Dr D Y Patil Prathisthan's
PADMASHREE DR. D Y PATIL COLLEGE OF ARCHITECTURE
Sector No. 29, B/h. Akurdi Railway Station, Nigdi Pradhikaran, Akurdi, Pune - 411044

CRITERIA 7

Institutional Values and Best Practices

7.1 Institutional Values and Social Responsibilities

7.1.3

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Criterion 7 Institutional Values and Best Practices

Key Indicator 7.1.3

Metric No.	*Quality Audits and environment and energy regularly undertaken by the institution*
7.1.3	*The Institutional environment and energy initiative are confirmed through the following* *1. Green Audit / Environment Audit* *2. Energy Audit* *3.Clean and Green Campus Initiative* *4. Beyond the Campus Environmental Promotion Activities*

Sr. No	Contents (Documents)		
1	Supporting Documents	Date	Year
1	*Green Audit Reports*	*23/11/22*	(2021-22)
2	*Energy Audit Reports*	*23/11/22*	(2021-22)
3	*Environment Audit Report*	*23/11/22*	(2021-22)
1	*Green Audit Reports*	*15/10/21*	(2020-21)
2	*Energy Audit Reports*	*15/10/21*	(2020-21)
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2	*Energy Audit Reports*	*28/09/20*	(2019-20)
3	*Environment Audit Report*	*28/09/20*	(2019-20)
1	*Green Audit Reports*	*22/06/2019*	(2018-19)
2	*Energy Audit Reports*	*22/06/2019*	(2018-19)
1	*Green Audit Reports*	*15/06/2018*	(2017-18)
2	*Energy Audit Reports*	*15/06/2018*	(2017-18)
Sr. No	Contents (Documents)		

3	**Supporting Documents**	**Date**	**Year**
1	***Clean and Green Campus Initiative***		
2	***Tree Plantation***	***17/12/21***	***2021-2022***
3	***Tree Plantation***	***12/12/19***	***2019-2020***
4	***Tree Plantation***	***25/10/2018***	**2018-2019**
5	***Tree Plantation***	***25/10/2017***	**2017-2018**
6	***Tree Plantation***	***15/12/2017***	**2017-2018**
7.	***Certificates of Awards received from recognized agency on Green Campus***		
4	**Supporting Documents**	**Date**	**Year**
Beyond the Campus Environmental Promotion Activities			
4	***Earth Day***	***22/4/2023***	***2022-23***
2	***Tree plantation, Cleanliness Drive, Climate change awareness Programme***	***7/5/2023***	***2022-23***
5	***World Environment Day***	***5/6/2023***	***2022-23***

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Sector No. 29, B/h. Akurdi Railway Station, Nigdi Pradhikaran, Akurdi, Pune - 411044

ACADEMIC YEAR (2021-22)

Criterion 7 Institutional Values and Best Practices

Key Indicator 7.1.3

Metric No.	***Quality Audits and environment and energy regularly undertaken by the institution***
7.1.3	***The Institutional environment and energy initiative are confirmed through the following*** ***1. Green Audit / Environment Audit*** ***2. Energy Audit*** ***3.Clean and Green Campus Initiative*** ***4. Beyond the Campus Environmental Promotion Activities***

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2	***Energy Audit Reports***	***23/11/22***	**(2021-22)**
3	***Environment Audit Report***	***23/11/22***	**(2021-22)**

Report

On

Green Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2021-22)

PADMASHREE DR. D.Y.PATIL COLLEGE OF ARCHITECTURE

Prepared by

Nutan Urja Solutions

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Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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(ISO 9001:2015, ISO 50001:2018, ISO 14001:2015)

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Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 23/11/2022

CERTIFICATE

This is to certify that we have conducted Green Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for the year 2021–22.

The College has already adopted **Green** practices like:

- Installation of Rain Water Harvesting system
- Installation of Sewage Treatment Plant.
- Installation of **350 kW** Roof Top Solar PV Power Plant.
- Usage of Energy Efficient LED
- Usage of Energy Efficient BEE STAR Rated equipment

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

Nutan Urja Solutions,

K G Bhatwadekar,

Certified Energy Auditor,

EA - 22428

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
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Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for awarding us the assignment of Green Audit of their college premises.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

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Executive Summary

Green Audit of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

1. Present Energy Consumption

Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

Table no 1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	61,090	48.9
2	Minimum	5,778	4.6
3	Average	26,749	21.4
4	Total	320,982	256.8

2. Various Measures Adopted for Energy Conservation

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Usage of Renewable Energy

The institute has installed **350 kW** Solar PV Power Plant.

4. Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

5. Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

6. Notes and Assumptions

1. Daily working hours-10 Nos

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2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

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Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

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1. Introduction

Padmashree Dr. D. Y. Patil college of Architecture has been established in the year 2000. The college is run by Padmashree Dr. D. Y. Patil Pratishthan, which has set up multiple centers of educational excellence at Pune, Mumbai and Kolhapur. The Institute strongly believes that world-class education is the stepping-stone to progress. With a long-standing commitment towards quality teaching and learning, the Institute has nurtured values that go into the making of successful careers. Reiterating excellence with every incoming batch, the Institute stands tall with its undeterred commitment to deliver better. Equipped with state-of-the-art infrastructure, the Institute always encourages individuals to think, question, explore and apply their well-honed minds to scale newer heights of success. The Institute believes in imparting education that'll build world class citizens of tomorrow.

Padmashree Dr. D. Y. Patil college of Architecture fosters a positive environment for Teaching, Non-Teaching staff and Students to meet the emerging challenges which stimulates the desire to collaborate and change the world. Padmashree Dr. D. Y. Patil College of Architecture, a gem of an Institution has successfully completed a decade & is budding with young & energetic talent creating a mark in this grand galaxy of homes of higher learning. Here architecture means not merely a science & construction of building but it will be open vistas of ideas & ideals. It is indeed a center of fusion between creativity &utility. It has been bringing out the best talents in the field of housing, modern living & other aspects essential for better community life & will continue to do so in the future.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present CO_2 emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

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2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption. The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Padmashree D. Y. Patil Educational Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

Table no 2.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-22	60,107	1,003,847
2	May-22	58,729	971,594
3	Apr-22	61,090	950,973
4	Mar-22	19,896	939,385
5	Feb-22	19,896	353,758
6	Jan-22	18,439	337,486
7	Dec-21	31,210	491,033
8	Nov-21	19,909	368,776
9	Oct-21	8,754	491,033
10	Sep-21	11,203	368,776
11	Aug-21	5,778	203,048
12	Jul-21	5,971	184,510
	Total	**320,982**	**6,664,219**

Variation in energy consumption is as follows,

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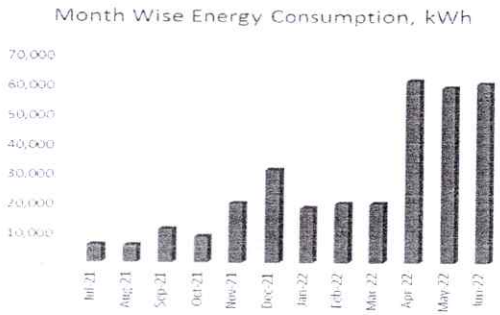

Figure 2.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

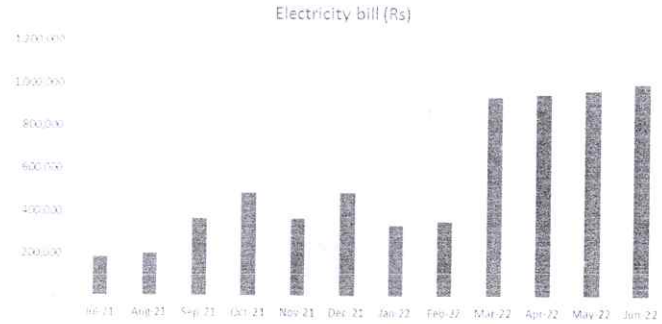

Figure 2.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 2.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	61,090	48.9
2	Minimum	5,778	4.6
3	Average	26,749	21.4
4	Total	320,982	256.8

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3. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

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

- 1 Unit (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.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. Calculation for CO_2 emissions due to Electrical Energy is carried for entire campus.

We herewith furnish the details of various forms of Energy consumption as under

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Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-22	60,107	48.1
2	May-22	58,729	47.0
3	Apr-22	61,090	48.9
4	Mar-22	19,896	15.9
5	Feb-22	19,896	15.9
6	Jan-22	18,439	14.8
7	Dec-21	31,210	25.0
8	Nov-21	19,909	15.9
9	Oct-21	8,754	7.0
10	Sep-21	11,203	9.0
11	Aug-21	5,778	4.6
12	Jul-21	5,971	4.8
	Total	**320,982**	**256.8**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

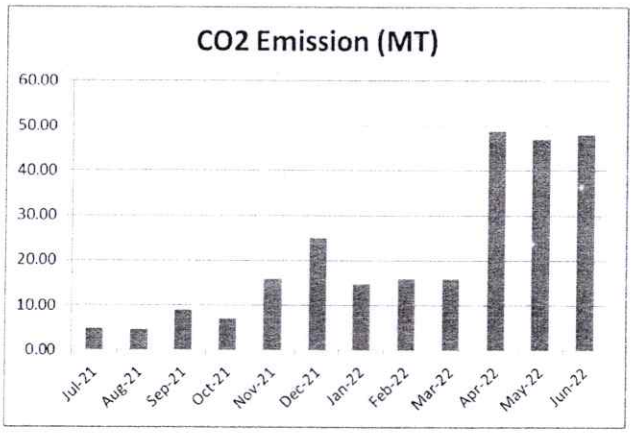

Figure 3.1: Month wise CO2 Emission

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4. Study of Usage of Alternate Energy

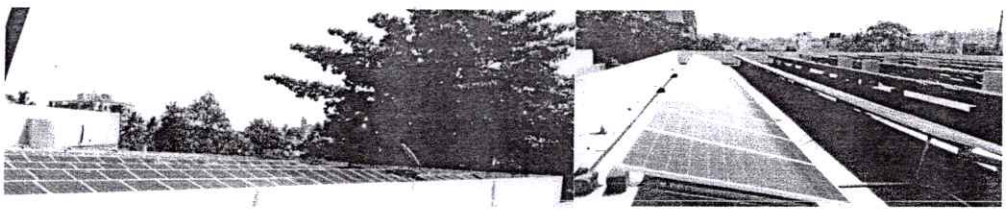
In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. The institute have installed Roof Top Solar PV System to cater energy requirement of all institutes of entire campus. The Installed Capacity of Solar PV Plant is **350 kWp**.

Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	320,982	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	400,572	kWh/Annum
3	Total Energy Requirement of College	721,554	kWh/Annum
4	% of Usage of Alternate Energy to Annual Energy Requirement	56	%

Photograph of Solar PV plant



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5. Study of Water System

5.1 Source of Water

College gets water from Pimpiri- Chinchwad Municipal Corporation. The RO treated water is provided for drinking.

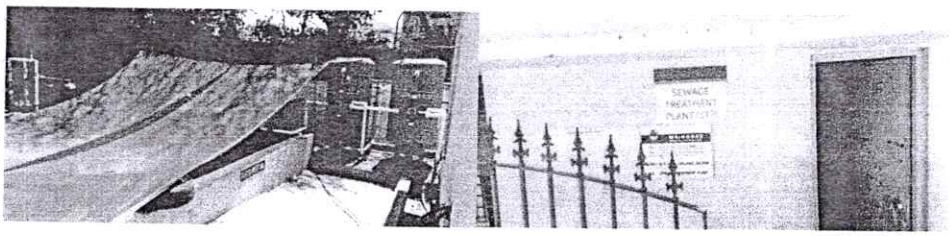
5.2 Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

5.3 Sewage Treatment Plant

The waste water generated in college campus is treated in Sewage Water Treatment Plant. This plant aims to remove contaminants from sewage to produce an effluent that is suitable for reuse application. The sewage water treatment plant is operating with 100 KLD water capacity.

Photograph of Sewage Treatment Plant



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6. Study of Waste Management

6.1 Solid Waste Management

The garbage collected in college is segregated into wet and dry centrally in campus. Waste bins are placed in college campus for collection of waste.

6.2 e-Waste Management

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

6.3 Waste Water Management

The waste water generated in college campus is treated in Sewage Water Treatment Plant. The sewage water treatment plant is operating with 100 KLD water capacity.

7. Study of Green Practices

7.1 No of students who don't use own Vehicle for coming to Institute

Student hostels are located near college campus only. Many students live in hostel campus. Many of the Out of total students coming to Institute, about 60% students use own Automobile. During the lockdown of Covid 19 negligible vehicles are reported on the campus during the year 2019-20 and 2020-21. Online teaching mode used for the teaching learning processes.

7.2 Usage of Public Transport

Padmashree D. Y. Patil Educational Complex campus can be conveniently reachable by public transport. Most of the staff is using own vehicles i.e cars and two wheelers. The capacity of parking is enough to accommodate all vehicles. During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Institute encourages students to not to use automobiles.

7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of Road within campus

7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste

- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

7.6 Food Service in college campus

There are canteens and cafeterias within college campus. Students need not to travel outside the college for food. Canteen contractor have Food license and shop act certificate. Hygiene in canteen is well maintained.

7.7 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

Figure 7.1: Beautiful maintained Garden of college

Report

On

Energy Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2021-22)

Prepared by

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Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 23/11/2022

CERTIFICATE

This is to certify that we have conducted Energy Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune as per the guidelines of Maharashtra Energy Development Agency (www.mahaurja.com) in the year 2021-22.

The College has already adopted **Energy Efficient** practices like:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of **350 kW** Roof Top Solar PV Power Plant.

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

Nutan Urja Solutions,

K G Bhatwadekar,
Certified Energy Auditor,
EA - 22428

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Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for awarding us the assignment of Energy Audit of their college premises.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures through energy savings. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 emissions. College consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table no 2.1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	61,090	48.87
2	Minimum	5,778	4.62
3	Average	26,749	21.40
4	Total	320,982	256.79

2. Energy Conservation Projects already installed

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Key Observations

1. Usage of LED lights.
2. Usage of star rated equipment.
3. Maintained a good power factor.

4. Percentage of Usage of Alternate Energy

The College has installed a Roof Top Solar PV Plant. The percentage of usage of Alternate Energy to Annual Energy Requirement is 56 %.

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5. Percentage of Usage of LED Lighting

The College has various Types of Light fittings. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 33 %.

6. Recommendations

Table no 1: Recommendations for energy savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 122 Nos T-8 fittings with 20W LED fittings	2,440	26,840	78,202	35
2	Replacement of 96 Nos Old Ceiling Fans with STAR rating fans	1,248	13,728	208,704	182
3	Installation of 200kW grid connected PV panel	300,000	3,300,000	10,000,000	36
	Total	**3,688**	**40,568**	**286,906**	**85**

7 Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

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Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

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Padmashree Dr. D Y Patil College of Architecture
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1. Introduction

Padmashree Dr. D. Y. Patil college of Architecture has been established in the year 2000. The college is run by Padmashree Dr. D. Y. Patil Pratishthan, which has set up multiple centers of educational excellence at Pune, Mumbai and Kolhapur. The Institute strongly believes that world-class education is the stepping-stone to progress. With a long-standing commitment towards quality teaching and learning, the Institute has nurtured values that go into the making of successful careers. Reiterating excellence with every incoming batch, the Institute stands tall with its undeterred commitment to deliver better. Equipped with state-of-the-art infrastructure, the Institute always encourages individuals to think, question, explore and apply their well-honed minds to scale newer heights of success. The Institute believes in imparting education that'll build world class citizens of tomorrow.

Padmashree Dr. D. Y. Patil college of Architecture fosters a positive environment for Teaching, Non-Teaching staff and Students to meet the emerging challenges which stimulates the desire to collaborate and change the world. Padmashree Dr. D. Y. Patil College of Architecture, a gem of an Institution has successfully completed a decade & is budding with young & energetic talent creating a mark in this grand galaxy of homes of higher learning. Here architecture means not merely a science & construction of building but it will be open vistas of ideas & ideals. It is indeed a center of fusion between creativity &utility. It has been bringing out the best talents in the field of housing, modern living & other aspects essential for better community life & will continue to do so in the future.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

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Akurdi, Pune

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1.3 General Details of College

Table No-1.1: Details of college

No	Head	Particulars
1	Name of Institution	Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune
2	Address	Padmashree D. Y. Patil Educational Complex, Sector 29, Nigdi, Akurdi, Maharashtra 411044
3	Affiliation	Savitribai Phule Pune University

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Akurdi, Pune

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2. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

Table No-2.1: Location wise study of Electrical fittings in various buildings

No	Location	FTL (40W)	LED tube (20W)	LED bulb (12W)	Computers (65W)	Ceiling Fans	Wall Fans	1.5 Tr Star rated AC
	Ground Floor							
1	Cafeteria		4			8		
2	Studio	17				12		
3	Kitchen		6					
4	Passage		14					
5	Vice Principal			10	1	1		
6	Admin Office			15	5			
7	Principal Office		2	12	1	2		1
8	First Year Studio	18		4		12		
9	Exam Central room		4		2		2	
10	CAP center	12				12		
11	Studio Third Year A	12			2	9		
12	Studio First Year B	10			2	6		
13	Staff Room			24			12	
14	Faculty Room		32		20		9	
15	Studio 403	15				9		
16	Studio 303	6				6		
17	Toillet (GF)	10		8		9		
	First Floor							
18	Toilet (First Floor)			8				
19	Passage	8						

20	Computer Lab	14	1		53	10		1
	Total	**122**	**63**	**81**	**86**	**96**	**23**	**2**

Apart from above load, the college has pumps, street lights. Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	122	40	4.9
2	LED Tube-20W	63	20	1.3
3	LED bulb	81	12	1.0
4	Computers	86	65	5.6
5	Ceiling Fans	96	65	6.2
6	Wall Fans	23	50	1.2
7	AC (1.5Tr Star Rated)	2	1838	3.7
8	LED focus Street light	5	35	0.2
9	Pumps (2 nos 5HP)			7.5
	Total			**18.7**

Data can be represented in terms of PIE chart as under,

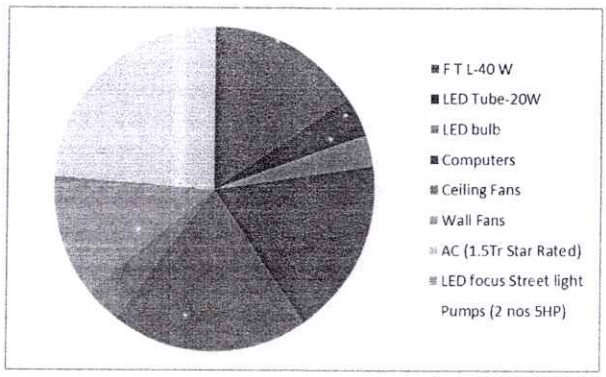

Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption. The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-22	60,107	1,003,847
2	May-22	58,729	971,594
3	Apr-22	61,090	950,973
4	Mar-22	19,896	939,385
5	Feb-22	19,896	353,758
6	Jan-22	18,439	337,486
7	Dec-21	31,210	491,033
8	Nov-21	19,909	368,776
9	Oct-21	8,754	491,033
10	Sep-21	11,203	368,776
11	Aug-21	5,778	203,048
12	Jul-21	5,971	184,510
	Total	**320,982**	**6,664,219**

Variation in energy consumption is as follows,

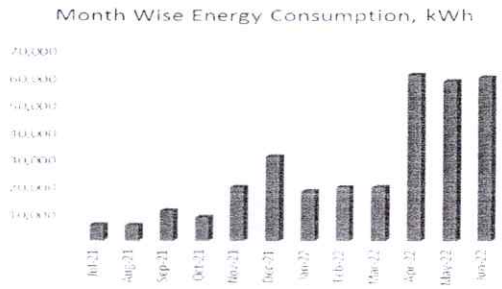

Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

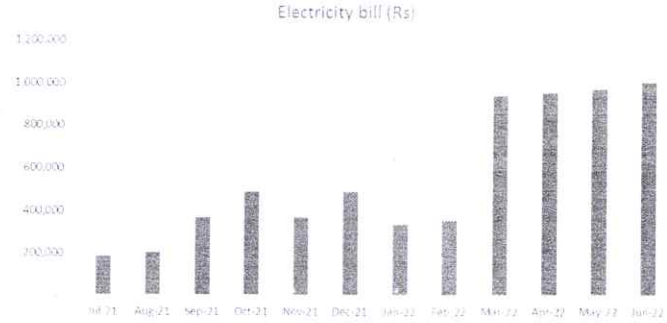

Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	61,090	48.87
2	Minimum	5,778	4.62
3	Average	26,749	21.40
4	Total	320,982	256.79

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4. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

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

- 1 Unit (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.

