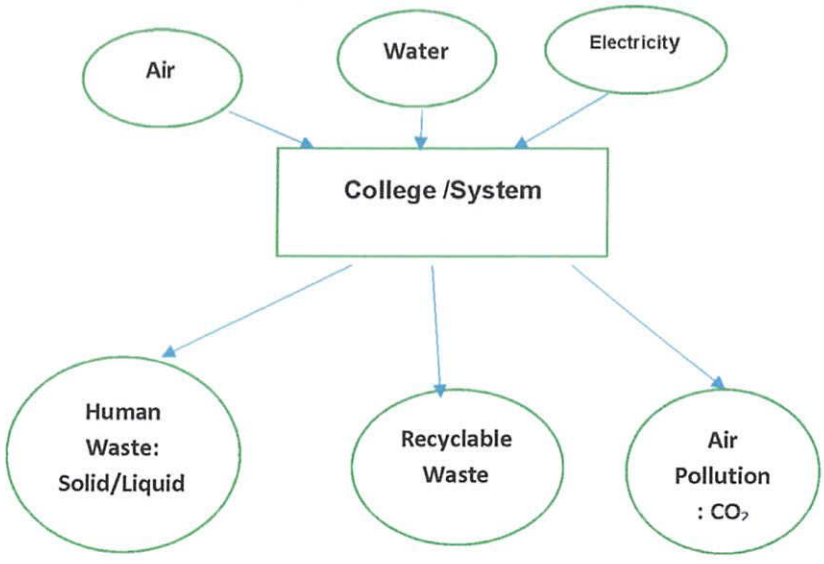
No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

CHAPTER-II
STUDY OF CONSUMPTION OF RECOURCES & CO_2 EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

We try to draw a schematic diagram for the College System & Environment as under.
Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO2 on account of consumption of Electrical Energy.

The basis of Calculation for CO_2 emissions due to usage of Electrical Energy are as under

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

Table No 5: Study of Consumption of Electrical Energy & CO_2 Emissions: 2020-21:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jul-20	14228	12.81
2	Aug-20	13708	12.34
3	Sep-20	15309	13.78
4	Oct-20	13800	12.42
5	Nov-20	11036	9.93

6	Dec-20	12618	11.36
7	Jan-21	15184	13.67
8	Feb-21	14826	13.34
9	Mar-21	16842	15.16
10	Apr-21	12630	11.37
11	May-21	10857	9.77
12	Jun-21	11983	10.78
13	Total	163019	146.72
14	Maximum	16842	15.16
15	Minimum	10857	9.77
16	Average	13526	12.17

Chart No 2: Month wise CO_2 Emissions:

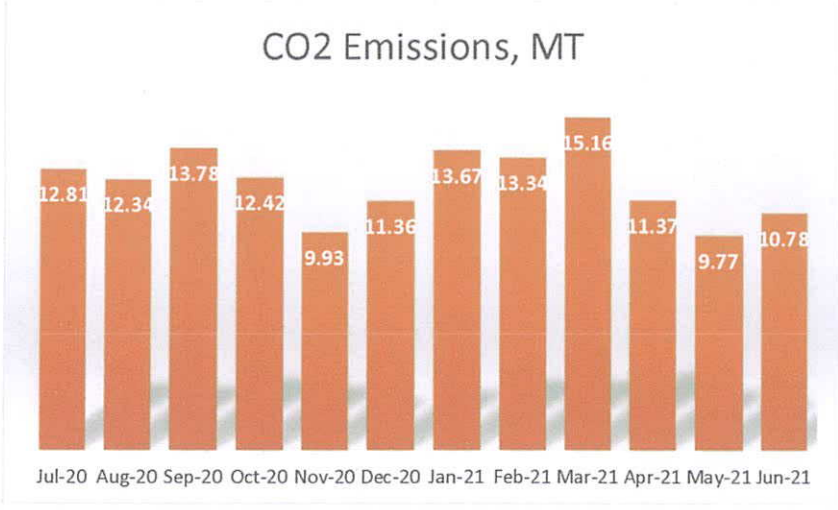


Table No 6: Important Parameters:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	163019	146.72
2	Maximum	16842	15.16
3	Minimum	10857	9.77
4	Average	13526	12.17

CHAPTER III
STUDY OF CO_2 EMISSION REDUCTION

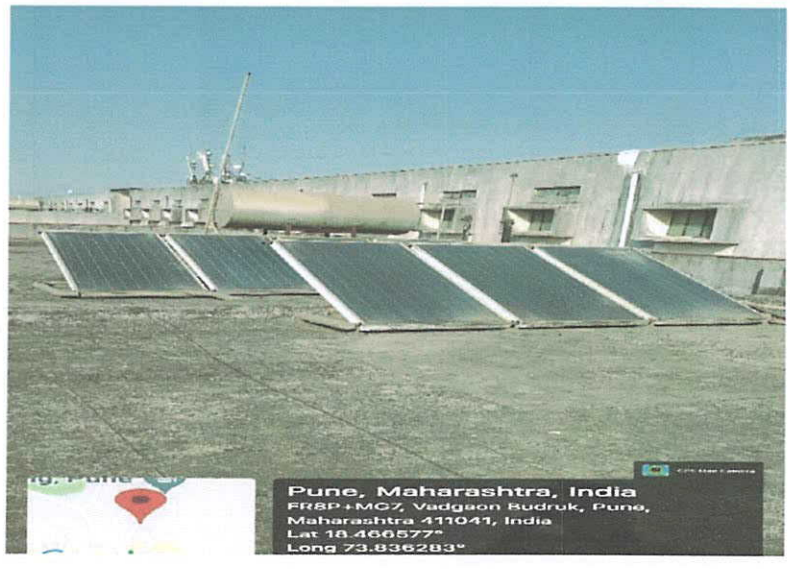
The College has installed Solar Water Heating Plant of Capacity **25000 LPD**.

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Solar Water Heating System.

Table No 7: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
2	100 LPD Solar Water Heating System saves	1500	kWh/Annum
3	Energy Saved by 25000 LPD System =(25000) * (1500) / (100)	375000	kWh
4	Usage Period in 2020-21	40	Nos
5	Energy Saved for 40 days of System operation in 20-21=(4)*(5)/365	**41096**	**kWh**
6	1 kWh of Electrical Energy is equivalent to	**0.9**	**Kg of CO_2**
7	Annual Reduction in CO_2 Emission = (5) * (6) /1000	**37**	**MT**

Photograph of Solar Thermal Water Heating 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.'**

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. As the AQI increases, it means that a large percentage of the population will experience severe adverse health effects. The measurement of the **AQI** requires an **air monitor** and an **air pollutant** concentration over a specified **averaging period**.

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 8: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
	C 1 Building			
1	Ground Floor	90	54	74
2	First Floor	86	52	69
3	Second Floor	83	49	62
	C 2 Building			
1	Ground Floor	83	49	62
2	First Floor	85	51	69

3	Second Floor	83	50	67
	C 3 Building			
1	Ground Floor	93	52	66
2	First Floor	95	56	78
3	Second Floor	85	51	69
4	Third Floor	87	51	68
	D 1 Building			
1	Ground Floor	86	52	69
2	First Floor	93	52	66
3	Second Floor	81	51	70
4	Third Floor	90	54	69
	D 2 Building			
1	Ground Floor	93	55	73
2	First Floor	86	51	63
3	Second Floor	83	51	62
4	Third Floor	85	51	74
	Management Building			
1	Ground Floor	83	52	69
2	First Floor	81	48	66
3	Second Floor	85	52	73
	Maximum	95	56	78
	Minimum	81	48	62

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 9: Study of Indoor Comfort Condition Parameters:

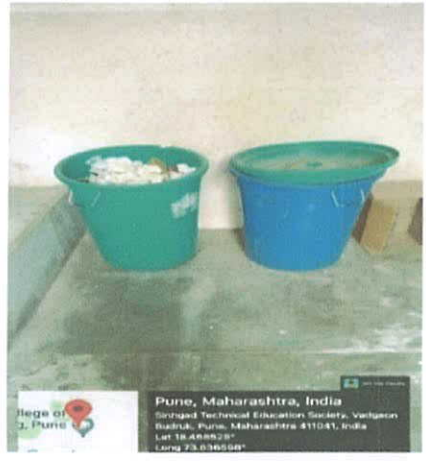
No	Location	Temperature, ^{0}C	Humidity, %	Lux Level	Noise Level, dB
	C 1 Building				
1	Ground Floor	28.9	41	156	45
2	First Floor	28.9	40	149	46
3	Second Floor	28.9	40	203	47
	C 2 Building				
1	Ground Floor	29	41	245	51
2	First Floor	29	41	169	56
3	Second Floor	29.1	40	136	52
	C 3 Building				
1	Ground Floor	29.1	40	148	63
2	First Floor	29.1	40	142	45
3	Second Floor	29	41	136	41
4	Third Floor	28.9	41	142	49
	D 1 Building				
1	Ground Floor	28.9	41	203	59
2	First Floor	29	41	213	58
3	Second Floor	29	40	230	64
4	Third Floor	29.1	40	206	49.3
	D 2 Building				
1	Ground Floor	29.2	40	210	46.9
2	First Floor	29.2	40	236	54.3
3	Second Floor	29	41	159	58
4	Third Floor	29	41	145	63.1
	Management Building				
1	Ground Floor	29	41	201	54.1
2	First Floor	29.1	41	196	59
3	Second Floor	29.1	41	189	61.3
	Maximum	29.2	41	245	64
	Minimum	28.9	40	136	41

CHAPTER VI
STUDY OF WASTE MANAGEMENT

6.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

Photograph of Waste Collection Bins:



6.2 Organic Waste Management:

Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.

6.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity 500 m3/Day. The treated Water is used for gardening purpose.

Photograph of Sewage Treatment Plant:

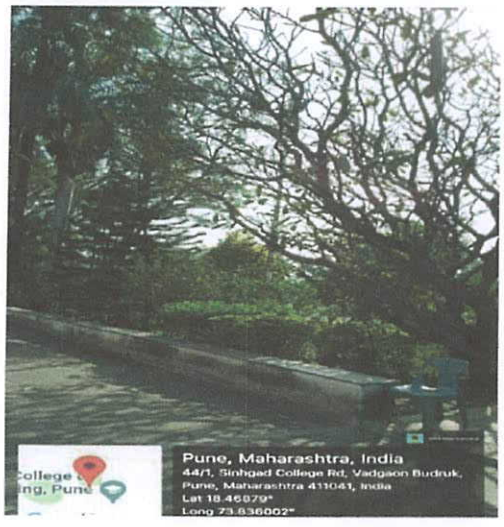
6.4 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

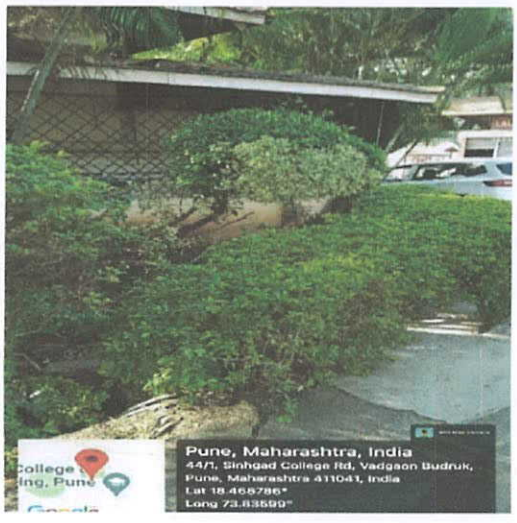
CHAPTER-VII
STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

7.1 Internal Tree Plantation:

The College has well maintained Tree Plantation in the campus.

Photograph of Tree plantation:

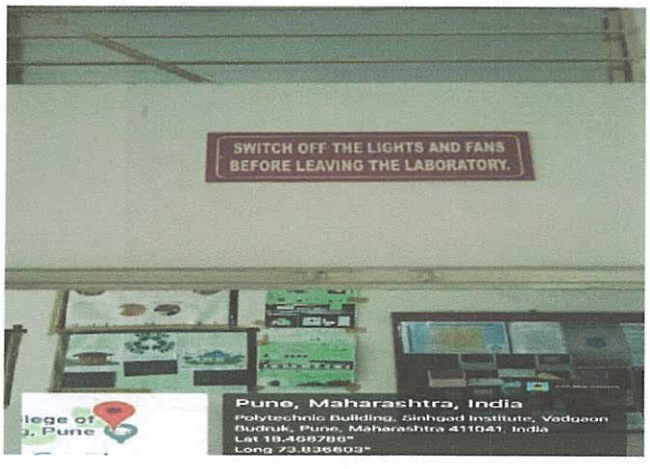




7.2 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation.

