

ENVIRONMENTAL AUDIT REPORT
of
Dr. D. Y. Patil Pratishthan's,
Dr. D. Y. Patil Institute of Engineering Management
and Research, Akurdi, Pune



Year: 2020-21

Prepared by

Enrich Consultants,

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MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001:2000 Reg. no. - RD/91/2462



Maharashtra Energy Development Agency

(Government of Maharashtra Institution)

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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 Mukangan English School, Purvati,
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

Yashashree, 26, Nirmal Bag Society,
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Ref: EC/DYPIEMR/20-21/03

Date: 25/7/2021

CERTIFICATE

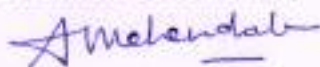
This is to certify that we have conducted Environmental Audit at Dr D Y Patil Pratishthan's Dr. D. Y. Patil Institute of Engineering Management and Research, Akurdi, Pune in the Academic year 2020-21.

The Institute has adopted following **Environment Friendly** practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting
- Installation of **20 kWp** Roof Top Solar PV Plant.
- Installation of **1500 LPD** Solar Thermal Water Heating System
- Segregation of Waste at source
- Installation of **100 KLPD** Sewage Treatment Plant
- Implementation of Rain Water Harvesting Project
- Provision of Sanitary Waste Incinerator
- Creation of awareness about Resource Conservation by Display of Posters

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

For Enrich Consultants,



A Y Mehendale,
Certified Energy Auditor
EA-8192



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ACKNOWLEDGEMENT

We at Enrich Consultants, Pune, express our sincere gratitude to the management of Dr D Y Patil Pratishthan's Dr. D. Y. Patil Institute of Engineering Management and Research, Akurdi, Pune, for awarding us the assignment of Environmental Audit of Akurdi campus for the Academic Year: 2020-21.

We are thankful to all the Head of the Departments & Staff members for helping us during the field study.



EXECUTIVE SUMMARY

1. Dr. D. Y. Patil Pratishthan's D Y Patil Institute of Engineering Management and Research, Akurdi, Pune consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

2. Pollution caused due to Institute Activities:

- **Air pollution:** Mainly CO₂ on account of Electricity & LPG Consumption
- **Solid Waste:** Bio degradable Waste, Garden Waste, Recyclable Waste and Human Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO₂ Emissions:

No	Parameter/Value	Energy Purchased, kWh	CO ₂ Emissions, MT
1	Total	61047	54.94
2	Maximum	9718	8.75
3	Minimum	2942	2.65
4	Average	5087.25	4.58

4. Various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
- Installation of **20 kWp** Roof Top Solar PV Plant
- Installation of **1500 LPD** Solar Thermal Water Heating System
- In campus Tree Plantation

5. Usage of Renewable Energy & CO₂ Emission Reduction:

- The Institute has installed **20 kWp** Roof Top Solar PV Plant.
- The Energy generated by Solar PV Plant in the Year: 20-21 is **24000 kWh**.
- The reduction in CO₂ Emissions due to Solar PV Plant in 20-21 is **21.6 MT**.

6. Indoor Air Quality:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	80	48	61
2	Minimum	71	43	52

7. Comfort Condition Parameters:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	29.4	54	187	54
2	Minimum	26.9	43	75	41



8. Waste Management:

8.1 Solid Waste Management:

8.1.1 Segregation of Waste at Source:

The waste is segregated at the source. There are Waste Collection Bins at various locations, to collect the Waste.

8.2 Liquid Waste Management:

The Institute has installed Sewage Treatment Plant of Capacity **100 KLPD**. The treated Water is used for watering the internal Garden.

8.3 E-Waste Management:

The E-Waste generated in the campus is disposed, through authorized vendors by calling the tenders, for disposal of E-Waste.

9. Rain Water Harvesting:

The Institute has installed Rain Water Harvesting Plant. The Rain Water is stored in an underground water tank and then is used for domestic purpose.

10. Environment Friendly Practices:

- Tree Plantation and Well maintained Garden.
- Provision of Sanitary Waste incinerator for disposal of Sanitary Waste
- Creation of Awareness in respect of Resource Conservation by displaying posters

11. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere
2. **1 kWp** Solar PV system generates **4 kWh** of Electrical Energy per Day
3. Annual Solar Energy Generation Days: **300 Nos**

12. References:

- For CO₂ Emission computation: www.tatapower.com
- For Solar PV Energy Generation: www.solarrooftop.gov.in
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI & Water Quality Standards: www.cpcb.com

ABBREVIATIONS

kWh	: kilo-Watt Hour
Qty	: Quantity
MT	: Metric Ton
CO ₂	: Carbon Di Oxide
kWp	: Kilo Watt Peak
AQI	: Air Quality Index
PM2.5	: Particulate Matter of Size 2.5 microns
PM 10	: Particulate Matter of Size 10 microns
CPCB	: Central Pollution Control Board
ISHARE	: 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 complied 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. Relevant Environmental Laws in India: Table No-1:

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

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

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 Audit Methodology:

1. Study of Institute as System
2. Study of present Energy Consumption
3. Study of CO₂ emissions & mitigation
4. Study of Indoor Air Quality
5. Study of Indoor Comfort Conditions
6. Study of Waste Management
7. Study of Rain Water Harvesting
8. Study of Environmental Friendly Initiatives

1.3 General Details of Institute: Table No: 4

No	Head	Particulars
1	Name	Dr. D. Y. Patil Pratishthan's Dr. D. Y. Patil Institute of Engineering Management and Research, Akurdi
2	Address	D Y Patil Educational Complex, Sector 29, Nigdi, Pradhikaran, Akurdi, Pune
3	Year of Establishment	2012-13



CHAPTER-II

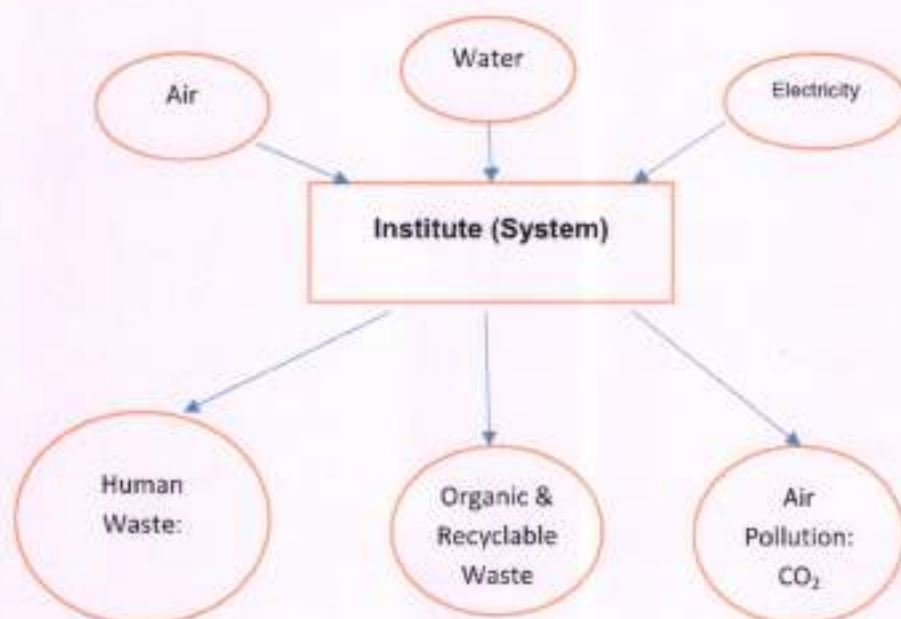
STUDY OF CONSUMPTION OF VARIOUS RESOURCES & CO₂ EMISSION

The Institute consumes following Natural/derived Resources:

1. Air
2. Water
3. Electrical Energy

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

Chart No 1: Representation of Institute as System:



A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities. Here we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the Institute for performing its day to day activities

The basis of Calculation for CO₂ emissions due to Electrical Energy is:

1 kWh of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere

Table No 5: Study of Energy Consumption & CO₂ Emission: 2020-21:

No	Month	Energy Purchased, kWh	CO ₂ Emission ,MT
1	Jul-20	2942	2.65
2	Aug-20	3663	3.30
3	Sep-20	4420	3.98

4	Oct-20	9718	8.75
5	Nov-20	4045	3.64
6	Dec-20	4592	4.13
7	Jan-21	7558	6.80
8	Feb-21	7276	6.55
9	Mar-21	5548	4.99
10	Apr-21	3998	3.60
11	May-21	3208	2.89
12	Jun-21	4079	3.67
13	Total	61047	54.94
14	Maximum	9718	8.75
15	Minimum	2942	2.65
16	Average	5087.25	4.58

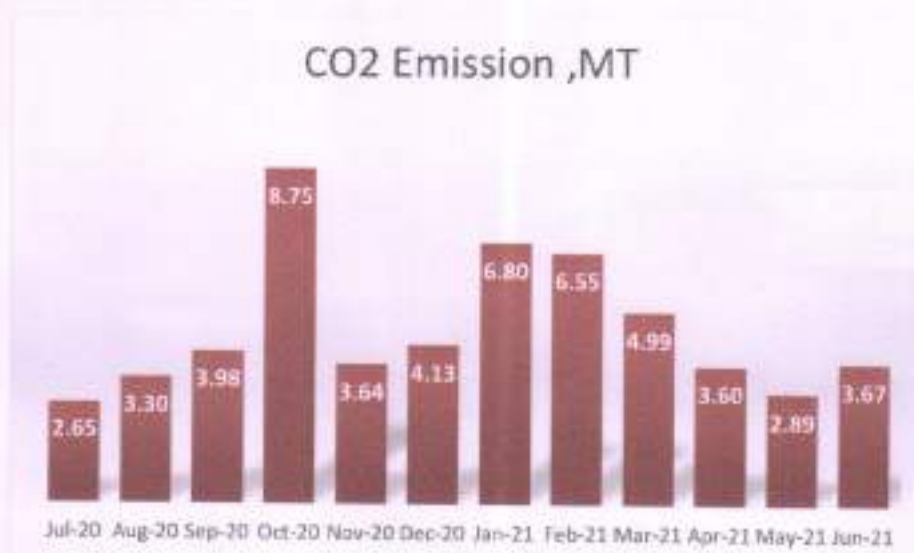
Chart No 2: Representation of Month wise CO₂ emissions:

Table No 6: Key Parameters:

No	Value	Energy Purchased, kWh	CO ₂ emissions, MT
1	Total	61047	54.94
2	Maximum	9718	8.75
3	Minimum	2942	2.65
4	Average	5087.25	4.58

CHAPTER-III

STUDY OF CO₂ EMISSION REDUCTION

The Institute has installed a Roof Top Solar PV Plant of capacity **20 kWp**. In the following Table we present the Annual Reduction in CO₂ Emissions due to Solar PV Plant.

Table No 7: Computation of Annual Reduction in CO₂ Emissions:

No	Particulars	Value	Unit
1	Installed Roof Top Solar PV Plant Capacity	20	kWp
2	Average Daily Energy Generated	4	kWh/kWp
3	Annual Generation Days	300	Nos
4	Annual Solar Energy Generated	24000	kWh
5	1 kWh of Electrical Energy emits	0.9	Kg of CO ₂
6	Annual Reduction in CO ₂ Emissions = (4) * (5) /1000	21.6	MT

Photograph of Roof Top Solar PV Plant:



CHAPTER IV

STUDY OF INDOOR AIR QUALITY

4.1 Importance of Air Quality:

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

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

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

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

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

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

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

4.2 Air Quality Index:

An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population. 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
3. PM 2.5- Particulate Matter of Size 2.5

Table No 8: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
	Basement			
1	Fluid Mechanics Lab	73	45	56



2	Workshop	80	48	61
3	Classroom	76	46	57
4	Heat Transfer Lab	75	45	61
	Ground Floor			
5	Admin section	71	43	54
6	Computer Faculty Room	75	45	56
7	Drawing Hall	71	43	55
8	Library	75	45	56
	First Floor			
9	E & TC Computer Lab	75	45	55
10	Classroom-24	80	48	58
11	1St Year Faculty Room	71	43	52
12	Seminar Hall	76	46	56
13	Maximum	80	48	61
14	Minimum	71	43	52

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 Parameters:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
	Basement				
1	Fluid Mechanics Lab	27.9	44	112	46
2	Workshop	27.3	49	91	45
3	Classroom	27	45	87	54
4	Heat Transfer Lab	26.9	44	89	52
	Ground Floor				
5	Admin section	28.2	43	84	43
6	Computer Faculty Room	27.6	48	87	46
7	Drawing Hall	28.1	49	120	46
8	Library	28.8	49	187	41
	First Floor				
9	E & TC Computer Lab	29.4	54	107	54
10	Classroom-24	29.2	54	110	49
11	1st Year Faculty Room	29.2	50	75	46
12	Seminar Hall	29.4	51	133	49
13	Maximum	29.4	54	187	54
14	Minimum	26.9	43	75	41

CHAPTER VI

STUDY OF WASTE MANAGEMENT

6.1 Solid Waste Management:

6.1.1 Provision of Separate Waste Collection Bins:

The Institute has good housekeeping practices. The Waste is segregated at source. Waste collection Bins are placed at strategic locations.

Photograph of Waste Collection Bin:



6.2 Liquid Waste Management:

The Institute has installed Sewage Treatment Plant of Capacity 100 KLPD. The treated Water is used for Watering the internal Garden.

Photograph of Sewage Treatment Plant:



6.3 E-Waste Management:

The E-Waste generated in the campus is disposed, through authorized vendors by calling the tenders, for disposal of E-Waste.

CHAPTER-VII

STUDY OF RAIN WATER HARVESTING

The Institute has installed Rain Water Harvesting System. The Water falling on the building terrace is collected and is stored in an underground Storage tank. Further it is used for domestic purpose.

Photograph of Rain Water Storage Tank:



CHAPTER-VIII

STUDY OF ENVIRONMENT FRIENDLY PRACTICES

8.1 Provision of Sanitary Waste Incinerator:

The Institute has installed a Sanitary Waste Incinerator, at Hostel Block to dispose of the Sanitary Waste.

Photograph of Sanitary Waste Incinerator:



7.2 Creation of Awareness about Resource Conservation:

The Institute has displayed Posters on Importance of Energy Conservation, appealing the stake holders to switch off the Equipment.

Photograph of Posters on importance of Energy Conservation:



ANNEXURE: 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 ^o C
2	Humidity	Less Than 70%