The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree Dr D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. Calculation for CO_2 emissions due to Electrical Energy is carried for entire campus.

We herewith furnish the details of various forms of Energy consumption as under

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Table 4.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-22	60,107	48.09
2	May-22	58,729	46.98
3	Apr-22	61,090	48.87
4	Mar-22	19,896	15.92
5	Feb-22	19,896	15.92
6	Jan-22	18,439	14.75
7	Dec-21	31,210	24.97
8	Nov-21	19,909	15.93
9	Oct-21	8,754	7.00
10	Sep-21	11,203	8.96
11	Aug-21	5,778	4.62
12	Jul-21	5,971	4.78
	Total	**320,982**	**256.79**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

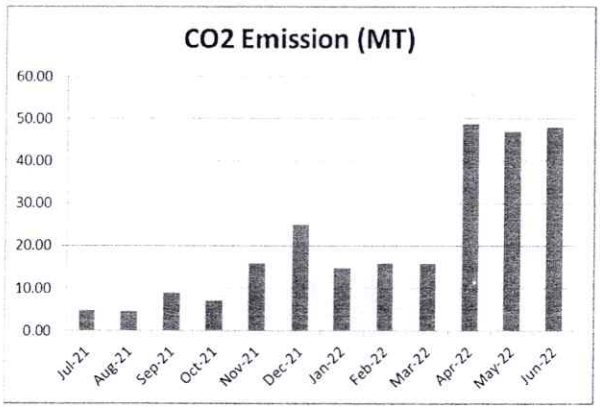

Figure 4.1: Month wise CO2 Emission

Padmashree Dr. D Y Patil College of Architecture, Akurdi Pune

5. Study of utilities

5.1 APFC Panel

The Office has already installed the APFC Panel. Capacitors of 110kVAR capacity is installed with panel.

5.2 Study of Lighting

In the facility, the lighting system can be divided mainly in to parts, indoor lighting and outdoor lighting. There are 122 FTL fittings with Electronic/ magnetic chokes , 63 nos of LED tubes, 81 nos of LED bulbs. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. There are 5 No of LED street lights.

5.3 Air-conditioners

There is 2 nos of star rated new AC of 1.5Tr capacity.

5.4 Fans

At building facility, there are about 96 Nos Old Ceiling Fans, which consumed about 65 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans. There are 23 nos of wall fans in the facility.

5.5 Water Pumps

There are in total 2 nos of Water pumps with 5HP capacities respectively.

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6. Study of usage of alternate energy

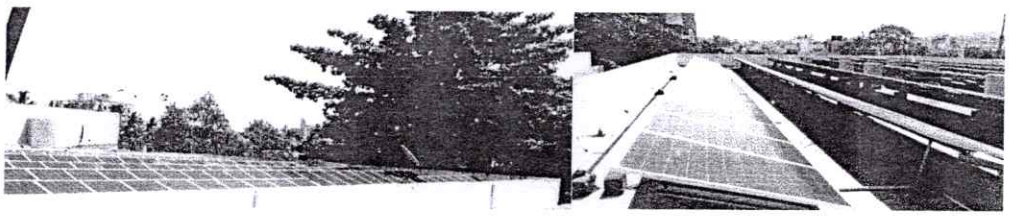
In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College.

The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Complex is having single energy meter for all institutes situated in complex. The institute have installed Roof Top Solar PV System to cater energy requirement of all institutes of entire campus. The Installed Capacity of Solar PV Plant is **350 kWp**.

Table 6.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	320,982	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	400,572	kWh/Annum
3	Total Energy Requirement of College	721,554	kWh/Annum
4	% of Usage of Alternate Energy to Annual Energy Requirement	56	%

Photograph of Solar PV plant



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7. Study of usage of LED lighting

In this chapter we study the lighting system of college and compute the percentage of total load catered by LED lighting.

Table 7.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	122	40	4.9
	LED lighting load			
1	LED tube	63	20	1.3
2	LED bulbs	81	12	1.0
3	LED street lights	5	35	0.2
	Total LED lighting load			**2.4**
	Total Lighting load			**7.3**

It can be seen that out of total lighting load 33% load is LED lighting load.

8. Energy conservation proposals

8.1 Replacement of Old T-8 FTLs with 20 W LED fittings

In the facility, there are about 122 Nos, T-8, FTL fittings with Electronic/magnetic chokes. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of T-8 fittings	122	Nos
2	Energy Demand of T-8 fitting	40	W/Unit
3	Energy Demand of 20 W LED fittin	20	W/Unit
4	Reduction in demad	20	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	9.76	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	2440	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	26840	Rs/Annum
11	Cost of 20 W LED Tube	641	Rs/Unit
12	Investment required	78202	Rs lump sum
13	Simple Payback period	35	Months

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8.2 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 96 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	96	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	52	W/Unit
4	Reduction in demad	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	4.992	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	1248	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	13728	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	208704	Rs lump sum
13	Simple Payback period	182	Months

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8.3 Installation of Solar PV panel

It is recommended to install 200 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of PV unit	200	kW
2	Energy saving	300000	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetory savings	3300000	Rs/ Annum
5	Investment required	10000000	Rs lump sum
6	Simple payback period	36	Months

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8.4 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 122 Nos T-8 fittings with 20W LED fittings	2,440	26,840	78,202	35
2	Replacement of 96 Nos Old Ceiling Fans with STAR rating fans	1,248	13,728	208,704	182
3	Installation of 200kW grid connected PV panel	300,000	3,300,000	10,000,000	36
	Total	**3,688**	**40,568**	**286,906**	**85**

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Akurdi Pune

Report

On

Environmental Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2021-22)

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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DR. D. Y. PATIL COLLEGE OF ARCHITECTURE
AR6558
AKURDI
PUNE-44.

PRINCIPAL
Dr. D. Y. Patil
College of Architecture
Akurdi, Pune - 411044

Nutan Urja Solutions

(ISO 9001:2015, ISO 50001:2018, ISO 14001:2015)

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 23/11/2022

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune in the year 2021-22.

The College has already adopted following projects for making the campus **Energy Efficient.**

- Installation of Sewage Treatment Plant
- Installation of Rain Water Harvesting System
- Installation of **350 kW** Solar PV Power Plant.

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

Nutan Urja Solutions,

K G Bhatwadekar,
Certified Energy Auditor,
EA – 22428

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DR. D. Y. PATIL COLLEGE OF ARCHITECTURE AR6538 AKURDIM PUNE -44.

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College of Architecture
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Akurdi, Pune - 411044

Acknowledgement

We at Nutan Urja Solutions, Pune wish to express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for assigning the work of Environmental Audit of college campus.

We appreciate the co-operation and support extended to our team members during the entire tenure of field study. We are also thankful to all other staff members who helped us during the Measurements at the field and for giving us the necessary inputs to carry out this vital exercise.

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Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the dependency on Natural resources & reduce the pollution.

Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune consumes various resources for day to day operations, namely: Air, Water, Electrical Energy & LPG.

1. Various Pollution due to College Activities:

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

2. Present Level of CO_2 Emissions:

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	61,090	48.9
2	Minimum	5,778	4.6
3	Average	26,749	21.4
4	Total	320,982	256.8

3. The various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
- Usage of Natural Day light in corridors
- Implementation of Rain Water Harvesting
- Installation of **350 kW** Solar PV Power Plant.
- Installation of Sewage Treatment Plant

4. Recommendations:

1. Installation of Bio Gas Generator Plant instead of Bio composting Plant.
2. Installation of Bio Composting Plant to generate fertilizer from garden waste.

5. Notes & Assumptions:

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

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2. 1 kWp Solar PV plant generates 5 kWh/day Electrical Energy for 300 days in an year.

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Abbreviations

AC	:	Air conditioner
PES	:	Progressive Education Society
CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd

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1. 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. 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

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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 Objectives

1. To study present usage of Natural resources the College is consuming
2. To Study the present pollution sources
3. To study various measures to make the campus Self sustainable in respect of Natural resources
4. To suggest the various measures to reduce the pollution: Air, Water, Noise

1.3 Audit Methodology:

1. Study of College as System
2. Study of Electrical Energy Consumption
3. Study of CO2 emissions
4. Suggestions on usage of Renewable Energy

1.4 General Details of College

No	Head	Particulars
1	Name of Institution	Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune
2	Address	Padmashree D. Y. Patil Educational Complex, Sector 29, Nigdi, Akurdi, Maharashtra 411044
3	Affiliation	Savitribai Phule Pune University

2. Study of Consumption of Various Resources

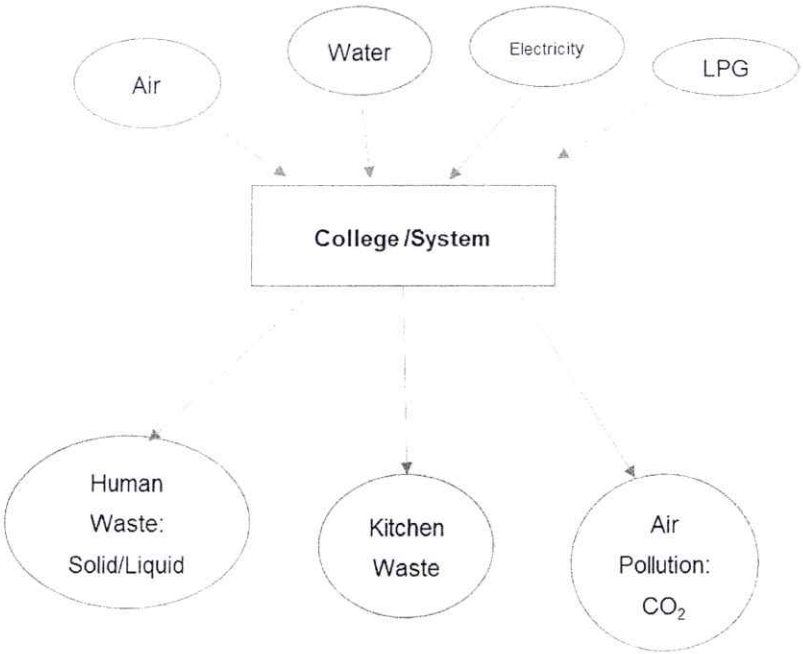
The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

Also, college emits following pollutants to environment

1. Human Waste: Solid/ Liquid
2. Kitchen waste
3. Air pollution

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



Now we compute the Generation of CO2 on account of consumption of Electrical Energy & LPG as under.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

The calculation of electrical energy consumption by college can be given as,

Table 2.1: Electrical Energy Consumption

No	Month	Energy (kWh)
1	Jun-22	60,107
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12	Jul-21	5,971
	Total	**320,982**
	Maximum	61,090
	Minimum	5,778
	Average	26,749

2.1 Variation of Monthly Electrical Energy Consumption

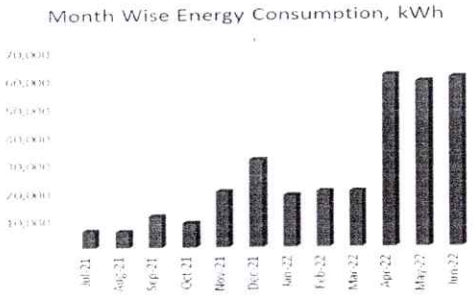


Figure 2.1 : Monthly Electrical Energy Consumption

2.2 Key Inference drawn

From the above analysis, we present following important parameters:

Table 2.2: Variation in Important Parameters

No	Parameter/ Value	Energy Consumed, kWh
1	**Maximum**	61,090
2	**Minimum**	5,778
3	**Average**	26,749
4	**Total**	320,982

3. Study of Environmental Pollution

In this Chapter, we present the various types of Pollution as under:

3.1 Air Pollution

The College is using two forms of Energies, namely: Thermal in the form of LPG and Electrical Energy used for day to day operations of the College. The major pollutant on account of above Energy forms is the Carbon Di Oxide.

- 1 unit (kWh) of Electrical Energy emits 0.8 Kg of CO_2 in the atmosphere
- 1 Kg of LPG emits 3 Kg of CO_2 in the atmosphere

In the following Table, we present the CO_2 emissions.

Table 3.1: Month wise Consumption of Electrical Energy & CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-22	60,107	48.1
2	May-22	58,729	47.0
3	Apr-22	61,090	48.9
4	Mar-22	19,896	15.9
5	Feb-22	19,896	15.9
6	Jan-22	18,439	14.8
7	Dec-21	31,210	25.0
8	Nov-21	19,909	15.9
9	Oct-21	8,754	7.0
10	Sep-21	11,203	9.0
11	Aug-21	5,778	4.6
12	Jul-21	5,971	4.8
	Total	**320,982**	**256.8**
	Maximum	61,090	48.9
	Minimum	5,778	4.6
	Average	26,749	21.4

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

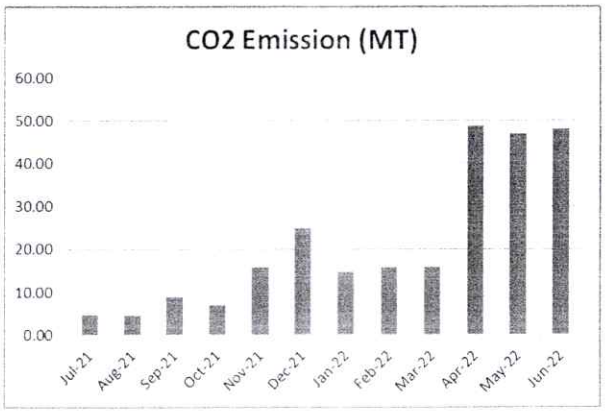


Figure 2.1: CO2 emission due to usage of electrical energy.

3.2 Study of Solid Waste Generation

The garbage collected in college is segregated into wet and dry centrally in campus. Waste bins are placed in college campus for collection of waste.

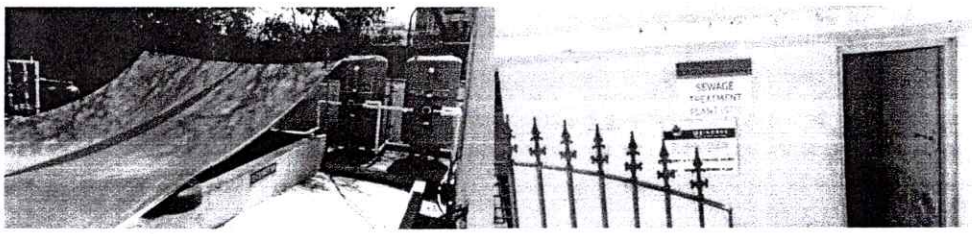
3.3 Canteen food wastage

The students and canteen staff are encouraged to have minimal food wastage. Canteen contractor have food license and shop act certificate. The canteen is encouraged for usage of paper tea cups.

3.4 Study of Liquid Waste Generation

The waste water generated in college campus is treated in Sewage Water Treatment Plant. This plant aims to remove contaminants from sewage to produce an effluent that is suitable for reuse application. The sewage water treatment plant is operating with 100 KLD water capacity.

Photograph of Sewage Treatment Plant



3.5 Study of e-Waste Management:

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

5. Recommendations

In order to reduce the dependency on Natural resources and also in order to reduce the various pollutions arising due to the day to day operations of the College we herewith recommend following recommendations.

- Installation of Bio Gas Generator Plant instead of Bio composting Plant.
- Installation of Bio Composting Plant to generate fertilizer from garden waste.

PRINCIPAL
Dr. D. Y. Patil
College of Architecture
Akurdi, Pune - 411044

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Dr D Y Patil Prathisthan's
PADMASHREE DR. D Y PATIL COLLEGE OF ARCHITECTURE
Sector No. 29, B/h. Akurdi Railway Station, Nigdi Pradhikaran, Akurdi, Pune - 411044

ACADEMIC YEAR (2020-21)

Criterion 7 Institutional Values and Best Practices

Key Indicator 7.1.3

Metric No.	***Quality Audits and environment and energy regularly undertaken by the institution***
7.1.3	***The Institutional environment and energy initiative are confirmed through the following*** ***1. Green Audit / Environment Audit*** ***2. Energy Audit*** ***3.Clean and Green Campus Initiative*** ***4. Beyond the Campus Environmental Promotion Activities***

Sr. No	**Contents (Documents)**		
A	**Supporting Documents**	**Date**	**Year**
1	***Green Audit Reports***	***15/10/21***	**(2020-21)**
2	***Energy Audit Reports***	***15/10/21***	**(2020-21)**
3	***Environment Audit Report***	***15/10/21***	**(2020-21)**

Report

On

Green Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2020-21)

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

NUTAN URJA SOLUTIONS

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Nutan Urja Solutions

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Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 15/10/2021

CERTIFICATE

This is to certify that we have conducted Green Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for the year 2020–21.