Photograph of Poster on Energy Conservation:



ANNEXURE-I:
VARIOUS AIR QUALITY, WATER 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 Water Quality Standards:

No	Designated Best Use	Criteria
1	Drinking Water Source without conventional Treatment but after disinfection	pH between **6.5 to 8.5** Dissolved Oxygen **6 mg/l or more**
2	Drinking water source after conventional treatment and disinfection	pH between **6 to 9** Dissolved Oxygen **4 mg/l or more**
3	Outdoor Bathing (Organized)	pH between **6.5 to 8.5** Dissolved Oxygen **5 mg/l or more**
4	Controlled Waste Disposal	pH between **6 to 8.5**

3. 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

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

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

ENERGY AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2019-20

Prepared by:

Enrich Consultants

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ENRICH CONSULTANTS Pune

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,
Ph No: 020-26614393/266144403
Email: ece@mahaurja.com, Web: www.mahaurja.com

ECN/2018-19/CR-05/4174 19th September , 2018

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	:	**Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Energy Conservation Programme*
Registration Number	:	***MEDA/ECN/CR-05/2018-19/EA-03***

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- This empanelment is valid till **31st March 2021** 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.

19/9/18

(Smita Kudarikar)
General Manager (EC)

ENRICH CONSULTANTS Pune

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/19-20/01 Date: 5/8/2020

CERTIFICATE

This is to certify that we have conducted Energy Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2019-20.

.The College has adopted following Energy Efficient practices:

- Maximum usage of Day Lighting
- Installation of 25000 LPD Solar Water Heating System at Hostel block.

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Energy Audit of their Campus for the Academic Year: 2019-20.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	261765	209.41
2	Maximum	27924	22.34
3	Minimum	10757.6	8.61
4	Average	23796.8	19.04

3. Energy Conservation projects already installed:

- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System.

4. Usage of Alternate Energy:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Energy purchased from MSEDCL is **261765 kWh.**
- Equivalent Energy Saved Solar Thermal Plant is **205479 kWh.**
- Total Annual Energy Demand: **467245 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **44 %.**

5. Usage of LED Lighting:

- The Total Annual Lighting Demand of the College is **144800 kWh.**
- The Total Annual LED Lighting Demand is **800 kWh.**
- The percentage of Annual LED Lighting to Annual Lighting Demand is **0.55 %.**

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.
3. Daily working hours-**8 Nos** (For Annual Lighting Load Calculations)
4. Annual working Days-**200 Nos** (For Annual Lighting Load Calculations)
5. Annual Hostel Operation Days in 19-20: **200 Nos**

7. Reference:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

STES	:	Sinhgad Technical Education Society
LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO_2 emissions
3. To study usage of Alternate Energy
4. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

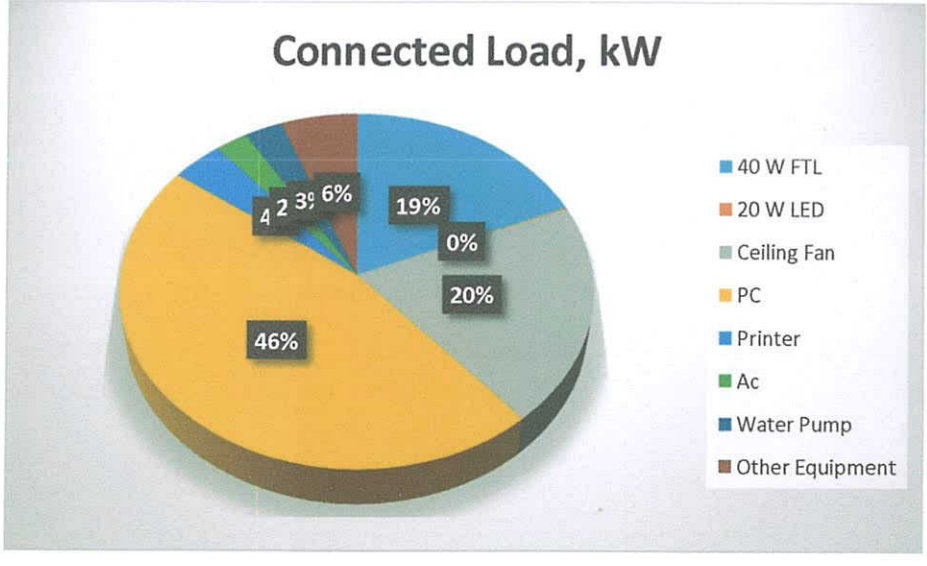
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	1800	40	72
2	20 W LED	20	20	0.4
3	Ceiling Fan	1200	65	78
4	PC	1200	150	180
5	Printer	100	150	15
6	Ac	5	1875	9.375
7	Water Pump	5	2238	11.19
8	Other Equipment	150	150	22.5
9	**Total**			**388**

Chart No 1: Study of Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 3: Electrical Bill Analysis- 2019-20:

No	Month	Energy Purchased, kWh
1	Jul-19	27924
2	Aug-19	26640
3	Sep-19	27120
4	Oct-19	26583.5
5	Nov-19	25672.3
6	Dec-19	24980
7	Jan-20	26336.4
8	Feb-20	25420.1
9	Mar-20	25384.1
10	Apr-20	10757.6
11	May-20	14947.2
12	Jun-20	11855.5
13	Total	261765
14	Maximum	27924
15	Minimum	10757.6
16	Average	23796.8

Chart No 2: Variation in Monthly Energy Consumption:

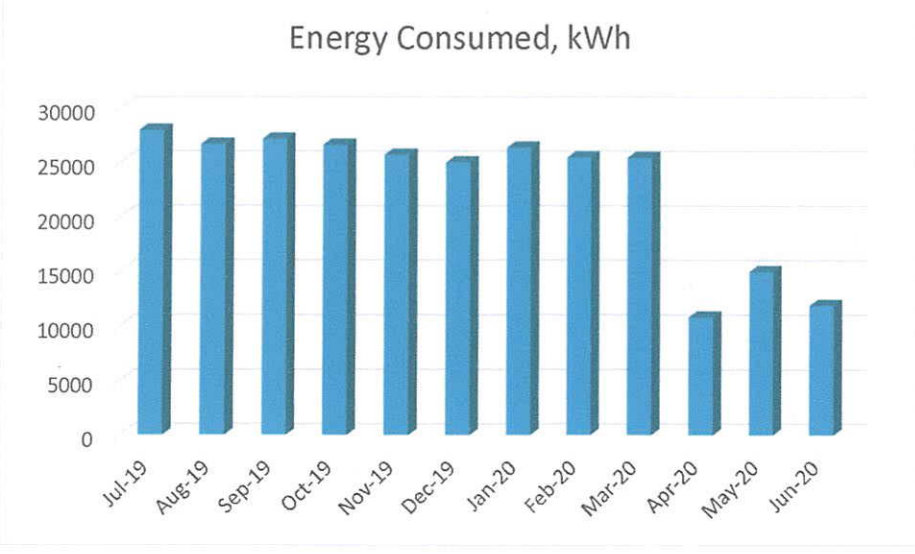


Table No 4: Various Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	261765
2	Maximum	27924
3	Minimum	10757.6
4	Average	23796.8

CHAPTER-IV
COMPUTATION OF CARBON FOOTPRINT

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 taking into account the usage of the Electrical Energy.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.8 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 5: Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jul-19	27924	22.34
2	Aug-19	26640	21.31
3	Sep-19	27120	21.70
4	Oct-19	26583.5	21.27
5	Nov-19	25672.3	20.54
6	Dec-19	24980	19.98
7	Jan-20	26336.4	21.07
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9	Mar-20	25384.1	20.31
10	Apr-20	10757.6	8.61
11	May-20	14947.2	11.96
12	Jun-20	11855.5	9.48
13	Total	261765	209.41
14	Maximum	27924	22.34
15	Minimum	10757.6	8.61
16	Average	23796.8	19.04

Chart No 3: Month wise CO_2 Emissions:

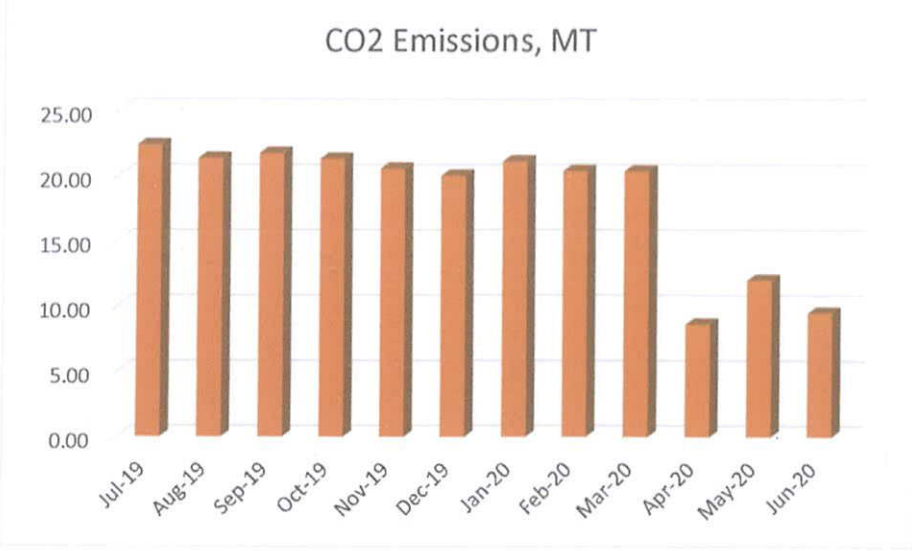


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	261765	209.41
2	Maximum	27924	22.34
3	Minimum	10757.6	8.61
4	Average	23796.8	19.04

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

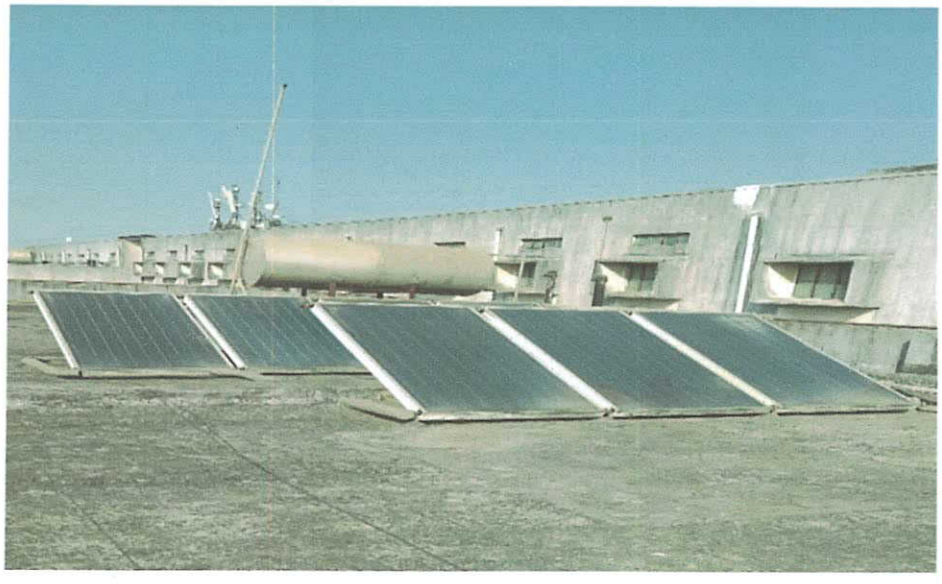
The College has installed Roof Top Solar PV Plant of Capacity **25000 LPD.**

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Energy Purchased from MSEDCL	**261765**	**kWh**
2	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
3	100 LPD Solar Water Heating System saves	1500	kWh/Annum
4	Energy Saved by 25000 LPD System =(25000) * (1500) / (100)	375000	kWh
5	Usage Period in the Year: 19-20	200	Nos
6	Equivalent Electrical Energy Saved in 200 days in the Year 19-20	**205479**	**kWh**
7	Total Energy Demand of College = **(1) + (6)**	**467245**	**kWh**
9	% of Usage of Alternate Energy to Total Annual Energy Demand= **(6)*100/ (7)**	**44.0**	%

Photograph of Solar Thermal Water Heating Plant:



CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In this chapter, we compute the percentage of usage of LED Lighting to Annual Lighting power requirement.

Table No 8: Percentage of Usage of LED Lighting to Annual Lighting Load:

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings	1800	Nos
2	Demand of 40 W FTL Fitting	40	W/Unit
3	Total Electrical Load of 40 W FTL Fittings	**72**	kW
4	No of 20 W LED Tube Lights	20	Nos
5	Demand of 20 W LED Tube Light	20	W/Unit
6	Total Electrical Load of 20 W LED Fittings	**0.4**	kW
7	Total Lighting Load=3+6	**72.4**	kW
8	Total LED Lighting Load= 6	**0.4**	kW
9	Average Daily Usage Period	10	Hours
10	Annual Working Days	200	Nos
11	Annual Total Lighting Load = 7*9*10	**144800**	kWh
12	Annual LED Lighting Load = 8*9*10	**800**	kWh
13	**Annual Lighting Requirement met by LED= 12*100/11**	**0.55**	%

GREEN AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2019-20

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS * Pune *

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,
Ph No: 020-26614393/266144403
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2018-19/CR-05/4174 19th September , 2018

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	:	**Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Energy Conservation Programme*
Registration Number	:	***MEDA/ECN/CR-05/2018-19/EA-03***

- 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** 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.

19/9/18
(Smita Kudarikar)
General Manager (EC)

ENRICH CONSULTANTS Pune

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/19-20/02 Date: 5/8/2020

CERTIFICATE

This is to certify that we have conducted Green Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2019-20.

.The College has adopted following Energy Efficient & Green Practices:

- Usage of Energy Efficient LED Light Fitting
- Maximum Usage of Day Lighting
- Installation of Solar Thermal Water Heating Plant of Capacity 25000 LPD.
- Provision of Separate bins for Dry & Wet Waste
- Conversions of leafy waste into compost, using *Jivamrut,* bio enzyme prepared using cow dung and cow urine.
- Installation of Sewage Treatment Plant of Capacity 275 m^3/Day
- Maintenance of good Internal Road
- Tree Plantation in the campus
- Provision of Ramp for Divyangajan
- Creation of awareness by Display of Posters on Resource Conservation

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Green Audit of their Campus for the Academic Year: 2019-20.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emissions:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	261765	209.41
2	Maximum	27924	22.34
3	Minimum	10757.6	8.61
4	Average	23796.8	19.04

3. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Equivalent Energy Saved Solar Thermal Plant is **205479 kWh.**
- Reduction in CO_2 Emissions in 2019-20 works out to be **164 MT.**

5. Waste Management:

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

5.2 Organic Waste Management:

Conversion of leafy waste into compost, using Jivamrut, a bio enzyme prepared using cow dung and cow urine.

5.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m^3/Day.** The treated Water is used for gardening purpose.

5.4 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

6. Green & Sustainable Initiatives

- Maintenance of good Internal Road
- Maintenance of Internal Garden
- Provision of Ramp for Divyangajan
- Display of Posters on Resource Conservation

7. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases **0.8 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.

8. References:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
STES	Sinhgad Technical Education Society
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 Objectives:

1. To study present Energy Consumption
2. To Study CO_2 emissions
3. To study usage of Renewable Energy
4. Study of Waste Management
5. Study of Rain Water Harvesting
6. Study of Green Practices

1.2 General Details of College: Table No 1:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills.

Table No 2: Electrical Bill Analysis- 2019-20:

No	Month	Energy Purchased, kWh
1	Jul-19	27924
2	Aug-19	26640
3	Sep-19	27120
4	Oct-19	26583.5
5	Nov-19	25672.3
6	Dec-19	24980
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Chart No 1: Variation in Monthly Energy Consumption:

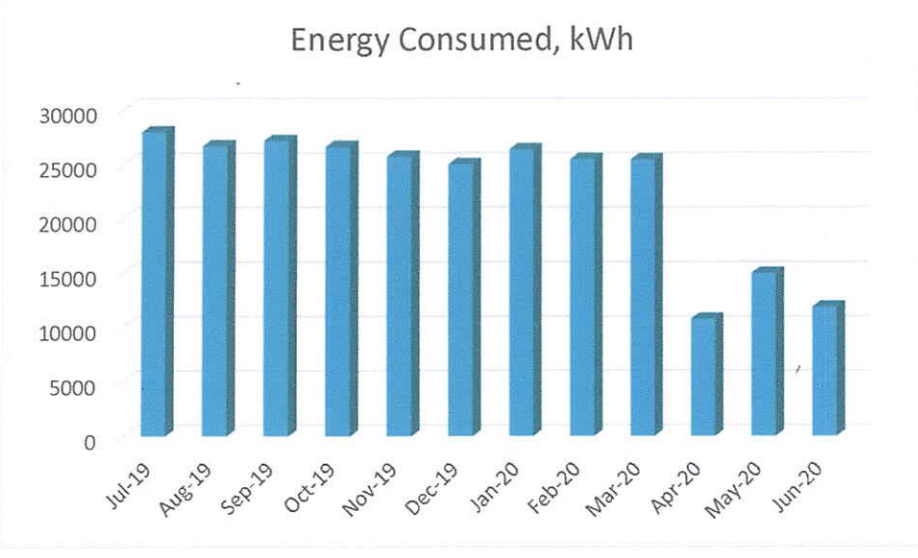

Table No 3: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	261765
2	Maximum	27924
3	Minimum	10757.6
4	Average	23796.8

CHAPTER III
COMPUTATION OF CARBON FOOTPRINT

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.

Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions is as under.

- **1 kWh** of Electrical Energy releases **0.8 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 4: Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jul-19	27924	22.34
2	Aug-19	26640	21.31
3	Sep-19	27120	21.70
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5	Nov-19	25672.3	20.54
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Chart No 2: Month wise CO_2 Emissions:

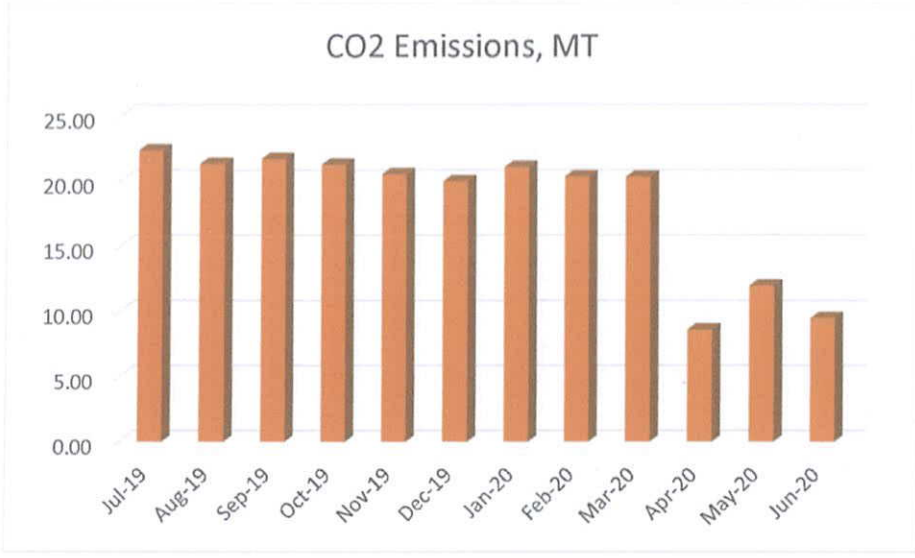

Table No 5: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	261765	209.41
2	Maximum	27924	22.34
3	Minimum	10757.6	8.61
4	Average	23796.8	19.04

CHAPTER IV
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Solar Water Heating Plant of Capacity **25000 LPD**.

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Solar Water Heating Plant.

Table No 6: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
2	100 LPD Solar Water Heating System saves	1500	kWh/Annum
3	Energy Saved by 25000 LPD System =(25000) * (1500) / (100)	375000	kWh
4	Usage Period in 2019-20	200	Days
5	Energy Saved for 200 days of System operation in 19-20	**205479**	**kWh**
6	1 kWh of Electrical Energy is equivalent to	**0.8**	**Kg of CO_2**
7	Annual Reduction in CO_2 Emission = (5) * (6) /1000	**164**	**MT**

Photograph of Solar Thermal Water Heating Plant:

CHAPTER V
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

Photograph of Waste Collection Bins:

5.2 Organic Waste Management:

Conversion of leafy waste into compost, using Jivamrut, a bio enzyme prepared using cow dung and cow urine.

5.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity 275 m^3/Day. The treated Water is used for gardening purpose.

Photograph of Sewage Treatment Plant:

5.4 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

CHAPTER-VI
STUDY OF GREEN PRACTICES

6.1 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:

6.2 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:

6.3 Provision of Ramp:

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

Photograph of Ramp:

6.4 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation.

Photograph of Poster on Energy Conservation:

ENVIRONMENTAL AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2019-20

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS Pune

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,
Ph No: 020-26614393/266144403
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2018-19/CR-05/4174 19th September , 2018

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FOR CLASS 'A'

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19/9/18
(Smita Kudarikar)
General Manager (EC)

ENRICH CONSULTANTS

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/19-20/03 Date: 5/8/2020

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2019-20.

The College has adopted following Environment Friendly Practices:

- Usage of Energy Efficient LED Light Fitting
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- Installation of Solar Thermal Water Heating Plant of Capacity 25000 LPD.
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- Tree Plantation in the campus
- Creation of awareness by Display of Posters on Resource Conservation

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

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A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Various Pollution due to College Activities:

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

3. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	261765	209.41
2	Maximum	27924	22.34
3	Minimum	10757.6	8.61
4	Average	23796.8	19.04

4. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System

5. Usage of Renewable Energy & Reduction in CO_2 Emission:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Equivalent Energy Saved Solar Thermal Water Heating Plant is **205479 kWh.**
- Reduction in CO_2 Emissions in 2019-20 works out to be **164 MT.**

6. Waste Management:

6.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

6.2 Organic Waste Management:

Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.

6.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m^3/Day.** The treated Water is used for gardening purpose.

6.4 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

7. Green & Sustainable Initiatives

- Maintenance of good Internal Road
- Maintenance of Internal Garden
- Provision of Ramp for Divyangajan
- Display of Posters on Resource Conservation

8. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.

9. References:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

Kg	:	Kilo Gram
STES	:	Sinhgad Technical Education Society
MSEDCL	:	Maharashtra State Distribution Company Limited
MT	:	Metric Ton
kWh	:	kilo-Watt Hour
LPD	:	Liters per Day
LED	:	Light Emitting Diode

CHAPTER-I
INTRODUCTION

1.1 Important Definitions:

1.1.1 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

1.1.2. 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

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

1.1.4. Table No-1: Relevant Environmental Laws in India:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
1980	The Forest (Conservation) Act
1981	The Air (Prevention and Control of Pollution) Act
1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Table No-2: Some Important Environmental Rules in India:

1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules

2011	E-waste (Management and Handling) Rules
2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules

1.1.6 Table No-3: National Environmental Plans & Policy Documents:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency
10	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives:

1. Study Resource Consumption & CO_2 Emissions
2. Study of CO_2 Emission Reduction
3. Study of Waste Management
4. Study of Rain Water Harvesting
5. Study of Environment Friendly Initiatives

1.3 General Details of College: Table No 4:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

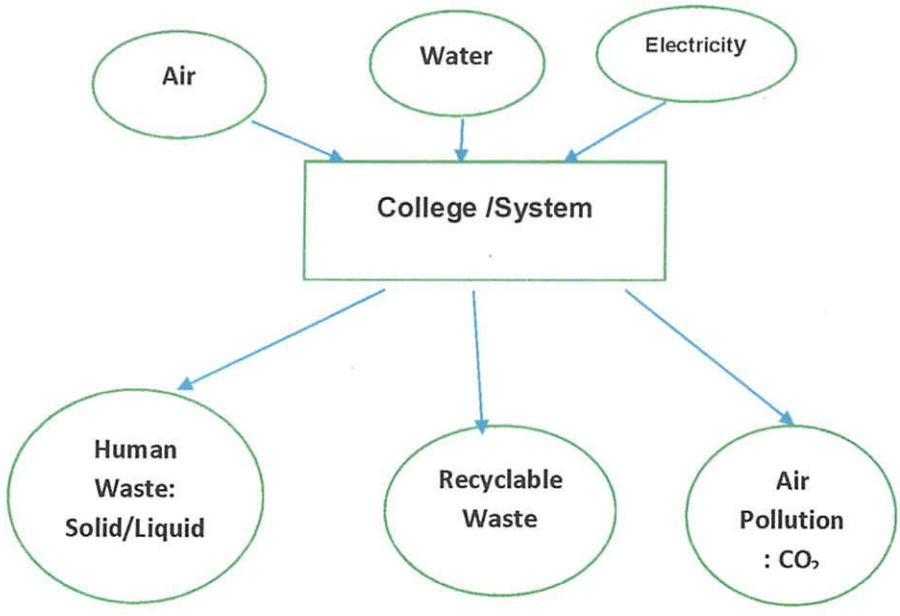
CHAPTER-II
STUDY OF RECOURCE CONSUMPTION & CO_2 EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

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

Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO_2 on account of consumption of Electrical Energy.