The College has already adopted **Green** practices like:

- Installation of Rain Water Harvesting system
- Installation of Sewage Treatment Plant.
- Installation of **350 kW** Roof Top Solar PV Power Plant.
- Usage of Energy Efficient LED
- Usage of Energy Efficient BEE STAR Rated equipment

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

Nutan Urja Solutions,

K G Bhatwadekar,
Certified Energy Auditor,
EA - 22428

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Contents

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi, Pune

Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for awarding us the assignment of Green Audit of their college premises.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture
Akurdi Pune

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Executive Summary

Green Audit of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

1. Present Energy Consumption

Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

Table no 1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	10,974	8.8
2	Minimum	2,942	2.4
3	Average	5,124	4.1
4	Total	61,482	49.2

2. Various Measures Adopted for Energy Conservation

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Usage of Renewable Energy

The institute has installed **350 kW** Solar PV Power Plant.

4. Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

5. Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

6. Notes and Assumptions

1. Daily working hours-10 Nos

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2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

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Akurdi Pune

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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1. Introduction

Padmashree Dr. D. Y. Patil college of Architecture has been established in the year 2000. The college is run by Padmashree Dr. D. Y. Patil Pratishthan, which has set up multiple centers of educational excellence at Pune, Mumbai and Kolhapur. The Institute strongly believes that world-class education is the stepping-stone to progress. With a long-standing commitment towards quality teaching and learning, the Institute has nurtured values that go into the making of successful careers. Reiterating excellence with every incoming batch, the Institute stands tall with its undeterred commitment to deliver better. Equipped with state-of-the-art infrastructure, the Institute always encourages individuals to think, question, explore and apply their well-honed minds to scale newer heights of success. The Institute believes in imparting education that'll build world class citizens of tomorrow.

Padmashree Dr. D. Y. Patil college of Architecture fosters a positive environment for Teaching, Non-Teaching staff and Students to meet the emerging challenges which stimulates the desire to collaborate and change the world. Padmashree Dr. D. Y. Patil College of Architecture, a gem of an Institution has successfully completed a decade & is budding with young & energetic talent creating a mark in this grand galaxy of homes of higher learning. Here architecture means not merely a science & construction of building but it will be open vistas of ideas & ideals. It is indeed a center of fusion between creativity &utility. It has been bringing out the best talents in the field of housing, modern living & other aspects essential for better community life & will continue to do so in the future.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present CO_2 emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

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2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption. The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Padmashree D. Y. Patil Educational Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

Table no 2.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-21	4,079	184,510
2	May-21	3,208	169,765
3	Apr-21	3,998	180,330
4	Mar-21	5,548	186,769
5	Feb-21	7,276	207,752
6	Jan-21	7,558	211,170
7	Dec-20	4,592	173,160
8	Nov-20	4,045	166,226
9	Oct-20	3,850	174,876
10	Sep-20	3,412	184,124
11	Aug-20	10,974	344,070
12	Jul-20	2,942	166,065
	Total	**61,482**	**2,348,817**

Variation in energy consumption is as follows,

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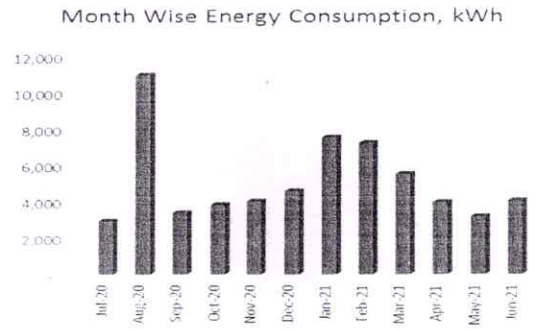

Figure 2.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

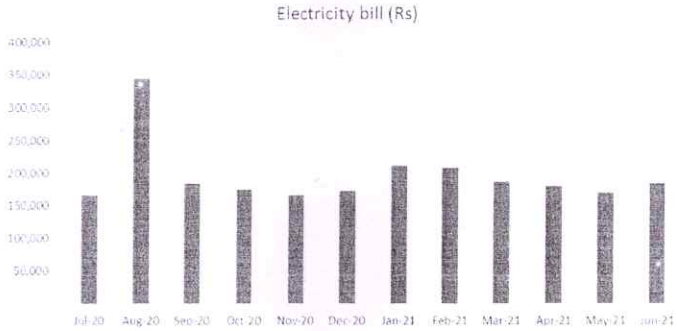

Figure 2.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 2.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	10,974	8.8
2	Minimum	2,942	2.4
3	Average	5,124	4.1
4	Total	61,482	49.2

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3. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

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

- 1 Unit (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.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. Calculation for CO_2 emissions due to Electrical Energy is carried for entire campus.

We herewith furnish the details of various forms of Energy consumption as under

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Akurdi Pune

Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-21	4,079	3.3
2	May-21	3,208	2.6
3	Apr-21	3,998	3.2
4	Mar-21	5,548	4.4
5	Feb-21	7,276	5.8
6	Jan-21	7,558	6.0
7	Dec-20	4,592	3.7
8	Nov-20	4,045	3.2
9	Oct-20	3,850	3.1
10	Sep-20	3,412	2.7
11	Aug-20	10,974	8.8
12	Jul-20	2,942	2.4
	Total	**61,482**	**49.2**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

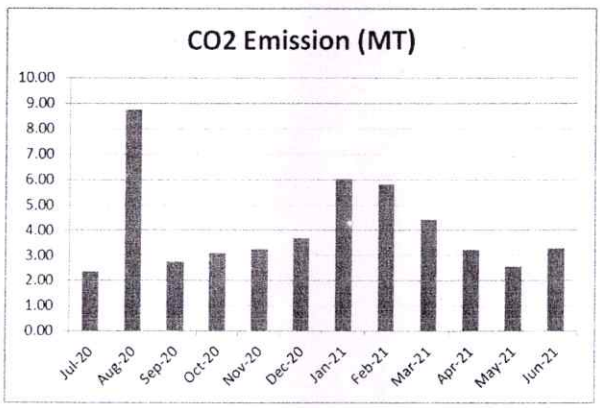

Figure 3.1: Month wise CO2 Emission

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4. Study of Usage of Alternate Energy

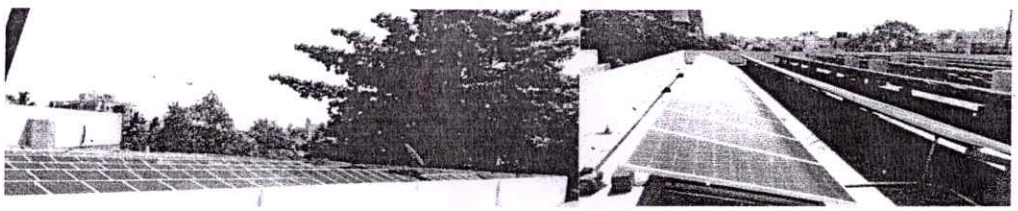
In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. The institute have installed Roof Top Solar PV System to cater energy requirement of all institutes of entire campus. The Installed Capacity of Solar PV Plant is **350 kWp**.

Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	61,482	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	380,614	kWh/Annum
3	Total Energy Requirement of College	442,096	kWh/Annum
4	% of Usage of Alternate Energy to Annual Energy Requirement	86	%

Photograph of Solar PV plant



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5. Study of Water System

5.1 Source of Water

College gets water from Pimpiri- Chinchwad Municipal Corporation. The RO treated water is provided for drinking.

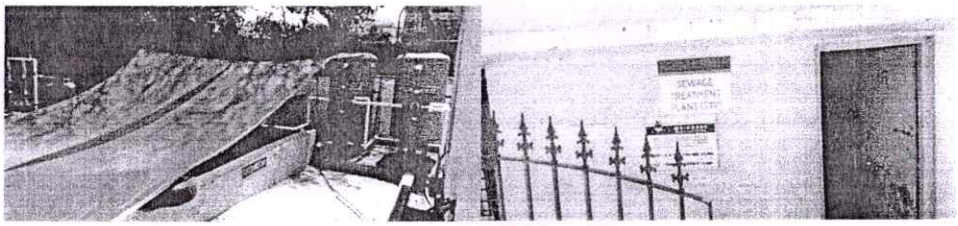
5.2 Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

5.3 Sewage Treatment Plant

The waste water generated in college campus is treated in Sewage Water Treatment Plant. This plant aims to remove contaminants from sewage to produce an effluent that is suitable for reuse application. The sewage water treatment plant is operating with 100 KLD water capacity.

Photograph of Sewage Treatment Plant



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6. Study of Waste Management

6.1 Solid Waste Management

The garbage collected in college is segregated into wet and dry centrally in campus. Waste bins are placed in college campus for collection of waste.

6.2 e-Waste Management

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

6.3 Waste Water Management

The waste water generated in college campus is treated in Sewage Water Treatment Plant. The sewage water treatment plant is operating with 100 KLD water capacity.

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7. Study of Green Practices

7.1 No of students who don't use own Vehicle for coming to Institute

Student hostels are located near college campus only. Many students live in hostel campus. Many of the Out of total students coming to Institute, about 60% students use own Automobile. During the lockdown of Covid 19 negligible vehicles are reported on the campus during the year 2019-20 and 2020-21. Online teaching mode used for the teaching learning processes.

7.2 Usage of Public Transport

Padmashree D. Y. Patil Educational Complex campus can be conveniently reachable by public transport. Most of the staff is using own vehicles i.e cars and two wheelers. The capacity of parking is enough to accommodate all vehicles. During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Institute encourages students to not to use automobiles.

7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of Road within campus

7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste

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Akurdi Pune

- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

7.6 Food Service in college campus

There are canteens and cafeterias within college campus. Students need not to travel outside the college for food. Canteen contractor have Food license and shop act certificate. Hygiene in canteen is well maintained.

7.7 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

Figure 7.1: Beautiful maintained Garden of college

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Report

On

Energy Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2020-21)

Prepared by

Nutan Urja Solutions

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Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 15/10/2021

CERTIFICATE

This is to certify that we have conducted Energy Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune as per the guidelines of Maharashtra Energy Development Agency (www.mahaurja.com) in the year 2020-21.

The College has already adopted **Energy Efficient** practices like:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of **350 kW** Roof Top Solar PV Power Plant.

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

Nutan Urja Solutions,

KGBhatwadekar

K G Bhatwadekar,
Certified Energy Auditor,
EA - 22428

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for awarding us the assignment of Energy Audit of their college premises.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures through energy savings. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 emissions. College consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table no 2.1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	10,974	8.8
2	Minimum	2,942	2.4
3	Average	5,124	4.1
4	Total	61,482	49.2

2. Energy Conservation Projects already installed

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Key Observations

1. Usage of LED lights.
2. Usage of star rated equipment.
3. Maintained a good power factor.

4. Percentage of Usage of Alternate Energy

The College has installed a Roof Top Solar PV Plant. The percentage of usage of Alternate Energy to Annual Energy Requirement is 86 %.

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5. Percentage of Usage of LED Lighting

The College has various Types of Light fittings. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 33 %.

6. Recommendations

Table no 1: Recommendations for energy savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 122 Nos T-8 fittings with 20W LED fittings	2,440	26,840	78,202	35
2	Replacement of 96 Nos Old Ceiling Fans with STAR rating fans	1,248	13,728	208,704	182
3	Installation of 200kW grid connected PV panel	300,000	3,300,000	10,000,000	36
	Total	**3,688**	**40,568**	**286,906**	**85**

7 Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
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kWh	:	kilo-Watt Hour
kVA	:	Active Power

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
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1. Introduction

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1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

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1.3 General Details of College

Table No-1.1: Details of college

No	Head	Particulars
1	Name of Institution	Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune
2	Address	Padmashree D. Y. Patil Educational Complex, Sector 29, Nigdi, Akurdi, Maharashtra 411044
3	Affiliation	Savitribai Phule Pune University

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Padmashree Dr. D Y Patil College of Architecture,
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2. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

Table No-2.1: Location wise study of Electrical fittings in various buildings

No	Location	FTL (40W)	LED tube (20W)	LED bulb (12W)	Computers (65W)	Ceiling Fans	Wall Fans	1.5 Tr Star rated AC
	Ground Floor							
1	Cafeteria		4			8		
2	Studio	17				12		
3	Kitchen		6					
4	Passage		14					
5	Vice Principal			10	1	1		
6	Admin Office			15	5			
7	Principal Office		2	12	1	2		1
8	First Year Studio	18		4		12		
9	Exam Central room		4		2		2	
10	CAP center	12				12		
11	Studio Third Year A	12			2	9		
12	Studio First Year B	10			2	6		
13	Staff Room			24			12	
14	Faculty Room		32		20		9	
15	Studio 403	15				9		
16	Studio 303	6				6		
17	Toillet (GF)	10		8		9		
	First Floor							
18	Toilet (First Floor)			8				
19	Passage	8						

20	Computer Lab	14	1		53	10		1
	Total	**122**	**63**	**81**	**86**	**96**	**23**	**2**

Apart from above load, the college has pumps, street lights. Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	122	40	4.9
2	LED Tube-20W	63	20	1.3
3	LED bulb	81	12	1.0
4	Computers	86	65	5.6
5	Ceiling Fans	96	65	6.2
6	Wall Fans	23	50	1.2
7	AC (1.5Tr Star Rated)	2	1838	3.7
8	LED focus Street light	5	35	0.2
9	Pumps (2 nos 5HP)			7.5
	Total			**18.7**

Data can be represented in terms of PIE chart as under,

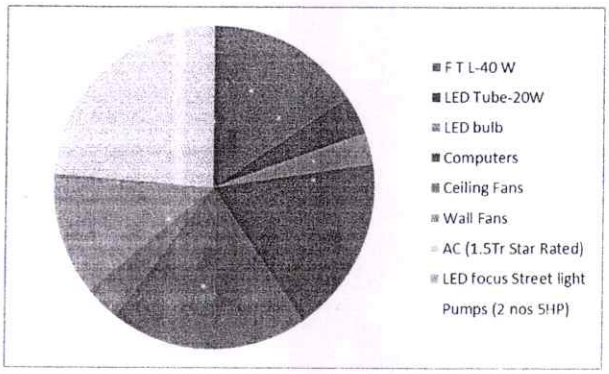

Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption. The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-21	4,079	184,510
2	May-21	3,208	169,765
3	Apr-21	3,998	180,330
4	Mar-21	5,548	186,769
5	Feb-21	7,276	207,752
6	Jan-21	7,558	211,170
7	Dec-20	4,592	173,160
8	Nov-20	4,045	166,226
9	Oct-20	3,850	174,876
10	Sep-20	3,412	184,124
11	Aug-20	10,974	344,070
12	Jul-20	2,942	166,065
	Total	**61,482**	**2,348,817**

Variation in energy consumption is as follows,

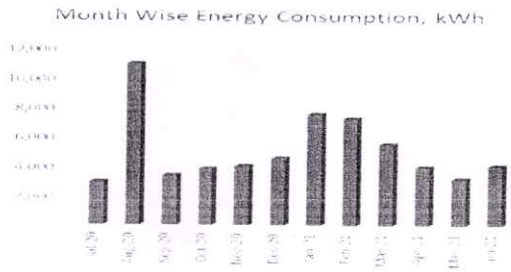

Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

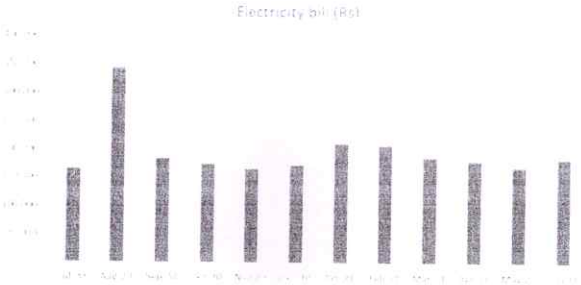

Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	10,974	8.8
2	Minimum	2,942	2.4
3	Average	5,124	4.1
4	Total	61,482	49.2

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4. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

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

- 1 Unit (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.

The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree Dr D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. Calculation for CO_2 emissions due to Electrical Energy is carried for entire campus.

We herewith furnish the details of various forms of Energy consumption as under

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Table 4.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-21	4,079	3.3
2	May-21	3,208	2.6
3	Apr-21	3,998	3.2
4	Mar-21	5,548	4.4
5	Feb-21	7,276	5.8
6	Jan-21	7,558	6.0
7	Dec-20	4,592	3.7
8	Nov-20	4,045	3.2
9	Oct-20	3,850	3.1
10	Sep-20	3,412	2.7
11	Aug-20	10,974	8.8
12	Jul-20	2,942	2.4
	Total	**61,482**	**49.2**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

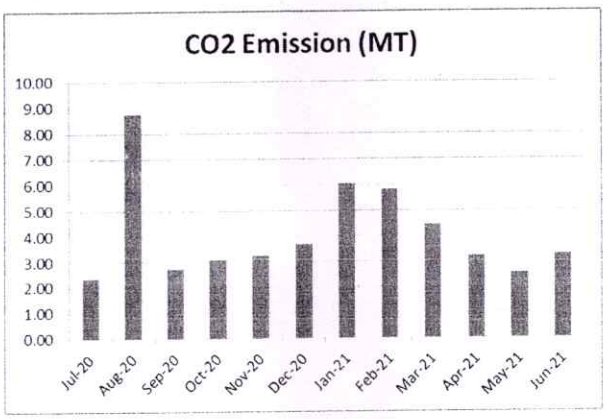

Figure 4.1: Month wise CO2 Emission

5. Study of utilities

5.1 APFC Panel

The Office has already installed the APFC Panel. Capacitors of 110kVAR capacity is installed with panel.

5.2 Study of Lighting

In the facility, the lighting system can be divided mainly in to parts, indoor lighting and outdoor lighting. There are 122 FTL fittings with Electronic/ magnetic chokes , 63 nos of LED tubes, 81 nos of LED bulbs. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. There are 5 No of LED street lights.

5.3 Air-conditioners

There is 2 nos of star rated new AC of 1.5Tr capacity.

5.4 Fans

At building facility, there are about 96 Nos Old Ceiling Fans, which consumed about 65 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans. There are 23 nos of wall fans in the facility.

5.5 Water Pumps

There are in total 2 nos of Water pumps with 5HP capacities respectively.

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6. Study of usage of alternate energy

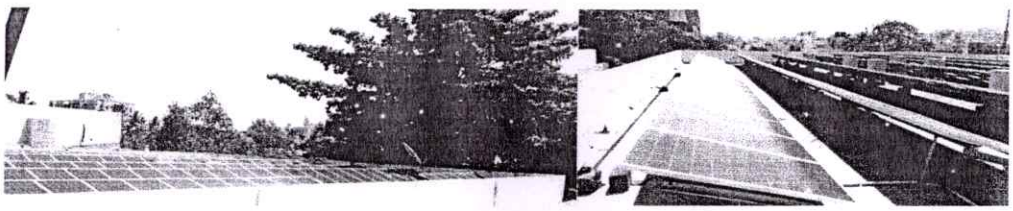
In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College.

The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Complex is having single energy meter for all institutes situated in complex. The institute have installed Roof Top Solar PV System to cater energy requirement of all institutes of entire campus. The Installed Capacity of Solar PV Plant is **350 kWp**.

Table 6.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	61,482	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	380,614	kWh/Annum
3	Total Energy Requirement of College	442,096	kWh/Annum
4	% of Usage of Alternate Energy to Annual Energy Requirement	86	%

Photograph of Solar PV plant



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7. Study of usage of LED lighting

In this chapter we study the lighting system of college and compute the percentage of total load catered by LED lighting.

Table 7.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	122	40	4.9
	LED lighting load			
1	LED tube	63	20	1.3
2	LED bulbs	81	12	1.0
3	LED street lights	5	35	0.2
	Total LED lighting load			**2.4**
	Total Lighting load			**7.3**

It can be seen that out of total lighting load 33% load is LED lighting load.

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8. Energy conservation proposals

8.1 Replacement of Old T-8 FTLs with 20 W LED fittings

In the facility, there are about 122 Nos, T-8, FTL fittings with Electronic/magnetic chokes. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of T-8 fittings	122	Nos
2	Energy Demand of T-8 fitting	40	W/Unit
3	Energy Demand of 20 W LED fittin	20	W/Unit
4	Reduction in demad	20	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	9.76	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	2440	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	26840	Rs/Annum
11	Cost of 20 W LED Tube	641	Rs/Unit
12	Investment required	78202	Rs lump sum
13	Simple Payback period	35	Months

8.2 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 96 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	96	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	52	W/Unit
4	Reduction in demad	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	4.992	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	1248	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	13728	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	208704	Rs lump sum
13	Simple Payback period	182	Months

8.3 Installation of Solar PV panel

It is recommended to install 200 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of PV unit	200	kW
2	Energy saving	300000	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetory savings	3300000	Rs/ Annum
5	Investment required	10000000	Rs lump sum
6	Simple payback period	36	Months

8.4 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 122 Nos T-8 fittings with 20W LED fittings	2,440	26,840	78,202	35
2	Replacement of 96 Nos Old Ceiling Fans with STAR rating fans	1,248	13,728	208,704	182
3	Installation of 200kW grid connected PV panel	300,000	3,300,000	10,000,000	36
	Total	**3,688**	**40,568**	**286,906**	**85**

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Report

On

Environmental Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2020-21)

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

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Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 15/10/2021

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune in the year 2020-21.

The College has already adopted following projects for making the campus **Energy Efficient.**

- Installation of Sewage Treatment Plant
- Installation of Rain Water Harvesting System
- Installation of **350 kW** Solar PV Power Plant.

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

Nutan Urja Solutions,

KGBhatwadekar

K G Bhatwadekar,
Certified Energy Auditor,
EA – 22428

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Acknowledgement

We at Nutan Urja Solutions, Pune wish to express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for assigning the work of Environmental Audit of college campus.

We appreciate the co-operation and support extended to our team members during the entire tenure of field study. We are also thankful to all other staff members who helped us during the Measurements at the field and for giving us the necessary inputs to carry out this vital exercise.

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Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the dependency on Natural resources & reduce the pollution.

Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune consumes various resources for day to day operations, namely: Air, Water, Electrical Energy & LPG.

1. Various Pollution due to College Activities:

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

2. Present Level of CO_2 Emissions:

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	10,974	8.8
2	Minimum	2,942	2.4
3	Average	5,124	4.1
4	Total	61,482	49.2

3. The various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
- Usage of Natural Day light in corridors
- Implementation of Rain Water Harvesting
- Installation of **350 kW** Solar PV Power Plant.
- Installation of Sewage Treatment Plant

4. Recommendations:

1. Installation of Bio Gas Generator Plant instead of Bio composting Plant.
2. Installation of Bio Composting Plant to generate fertilizer from garden waste.

5. Notes & Assumptions:

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

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2. 1 kWp Solar PV plant generates 5 kWh/day Electrical Energy for 300 days in an year.

Abbreviations

AC	:	Air conditioner
PES	:	Progressive Education Society
CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd

1. 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. 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 Objectives

1. To study present usage of Natural resources the College is consuming
2. To Study the present pollution sources
3. To study various measures to make the campus Self sustainable in respect of Natural resources
4. To suggest the various measures to reduce the pollution: Air, Water, Noise

1.3 Audit Methodology:

1. Study of College as System
2. Study of Electrical Energy Consumption
3. Study of CO2 emissions
4. Suggestions on usage of Renewable Energy

1.4 General Details of College

No	Head	Particulars
1	Name of Institution	Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune
2	Address	Padmashree D. Y. Patil Educational Complex, Sector 29, Nigdi, Akurdi, Maharashtra 411044
3	Affiliation	Savitribai Phule Pune University

2. Study of Consumption of Various Resources

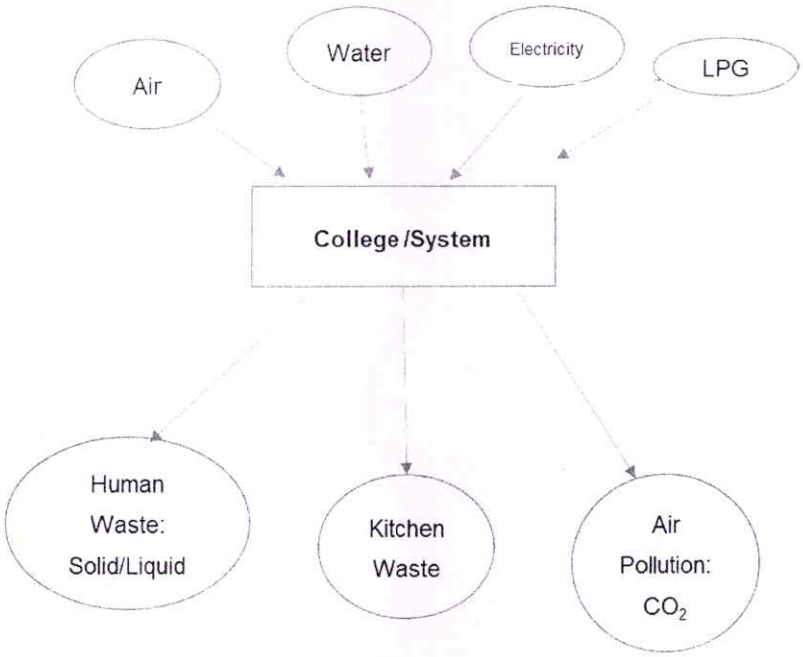
The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

Also, college emits following pollutants to environment

1. Human Waste: Solid/ Liquid
2. Kitchen waste
3. Air pollution

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



Now we compute the Generation of CO2 on account of consumption of Electrical Energy & LPG as under.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

The calculation of electrical energy consumption by college can be given as,

Table 2.1: Electrical Energy Consumption

No	Month	Energy (kWh)
1	Jun-21	4,079
2	May-21	3,208
3	Apr-21	3,998
4	Mar-21	5,548
5	Feb-21	7,276
6	Jan-21	7,558
7	Dec-20	4,592
8	Nov-20	4,045
9	Oct-20	3,850
10	Sep-20	3,412
11	Aug-20	10,974
12	Jul-20	2,942
	Total	**61,482**
	Maximum	10,974
	Minimum	2,942
	Average	5,124

2.1 Variation of Monthly Electrical Energy Consumption

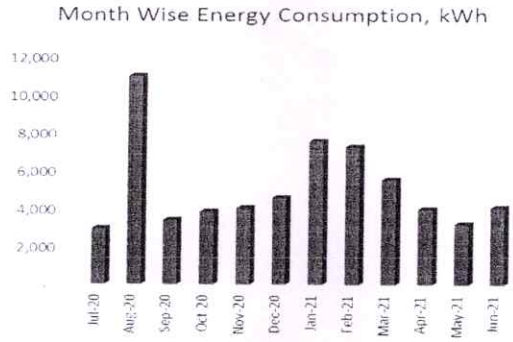


Figure 2.1 : Monthly Electrical Energy Consumption

2.2 Key Inference drawn

From the above analysis, we present following important parameters:

Table 2.2: Variation in Important Parameters

No	Parameter/ Value	Energy Consumed, kWh
1	**Maximum**	10,974
2	**Minimum**	2,942
3	**Average**	5,124
4	**Total**	61,482

3. Study of Environmental Pollution

In this Chapter, we present the various types of Pollution as under:

3.1 Air Pollution

The College is using two forms of Energies, namely: Thermal in the form of LPG and Electrical Energy used for day to day operations of the College. The major pollutant on account of above Energy forms is the Carbon Di Oxide.

- 1 unit (kWh) of Electrical Energy emits 0.8 Kg of CO_2 in the atmosphere
- 1 Kg of LPG emits 3 Kg of CO_2 in the atmosphere

In the following Table, we present the CO_2 emissions.

Table 3.1: Month wise Consumption of Electrical Energy & CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-21	4,079	3.3
2	May-21	3,208	2.6
3	Apr-21	3,998	3.2
4	Mar-21	5,548	4.4
5	Feb-21	7,276	5.8
6	Jan-21	7,558	6.0
7	Dec-20	4,592	3.7
8	Nov-20	4,045	3.2
9	Oct-20	3,850	3.1
10	Sep-20	3,412	2.7
11	Aug-20	10,974	8.8
12	Jul-20	2,942	2.4
	Total	**61,482**	**49.2**
	Maximum	10,974	8.8
	Minimum	2,942	2.4
	Average	5,124	4.1

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

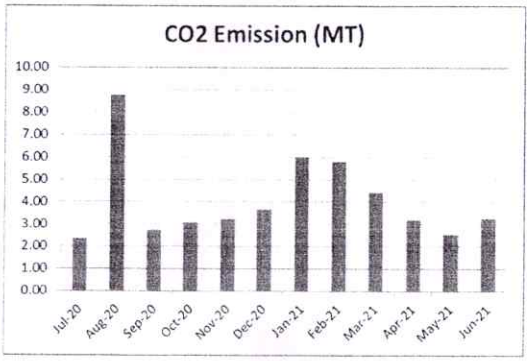


Figure 2.1: CO2 emission due to usage of electrical energy.

3.2 Study of Solid Waste Generation

The garbage collected in college is segregated into wet and dry centrally in campus. Waste bins are placed in college campus for collection of waste.

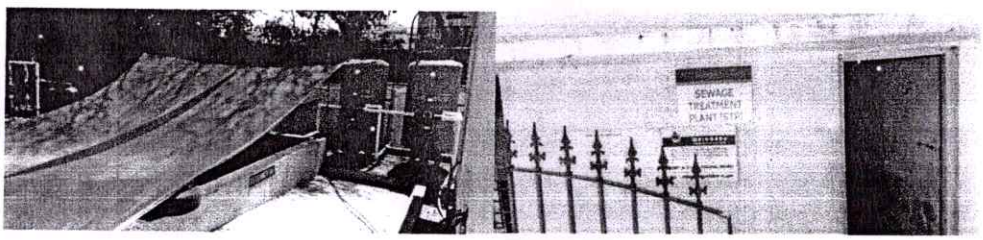
3.3 Canteen food wastage

The students and canteen staff are encouraged to have minimal food wastage. Canteen contractor have food license and shop act certificate. The canteen is encouraged for usage of paper tea cups.

3.4 Study of Liquid Waste Generation

The waste water generated in college campus is treated in Sewage Water Treatment Plant. This plant aims to remove contaminants from sewage to produce an effluent that is suitable for reuse application. The sewage water treatment plant is operating with 100 KLD water capacity.

Photograph of Sewage Treatment Plant



3.5 Study of e-Waste Management:

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

5. Recommendations

In order to reduce the dependency on Natural resources and also in order to reduce the various pollutions arising due to the day to day operations of the College we herewith recommend following recommendations.

- Installation of Bio Gas Generator Plant instead of Bio composting Plant.
- Installation of Bio Composting Plant to generate fertilizer from garden waste.

Dr D Y Patil Prathisthan's
PADMASHREE DR. D Y PATIL COLLEGE OF ARCHITECTURE
Sector No. 29, B/h. Akurdi Railway Station, Nigdi Pradhikaran, Akurdi, Pune - 411044

ACADEMIC YEAR (2019-20)

Dr D Y Patil Prathisthan's
PADMASHREE DR. D Y PATIL COLLEGE OF ARCHITECTURE
Sector No. 29, B/h. Akurdi Railway Station, Nigdi Pradhikaran, Akurdi, Pune - 411044

Criterion 7 Institutional Values and Best Practices

Key Indicator 7.1.3

Metric No.	*Quality Audits and environment and energy regularly undertaken by the institution*
7.1.3	*The Institutional environment and energy initiative are confirmed through the following* *1. Green Audit / Environment Audit* *2. Energy Audit* *3.Clean and Green Campus Initiative* *4. Beyond the Campus Environmental Promotion Activities*

Sr. No	Contents (Documents)		
A	Supporting Documents	Date	Year
1	*Green Audit Reports*	*28/09/20*	(2019-20)
2	*Energy Audit Reports*	*28/09/20*	(2019-20)
3	*Environment Audit Report*	*28/09/20*	(2019-20)

Report

On

Green Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2019-20)

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

NUTAN URJA SOLUTIONS

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 28/09/2020

CERTIFICATE

This is to certify that we have conducted Green Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for the year 2019–20.

The College has already adopted **Green** practices like:

- Installation of Rain Water Harvesting system
- Installation of Sewage Treatment Plant.
- Installation of **350 kW** Roof Top Solar PV Power Plant.
- Usage of Energy Efficient LED
- Usage of Energy Efficient BEE STAR Rated equipment

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

Nutan Urja Solutions,

K G Bhatwadekar,
Certified Energy Auditor,
EA - 22428

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for awarding us the assignment of Green Audit of their college premises.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Executive Summary

Green Audit of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

1. Present Energy Consumption

Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

Table no 1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	39,074	31.3
2	Minimum	265	0.2
3	Average	22,456	18.0
4	Total	269,471	215.6

2. Various Measures Adopted for Energy Conservation

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Usage of Renewable Energy

The institute has installed **350 kW** Solar PV Power Plant.

4. Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

5. Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

6. Notes and Assumptions

1. Daily working hours-10 Nos

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Akurdi Pune

2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

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Akurdi Pune

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

1. Introduction

Padmashree Dr. D. Y. Patil college of Architecture has been established in the year 2000. The college is run by Padmashree Dr. D. Y. Patil Pratishthan, which has set up multiple centers of educational excellence at Pune, Mumbai and Kolhapur. The Institute strongly believes that world-class education is the stepping-stone to progress. With a long-standing commitment towards quality teaching and learning, the Institute has nurtured values that go into the making of successful careers. Reiterating excellence with every incoming batch, the Institute stands tall with its undeterred commitment to deliver better. Equipped with state-of-the-art infrastructure, the Institute always encourages individuals to think, question, explore and apply their well-honed minds to scale newer heights of success. The Institute believes in imparting education that'll build world class citizens of tomorrow.

Padmashree Dr. D. Y. Patil college of Architecture fosters a positive environment for Teaching, Non-Teaching staff and Students to meet the emerging challenges which stimulates the desire to collaborate and change the world. Padmashree Dr. D. Y. Patil College of Architecture, a gem of an Institution has successfully completed a decade & is budding with young & energetic talent creating a mark in this grand galaxy of homes of higher learning. Here architecture means not merely a science & construction of building but it will be open vistas of ideas & ideals. It is indeed a center of fusion between creativity &utility. It has been bringing out the best talents in the field of housing, modern living & other aspects essential for better community life & will continue to do so in the future.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present CO_2 emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption. The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Padmashree D. Y. Patil Educational Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

Table no 2.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-20	3,240	170,142
2	May-20	265	162,544
3	Apr-20	3,214	169,792
4	Mar-20	6,674	211,400
5	Feb-20	36,554	616,859
6	Jan-20	34,248	579,602
7	Dec-19	31,500	532,538
8	Nov-19	23,942	430,041
9	Oct-19	24,164	455,439
10	Sep-19	35,724	712,655
11	Aug-19	30,872	522,504
12	Jul-19	39,074	507,043
	Total	**269,471**	**5,070,559**

Variation in energy consumption is as follows,

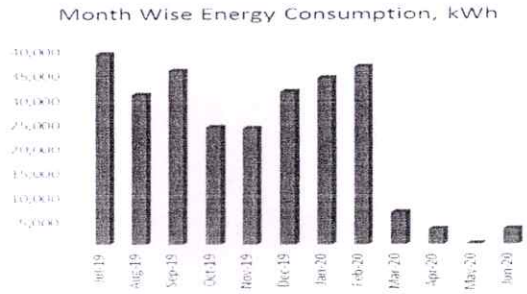

Figure 2.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

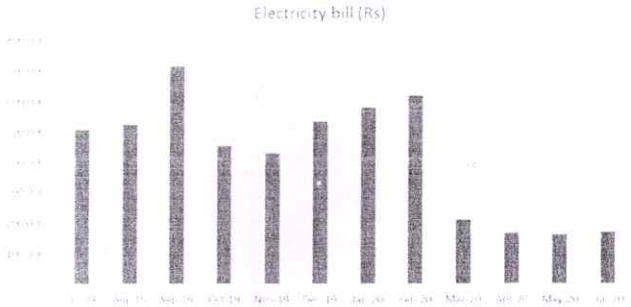

Figure 2.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 2.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	39,074	31.3
2	Minimum	265	0.2
3	Average	22,456	18.0
4	Total	269,471	215.6

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3. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

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

- 1 Unit (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.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. Calculation for CO_2 emissions due to Electrical Energy is carried for entire campus.