The basis of Calculation for CO_2 emissions due to usage of Electrical Energy are as under

- **1 kWh** of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere

Table No 5: Study of Consumption of Electrical Energy & CO_2 Emissions: 2019-20:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jul-19	27924	22.34
2	Aug-19	26640	21.31
3	Sep-19	27120	21.70
4	Oct-19	26583.5	21.27
5	Nov-19	25672.3	20.54

6	Dec-19	24980	19.98
7	Jan-20	26336.4	21.07
8	Feb-20	25420.1	20.34
9	Mar-20	25384.1	20.31
10	Apr-20	10757.6	8.61
11	May-20	14947.2	11.96
12	Jun-20	11855.5	9.48
13	Total	261765	209.41
14	Maximum	27924	22.34
15	Minimum	10757.6	8.61
16	Average	23796.8	19.04

Chart No 2: Month wise CO_2 Emissions:

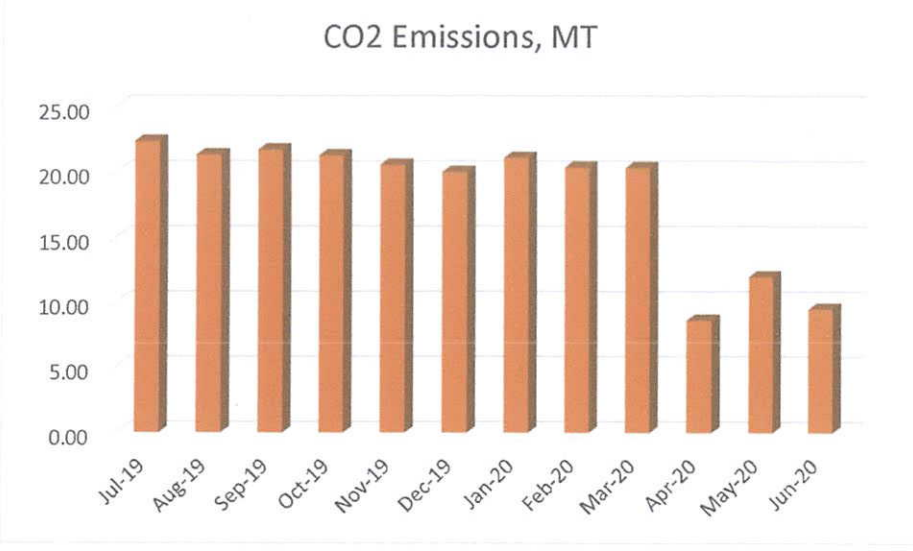


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	261765	209.41
2	Maximum	27924	22.34
3	Minimum	10757.6	8.61
4	Average	23796.8	19.04

CHAPTER III
STUDY OF CO_2 EMISSION REDUCTION

The College has installed Solar Water Heating Plant of Capacity **25000 LPD**.

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Solar Water Heating Plant.

Table No 7: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
2	100 LPD Solar Water Heating System saves	1500	kWh/Annum
3	Energy Saved by 25000 LPD System =(25000) * (1500) / (100)	375000	kWh
4	Usage Period in 2019-20	200	Days
5	Energy Saved for 200 days of System operation in 2019-20	**205479**	**kWh**
6	1 kWh of Electrical Energy is equivalent to	**0.8**	**Kg of CO_2**
7	Annual Reduction in CO_2 Emission = (5) * (6) /1000	**164**	**MT**

Photograph of Solar Thermal Water Heating Plant:

CHAPTER IV
STUDY OF WASTE MANAGEMENT

4.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

Photograph of Waste Collection Bins:

4.2 Organic Waste Management:

Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.

4.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m^3/Day**. The treated Water is used for gardening purpose.

Photograph of Sewage Treatment Plant:

4.4 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

CHAPTER-V
STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

5.1 Internal Tree Plantation:

The College has well maintained Tree Plantation in the campus.

Photograph of Tree plantation:

5.2 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation.

Photograph of Poster on Energy Conservation:

ENERGY AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2018-19

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS Pune

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006
Ph No: 020-26614393/266144403, Fax No: 020-26615031
Email: econ@mahaurja.com , Web: www.mahaurja.com

ECN/2017-18/CR-01/5726 30th November 2017

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 under Save Energy Programme of MEDA.

Name and Address of the firm	:	Enrich Consultants Yashashree, Plot No. 26,Nirmal Baug Society,Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Save Energy Programme.*
Registration Number	:	***MEDA/ECN/CR-01/2017-18/EA-37***

- The Save Energy 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid upto **3 year** from the date of registration, to carry out energy audits under the Save Energy Programme of MEDA.
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

30/11

(Smita Kudarikar)
Manager (EC)

ENRICH CONSULTANTS Pune

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/18-19/01

Date: 03/8/2019

CERTIFICATE

This is to certify that we have conducted Energy Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2018-19.

.The College has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting
- Installation of 25000 LPD Solar Water Heating System at Hostel block.

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Enrich Consultants,

ENRICH CONSULTANTS * Pune *

A Y Mehendale,
Certified Energy Auditor
EA-8192

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Energy Audit of their Campus for the Academic Year: 2018-19.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	318004	254.40
2	Maximum	33115	26.49
3	Minimum	15241	12.19
4	Average	26500.2	21.20

3. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System.

4. Usage of Alternate Energy:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Energy purchased from MSEDCL is **318004 kWh.**
- Equivalent Energy Saved Solar Thermal Plant is **226027 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **41.5 %.**

5. Usage of LED Lighting:

- The Total Annual Lighting Demand of the College is **159280 kWh.**
- The Total Annual LED Lighting Demand is **880 kWh.**
- The percentage of Annual LED Lighting to Annual Lighting Demand is **0.55 %.**

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.
3. Daily working hours-**8 Nos** (For Lighting Load Calculations)
4. Annual working Days-**220 Nos** (For Lighting Load Calculations)
5. Annual Hostel Operation Days in 18-19: **220 Nos**

7. Reference:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

STES	:	Sinhgad Technical Education Society
LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO_2 emissions
3. To study usage of Alternate Energy
4. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

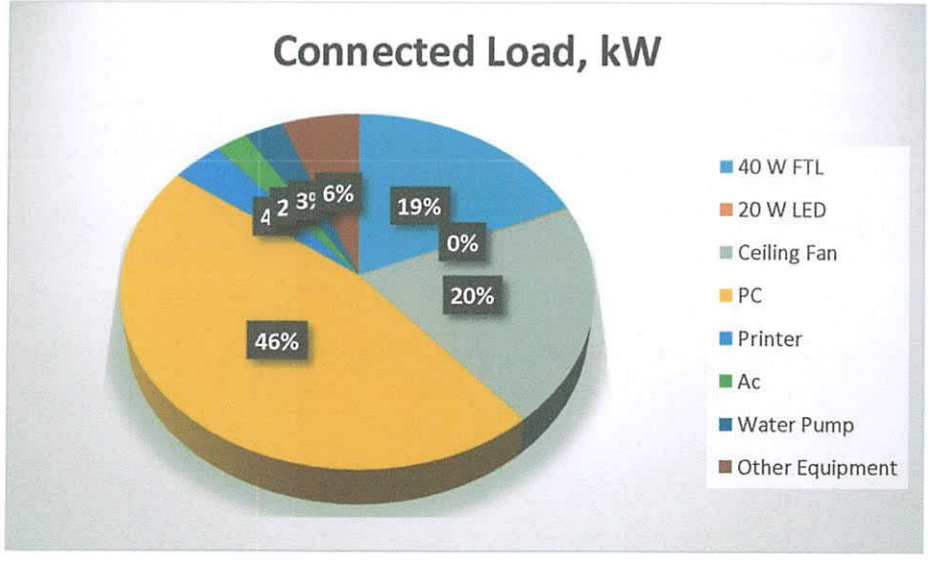
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	1800	40	72
2	20 W LED	20	20	0.4
3	Ceiling Fan	1200	65	78
4	PC	1200	150	180
5	Printer	100	150	15
6	Ac	5	1875	9.375
7	Water Pump	5	2238	11.19
8	Other Equipment	150	150	22.5
9	**Total**			**388**

Chart No 1: Study of Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 3: Electrical Bill Analysis- 2018-19:

No	Month	Energy Purchased, kWh
1	Jul-18	28385
2	Aug-18	30364
3	Sep-18	31066
4	Oct-18	33115
5	Nov-18	15241
6	Dec-18	23581
7	Jan-19	27742
8	Feb-19	21374
9	Mar-19	30131
10	Apr-19	30073
11	May-19	26000
12	Jun-19	20932
13	Total	318004
14	Maximum	33115
15	Minimum	15241
16	Average	26500.2

Chart No 2: Variation in Monthly Energy Consumption:

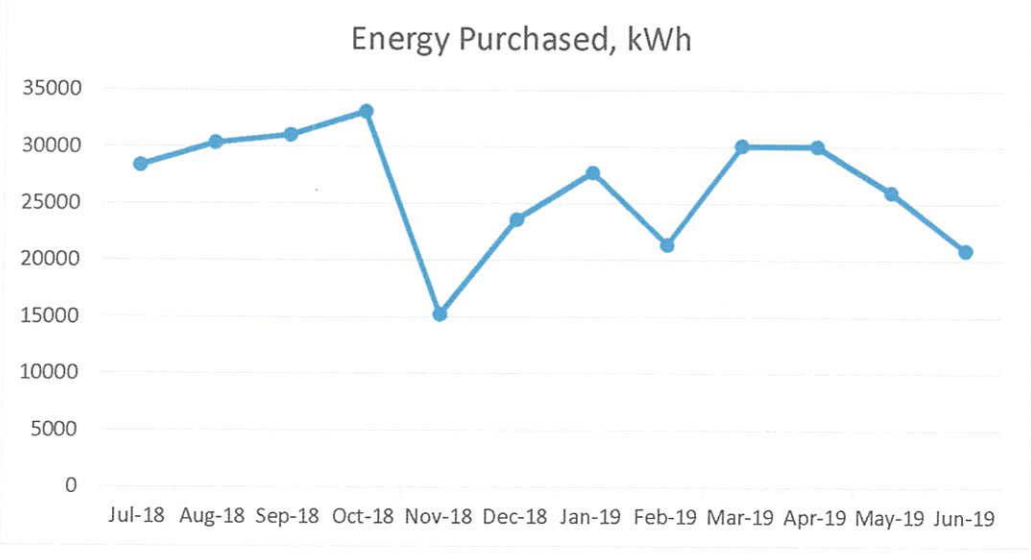


Table No 4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	318004
2	Maximum	33115
3	Minimum	15241
4	Average	26500.2

CHAPTER-IV
COMPUTATION OF CARBON FOOTPRINT

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 taking into account the usage of the Electrical Energy.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.8 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 5: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Jul-18	28385	22.71
2	Aug-18	30364	24.29
3	Sep-18	31066	24.85
4	Oct-18	33115	26.49
5	Nov-18	15241	12.19
6	Dec-18	23581	18.86
7	Jan-19	27742	22.19
8	Feb-19	21374	17.10
9	Mar-19	30131	24.10
10	Apr-19	30073	24.06
11	May-19	26000	20.80
12	Jun-19	20932	16.75
13	Total	318004	254.40
14	Maximum	33115	26.49
15	Minimum	15241	12.19
16	Average	26500.2	21.20

Chart No 3: Month wise CO_2 Emissions:

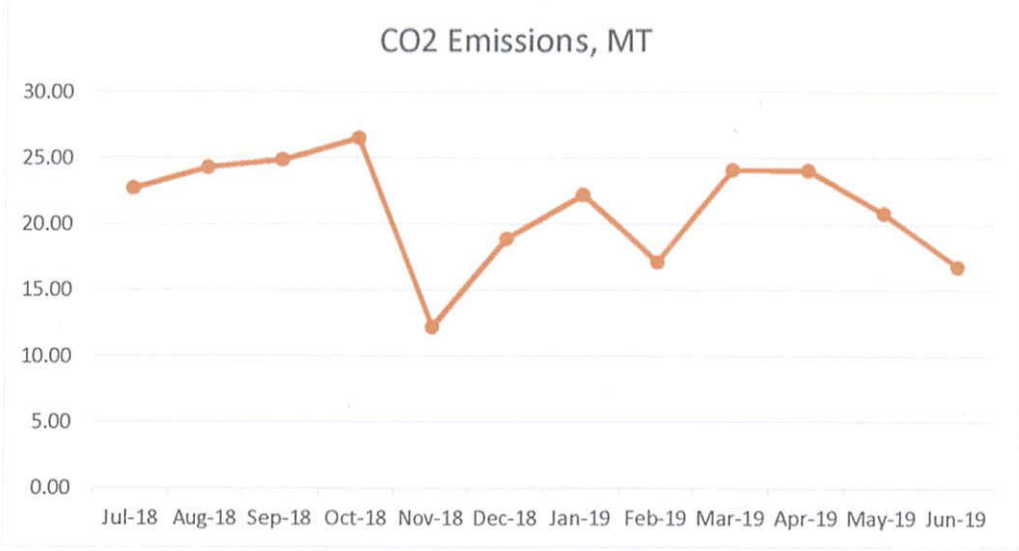


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	318004	254.40
2	Maximum	33115	26.49
3	Minimum	15241	12.19
4	Average	26500.2	21.20

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **25000 LPD.**

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Energy Purchased from MSEDCL	**318004**	**kWh**
2	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
3	100 LPD Solar Water Heating System saves	1500	kWh/Annum
4	Energy Saved by 25000 LPD System =(25000) * (1500) / (100)	375000	kWh
5	Usage Period in 2018-19	220	Nos
6	Energy Saved for 220 days of System operation in 18-19	**226027**	**kWh**
7	Total Energy Demand of College = **(1) + (6)**	**544031**	**kWh**
9	% of Usage of Alternate Energy to Total Annual Energy Demand= **(7)*100/ (8)**	**41.5**	%

Photograph of Solar Thermal Water Heating Plant:

CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In this chapter, we compute the percentage of usage of LED Lighting to Annual Lighting power requirement.

Table No 8: Percentage of Usage of LED Lighting to Annual Lighting Load:

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings	1800	Nos
2	Demand of 40 W FTL Fitting	40	W/Unit
3	Total Electrical Load of 40 W FTL Fittings	**72**	kW
4	No of 20 W LED Tube Lights	20	Nos
5	Demand of 20 W LED Tube Light	20	W/Unit
6	Total Electrical Load of 20 W LED Fittings	**0.4**	kW
7	Total Lighting Load=3+6	**72.4**	kW
8	Total LED Lighting Load= 6	**0.4**	kW
9	Average Daily Usage Period	10	Hours
10	Annual Working Days	220	Nos
11	Annual Total Lighting Load = 7*9*10	**159280**	kWh
12	Annual LED Lighting Load = 8*9*10	**880**	kWh
13	**Annual Lighting Requirement met by LED= 12*100/11**	**0.55**	**%**

GREEN AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2018-19

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS * Pune *

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006
Ph No: 020-26614393/266144403, Fax No: 020-26615031
Email: econ@mahaurja.com , Web: www.mahaurja.com

ECN/2017-18/CR-01/5726 30th November 2017

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 under Save Energy Programme of MEDA.

Name and Address of the firm	:	Enrich Consultants Yashashree, Plot No. 26,Nirmal Baug Society,Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Save Energy Programme.*
Registration Number	:	***MEDA/ECN/CR-01/2017-18/EA-37***

- The Save Energy 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.
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- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

(Smita Kudarikar)
Manager (EC)

ENRICH CONSULTANTS Pune

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/18-19/02

Date: 03/8/2019

CERTIFICATE

This is to certify that we have conducted Green Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2018-19.

The College has adopted following Green Initiatives:

- Usage of Energy Efficient LED Light Fitting
- Maximum Usage of Day Lighting
- Installation of Solar Thermal Water Heating Plant of Capacity 25000 LPD.
- Provision of Separate bins for Dry & Wet Waste
- Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.
- Installation of Sewage Treatment Plant of Capacity 275 m^3/Day
- Maintenance of good Internal Road
- Tree Plantation in the campus.

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Green Audit of their Campus for the Academic Year: 2018-19.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emissions:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	318004	254.40
2	Maximum	33115	26.49
3	Minimum	15241	12.19
4	Average	26500.2	21.20

3. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Equivalent Energy Saved Solar Thermal Plant is **226027 kWh.**
- Reduction in CO_2 Emissions in 2020-21 works out to be **181 MT.**

5. Waste Management:

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

5.2 Organic Waste Management:

Conversion of leafy waste into compost, using Jivamrut, a bio enzyme prepared using cow dung and cow urine.

5.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m^3/Day.** The treated Water is used for gardening purpose.

5.4 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

6. Green Practices:

- Maintenance of good Internal Road
- Maintenance of Internal Garden

7. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases **0.8 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.

8. Reference:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
STES	Sinhgad Technical Education Society
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 Objectives:

1. To study present Energy Consumption
2. To Study CO_2 emissions
3. To study usage of Renewable Energy
4. Study of Waste Management
5. Study of Rain Water Harvesting
6. Study of Green Practices

1.2 General Details of College: Table No 1:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills

Table No 2: Electrical Bill Analysis- 2018-19:

No	Month	Energy Purchased, kWh
1	Jul-18	28385
2	Aug-18	30364
3	Sep-18	31066
4	Oct-18	33115
5	Nov-18	15241
6	Dec-18	23581
7	Jan-19	27742
8	Feb-19	21374
9	Mar-19	30131
10	Apr-19	30073
11	May-19	26000
12	Jun-19	20932
13	Total	318004
14	Maximum	33115
15	Minimum	15241
16	Average	26500.2

Chart No 1: Variation in Monthly Energy Consumption:

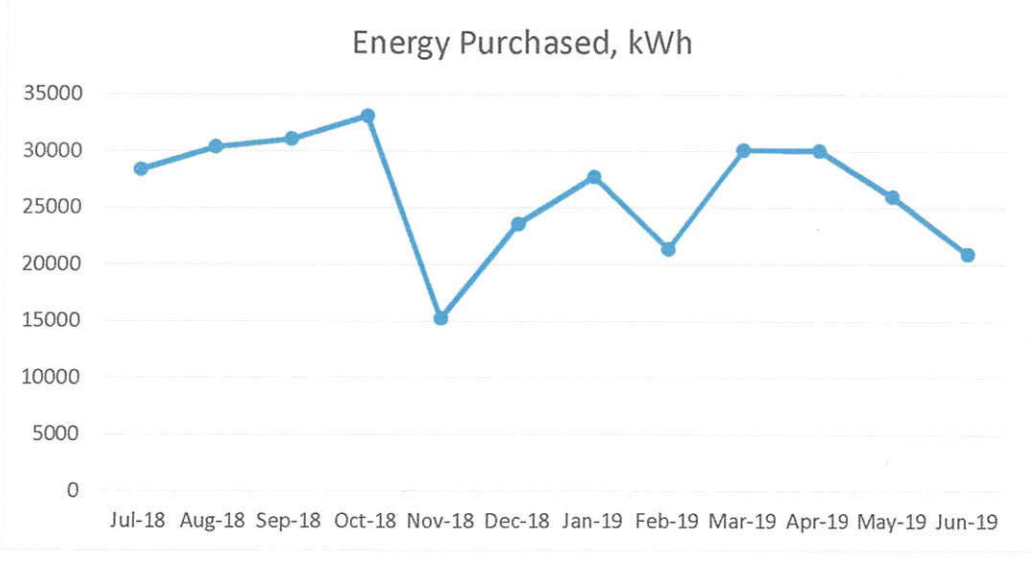


Table No 3: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	318004
2	Maximum	33115
3	Minimum	15241
4	Average	26500.2

CHAPTER III
COMPUTATION OF CARBON FOOT PRINT

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.

Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions is as under.

- **1 kWh** of Electrical Energy releases **0.8 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 4: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Jul-18	28385	22.71
2	Aug-18	30364	24.29
3	Sep-18	31066	24.85
4	Oct-18	33115	26.49
5	Nov-18	15241	12.19
6	Dec-18	23581	18.86
7	Jan-19	27742	22.19
8	Feb-19	21374	17.10
9	Mar-19	30131	24.10
10	Apr-19	30073	24.06
11	May-19	26000	20.80
12	Jun-19	20932	16.75
13	Total	318004	254.40
14	Maximum	33115	26.49
15	Minimum	15241	12.19
16	Average	26500.2	21.20

Chart No 2: Month wise CO_2 Emissions:

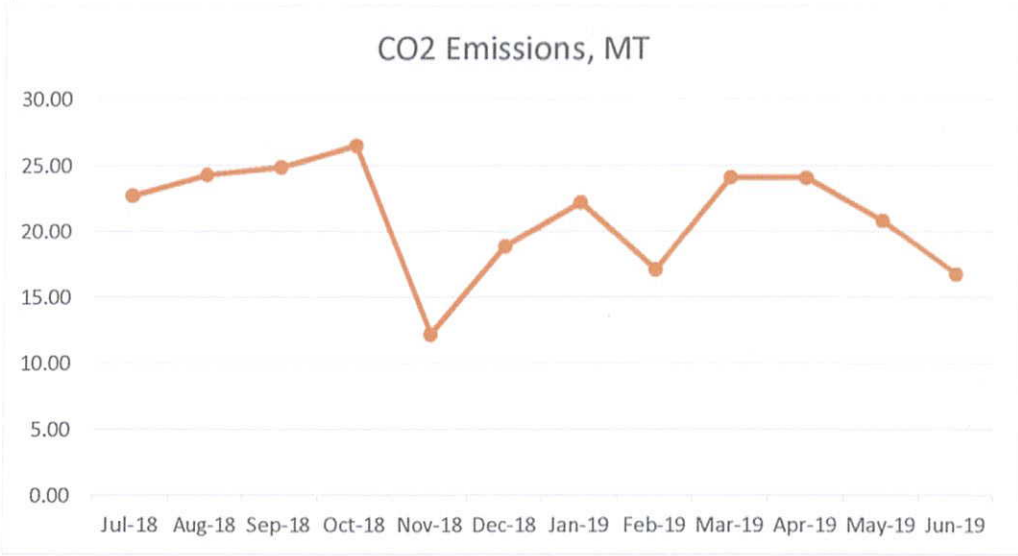


Table No 5: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	318004	254.40
2	Maximum	33115	26.49
3	Minimum	15241	12.19
4	Average	26500.2	21.20

CHAPTER IV
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Solar Water Heating Plant of Capacity **25000 LPD**.

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Solar Water Heating Plant.

Table No 6: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
2	100 LPD Solar Water Heating System saves	1500	kWh/Annum
3	Energy Saved by 25000 LPD System =(25000) * (1500) / (100)	375000	kWh
4	Usage Period in 2018-19	220	Days
5	Energy Saved for 220 days of System operation in 18-19	**226027**	**kWh**
6	1 kWh of Electrical Energy is equivalent to	**0.8**	**Kg of CO_2**
7	Annual Reduction in CO_2 Emission = (5) * (6) /1000	**181**	**MT**

Photograph of Solar Thermal Water Heating Plant:

CHAPTER V
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:
The Waste is segregated at source and the recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.
Photograph of Waste Collection Bins:

5.2 Organic Waste Management:
Conversion of leafy waste into compost, using Jivamrut, a bio enzyme prepared using cow dung and cow urine.

5.3 Liquid Waste Management:
The College has installed Sewage Treatment Plant of Capacity 275 m^3/Day. The treated Water is used for gardening purpose.

Photograph of Sewage Treatment Plant:

5.4 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

CHAPTER-VI
STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 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:

6.2 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:

ENERGY AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2017-18

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS Pune

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006
Ph No: 020-26614393/266144403, Fax No: 020-26615031
Email: econ@mahaurja.com , Web: www.mahaurja.com

ECN/2017-18/CR-01/5726 30th November 2017

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 under Save Energy Programme of MEDA.