We herewith furnish the details of various forms of Energy consumption as under

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-20	3,240	2.6
2	May-20	265	0.2
3	Apr-20	3,214	2.6
4	Mar-20	6,674	5.3
5	Feb-20	36,554	29.2
6	Jan-20	34,248	27.4
7	Dec-19	31,500	25.2
8	Nov-19	23,942	19.2
9	Oct-19	24,164	19.3
10	Sep-19	35,724	28.6
11	Aug-19	30,872	24.7
12	Jul-19	39,074	31.3
	Total	**269,471**	**215.6**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

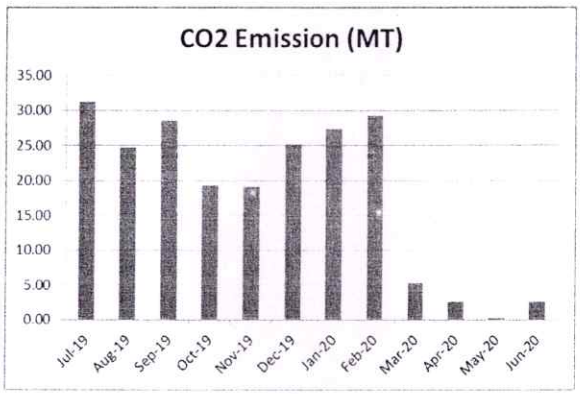

Figure 3.1: Month wise CO2 Emission

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

4. Study of Usage of Alternate Energy

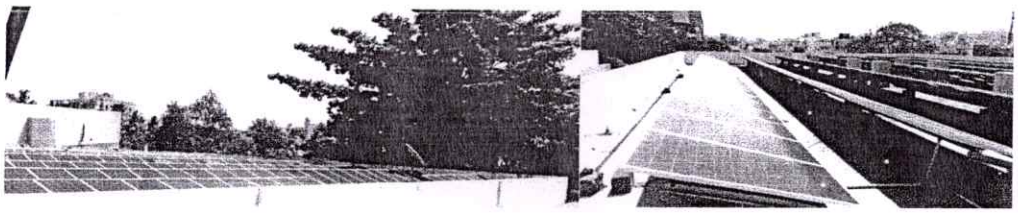
In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. The institute have installed Roof Top Solar PV System to cater energy requirement of all institutes of entire campus. The Installed Capacity of Solar PV Plant is **350 kWp**.

Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	269,471	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	343,271	kWh/Annum
3	Total Energy Requirement of College	612,742	kWh/Annum
4	% of Usage of Alternate Energy to Annual Energy Requirement	56	%

Photograph of Solar PV plant



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Akurdi Pune

5. Study of Water System

5.1 Source of Water

College gets water from Pimpiri- Chinchwad Municipal Corporation. The RO treated water is provided for drinking.

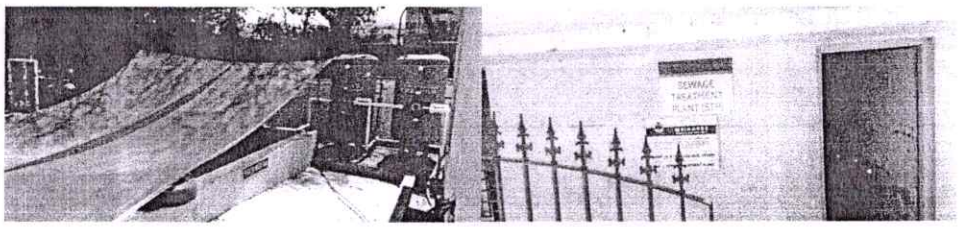
5.2 Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

5.3 Sewage Treatment Plant

The waste water generated in college campus is treated in Sewage Water Treatment Plant. This plant aims to remove contaminants from sewage to produce an effluent that is suitable for reuse application. The sewage water treatment plant is operating with 100 KLD water capacity.

Photograph of Sewage Treatment Plant



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6. Study of Waste Management

6.1 Solid Waste Management

The garbage collected in college is segregated into wet and dry centrally in campus. Waste bins are placed in college campus for collection of waste.

6.2 e-Waste Management

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

6.3 Waste Water Management

The waste water generated in college campus is treated in Sewage Water Treatment Plant. The sewage water treatment plant is operating with 100 KLD water capacity.

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

7. Study of Green Practices

7.1 No of students who don't use own Vehicle for coming to Institute

Student hostels are located near college campus only. Many students live in hostel campus. Many of the Out of total students coming to Institute, about 60% students use own Automobile. During the lockdown of Covid 19 negligible vehicles are reported on the campus during the year 2019-20. Online teaching mode used for the teaching learning processes.

7.2 Usage of Public Transport

Padmashree D. Y. Patil Educational Complex campus can be conveniently reachable by public transport. Most of the staff is using own vehicles i.e cars and two wheelers. The capacity of parking is enough to accommodate all vehicles. During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Institute encourages students to not to use automobiles.

7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of Road within campus

7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

- Display of boards in the campus for Plastic Free campus

7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

7.6 Food Service in college campus

There are canteens and cafeterias within college campus. Students need not to travel outside the college for food. Canteen contractor have Food license and shop act certificate. Hygiene in canteen is well maintained.

7.7 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

Figure 7.1: Beautiful maintained Garden of college

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Report

On

Energy Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2019-20)

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

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Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 28/09/2020

CERTIFICATE

This is to certify that we have conducted Energy Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune as per the guidelines of Maharashtra Energy Development Agency (www.mahaurja.com) in the year 2019-20.

The College has already adopted **Energy Efficient** practices like:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of **350 kW** Roof Top Solar PV Power Plant.

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

Nutan Urja Solutions,

KGBhatwadekar

K G Bhatwadekar,
Certified Energy Auditor,
EA - 22428

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for awarding us the assignment of Energy Audit of their college premises.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures through energy savings. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 emissions. College consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table no 2.1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	39,074	31.3
2	Minimum	265	0.2
3	Average	22,456	18.0
4	Total	269,471	215.6

2. Energy Conservation Projects already installed

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Key Observations

1. Usage of LED lights.
2. Usage of star rated equipment.
3. Maintained a good power factor.

4. Percentage of Usage of Alternate Energy

The College has installed a Roof Top Solar PV Plant. The percentage of usage of Alternate Energy to Annual Energy Requirement is 56 %.

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Akurdi Pune

5. Percentage of Usage of LED Lighting

The College has various Types of Light fittings. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 33 %.

6. Recommendations

Table no 1: Recommendations for energy savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 122 Nos T-8 fittings with 20W LED fittings	2,440	26,840	78,202	35
2	Replacement of 96 Nos Old Ceiling Fans with STAR rating fans	1,248	13,728	208,704	182
3	Installation of 200kW grid connected PV panel	300,000	3,300,000	10,000,000	36
	Total	**3,688**	**40,568**	**286,906**	**85**

7 Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

1.3 General Details of College

Table No-1.1: Details of college

No	Head	Particulars
1	Name of Institution	Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune
2	Address	Padmashree D. Y. Patil Educational Complex, Sector 29, Nigdi, Akurdi, Maharashtra 411044
3	Affiliation	Savitribai Phule Pune University

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

2. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

Table No-2.1: Location wise study of Electrical fittings in various buildings

No	Location	FTL (40W)	LED tube (20W)	LED bulb (12W)	Computers (65W)	Ceiling Fans	Wall Fans	1.5 Tr Star rated AC
	Ground Floor							
1	Cafeteria		4			8		
2	Studio	17				12		
3	Kitchen		6					
4	Passage		14					
5	Vice Principal			10	1	1		
6	Admin Office			15	5			
7	Principal Office		2	12	1	2		1
8	First Year Studio	18		4		12		
9	Exam Central room		4		2		2	
10	CAP center	12				12		
11	Studio Third Year A	12			2	9		
12	Studio First Year B	10			2	6		
13	Staff Room			24			12	
14	Faculty Room		32		20		9	
15	Studio 403	15				9		
16	Studio 303	6				6		
17	Toillet (GF)	10		8		9		
	First Floor							
18	Toilet (First Floor)			8				
19	Passage	8						

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Akurdi Pune

20	Computer Lab	14	1		53	10		1
	Total	**122**	**63**	**81**	**86**	**96**	**23**	**2**

Apart from above load, the college has pumps, street lights. Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	122	40	4.9
2	LED Tube-20W	63	20	1.3
3	LED bulb	81	12	1.0
4	Computers	86	65	5.6
5	Ceiling Fans	96	65	6.2
6	Wall Fans	23	50	1.2
7	AC (1.5Tr Star Rated)	2	1838	3.7
8	LED focus Street light	5	35	0.2
9	Pumps (2 nos 5HP)			7.5
	Total			**18.7**

Data can be represented in terms of PIE chart as under,

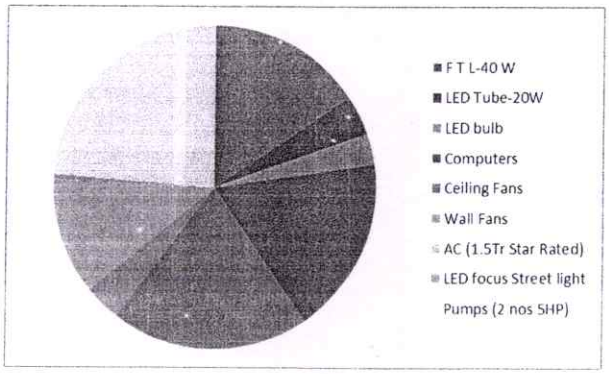

Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption. The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-20	3,240	170,142
2	May-20	265	162,544
3	Apr-20	3,214	169,792
4	Mar-20	6,674	211,400
5	Feb-20	36,554	616,859
6	Jan-20	34,248	579,602
7	Dec-19	31,500	532,538
8	Nov-19	23,942	430,041
9	Oct-19	24,164	455,439
10	Sep-19	35,724	712,655
11	Aug-19	30,872	522,504
12	Jul-19	39,074	507,043
	Total	**269,471**	**5,070,559**

Variation in energy consumption is as follows,

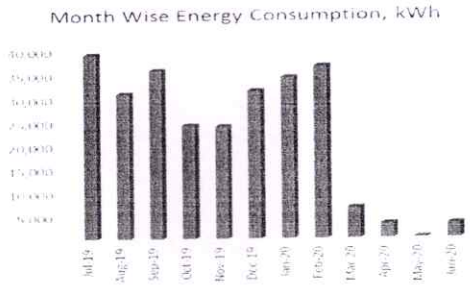

Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

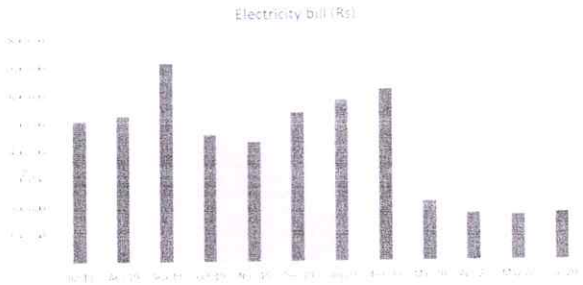

Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	39,074	31.3
2	Minimum	265	0.2
3	Average	22,456	18.0
4	Total	269,471	215.6

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4. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

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

- 1 Unit (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.

The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree Dr D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. Calculation for CO_2 emissions due to Electrical Energy is carried for entire campus.

We herewith furnish the details of various forms of Energy consumption as under

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Table 4.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-20	3,240	2.6
2	May-20	265	0.2
3	Apr-20	3,214	2.6
4	Mar-20	6,674	5.3
5	Feb-20	36,554	29.2
6	Jan-20	34,248	27.4
7	Dec-19	31,500	25.2
8	Nov-19	23,942	19.2
9	Oct-19	24,164	19.3
10	Sep-19	35,724	28.6
11	Aug-19	30,872	24.7
12	Jul-19	39,074	31.3
	Total	**269,471**	**215.6**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

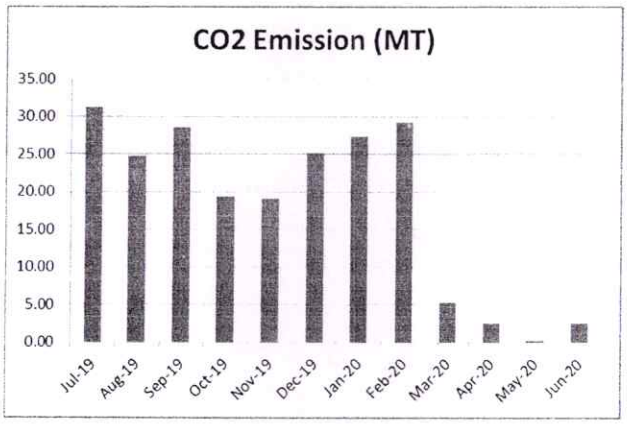

Figure 4.1: Month wise CO2 Emission

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Akurdi Pune

5. Study of utilities

5.1 APFC Panel

The Office has already installed the APFC Panel. Capacitors of 110kVAR capacity is installed with panel.

5.2 Study of Lighting

In the facility, the lighting system can be divided mainly in to parts, indoor lighting and outdoor lighting. There are 122 FTL fittings with Electronic/ magnetic chokes , 63 nos of LED tubes, 81 nos of LED bulbs. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. There are 5 No of LED street lights.

5.3 Air-conditioners

There is 2 nos of star rated new AC of 1.5Tr capacity.

5.4 Fans

At building facility, there are about 96 Nos Old Ceiling Fans, which consumed about 65 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans. There are 23 nos of wall fans in the facility.

5.5 Water Pumps

There are in total 2 nos of Water pumps with 5HP capacities respectively.

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Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

6. Study of usage of alternate energy

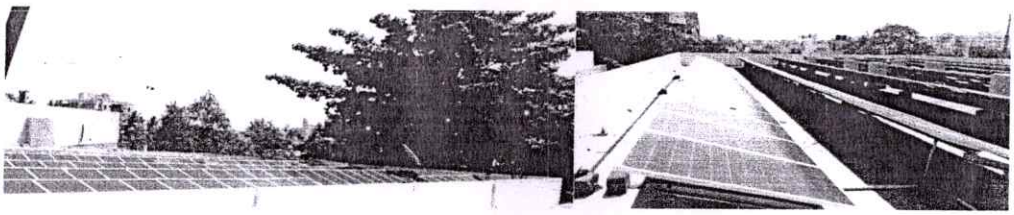
In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College.

The Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Complex is having single energy meter for all institutes situated in complex. The institute have installed Roof Top Solar PV System to cater energy requirement of all institutes of entire campus. The Installed Capacity of Solar PV Plant is **350 kWp**.

Table 6.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	269,471	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	343,271	kWh/Annum
3	Total Energy Requirement of College	612,742	kWh/Annum
4	% of Usage of Alternate Energy to Annual Energy Requirement	56	%

Photograph of Solar PV plant



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7. Study of usage of LED lighting

In this chapter we study the lighting system of college and compute the percentage of total load catered by LED lighting.

Table 7.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	122	40	4.9
	LED lighting load			
1	LED tube	63	20	1.3
2	LED bulbs	81	12	1.0
3	LED street lights	5	35	0.2
	Total LED lighting load			**2.4**
	Total Lighting load			**7.3**

It can be seen that out of total lighting load 33% load is LED lighting load.

8. Energy conservation proposals

8.1 Replacement of Old T-8 FTLs with 20 W LED fittings

In the facility, there are about 122 Nos, T-8, FTL fittings with Electronic/magnetic chokes. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of T-8 fittings	122	Nos
2	Energy Demand of T-8 fitting	40	W/Unit
3	Energy Demand of 20 W LED fittin	20	W/Unit
4	Reduction in demad	20	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	9.76	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	2440	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	26840	Rs/Annum
11	Cost of 20 W LED Tube	641	Rs/Unit
12	Investment required	78202	Rs lump sum
13	Simple Payback period	35	Months

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Akurdi Pune

8.2 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 96 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	96	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	52	W/Unit
4	Reduction in demad	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	4.992	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	1248	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	13728	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	208704	Rs lump sum
13	Simple Payback period	182	Months

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Akurdi Pune

8.3 Installation of Solar PV panel

It is recommended to install 200 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of PV unit	200	kW
2	Energy saving	300000	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetory savings	3300000	Rs/ Annum
5	Investment required	10000000	Rs lump sum
6	Simple payback period	36	Months

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8.4 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 122 Nos T-8 fittings with 20W LED fittings	2,440	26,840	78,202	35
2	Replacement of 96 Nos Old Ceiling Fans with STAR rating fans	1,248	13,728	208,704	182
3	Installation of 200kW grid connected PV panel	300,000	3,300,000	10,000,000	36
	Total	**3,688**	**40,568**	**286,906**	**85**

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Report

On

Environmental Audit

At

Padmashree Dr. D Y Patil College of Architecture

Akurdi,Pune

(Year 2019-20)

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

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Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 28/09/2020

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune in the year 2019-20.

The College has already adopted following projects for making the campus **Energy Efficient.**

- Installation of Sewage Treatment Plant
- Installation of Rain Water Harvesting System
- Installation of **350 kW** Solar PV Power Plant.

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

Nutan Urja Solutions,

K G Bhatwadekar,
Certified Energy Auditor,
EA – 22428

NUTAN URJA SOLUTIONS

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Table of Contents

Acknowledgement

We at Nutan Urja Solutions, Pune wish to express our sincere gratitude to the management of Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune for assigning the work of Environmental Audit of college campus.

We appreciate the co-operation and support extended to our team members during the entire tenure of field study. We are also thankful to all other staff members who helped us during the Measurements at the field and for giving us the necessary inputs to carry out this vital exercise.

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the dependency on Natural resources & reduce the pollution.

Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune consumes various resources for day to day operations, namely: Air, Water, Electrical Energy & LPG.

1. Various Pollution due to College Activities:

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

2. Present Level of CO_2 Emissions:

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	39,074	31.3
2	Minimum	265	0.2
3	Average	22,456	18.0
4	Total	269,471	215.6

3. The various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
- Usage of Natural Day light in corridors
- Implementation of Rain Water Harvesting
- Installation of **350 kW** Solar PV Power Plant.
- Installation of Sewage Treatment Plant

4. Recommendations:

1. Installation of Bio Gas Generator Plant instead of Bio composting Plant.
2. Installation of Bio Composting Plant to generate fertilizer from garden waste.

5. Notes & Assumptions:

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

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2. 1 kWp Solar PV plant generates 5 kWh/day Electrical Energy for 300 days in an year.

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Abbreviations

AC	:	Air conditioner
PES	:	Progressive Education Society
CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd

1. 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. 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

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Akurdi Pune

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 Objectives

1. To study present usage of Natural resources the College is consuming
2. To Study the present pollution sources
3. To study various measures to make the campus Self sustainable in respect of Natural resources
4. To suggest the various measures to reduce the pollution: Air, Water, Noise

1.3 Audit Methodology:

1. Study of College as System
2. Study of Electrical Energy Consumption
3. Study of CO2 emissions
4. Suggestions on usage of Renewable Energy

1.4 General Details of College

No	Head	Particulars
1	Name of Institution	Padmashree DR. D Y Patil College Of Architecture Akurdi, Pune
2	Address	Padmashree D. Y. Patil Educational Complex, Sector 29, Nigdi, Akurdi, Maharashtra 411044
3	Affiliation	Savitribai Phule Pune University

2. Study of Consumption of Various Resources

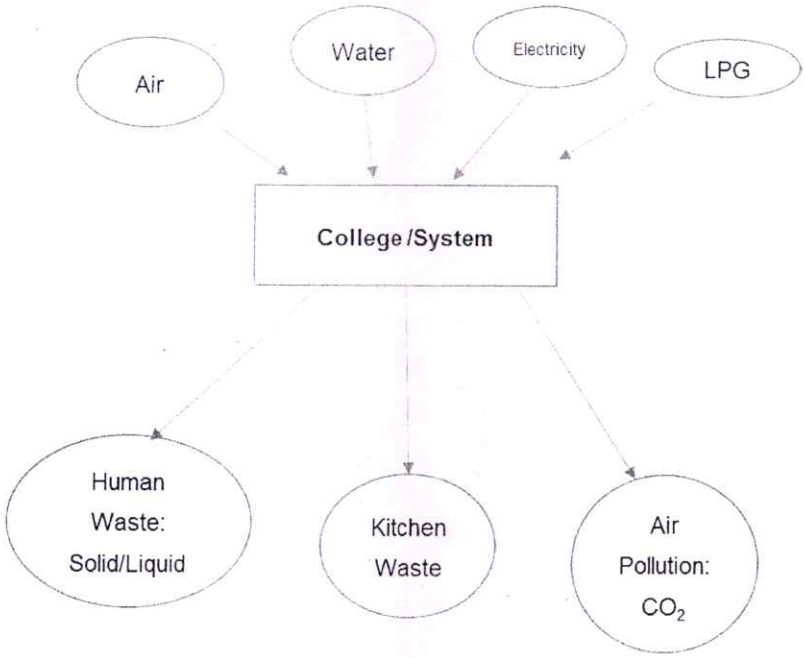
The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

Also, college emits following pollutants to environment

1. Human Waste: Solid/ Liquid
2. Kitchen waste
3. Air pollution

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



Now we compute the Generation of CO2 on account of consumption of Electrical Energy & LPG as under.

The Padmashree DR. D Y Patil College Of Architecture Akurdi,Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

The calculation of electrical energy consumption by college can be given as,

Table 2.1: Electrical Energy Consumption

No	Month	Energy (kWh)
1	Jun-20	3,240
2	May-20	265
3	Apr-20	3,214
4	Mar-20	6,674
5	Feb-20	36,554
6	Jan-20	34,248
7	Dec-19	31,500
8	Nov-19	23,942
9	Oct-19	24,164
10	Sep-19	35,724
11	Aug-19	30,872
12	Jul-19	39,074
	Total	**269,471**
	Maximum	39,074
	Minimum	265
	Average	22,456

2.1 Variation of Monthly Electrical Energy Consumption

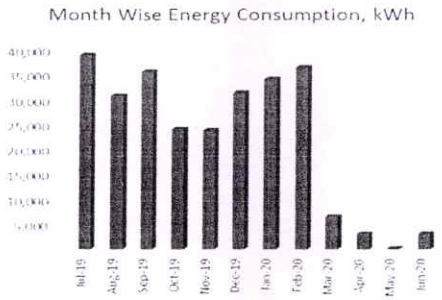


Figure 2.1 : Monthly Electrical Energy Consumption

2.2 Key Inference drawn

From the above analysis, we present following important parameters:

Table 2.2: Variation in Important Parameters

No	Parameter/ Value	Energy Consumed, kWh
1	**Maximum**	39,074
2	**Minimum**	265
3	**Average**	22,456
4	**Total**	269,471

3. Study of Environmental Pollution

In this Chapter, we present the various types of Pollution as under:

3.1 Air Pollution

The College is using two forms of Energies, namely: Thermal in the form of LPG and Electrical Energy used for day to day operations of the College. The major pollutant on account of above Energy forms is the Carbon Di Oxide.

- 1 unit (kWh) of Electrical Energy emits 0.8 Kg of CO_2 in the atmosphere
- 1 Kg of LPG emits 3 Kg of CO_2 in the atmosphere

In the following Table, we present the CO_2 emissions.

Table 3.1: Month wise Consumption of Electrical Energy & CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-20	3,240	2.6
2	May-20	265	0.2
3	Apr-20	3,214	2.6
4	Mar-20	6,674	5.3
5	Feb-20	36,554	29.2
6	Jan-20	34,248	27.4
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11	Aug-19	30,872	24.7
12	Jul-19	39,074	31.3
	Total	**269,471**	**215.6**
	Maximum	39,074	31.3
	Minimum	265	0.2
	Average	22,456	18.0

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

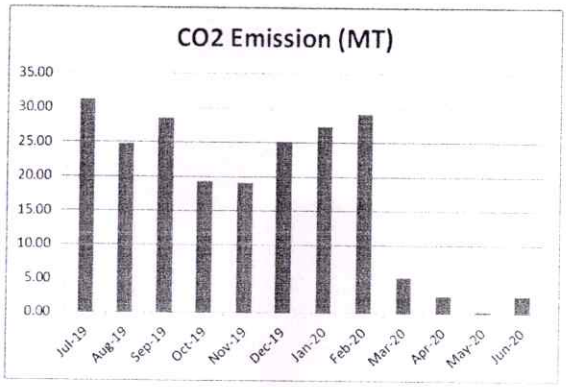


Figure 2.1: CO2 emission due to usage of electrical energy.

3.2 Study of Solid Waste Generation

The garbage collected in college is segregated into wet and dry centrally in campus. Waste bins are placed in college campus for collection of waste.

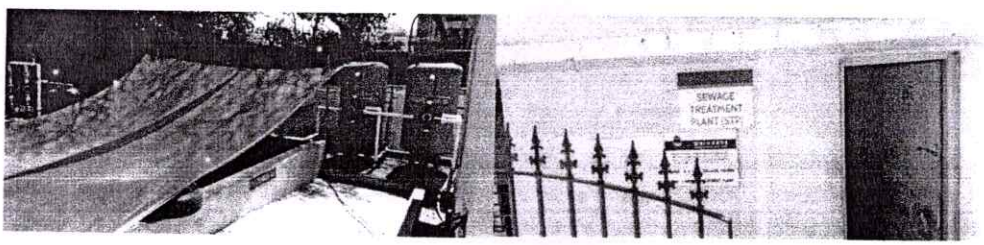
3.3 Canteen food wastage

The students and canteen staff are encouraged to have minimal food wastage. Canteen contractor have food license and shop act certificate. The canteen is encouraged for usage of paper tea cups.

3.4 Study of Liquid Waste Generation

The waste water generated in college campus is treated in Sewage Water Treatment Plant. This plant aims to remove contaminants from sewage to produce an effluent that is suitable for reuse application. The sewage water treatment plant is operating with 100 KLD water capacity.

Photograph of Sewage Treatment Plant



3.5 Study of e-Waste Management:

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

5. Recommendations

In order to reduce the dependency on Natural resources and also in order to reduce the various pollutions arising due to the day to day operations of the College we herewith recommend following recommendations.

- Installation of Bio Gas Generator Plant instead of Bio composting Plant.
- Installation of Bio Composting Plant to generate fertilizer from garden waste.

Dr D Y Patil Prathisthan's
PADMASHREE DR. D Y PATIL COLLEGE OF ARCHITECTURE
Sector No. 29, B/h. Akurdi Railway Station, Nigdi Pradhikaran, Akurdi, Pune - 411044

ACADEMIC YEAR (2018-19)

Dr D Y Patil Prathisthan's
PADMASHREE DR. D Y PATIL COLLEGE OF ARCHITECTURE
Sector No. 29, B/h. Akurdi Railway Station, Nigdi Pradhikaran, Akurdi, Pune - 411044

Criterion 7 Institutional Values and Best Practices

Key Indicator 7.1.3

Metric No.	*Quality Audits and environment and energy regularly undertaken by the institution*
7.1.3	*The Institutional environment and energy initiative are confirmed through the following* *1. Green Audit / Environment Audit* *2. Energy Audit* *3.Clean and Green Campus Initiative* *4. Beyond the Campus Environmental Promotion Activities*

Sr. No	Contents (Documents)		
A	Supporting Documents	Date	Year
1	*Green Audit Reports*	*22/06/2019*	(2018-19)
2	*Energy Audit Reports*	*22/06/2019*	(2018-19)

GREEN AUDIT REPORT

OF

Dr. D. Y. Patil Pratishthan's,
Padmashree Dr. D. Y. Patil College of Architecture,
Akurdi, Pune 411 044

Year: 2018-19

Prepared by:

Enrich Consultants

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi 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)

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Pune

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/DYPCOA/18-19/02

Date: 22/6/2022

CERTIFICATE

This is to certify that we have conducted Green Audit at Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi, Pune in the Year 2018-19.

The College has adopted following Energy Efficient and Green Practices:

- Usage of Energy Efficient LED Fittings
- Segregation of Waste at Source
- Installation of 180 KLPD Sewage Treatment Plant of Capacity
- Maintenance of Good Internal Road
- Internal Tree Plantation

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

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

ENRICH CONSULTANTS PUNE

ACKNOWLEDGEMENT

We at Enrich Consultants, Pune, express our sincere gratitude to the management of Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi, Pune for awarding us the assignment of Green Audit of their Akurdi Campus, for the Academic Year: 2018-19.

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

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

ENRICH CONSULTANTS PUNE

EXECUTIVE SUMMARY

1. Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi , Pune consumes Energy in the form of Electrical Energy; used for various gadgets, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	37139	29.71
2	Maximum	3458	2.77
3	Minimum	2798	2.24
4	Average	3094.92	2.48

3. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment

4. Usage of Renewable Energy:

- The College has yet to install Roof Top Solar PV Plant

5. Waste Management:

5.1 Segregation of Waste at Source:

The solid waste is segregated at source. There are separate bins for collection at various points and is disposed of for further action.

5.2 Liquid Waste Management:

The College has installed Sewage Treatment Plant of capacity 180 KLPD. The treated water is used for gardening purpose.

6. Rain Water Management:

The College has yet to install Rain Water Management Project.

7. Green Practices:

- Maintenance of good Internal Road
- Maintenance of Internal Garden

8. Assumption:

- **1 kWh** of Electrical Energy releases **0.8 Kg** of CO_2into atmosphere

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi, Pune

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
kWh	Kilo Watt Hour
kWp	Kilo Watt Peak
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
LPD	Liters per Day

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

ENRICH CONSULTANTS PUNE

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 Management
6. Study of Green & Sustainable Practices

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of the Institution	Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture
2	Address	D Y Patil Educational Complex, Sector 29, Nigdi, Pradhikaran, Akurdi, Pune
3	Year of Establishment	2000
4	Affiliation	Savitribai Phule Pune University

Dr. D Y Patil Pratishthan's
Padmashree Dr. D. Y. Patil College of Architecture,
Akurdi, Pune

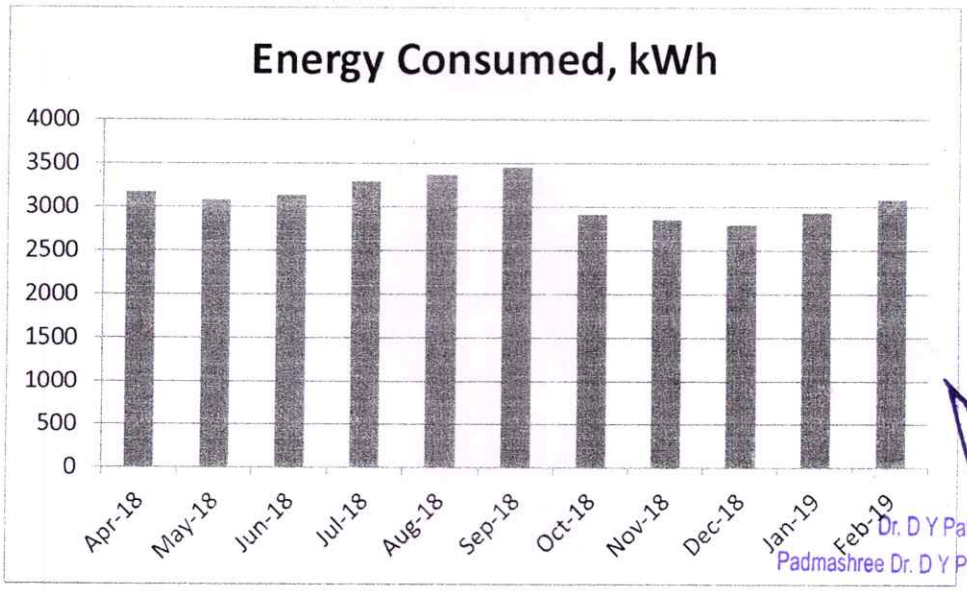
CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 2: Study of Electrical Energy Consumption: 18-19:

No	Month	Energy Consumed, kWh
1	Apr-18	3175
2	May-18	3085
3	Jun-18	3139
4	Jul-18	3296
5	Aug-18	3375
6	Sep-18	3458
7	Oct-18	2917
8	Nov-18	2857
9	Dec-18	2798
10	Jan-19	2936
11	Feb-19	3086
12	Mar-19	3017
13	Total	37139
14	Maximum	3458
15	Minimum	2798
16	Average	3094.92

Chart No: 1: Study of variation of Monthly Electrical Energy Consumption:



Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Table No 3: Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh
1	Total	37139
2	Maximum	3458
3	Minimum	2798
4	Average	3094.92

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

CHAPTER-III
STUDY OF CO_2 EMISSION

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 due to Electrical Energy are 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	Apr-18	3175	2.54
2	May-18	3085	2.47
3	Jun-18	3139	2.51
4	Jul-18	3296	2.64
5	Aug-18	3375	2.70
6	Sep-18	3458	2.77
7	Oct-18	2917	2.33
8	Nov-18	2857	2.29
9	Dec-18	2798	2.24
10	Jan-19	2936	2.35
11	Feb-19	3086	2.47
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13	Total	37139	29.71
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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Chart No: 2: Representation of Month wise CO_2 Emissions:

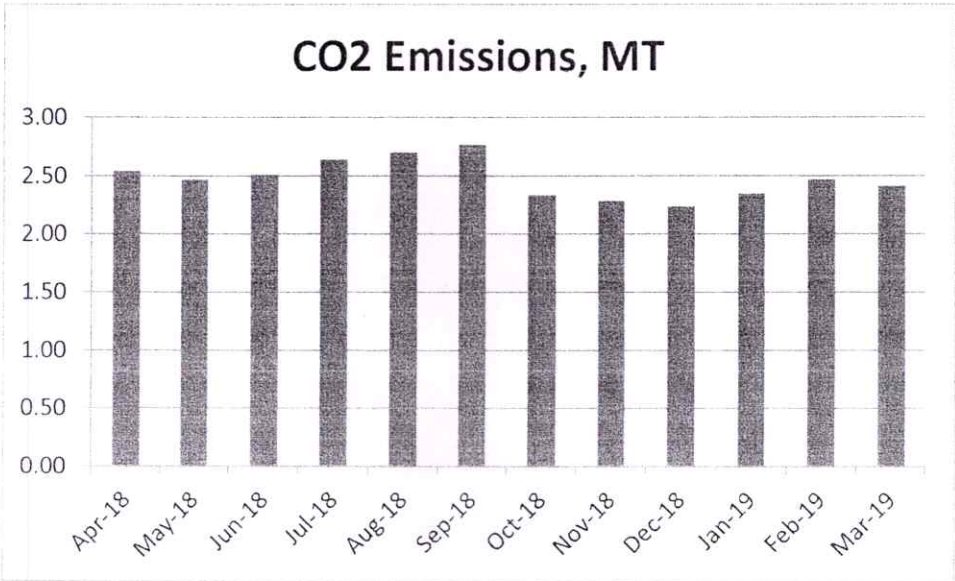


Table No 5: Variation in Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	37139	29.71
2	Maximum	3458	2.77
3	Minimum	2798	2.24
4	Average	3094.92	2.48

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

CHAPTER-IV
STUDY OF USAGE OF RENEWABLE ENERGY

The College has yet to install Roof Top Solar PV Plant

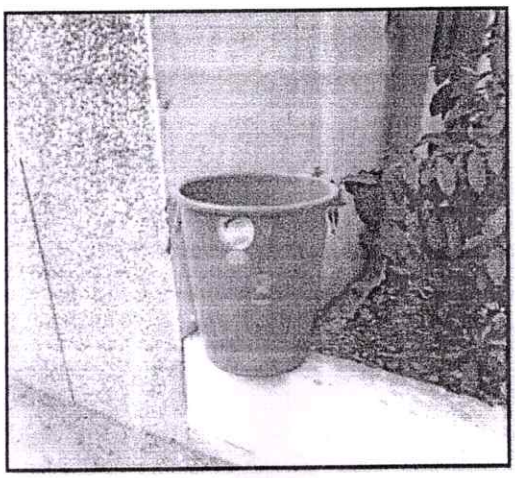
Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

CHAPTER V
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:

The solid waste is segregated at source. There are separate bins for collection at various points and is disposed of for further for action.

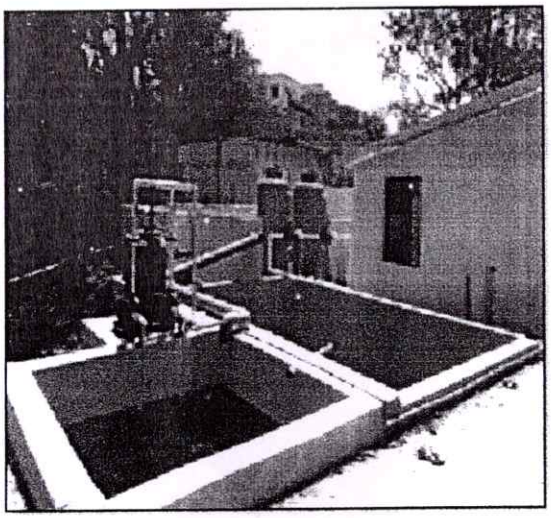
Photograph of Waste Collection Bins:



5.2 Liquid Waste Management:

The College has installed Sewage Treatment Plant of capacity **180 KLPD**. The treated water is used for gardening purpose.