Name and Address of the firm	:	Enrich Consultants Yashashree, Plot No. 26,Nirmal Baug Society,Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Save Energy Programme.*
Registration Number	:	***MEDA/ECN/CR-01/2017-18/EA-37***

- The Save Energy 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid upto **3 year** from the date of registration, to carry out energy audits under the Save Energy Programme of MEDA.
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

30/11

(Smita Kudarikar)
Manager (EC)

ENRICH CONSULTANTS Pune

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/17-18/01 Date: 21/8/2018

CERTIFICATE

This is to certify that we have conducted Energy Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2017-18.

.The College has adopted following Energy Efficient practices:

- Maximum usage of Day Lighting
- Installation of 25000 LPD Solar Water Heating System at Hostel block.

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Energy Audit of their Campus for the Academic Year: 2017-18.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	375143	300.11
2	Maximum	37580	30.06
3	Minimum	26890	21.51
4	Average	31261.8	25.01

3. Energy Conservation projects already installed:

- Maximum Usage of Day Lighting
- Installation of **20000 LPD** Solar Water Heating System.

4. Usage of Alternate Energy:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Energy purchased from MSEDCL is **163019 kWh.**
- Equivalent Energy Saved Solar Thermal Plant is **41096 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **20.13 %.**

5. Usage of LED Lighting:

At present the % of Usage of LED Lighting works out to be zero percent. It is recommended to replace the FTL fittings by LED Fittings.

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.
3. Daily working hours-**4 Nos** (For Lighting Calculations)
4. Annual working Days-**120 Nos** (For Lighting Calculations)
5. Annual Hostel Operation Days in 20-21: **40 Nos**

7. Reference:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

STES	:	Sinhgad Technical Education Society
LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO_2 emissions
3. To study usage of Alternate Energy
4. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

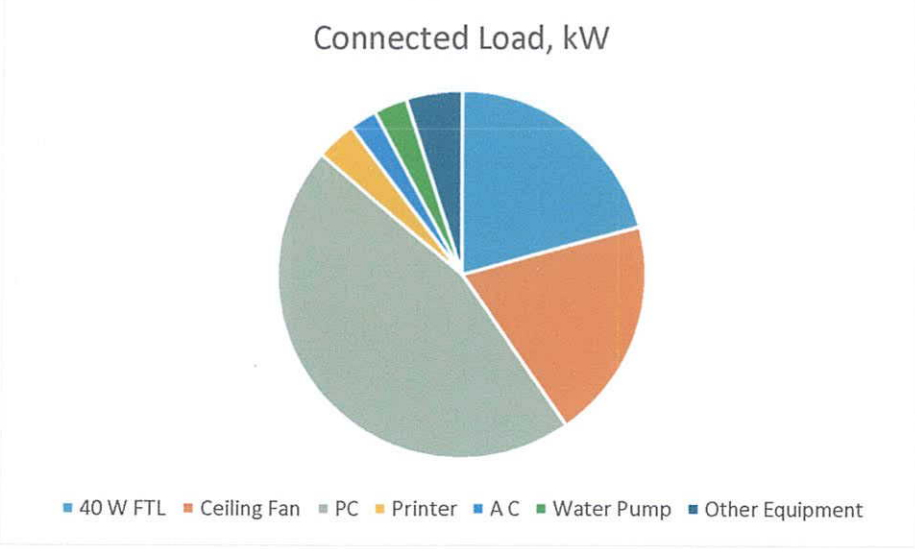
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	2000	40	80
2	Ceiling Fan	1150	65	74.75
3	PC	1180	150	177
4	Printer	90	150	13.5
5	A C	5	1875	9.375
6	Water Pump	5	2238	11.19
7	Other Equipment	125	150	18.75
8	**Total**			**384**

Chart No 1: Study of Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 3: Electrical Bill Analysis- 2017-18:

No	Month	Energy Consumed, kWh
1	Jul-17	32351
2	Aug-17	34195
3	Sep-17	37580
4	Oct-17	32653
5	Nov-17	30952
6	Dec-17	28555
7	Jan-18	2969
8	Feb-18	20224
9	Mar-18	36625
10	Apr-18	34310
11	May-18	31112
12	Jun-18	26890
13	Total	375143
14	Maximum	37580
15	Minimum	26890
16	Average	31261.8

Chart No 2: Variation in Monthly Energy Consumption:

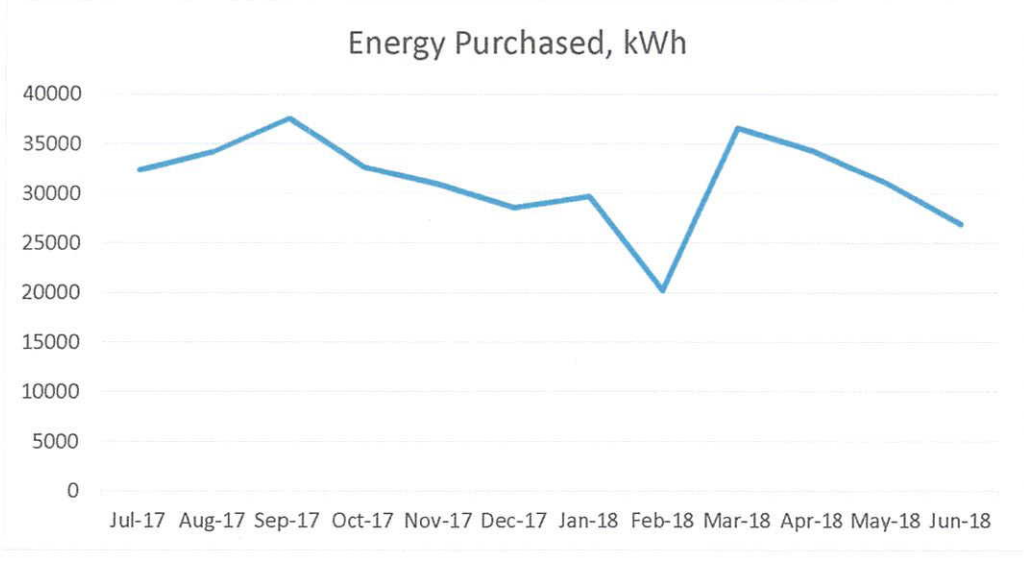


Table No 4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	375143
2	Maximum	3758
3	Minimum	26890
4	Average	31261.8

CHAPTER-IV
COMPUTATION OF CARBON FOOTPRINT

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 taking into account the usage of the Electrical Energy.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.8 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 5: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Jul-17	32350.8	25.88
2	Aug-17	34195.2	27.36
3	Sep-17	37580.4	30.06
4	Oct-17	32653.2	26.12
5	Nov-17	30951.6	24.76
6	Dec-17	28555.2	22.84
7	Jan-18	29695.2	23.76
8	Feb-18	20223.6	16.18
9	Mar-18	36625.2	29.30
10	Apr-18	34310.4	27.45
11	May-18	31112.4	24.89
12	Jun-18	26889.6	21.51
13	Total	375143	300.11
14	Maximum	37580.4	30.06
15	Minimum	26889.6	21.51
16	Average	31261.8	25.01

Chart No 3: Month wise CO_2 Emissions:

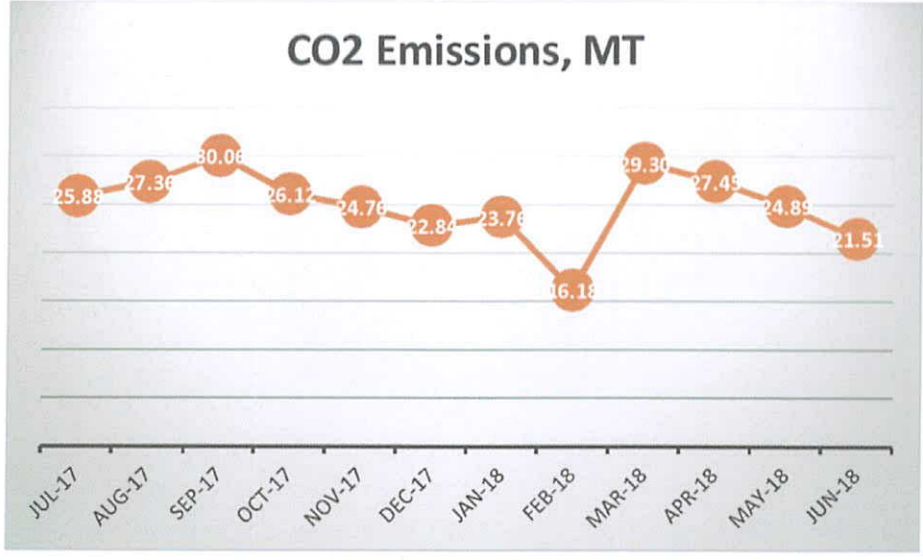


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	375143	300.11
2	Maximum	37580	30.06
3	Minimum	26890	21.51
4	Average	31261.8	25.01

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **25000 LPD.**

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Energy Purchased from MSEDCL		**kWh**
2	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
3	100 LPD Solar Water Heating System saves	1500	kWh/Annum
4	Energy Saved by 25000 LPD System =(25000) * (1000) / (100)	375000	kWh
5	Usage Period in 2017-18	220	Nos
6	Energy Saved for 220 days of System operation in 17-18	**226027**	**kWh**
7	Total Energy Demand of College = **(1) + (6)**	**601170**	**kWh**
9	% of Usage of Alternate Energy to Total Annual Energy Demand= **(7)*100/ (8)**	**37.6**	%

Photograph of Solar Thermal Water Heating Plant:

CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

As on Date, it is observed that there are 40 W FTL Fittings in the campus. There are no LED Lights in the campus. Hence the percentage of Usage of LED Lighting Demand to Annual Lighting Demand works out to be zero percent.

GREEN AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2017-18

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS Pune

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006
Ph No: 020-26614393/266144403, Fax No: 020-26615031
Email: econ@mahaurja.com , Web: www.mahaurja.com

ECN/2017-18/CR-01/5726 30th November 2017

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 under Save Energy Programme of MEDA.

Name and Address of the firm	:	Enrich Consultants Yashashree, Plot No. 26,Nirmal Baug Society,Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Save Energy Programme.*
Registration Number	:	***MEDA/ECN/CR-01/2017-18/EA-37***

- The Save Energy 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.
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- This empanelment is valid upto **3 year** from the date of registration, to carry out energy audits under the Save Energy Programme of MEDA.
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

(Smita Kudarikar)
Manager (EC)

ENRICH CONSULTANTS Pune

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/17-18/02 Date: 21/8/2018

CERTIFICATE

This is to certify that we have conducted Green Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2017-18.

The College has adopted following Green Initiatives:

- Maximum Usage of Day Lighting
- Installation of Solar Thermal Water Heating Plant of Capacity 25000 LPD.
- Provision of Separate bins for Dry & Wet Waste
- Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.
- Installation of Sewage Treatment Plant of Capacity 275 m^3/Day
- Maintenance of good Internal Road
- Tree Plantation in the campus

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Green Audit of their Campus for the Academic Year: 2017-18.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emissions:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	375143	300.11
2	Maximum	37580	30.06
3	Minimum	26890	21.51
4	Average	31261.8	25.01

3. Various initiatives taken for Energy Conservation:

- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Equivalent Energy Saved Solar Thermal Plant is **226027 kWh.**
- Reduction in CO_2 Emissions in 2020-21 works out to be **181 MT.**

5. Waste Management:

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

5.2 Organic Waste Management:

Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.

5.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m^3/Day.** The treated Water is used for gardening purpose.

5.4 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

6. Green & Sustainable Initiatives

- Maintenance of good Internal Road
- Maintenance of Internal Garden

7. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.