Photograph of Sewage Treatment Plant:



Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi, Pune

CHAPTER-VI
STUDY OF RAIN WATER MANAGEMENT

The College has yet to install Rain Water Management Project.

Dr. D Y Patil Pratishthan's
Padmashree Dr. D. Y. Patil College of Architecture,
Pune

CHAPTER-VII
STUDY OF GREEN PRACTICES

7.1 Pedestrian Friendly Road

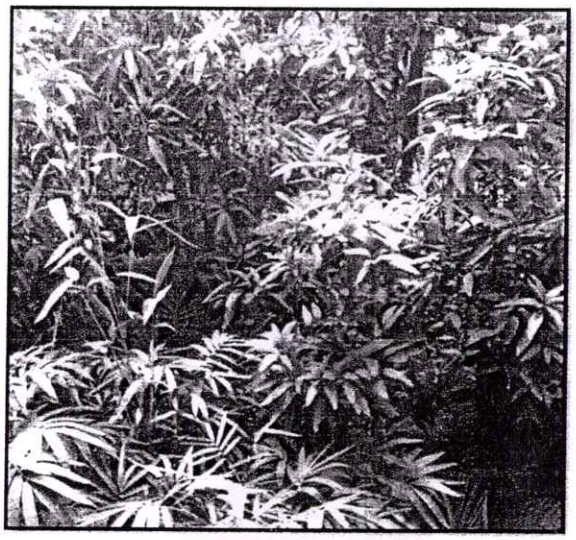
The College has well maintained internal road to facilitate the easy movement of the students within the campus.

Photograph of internal road in the campus:

7.2 Internal Tree Plantation:

The College has well maintained lawn and internal Tree Plantation.

Photograph of Tree Plantation in the campus:



Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

ENERGY AUDIT REPORT

OF

Dr. D. Y. Patil Pratishthan's,
Padmashree Dr. D. Y. Patil College of Architecture,
Akurdi, Pune-411 044

Year: 2018-19

Prepared by:

Enrich Consultants

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

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi 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.

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19/9/18

(Smita Kudarikar)
General Manager (EC)

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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/DYPCOA/18-19/01

Date: 22/6/2019

CERTIFICATE

This is to certify that we have conducted Energy Audit at Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi, Pune in the Year 2018-19.

The College has adopted Energy Efficient Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting

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

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

INDEX

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

EXECUTIVE SUMMARY

1. Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi , Pune consumes Energy in the form of Electrical Energy; used for various gadgets, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	37139	29.71
2	Maximum	3458	2.77
3	Minimum	2798	2.24
4	Average	3094.92	2.48

3. Energy Conservation projects installed:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment

4. Usage of Alternate Energy:

- The College has yet to install Roof Top Solar PV Plant
- The percentage of usage of Alternate Energy to Annual Energy Demand is Nil

5. Usage of LED Lighting:

- The Total LED Lighting load of College is 1.36 kW.
- The Lighting Load is 8.36 kW.
- The % of LED Lighting to Total Lighting Load is 16.27 %.

6. Assumption:

1. 1 kWh of Electrical Energy releases 0.8 Kg of CO_2 into atmosphere

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

ENRICH CONSULTANTS PUNE

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
MSEDCL	Maharashtra Electricity Distribution Company Limited
kWh	Kilo Watt Hour
kWp	Kilo Watt Peak
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
FTL	Fluorescent Tube Light
LED	Light Emitting Diode

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

ENRICH CONSULTANTS PUNE

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study Connected Load and Present Energy Consumption
2. To Study the 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 the Institution	Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture
2	Address	D Y Patil Educational Complex, Sector 29, Nigdi, Pradhikaran, Akurdi, Pune
3	Year of Establishment	2000
4	Affiliation	Savitribai Phule Pune University

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

CHAPTER-II
STUDY OF CONNECTED LOAD

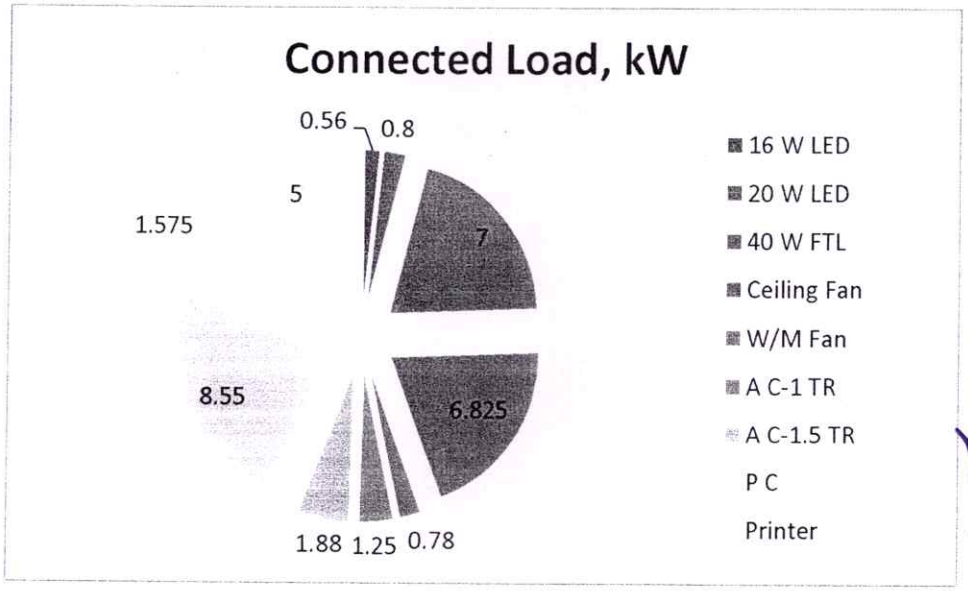
The major contributors to the connected load of the College are as under.

Table No 2: Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	16 W LED	35	16	0.56
2	20 W LED	40	20	0.8
3	40 W FTL	175	40	7
4	Ceiling Fan	105	65	6.825
5	W/M Fan	15	52	0.78
6	A C-1 TR	1	1250	1.25
7	A C-1.5 TR	1	1875	1.88
8	P C	57	150	8.55
9	Printer	9	175	1.575
10	Other Equipment	20	250	5
11	**Total**			**34**

We present the above Data in a PIE Chart as under.

Chart No1: Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of Energy Consumption

Table No. 3: Study of Electrical Energy Consumption: 18-19:

No	Month	Energy Consumed, kWh
1	Apr-18	3175
2	May-18	3085
3	Jun-18	3139
4	Jul-18	3296
5	Aug-18	3375
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7	Oct-18	2917
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11	Feb-19	3086
12	Mar-19	3017
13	Total	37139
14	Maximum	3458
15	Minimum	2798
16	Average	3094.92

Chart No 2: To study the variation of Monthly Electrical Energy Consumption:

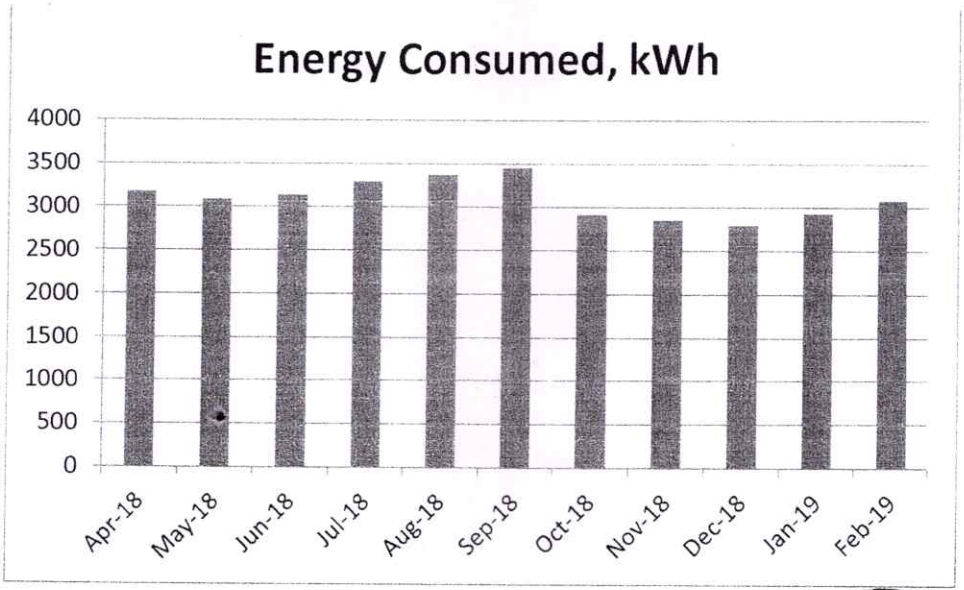

Table No 4: Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh
1	Total	37139
2	Maximum	3458
3	Minimum	2798
4	Average	3094.92

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

CHAPTER-IV
STUDY OF CO_2 EMISSION

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 two forms of Energy namely: Electrical Energy for various Electrical gadgets.

Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy 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 5: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Apr-18	3175	2.54
2	May-18	3085	2.47
3	Jun-18	3139	2.51
4	Jul-18	3296	2.64
5	Aug-18	3375	2.70
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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Chart No 3: Representation of Month wise CO_2 Emissions:

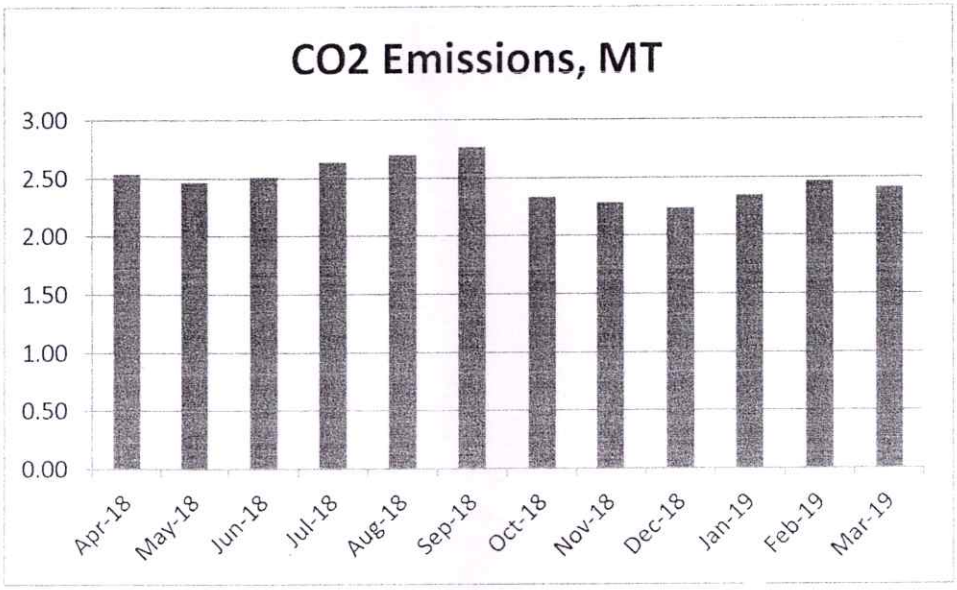

Table No 6: Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	37139	29.71
2	Maximum	3458	2.77
3	Minimum	2798	2.24
4	Average	3094.92	2.48

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has yet to install Roof Top Solar PV Plant

The percentage of usage of Alternate Energy to Annual Energy Demand is Nil

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

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

Table No 7: Percentage of Usage of LED Lighting to Total Lighting Load:

No	Particulars	Value	Unit
1	Qty of 16 W LED Fitting	35	Nos
2	Load of 16 W LED Fitting	16	W/Unit
3	Total Load of 16 W LED Fittings	**0.56**	kW
4	Qty of 20 W LED Fitting	40	Nos
5	Load of 20 W LED Fitting	20	W/Unit
6	Total Load of 20 W LED Fittings	**0.8**	kW
7	Qty of 40 W FTL Fitting	175	Nos
8	Load of 40 W FTL Fitting	40	W/Unit
9	Total Load of 40 W FTL Fittings	**7**	kW
10	Total LED Lighting Load= 3+6	**1.36**	kW
11	Total Lighting Load= 3+6+9	**8.36**	kW
12	Percentage of LED to Total Lighting Load=(10)*100/(11)	**16.27**	%

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

ENRICH CONSULTANTS PUNE

Dr D Y Patil Prathisthan's
PADMASHREE DR. D Y PATIL COLLEGE OF ARCHITECTURE
Sector No. 29, B/h. Akurdi Railway Station, Nigdi Pradhikaran, Akurdi, Pune - 411044

ACADEMIC YEAR (2017-18)

Criterion 7 Institutional Values and Best Practices

Key Indicator 7.1.3

Metric No.	*Quality Audits and environment and energy regularly undertaken by the institution*
7.1.3	*The Institutional environment and energy initiative are confirmed through the following* *1. Green Audit / Environment Audit* *2. Energy Audit* *3.Clean and Green Campus Initiative* *4. Beyond the Campus Environmental Promotion Activities*

Sr. No	Contents (Documents)		
A	Supporting Documents	Date	Year
1	*Green Audit Reports*	*15/06/2018*	(2017-18)
2	*Energy Audit Reports*	*15/06/2018*	(2017-18)

GREEN AUDIT REPORT

OF

Dr. D. Y. Patil Pratishthan's,
Padmashree Dr. D. Y. Patil College of Architecture,
Akurdi, Pune 411 044

Year: 2017-18

Prepared by:

Enrich Consultants

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

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi 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: 020-26614393/26614403 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 Manarashtra 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.

(Smita Kudarikar)
Manager (EC)

Dr. D Y Patil Pratishthan's
Padmashree Dr. D.Y.Patil College of Architecture,
Akurdi, Pune

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/DYPCOA/17-18/02 Date: 15/6/2018

CERTIFICATE

This is to certify that we have conducted Green Audit at Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi, Pune in the Year 2017-18.

The College has adopted following Energy Efficient and Green Practices:

- Usage of Energy Efficient LED Fittings
- Segregation of Waste at Source
- Provision of Sanitary Waste Incinerator
- Installation of 180 KLPD Sewage Treatment Plant of Capacity
- Maintenance of Good Internal Road
- Landscaped Lawn & Internal Tree Plantation

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

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Pune

ACKNOWLEDGEMENT

We at Enrich Consultants, Pune, express our sincere gratitude to the management of Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi, Pune for awarding us the assignment of Green Audit of their Akurdi Campus, for the Academic Year: 2017-18.

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

Dr. D.Y Patil Pratishthan's
Padmashree D.Y. Patil College of Architecture,
Akurdi, Pune

EXECUTIVE SUMMARY

1. **Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi , Pune** consumes Energy in the form of **Electrical Energy;** used for various gadgets, office & other facilities.

2. **Present Energy Consumption & CO_2 Emission:**

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	36750	29.4
2	Maximum	3650	2.92
3	Minimum	2796	2.24
4	Average	3062.5	2.45

3. **Energy Conservation projects already installed:**

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment

4. **Usage of Renewable Energy:**

The College has yet to install Roof Top Solar PV Plant

5. **Waste Management:**

5.1 Segregation of Waste at Source:

The solid waste is segregated at source. There are separate bins for collection at various points and is disposed of for further action.

5.2 Liquid Waste Management:

The College has installed Sewage Treatment Plant of capacity 180 KLPD. The treated water is used for gardening purpose.

6. **Rain Water Management:**

The College has yet to install Rain Water Management Project.

7. **Green Practices:**

- Maintenance of good Internal Road
- Maintenance of Internal Garden

8. **Assumption:**

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

Dr. D Y Patil Pratishthan's Padmashree Dr. D Y Patil College of Architecture, Akurdi Pune

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
kWh	Kilo Watt Hour
kWp	Kilo Watt Peak
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
LPD	Liters per Day
LPG	Liquefied Petroleum Gas
COA	College of Architecture

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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 Management
6. Study of Green & Sustainable Practices

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of the Institution	Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture
2	Address	D Y Patil Educational Complex, Sector 29, Nigdi, Pradhikaran, Akurdi, Pune
3	Year of Establishment	2000
4	Affiliation	Savitribai Phule Pune University

Dr. D.Y.Patil Pratishthan's
Padmashree Dr. D.Y.Patil College of Architecture,

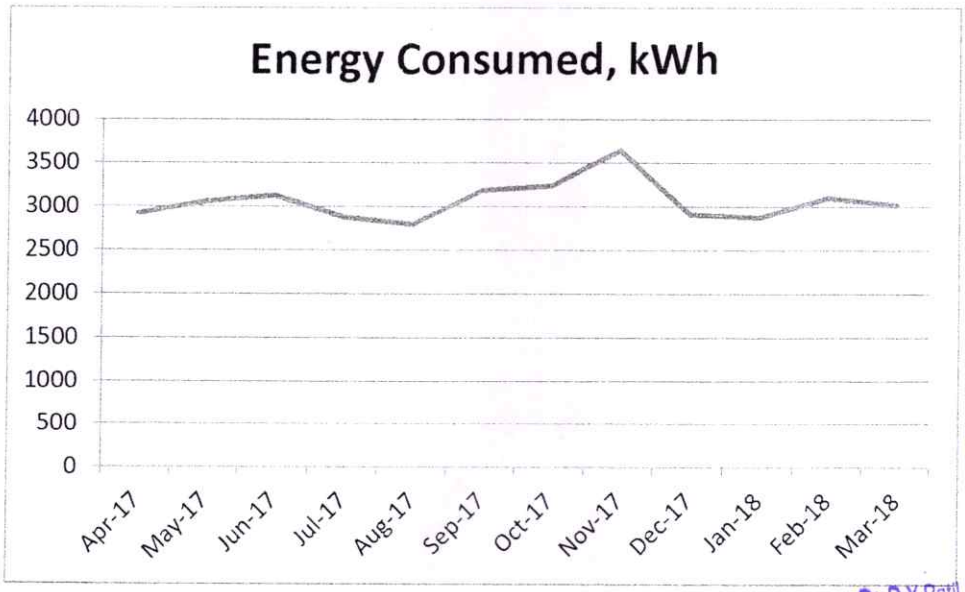
CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 2: Study of Electrical Energy Consumption: 17-18:

No	Month	Energy Consumed, kWh
1	Apr-17	2917
2	May-17	3057
3	Jun-17	3125
4	Jul-17	2875
5	Aug-17	2796
6	Sep-17	3185
7	Oct-17	3236
8	Nov-17	3650
9	Dec-17	2915
10	Jan-18	2875
11	Feb-18	3102
12	Mar-18	3017
13	Total	36750
14	Maximum	3650
15	Minimum	2796
16	Average	3062.5

Chart No: 1: Study of variation of Monthly Electrical Energy Consumption:



Dr. D Y Patil Pratishthan's
Padmashree Dr. D. Y. Patil College of Architecture,

Table No 3: Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh
1	Total	36750
2	Maximum	3650
3	Minimum	2796
4	Average	3062.5

CHAPTER-III
STUDY OF CO_2 EMISSION

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 due to Electrical Energy 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	Apr-17	2917	2.334
2	May-17	3057	2.446
3	Jun-17	3125	2.5
4	Jul-17	2875	2.3
5	Aug-17	2796	2.24
6	Sep-17	3185	2.55
7	Oct-17	3236	2.59
8	Nov-17	3650	2.92
9	Dec-17	2915	2.33
10	Jan-18	2875	2.3
11	Feb-18	3102	2.48
12	Mar-18	3017	2.41
13	Total	36750	29.4
14	Maximum	3650	2.92
15	Minimum	2796	2.24
16	Average	3062.5	2.45

Chart No: 2: Representation of Month wise CO_2 Emissions:

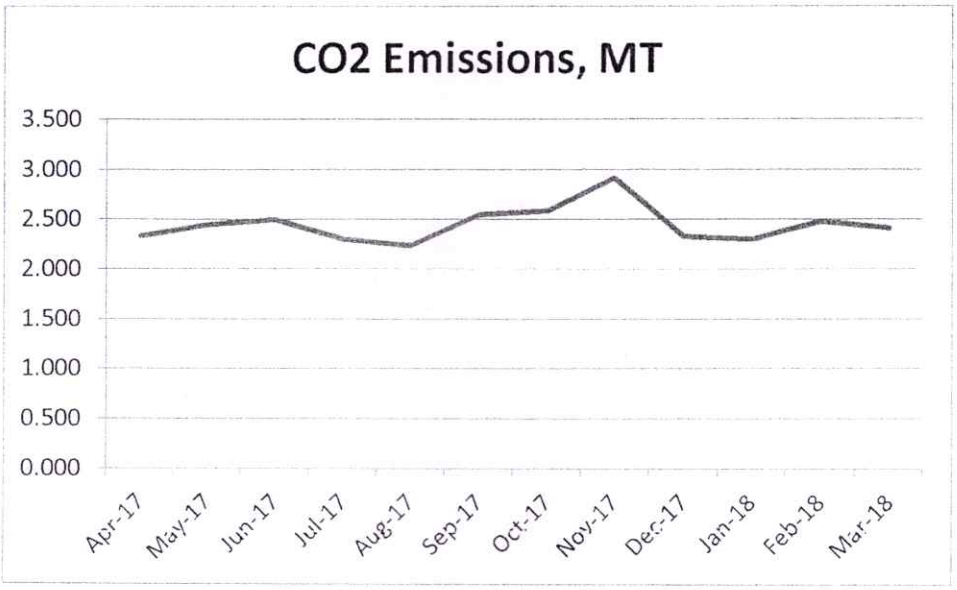


Table No 5: Variation in Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	36750	29.4
2	Maximum	3650	2.92
3	Minimum	2796	2.24
4	Average	3062.5	2.45

CHAPTER-IV
STUDY OF USAGE OF RENEWABLE ENERGY

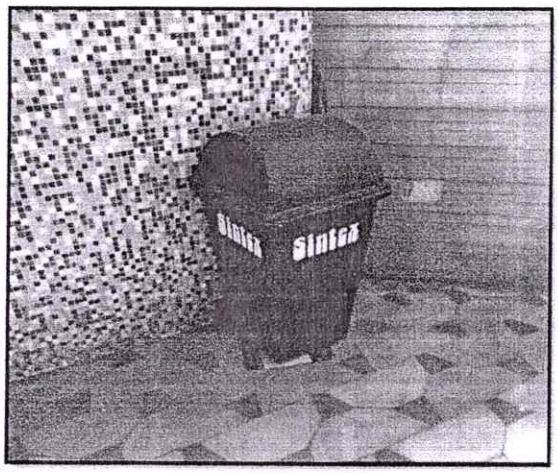
The College has yet to install Roof top Solar PV Plant.

CHAPTER V
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:

The solid waste is segregated at source. There are separate bins for collection at various points and is disposed of for further for action.

Photograph of Waste Collection Bin:



5.2 Liquid Waste Management:

The College has installed Sewage Treatment Plant of capacity **180 KLPD**. The treated water is used for gardening purpose.

CHAPTER-VI
STUDY OF RAIN WATER MANAGEMENT

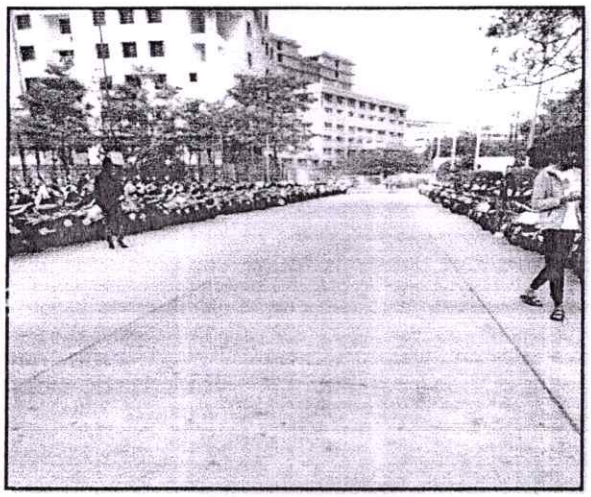
The College has yet to install Rain Water Management Project.

CHAPTER-VII
STUDY OF GREEN PRACTICES

7.1 Pedestrian Friendly Road & Internal Tree Plantation:

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

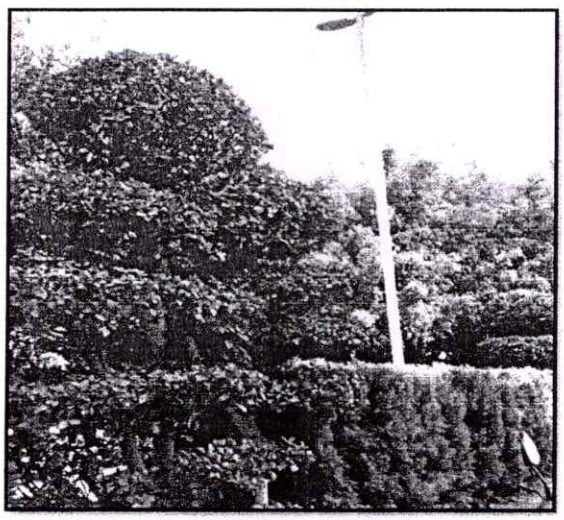
Photograph of internal road in the campus:



7.2 Internal Tree Plantation:

The College has well maintained Landscaped Lawn and Internal Tree Plantation.

Photograph of Trees & Plants in the campus:



ENERGY AUDIT REPORT

of

Dr D Y Patil Pratishthan's,
Padmashree Dr. D. Y. Patil College of Architecture,
Akurdi, Pune-411 044

DYP
DR. D.Y.PATIL
COLLEGE OF
ARCHITECTURE
AKURDI

Year: 2017-18

Prepared by:

Enrich Consultants

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

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

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: 020-26614393/26614403, 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'

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(Smita Kudarikar)
Manager (EC)

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Pune

ENRICH CONSULTANTS PUNE

Enrich Consultants

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Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/DYPCOA/17-18/01

Date: 15/6/2018

CERTIFICATE

This is to certify that we have conducted Energy Audit at Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi, Pune in the Year 2017-18.

The College has adopted Energy Efficient Practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting

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

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS ★ PUNE ★

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi, Pune

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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

ENRICH CONSULTANTS * PUNE *

ACKNOWLEDGEMENT

We at Enrich Consultants, Pune, express our sincere gratitude to the management of Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi, Pune for awarding us the assignment of Energy Audit of their Akurdi Campus, for the Academic Year: 2017-18.

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

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture
Akurdi, Pune

ENRICH CONSULTANTS PUNE

EXECUTIVE SUMMARY

1. **Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture, Akurdi , Pune** consumes Energy in the form of **Electrical Energy;** used for various gadgets, office & other facilities.

2. **Present Energy Consumption:**

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	36750	29.4
2	Maximum	3650	2.92
3	Minimum	2796	2.24
4	Average	3062.5	2.45

3. **Energy Conservation projects already installed:**

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment

4. **Usage of Alternate Energy:**

- The College has yet to install the Roof Top Solar PV Plant.
- The percentage of usage of Alternate Energy to Annual Energy Demand is Nil

5. **Usage of LED Lighting:**

- The Total LED Lighting load of College is **1.10 kW.**
- The Total Lighting Load is **8.70 kW.**
- The % of LED Lighting to Total Lighting Load is **12.64 %.**

6. **Assumption:**

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

Dr. D Y Patil Pratishthan's
Padmashree Dr D Y Patil College of Architecture,
Akurdi, Pune

ENRICH CONSULTANTS PUNE

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
MSEDCL	Maharashtra Electricity Distribution Company Limited
kWh	Kilo Watt Hour
kWp	Kilo Watt Peak
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
FTL	Fluorescent Tube Light
LED	Light Emitting Diode
COA	College of Architecture

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Pune

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study Connected Load
2. To study Present Energy Consumption
3. To study the CO_2 emissions
4. To study usage of Alternate Energy
5. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of the Institution	Dr. D. Y. Patil Pratishthan's Padmashree Dr. D. Y. Patil College of Architecture
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Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Pune

ENRICH CONSULTANTS ★ PUNE ★

CHAPTER-II
STUDY OF CONNECTED LOAD

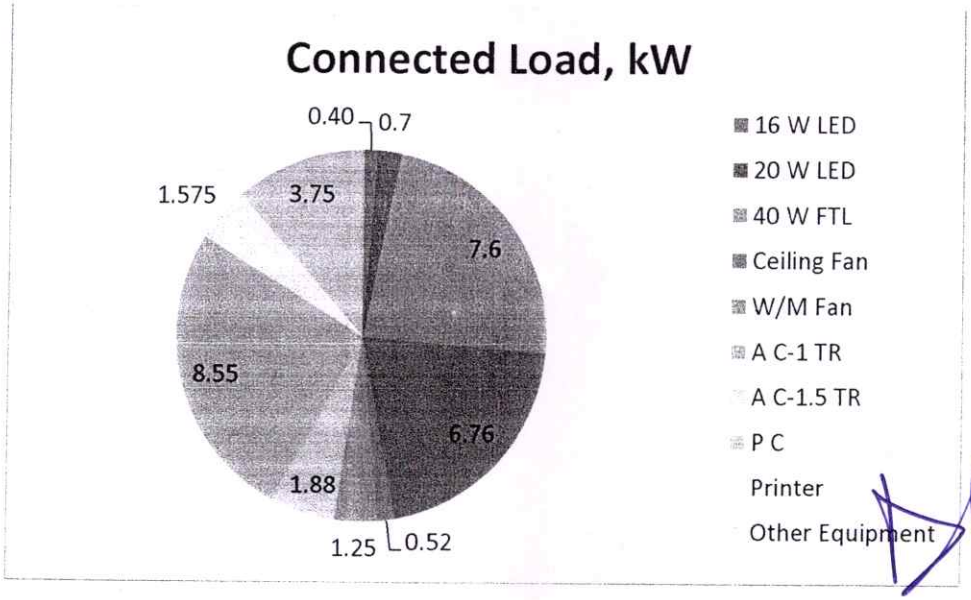
The major contributors to the connected load of the College are as under.

Table No 2: Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	16 W LED	25	16	0.40
2	20 W LED	35	20	0.7
3	40 W FTL	190	40	7.6
4	Ceiling Fan	104	65	6.76
5	W/M Fan	10	52	0.52
6	A C-1 TR	1	1250	1.25
7	A C-1.5 TR	1	1875	1.88
8	P C	57	150	8.55
9	Printer	9	175	1.575
10	Other Equipment	15	250	3.75
11	**Total**			**33**

We present the above Data in a PIE Chart as under.

Chart No1: Connected Load:



Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi, Pune

CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of Energy Consumption

Table No. 3: Study of Electrical Energy Consumption: 17-18:

No	Month	Energy Consumed, kWh
1	Apr-17	2917
2	May-17	3057
3	Jun-17	3125
4	Jul-17	2875
5	Aug-17	2796
6	Sep-17	3185
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12	Mar-18	3017
13	Total	36750
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15	Minimum	2796
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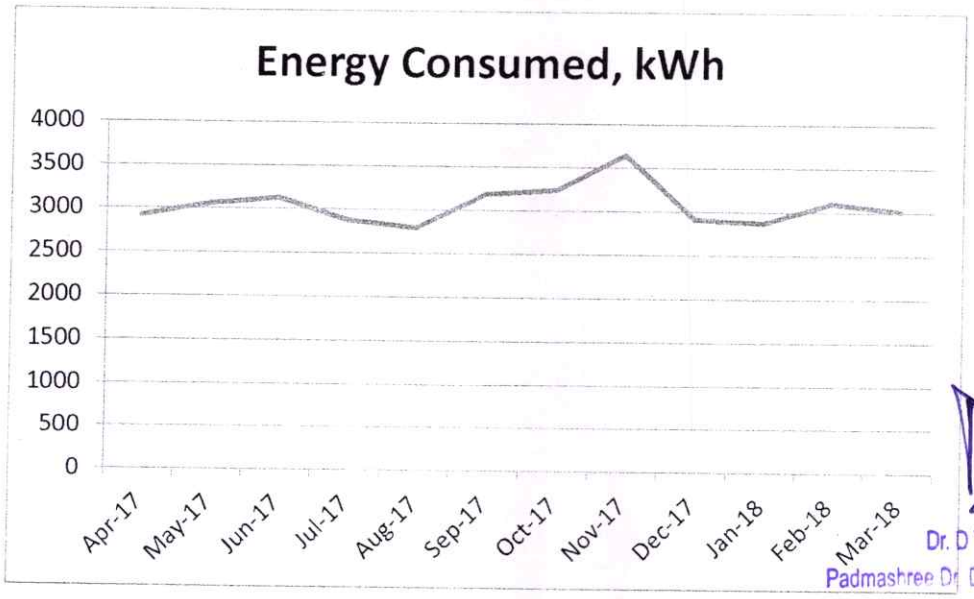
Chart No 2: To study the variation of Monthly Electrical Energy Consumption:



Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

Table No 4: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	36750
2	Maximum	3650
3	Minimum	2796
4	Average	3062.5

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune

CHAPTER-IV
STUDY OF CO_2 EMISSION

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 due to Electrical Energy 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 5: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Apr-17	2917	2.334
2	May-17	3057	2.446
3	Jun-17	3125	2.5
4	Jul-17	2875	2.3
5	Aug-17	2796	2.24
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Dr. D Y Patil Pratishthan's
Padmashree Dr. D. Y. Patil College of Architecture,
Akurdi Pune

ENRICH CONSULTANTS PUNE

Chart No 3: Representation of Month wise CO_2 Emissions:

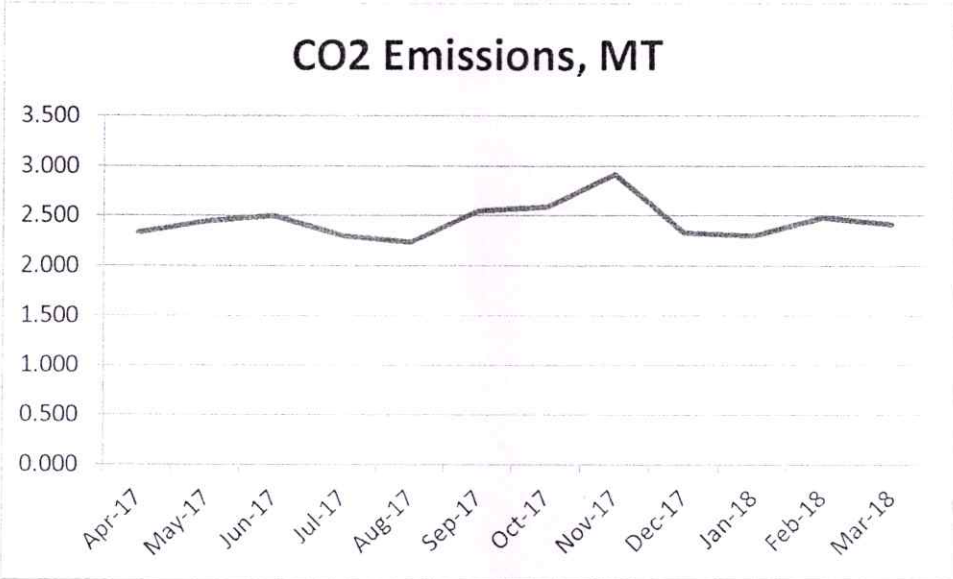

Table No 6: Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	36750	29.4
2	Maximum	3650	2.92
3	Minimum	2796	2.24
4	Average	3062.5	2.45

Dr. D Y Patil Pratishthan's
Padmashree Dr. D.Y. Patil College of Architecture,
Pune

ENRICH CONSULTANTS PUNE

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has yet to install Roof top Solar PV Plant.

CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

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

Table No 7: Percentage of Usage of LED Lighting to Total Lighting Load:

No	Particulars	Value	Unit
1	Qty of 16 W LED Fitting	25	Nos
2	Load of 16 W LED Fitting	16	W/Unit
3	Total Load of 16 W LED Fittings	**0.4**	kW
4	Qty of 20 W LED Fitting	35	Nos
5	Load of 20 W LED Fitting	20	W/Unit
6	Total Load of 20 W LED Fittings	**0.7**	kW
7	Qty of 40 W FTL Fitting	190	Nos
8	Load of 40 W FTL Fitting	40	W/Unit
9	Total Load of 40 W FTL Fittings	**7.6**	kW
10	Total LED Lighting Load= 3+6	**1.10**	kW
11	Total Lighting Load= 3+6+9	**8.70**	kW
12	Percentage of LED to Total Lighting Load = **(10)*100/(11)**	**12.64**	%

Dr. D Y Patil Pratishthan's
Padmashree Dr. D Y Patil College of Architecture,
Akurdi Pune