8. Reference:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
STES	Sinhgad Technical Education Society
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 Objectives:

1. To study present Energy Consumption
2. To Study CO_2 emissions
3. To study usage of Renewable Energy
4. Study of Waste Management
5. Study of Rain Water Harvesting
6. Study of Green Practices

1.2 General Details of College: Table No 1:

No	Head	Particulars
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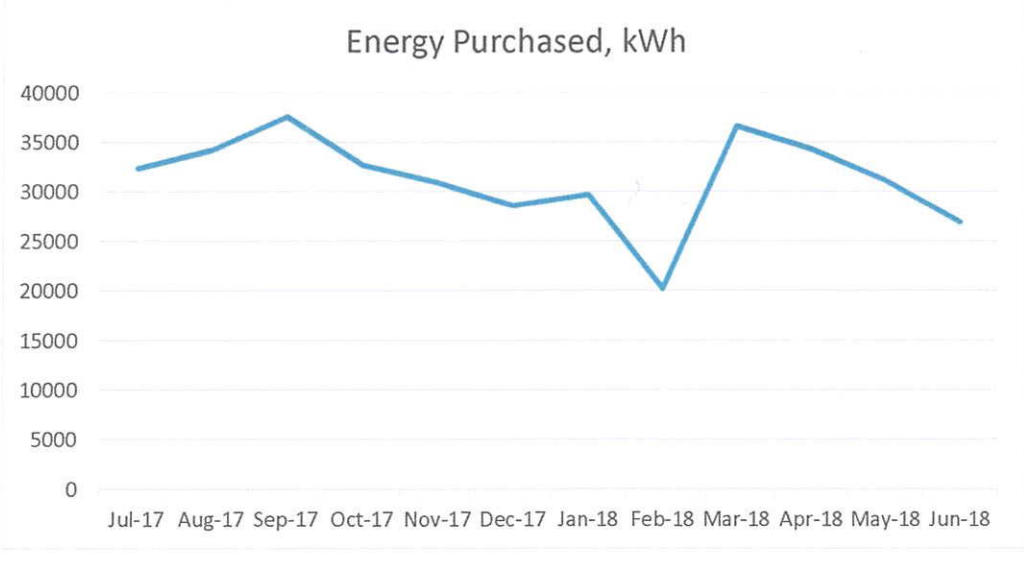

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Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions is as under.

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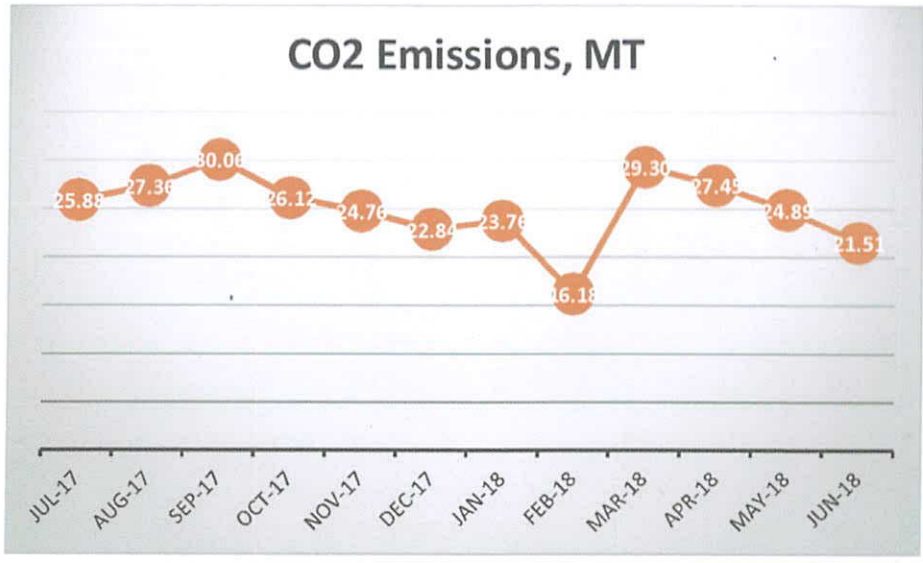

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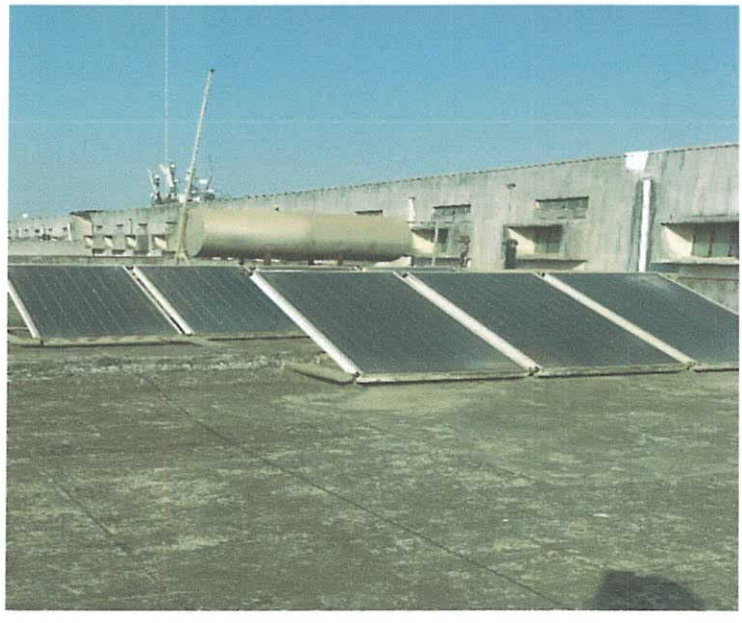
1	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
2	100 LPD Solar Water Heating System saves	1500	kWh/Annum
3	Energy Saved by 25000 LPD System =(25000) * (1000) / (100)	375000	kWh
4	Usage Period in 2017-18	220	Days
5	Energy Saved for 220 days of System operation in 2017-18	**226027**	**kWh**
6	1 kWh of Electrical Energy is equivalent to	**0.8**	**Kg of CO_2**
7	Annual Reduction in CO_2 Emission = (5) * (6) /1000	**181**	**MT**

Photograph of Solar Thermal Water Heating Plant:



CHAPTER V
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

Photograph of Waste Collection Bins:

5.2 Organic Waste Management:

Conversion of leafy waste into compost, using *Jivamrut,* a bio enzyme prepared using cow dung and cow urine.

5.3 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity 275 m^3/Day. The treated Water is used for gardening purpose.

Photograph of Sewage Treatment Plant:

5.4 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

CHAPTER-VI
STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 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:

6.2 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:

ENERGY AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2016-17

Prepared by:

Enrich Consultants

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

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no : RQ 91 / 2462

Maharashtra Energy Development Agency
(A Government of Maharashtra Institution)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006
Ph No: 020-26614393/266144403, Fax No: 020-26615031
Email: econ@mahaurja.com , Web: www.mahaurja.com

ECN/2014-15/CR-10/6038 14 November, 2014

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 under Save Energy Programme of MEDA.

Name and Address of the firm	:	Enrich Consultants Yashashree, Plot No. 26, Nirmal Baug Society, Parvati, Pune - 411009.
Registration Category	:	*Empanelled Consultant for Save Energy Programme.*
Registration Number	:	***MEDA/ECN/CR-10/2014-15/ EA-37***

- The Save Energy 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid upto **3 years** from the date of registration, to carry out energy audits under the Save Energy Programme of MEDA.
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

Hemant H. L. Patil

(Hemant H. Patil)
Manager (EC)

ENRICH CONSULTANTS Pune

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/16-17/01

Date: 23/8/2017

CERTIFICATE

This is to certify that we have conducted Energy Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2016-17.

.The College has adopted following Energy Efficient practices:

- Maximum usage of Day Lighting
- Installation of 25000 LPD Solar Water Heating System at Hostel block.

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Enrich Consultants,

ENRICH CONSULTANTS Pune

A Y Mehendale,
Certified Energy Auditor
EA-8192

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Energy Audit of their Campus for the Academic Year: 16-17.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	389299	311.44
2	Maximum	37522	30.02
3	Minimum	27294	21.84
4	Average	32441.6	25.95

3. Energy Conservation projects already installed:

- Maximum Usage of Day Lighting
- Installation of **20000 LPD** Solar Water Heating System.

4. Usage of Alternate Energy:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Energy purchased from MSEDCL is **389299 kWh.**
- Equivalent Energy Saved Solar Thermal Plant is **220890 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **36.2 %.**

5. Usage of LED Lighting:

At present the % of Usage of LED Lighting works out to be zero percent. It is recommended to replace the FTL fittings by LED Fittings.

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.
3. Annual Hostel Operation Days in 16-17: **215 Nos**

7. Reference:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

STES	:	Sinhgad Technical Education Society
LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO_2 emissions
3. To study usage of Alternate Energy
4. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

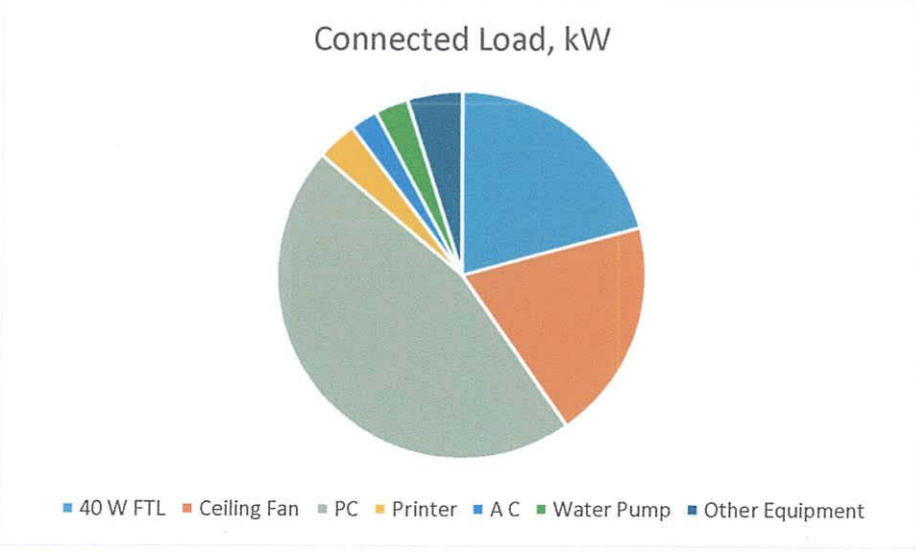
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	2000	40	80
2	Ceiling Fan	1150	65	74.75
3	PC	1180	150	177
4	Printer	90	150	13.5
5	A C	5	1875	9.375
6	Water Pump	5	2238	11.19
7	Other Equipment	125	150	18.75
8	**Total**			**384**

Chart No 1: Study of Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 3: Electrical Bill Analysis- 2016-17:

No	Month	Energy Purchased, kWh
1	Jul-16	32351
2	Aug-16	32754
3	Sep-16	35224
4	Oct-16	33248
5	Nov-16	27478
6	Dec-16	29977
7	Jan-17	32622
8	Feb-17	31949
9	Mar-17	37522
10	Apr-17	36961
11	May-17	31920
12	Jun-17	27294
13	Total	389299
14	Maximum	37522
15	Minimum	27294
16	Average	32441.6

Chart No 2: Variation in Monthly Energy Consumption:

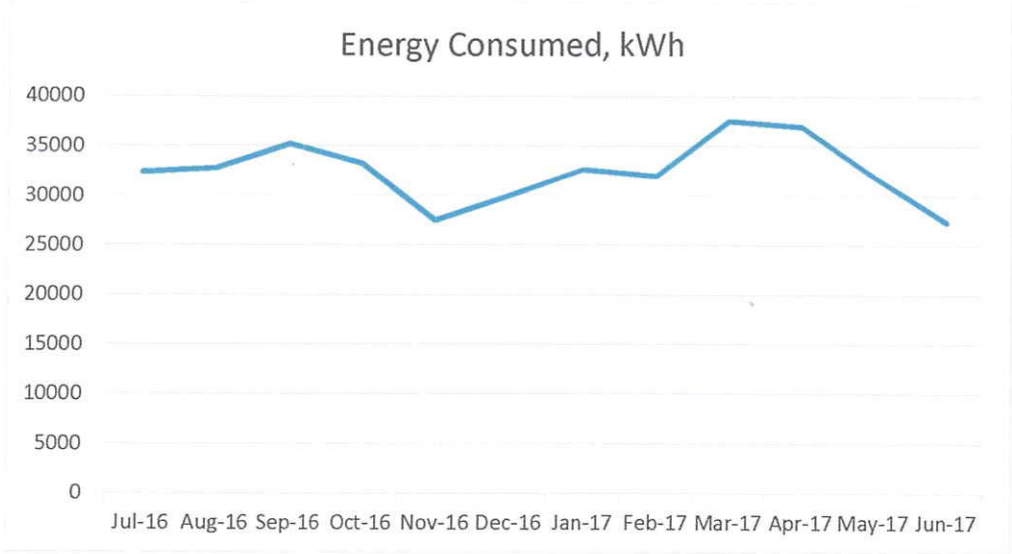


Table No 4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	389299
2	Maximum	37522
3	Minimum	27294
4	Average	32441.6

CHAPTER-IV
COMPUTATION OF CARBON FOOTPRINT

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 taking into account the usage of the Electrical Energy.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.8 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 5: Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jul-16	32351	25.88
2	Aug-16	32754	26.20
3	Sep-16	35224	28.18
4	Oct-16	33248	26.60
5	Nov-16	27478	21.98
6	Dec-16	29977	23.98
7	Jan-17	32622	26.10
8	Feb-17	31949	25.56
9	Mar-17	37522	30.02
10	Apr-17	36961	29.57
11	May-17	31920	25.54
12	Jun-17	27294	21.84
13	Total	**389299**	311.44
14	Maximum	37522	30.02
15	Minimum	27294	21.84
16	Average	32441.6	25.95

Chart No 3: Month wise CO_2 Emissions:

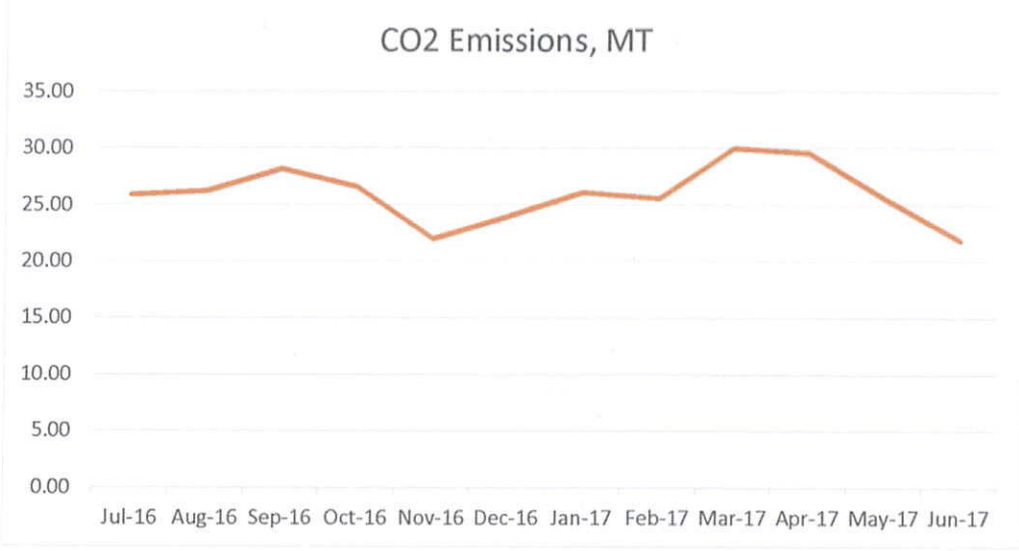


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	389299	311.44
2	Maximum	37522	30.02
3	Minimum	27294	21.84
4	Average	32441.6	25.95

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **25000 LPD.**

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Energy Purchased from MSEDCL	**289299**	**kWh**
2	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
3	100 LPD Solar Water Heating System saves	1500	kWh/Annum
4	Energy Saved by 25000 LPD System =(25000) * (1000) / (100)	375000	kWh
5	Usage Period in 2016-17	215	Nos
6	Energy Saved for 215 days of System operation in 16-17	**220890**	**kWh**
7	Total Energy Demand of College = **(1) + (6)**	**610190**	**kWh**
9	% of Usage of Alternate Energy to Total Annual Energy Demand= **(7)*100/ (8)**	**20.13**	%

Photograph of Solar Thermal Water Heating Plant:

CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

There are no LED Lights in the campus. Hence the percentage of Usage of LED Lighting Demand to Annual Lighting Demand works out to be zero percent.

GREEN AUDIT REPORT

of

Sinhgad Technical Education Society's,

SINHGAD COLLEGE OF ENGINEERING,

S. 44/1, Vadgaon (Bk.), Pune 411 041

Sinhgad Institutes

Year: 2016-17

Prepared by:

Enrich Consultants

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

ENRICH CONSULTANTS Pune

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

Maharashtra Energy Development Agency
(A Government of Maharashtra Institution)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006
Ph No: 020-26614393/266144403, Fax No: 020-26615031
Email: econ@mahaurja.com , Web: www.mahaurja.com

ECN/2014-15/CR-10/6038 14 November, 2014

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 under Save Energy Programme of MEDA.

Name and Address of the firm	:	Enrich Consultants Yashashree, Plot No. 26, Nirmal Baug Society, Parvati, Pune - 411009.
Registration Category	:	*Empanelled Consultant for Save Energy Programme.*
Registration Number	:	***MEDA/ECN/CR-10/2014-15/ EA-37***

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- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

Hemant H. Patil
(Hemant H. Patil)
Manager (EC)

ENRICH CONSULTANTS Pune

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/16-17/02 Date: 23/8/2017

CERTIFICATE

This is to certify that we have conducted Green Audit at Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041 in the Academic year 2016-17.

The College has adopted following Green Initiatives:

- Maximum Usage of Day Lighting
- Installation of Solar Thermal Water Heating Plant of Capacity 25000 LPD.
- Provision of Separate bins for Dry & Wet Waste
- Installation of Sewage Treatment Plant of Capacity 275 m^3/Day
- Maintenance of good Internal Road
- Tree Plantation in the campus

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

ENRICH CONSULTANTS Pune

A Y Mehendale,
Certified Energy Auditor
EA-8192

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad College of Engineering, S. No. 44/1, Vadgaon (Bk.), Pune 411 041, for awarding us the assignment of Green Audit of their Campus for the Academic Year: 2016-17.

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

EXECUTIVE SUMMARY

1. Sinhgad Technical Education Society's Sinhgad College of Engineering, Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emissions:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	389299	311.44
2	Maximum	37522	30.02
3	Minimum	27294	21.84
4	Average	32441.6	25.95

3. Various initiatives taken for Energy Conservation:

- Maximum Usage of Day Lighting
- Installation of **25000 LPD** Solar Water Heating System

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed Solar Thermal Water Heating Plant of Capacity **25000 LPD.**
- Equivalent Energy Saved Solar Thermal Plant is **220890 kWh.**
- Reduction in CO_2 Emissions in 2020-21 works out to be **177 MT.**

5. Waste Management:

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

5.2 Liquid Waste Management:

The College has installed Sewage Treatment Plant of Capacity **275 m^3/Day.** The treated Water is used for gardening purpose.

5.3 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

6. Green Practices:

- Maintenance of good Internal Road
- Maintenance of Internal Garden

7. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases **0.8 Kg** of CO_2 into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Electrical Energy per Annum.

8. References:

- For Energy saved by Solar Thermal Plant: www.mahaurja.com

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
STES	Sinhgad Technical Education Society
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 Objectives:

1. To study present Energy Consumption
2. To Study CO_2 emissions
3. To study usage of Renewable Energy
4. Study of Waste Management
5. Study of Rain Water Harvesting
6. Study of Green & Sustainable Practices

1.2 General Details of College: Table No 1:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad College of Engineering
2	Address	S. No. 41/1, Vadgaon (Bk), Pune
3	Affiliation	Savitribai Phule Pune University

CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills

Table No 2: Electrical Bill Analysis- 2016-17:

No	Month	Energy Purchased, kWh
1	Jul-16	32351
2	Aug-16	32754
3	Sep-16	35224
4	Oct-16	33248
5	Nov-16	27478
6	Dec-16	29977
7	Jan-17	32622
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Chart No 1: Variation in Monthly Energy Consumption:

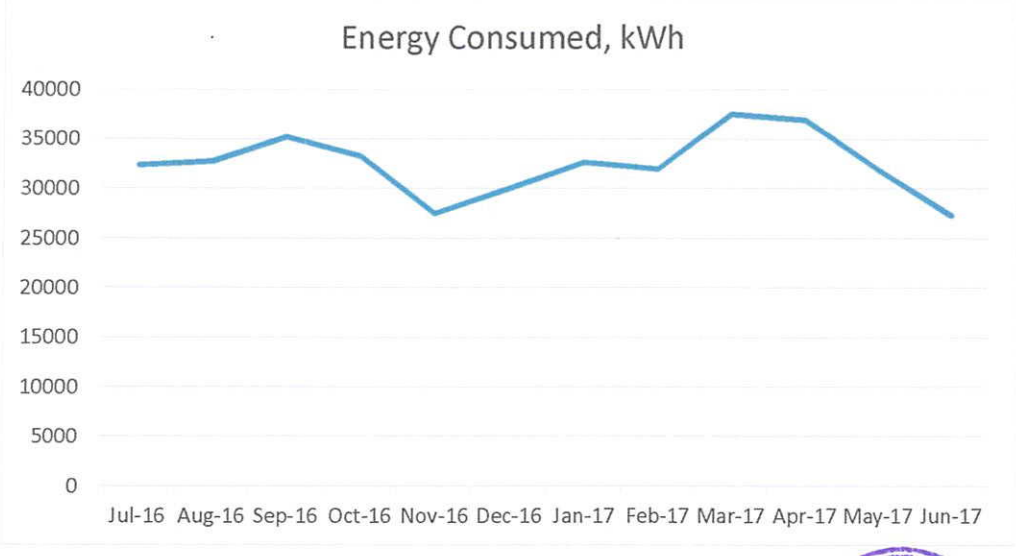

Table No 3: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	389299
2	Maximum	37522
3	Minimum	27294
4	Average	32441.6

CHAPTER III
COMPUTATION OF CARBON FOOT PRINT

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.

Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions is as under.

- **1 kWh** of Electrical Energy releases **0.8 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 4: Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jul-16	32351	25.88
2	Aug-16	32754	26.20
3	Sep-16	35224	28.18
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11	May-17	31920	25.54
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14	Maximum	37522	30.02
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16	Average	32441.6	25.95

Chart No 2: Month wise CO_2 Emissions:

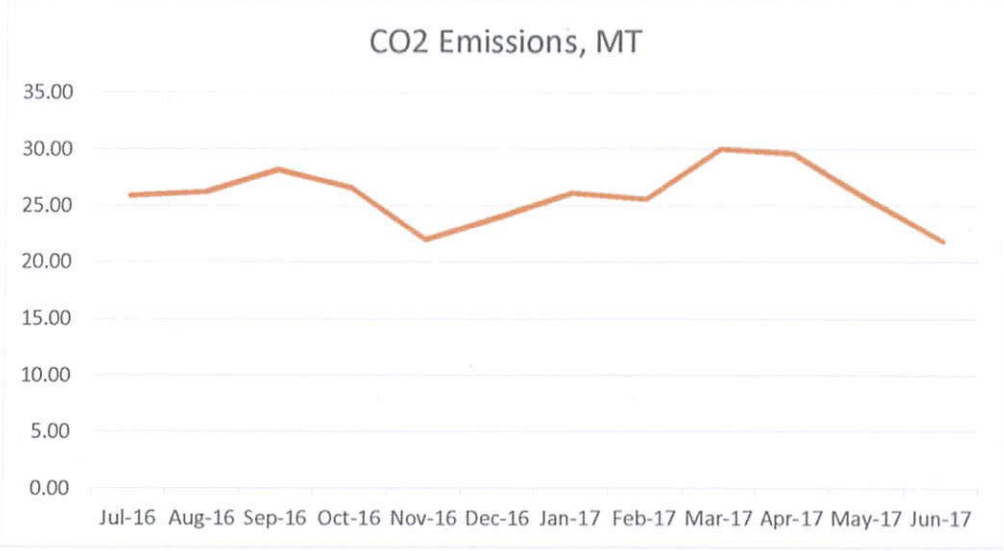

Table No 5: Variation in Important Parameters:

No	Parameter/ Value	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	389299	311.44
2	Maximum	37521.6	30.02
3	Minimum	27294	21.84
4	Average	32441.6	25.95

CHAPTER IV
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Solar Water Heating Plant of Capacity **25000 LPD**.

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Solar Water Heating Plant.

Table No 6: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Solar Thermal Water Heating Plant	25000	LPD
2	100 LPD Solar Water Heating System saves	1500	kWh/Annum
3	Energy Saved by 25000 LPD System =(25000) * (1000) / (100)	375000	kWh
4	Usage Period in 2016-17	215	Days
5	Energy Saved for 40 days of System operation in 16-17	**220890**	**kWh**
6	1 kWh of Electrical Energy is equivalent to	**0.8**	**Kg of CO_2**
7	Annual Reduction in CO_2 Emission = (5) * (6) /1000	**177**	**MT**

Photograph of Solar Thermal Water Heating Plant:

CHAPTER V
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:
The Waste is segregated at source and the recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

5.2 Liquid Waste Management:
The College has installed Sewage Treatment Plant of Capacity 275 m^3/Day. The treated Water is used for gardening purpose.

Photograph of Sewage Treatment Plant:

5.3 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

CHAPTER-VI
STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 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:

6.2 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation: