



PowerTech Energy Solutions
Conserve to Consume

Energy & Green Audit Report Of Arts, Commerce and Science College, Satral, Tal- Rahuri



Submitted By

PowerTech Energy Solutions

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ENERGY AUDIT COMPLETION CERTIFICATE

This is to certify that following utility has carried out Energy Audit as per guidelines laid down in The Energy Conservation Act, 2001 in the month of December 2021

Name of the Installation	Pravara Rural Education Society Arts, Commerce and Science College, Satral, Tal. Rahuri, Dist. Ahmednagar
Details of Facilities Audited	Main college building including laboratories, libraries, common area campus.etc
Date of Energy Audit	30 December 2021
Name of Certified Energy Auditor	Mr. Swapnil Gaikwad
Certification No.	EA 20121
Validity of the Certificate	29 December 2022

Authorised Signatory



Mr. Atul Kakad
Partner-PowerTech Energy Solutions

GREEN AUDIT COMPLETION CERTIFICATE

This is to certify that following utility has carried out Green Audit as per guidelines laid down in The Energy Conservation Act, 2001 in the month of December 2021

Name of the Installation	Pravara Rural Education Society's Arts, Commerce and Science College, Satral, Tal. Rahuri, Dist. Ahmednagar
Details of Facilities Audited	Main college building including laboratories, libraries, common area campus.etc
Date of Green Audit	30 December 2021
Name of Certified Energy Auditor	Mr. Swapnil Gaikwad
Certification No.	EA 20121
Validity of the Certificate	29 December 2022

Authorised Signatory



Mr. Atul Kakad
Partner-PowerTech Energy Solutions

1 Executive Summary – Energy Audit

Sr. No	Area	Proposed Action	Expected Result	Monthly Energy Savings in kWh	Annual Reduction in CO ₂ emission in Tons	Monthly Cost Savings in Rs	Investment in Rs.	Payback Period in Months
1	Fan Recommendation 1	Replace existing 75 watt conventional ceiling fans with 40 watt energy efficient fans	<ul style="list-style-type: none"> Total No. of ceiling fans present = 83 Nos. Total No. of ceiling fans presently operated= 83 Nos. Total No. of ceiling fans to be replace= 83 Nos. Daily Running Hrs. =3 Hrs. Monthly Working Days = 26 	209	1.98	1909	149400	78
Total				209	1.98	1909	149400	78

2 Executive Summary – Green Audit

Sr.No	Area	Observations	Remark
1	Tree Plantation	College has planted 125 trees and medicine trees in last year and also plan to plant more no. of trees in coming years	Good initiative taken by college toward green campus
2	Solid Waste Management	College has vermicompost plant where solid waste has been used as a raw material. Vermic plant is producing approx. 2.5 Tons of compost in a period of 2 months	Good initiative taken by college towards solid waste management
3	Rain Water Harvesting	Rain water harvesting system is installed in college to use the rain water for gardening purpose. Capacity of the storage tank is 500 lit.	Good initiative taken by college to use rain water
4	Solar Energy	College has implemented solar PV system of 15.36 kW which is generating almost 11000 units annual which helps to reduce 8.7 tones	Good initiative taken to by college toward use of renewable energy
5	E waste Management	At present, E -waste generated by college is sent to their Head office	College shall ensure that e-waste generated by them is channelised through collection centre or dealer of authorised producer or dismantler or recycler

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3 Acknowledgement

PowerTech Energy Solutions extends gratitude to Arts, Commerce and Science College, Satral for extending us the opportunity to conduct the Energy & Green Audit.

We are thankful to the professors & supporting staff of the college for their transparency & consistent support in sharing relevant information and for providing data about policies and projects along with their other valuable information. This report would have not been possible without their support.

The study team would like to acknowledge the following distinguished personnel's of Arts, Commerce and Science College, Satral in person for the diligent involvement and cooperation.

Smt. Jayashri Singar

Principal

Prof. D. N. Gholap

Department of Botany

Dr. R.S. Tambe

Department of Zoology

4 About College

Arts, Commerce and Science College, Satral was established in August 1998 under the mentorship of Pravara Rural Education Society, Pravaranagar and with great vision of Balasaheb Vikhe Patil, Padmabhushan Awardee. It stands with a specific objective of elevation of rural masses through quality, need based and appropriate education by achieving academic excellence among rural youth with relevance to employability and rural development right from grass root level. The College is situated on the bank of sacred PRAVARA River in Satral village. Satral is located in the core of Panchkroshi, (cluster of five Villages). At present the college has its 12.5 acres of expansive premises dotted with beautiful lush green surroundings, large class rooms, well equipped laboratories, exclusive library and spacious playgrounds congenial to academic growth and all round development of learners.

The College is permanently affiliated to Savitribai Phule University, Pune & is approved under Section 2 (f) & Section 12 (b) of the UGC act. The college also received 'A' grade with CGPA 3.15 by NAAC in 2012.

4.1 Vision:

To provide higher educational avenues to develop overall personality of the students in rural and economically weaker classes.

4.2 Mission:

To inculcate moral values and the spirit of fair competition, which make students academically sound and socially conscience to become responsible.

4.3 Goals:

- To achieve academic excellence of higher education.
- To bring higher educational opportunities within the reach of the under privileged section of society and girls.
- To inculcate value based education to empower the youth for development of the nation.
- To develop an overall personality of the students by giving ample exposure in co-curricular and extracurricular activities.
- To develop nexus between educational institution and society for mutual benefits by socio-Economics and culture transformation through higher education.

5 Energy Audit

An energy audit is an inspection, survey and analysis of energy flows, for energy conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output(s). In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprints.

5.1 Electricity Bill Analysis

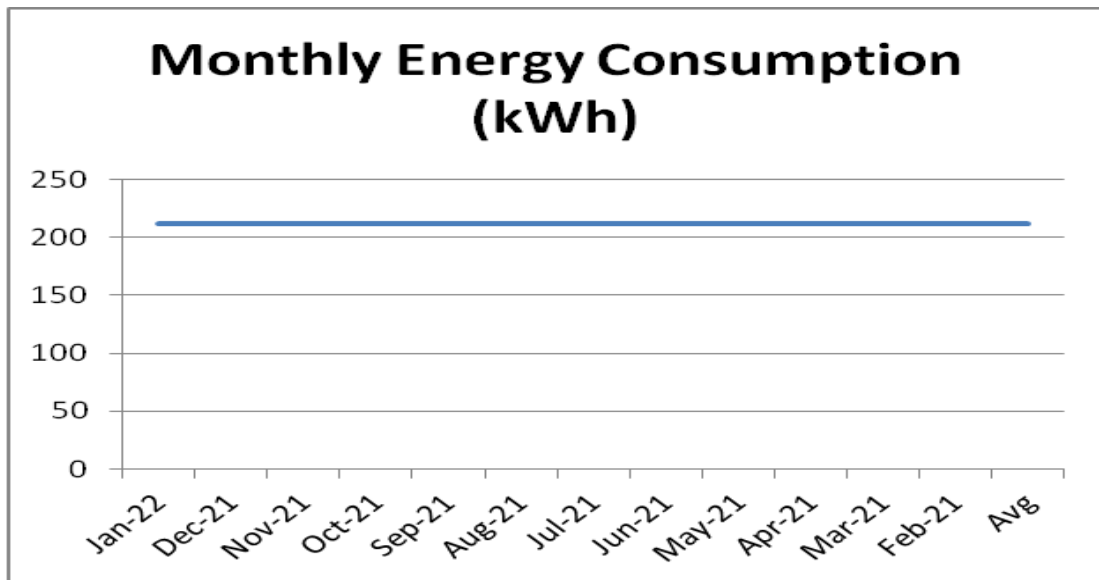
At present, There are 3 energy meters. Two are for college campus purpose while one is for agricultural pumping purpose

Below table shows the bill analysis for consumer number – 850660009217

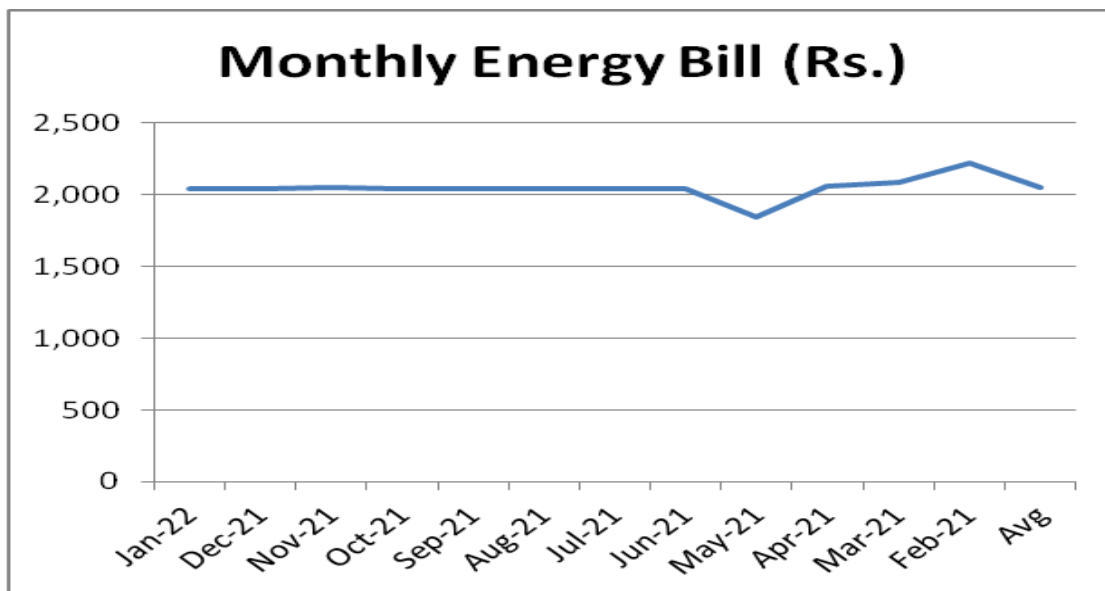
Consumer Number:	850660009217
Consumer Name :	PRI. ART SCI & COM COLLAGE SATRAL
Sanctioned Load:	2 kW

Month	Unit Consumption (kWh)	Bill Amount (Rs)	Avg. Unit Rate (Rs/kWh)
Jan-22	212	2,044	9.6
Dec-21	212	2,040	9.6
Nov-21	212	2,050	9.7
Oct-21	212	2,044	9.6
Sep-21	212	2,040	9.6
Aug-21	212	2,040	9.6
Jul-21	212	2,040	9.6
Jun-21	212	2,040	9.6
May-21	212	1,840	8.7
Apr-21	212	2,059	9.7
Mar-21	212	2,090	9.9
Feb-21	212	2,220	10.5
Avg.	212	2,046	9.65
Total	2756	26,593	

Below graph shows the profile of monthly energy consumption



Below graph shows the profile of monthly energy bill

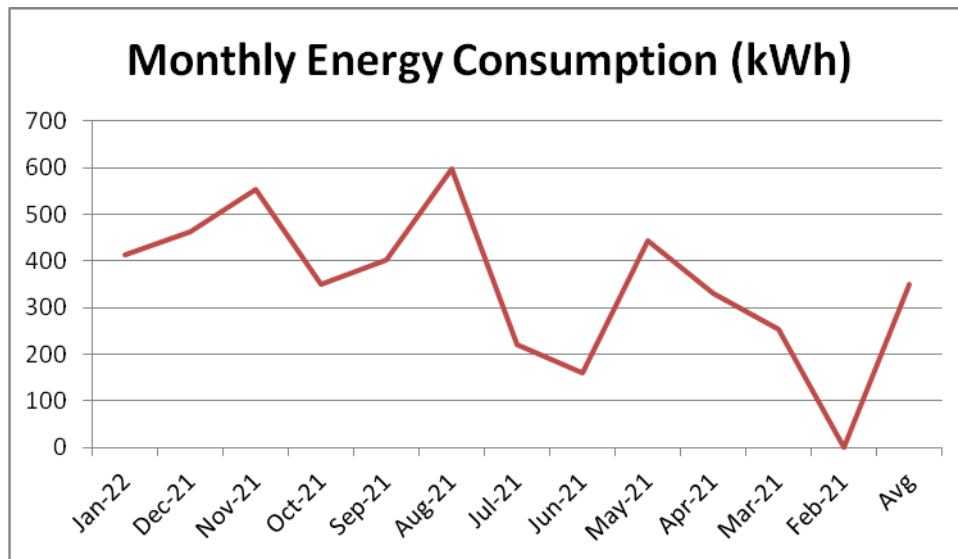


Below table shows the bill analysis for consumer number – **850660009535**

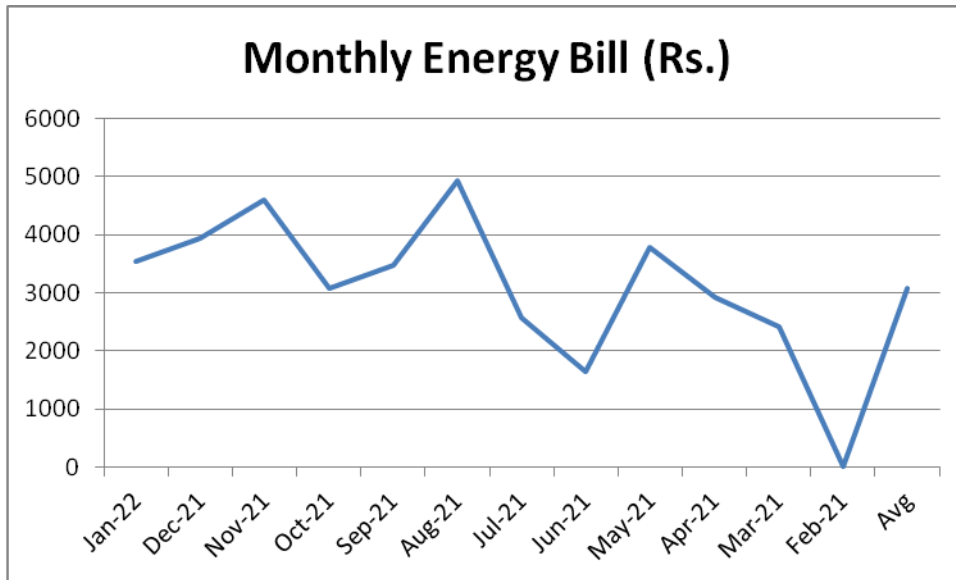
Consumer Number:	850660009535
Consumer Name :	PRACHARYA ARTS, COMMERCE & SCIENCE COLLEGE SATRAL

Month	Unit Consumption (kWh)	Bill Amount (Rs)	Avg. Unit Rate (Rs/kWh)
Jan-22	412	3,540.00	8.6
Dec-21	464	3,930.00	8.5
Nov-21	554	4,610.00	8.3
Oct-21	351	3,090.00	8.8
Sep-21	402	3,471.40	8.6
Aug-21	597	4,940.00	8.3
Jul-21	222	2,570.00	11.6
Jun-21	160	1653.35	10.3
May-21	443	3,779.41	8.5
Apr-21	330	2,930.49	8.9
Mar-21	254	2,423.06	9.5
Feb-21	1	0.00	0.0
Avg.	349	3,078	8.33
Total	4539	40016	

Below graph shows the profile of monthly energy consumption



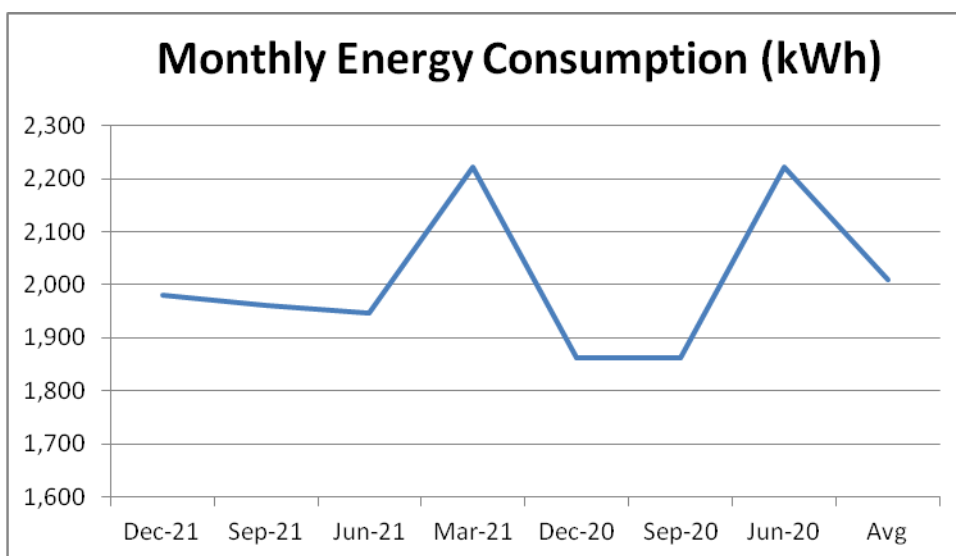
Below graph shows the profile of monthly energy bill



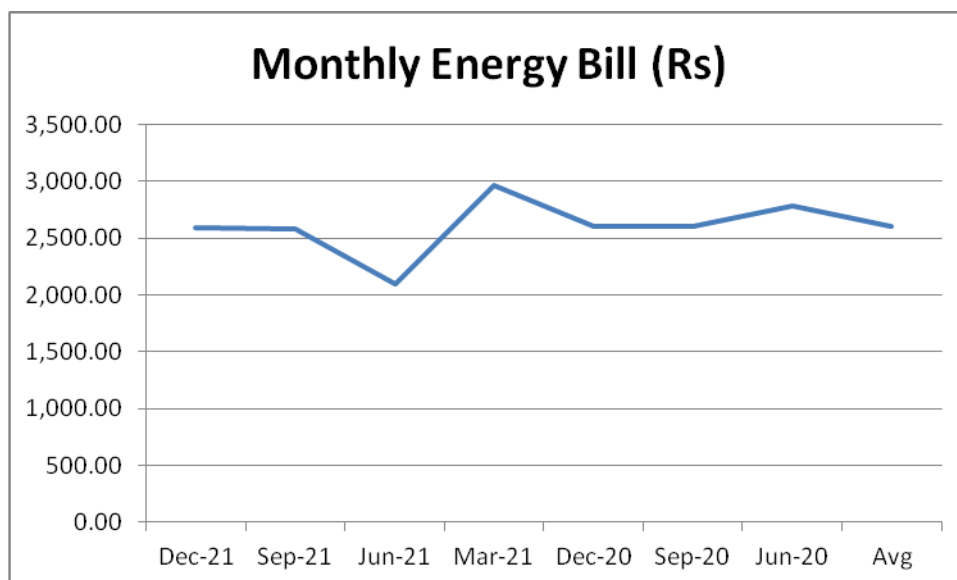
Below table shows the bill analysis for consumer number – 850660027495

Month	Unit Consumption (kWh)	Bill Amount (Rs)	Avg. Unit Rate
Dec-21	1,980	2,590.00	1.3
Sep-21	1,962	2,580.00	1.3
Jun-21	1,947	2,100.00	1.1
Mar-21	2,223	2,970.00	1.3
Dec-20	1,863	2,600.00	1.4
Sep-20	1,863	2,600.00	1.4
Jun-20	2,223	2,780.00	1.3
Avg.	2009	2603	1.30
Total	14061	18220	

Below graph shows the profile of monthly energy consumption



Below graph shows the profile of monthly energy bill

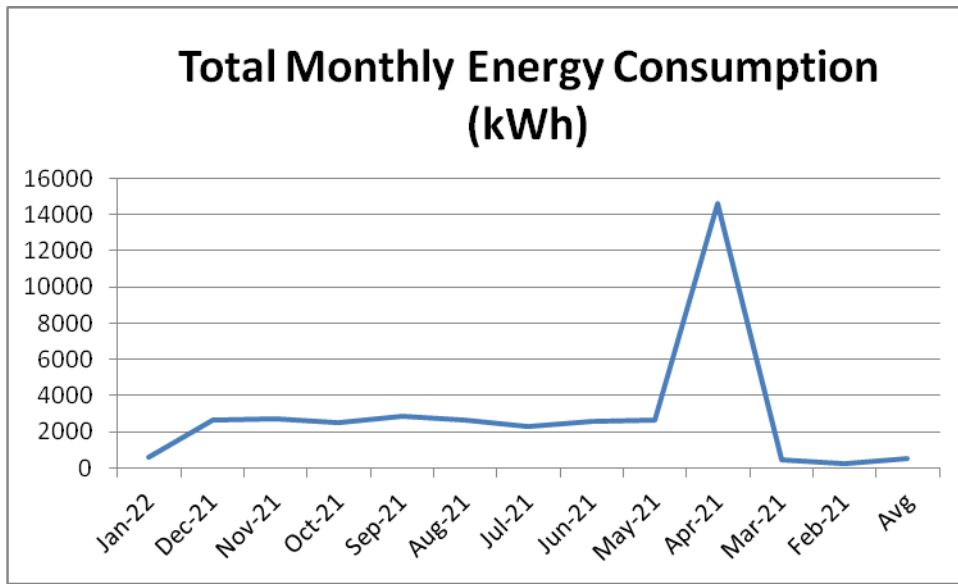


Total Energy Consumption – All 3 Meter

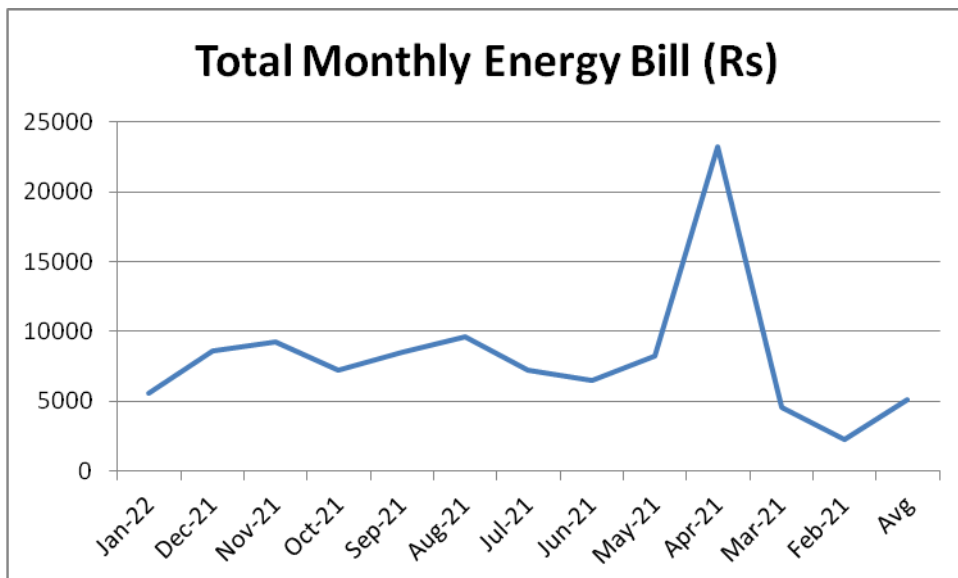
Below table shows the energy consumption of profile of all 3 meters

Month	Unit Consumption (kWh)	Bill Amount (Rs)
Jan-22	624	5584
Dec-21	2656	8560
Nov-21	2728	9240
Oct-21	2510	7234
Sep-21	2837	8481
Aug-21	2672	9580
Jul-21	2297	7210
Jun-21	2595	6473
May-21	2664	8222
Apr-21	14603	23210
Mar-21	466	4513
Feb-21	213	2220
Avg.	561	5124
Total	7295	66609

Below graph shows the profile of monthly energy consumption



Below graph shows the profile of monthly energy bill



5.2 Connected Load List

Area	Type	Total Qty	ON Qty	OFF Qty	Wattage	Load in kW	Daily Op hr	Mtly Op Hr	Daily kWh	Monthly kWh
Gymkhana	LED TL	6	6	0	18	0.11	5	125	0.5	13.5
Gymkhana	Ceiling Fan	1	1	0	75	0.08	5	125	0.4	9.4
Canteen	LED TL	2	2	0	18	0.04	5	125	0.2	4.5
Library	LED TL	6	6	0	18	0.11	8	200	0.9	21.6
Library	Fan	5	5	0	75	0.38	8	200	3.0	75.0
Seminar Hall	LED TL	9	9	0	18	0.16	0	12	0.0	1.9
Seminar Hall	Fan	12	12	0	75	0.90	0	12	0.0	10.8
Research Lab	LED	6	6	6	18	0.11	3	91.5	0.3	9.9
Ladies Toilet	LED TL	1	1	0	18	0.02	12	366	0.2	6.6
Gents Toilet	LED TL	2	2	0	18	0.04	0	0	0.0	0.0
Passage near gym	LED TL	5	5	0	18	0.09	12	366	1.1	32.9
Chemistry Lab 2 & 3	LED TL	4	4	0	18	0.07	8	244	0.6	17.6
Chemistry Lab 2 & 3	Fan	5	5	0	75	0.38	8	244	3.0	91.5
Chemistry Lab 2 & 3	Exhaust fan	3	3	0	50	0.15	4	122	0.6	18.3
Chemistry Lab 1	LED TL	4	4	0	18	0.07	8	244	0.6	17.6
Chemistry Lab 1	Exhaust fan	1	1	0	150	0.15	7	213.5	1.1	32.0
Chemistry Lab 1	Exhaust fan	3	3	0	65	0.20	7	213.5	1.4	41.6
Principal cabin	LED TL	3	3	0	18	0.05	8	244	0.4	13.2
Principal cabin	Fan	2	2	0	75	0.15	11	335.5	1.7	50.3
Office Area	LED TL	3	3	0	18	0.05	8	244	0.4	13.2
Office Area	Fan	3	3	0	75	0.23	8	244	1.8	54.9
Examination Dept	LED TL	2	2	0	18	0.04	8	244	0.3	8.8
Examination Dept	Fan	2	2	0	75	0.15	8	244	1.2	36.6
Ground floor passage	LED TL	8	8	0	18	0.14	12	366	1.7	52.7
Ground floor passage	LED Bulb	1	1	0	7	0.01	12	366	0.1	2.6
1st floor BSR	LED TL	2	2	0	18	0.04	4	122	0.1	4.4
1st floor BSR	Fan	1	1	0	75	0.08	4	122	0.3	9.2
Geology Lab	LED TL	2	2	0	18	0.04	8	244	0.3	8.8
Geology Lab	Fan	2	2	0	75	0.15	8	244	1.2	36.6
Principal cabin	AC 1.5 Ton	1	1	0		0.00		0	0.0	0.0
Botany Lab	LED TL	3	3	0	18	0.05	8	244	0.4	13.2
Botany Lab	Fan	2	2	0	75	0.15	8	244	1.2	36.6
Ladies Room	LED TL	4	4	0	18	0.07	7	213.5	0.5	15.4
Ladies Room	Fan	3	3	0	75	0.23	7	213.5	1.6	48.0
VLC Room	LED TL	5	5	0	18	0.09	7	213.5	0.6	19.2
VLC Room	Fan	3	3	0	75	0.23	7	213.5	1.6	48.0

Area	Type	Total Qty	ON Qty	OFF Qty	Wattage	Load in kW	Daily Op hr	Mtly Op Hr	Daily kWh	Monthly kWh
Exam Room	LED TL	2	2	0	18	0.04	4	122	0.1	4.4
Exam Room	Fan	3	3	0	75	0.23	4	122	0.9	27.5
Physical Lab	LED TL	3	3	0	18	0.05	4	122	0.2	6.6
Physical Lab	Fan	3	3	0	75	0.23	4	122	0.9	27.5
1st floor passage	LED TL	6	6	0	18	0.11	8	244	0.9	26.4
2nd floor class - 1	LED TL	2	2	0	18	0.04	6	183	0.2	6.6
2nd floor class - 1	Fan	2	2	0	75	0.15	6	183	0.9	27.5
2nd floor class - 2 & 3	LED TL	4	4	0	18	0.07	6	183	0.4	13.2
2nd floor class - 2 & 3	Fan	4	4	0	75	0.30	6	183	1.8	54.9
English Lab	LED TL	3	3	0	18	0.05	7	213.5	0.4	11.5
English Lab	Fan	4	4	0	75	0.30	7	213.5	2.1	64.1
HOD	LED TL	1	1	0	18	0.02	3	91.5	0.1	1.6
HOD	Fan	3	3	0	75	0.23	3	91.5	0.7	20.6
2nd floor passage	LED TL	3	3	0	18	0.05	0	0	0.0	0.0
3rd floor Library	LED TL	5	5	0	18	0.09	6	183	0.5	16.5
3rd floor Library	Fan	3	3	0	75	0.23	6	183	1.4	41.2
3rd floor class room	LED TL	1	1	0	18	0.02	6	183	0.1	3.3
3rd floor class room	Fan	2	2	0	75	0.15	6	183	0.9	27.5
Staff room	LED TL	2	2	0	18	0.04	6	183	0.2	6.6
Staff room	Fan	2	2	0	75	0.15	6	183	0.9	27.5
Class room block 1	LED TL	2	2	0	18	0.04	6	183	0.2	6.6
Class room block 1	Fan	2	2	0	75	0.15	6	183	0.9	27.5
Class room block 2	LED TL	2	2	0	18	0.04	6	183	0.2	6.6
Class room block 2	Fan	2	2	0	75	0.15	6	183	0.9	27.5
NSS	LED TL	1	1	0	18	0.02	6	183	0.1	3.3
NSS	Fan	2	2	0	75	0.15	6	183	0.9	27.5
Geography Dept	LED TL	3	3	0	18	0.05	6	183	0.3	9.9
Geography Dept	Fan	3	3	0	75	0.23	6	183	1.4	41.2
3rd floor passage	LED TL	3	3	0	18	0.05	0	0	0.0	0.0
Stair case	LED TL	3	3	0	18	0.05	0	0	0.0	0.0
Street light	LED SL	8	8	0	35	0.28	12	366	3.4	102.5
Street light	LED SL	10	10	0	35	0.35	12	366	4.2	128.1
Total						9.0				1671.4

5.2.1 Type wise lighting distribution in college

Light Type	Quantity
LED	6
LED Bulb	1
LED SL	18
LED TL	117
Total	142

6 Energy Saving Measure 1 – Replacement of conventional ceiling fans with energy efficient ceiling fans

Location	Fan Type	Qty	UF	Wattage	Op Hr	Load	Mthly Kwh	Change	New Wattage	New Load	Mthly Kwh	Saving Kwh	Saving Rs	Unit Rate	Inv	Payback (Months)
Gymkhana	Ceiling Fan	1	1	75	5	0.08	9.5625	40W Ceiling Fan	40.00	0.04	5.10	4.46	26.95	1850.00	1850.00	68.6
Library	Ceiling Fan	5	1	75	8	0.38	76.5	40W Ceiling Fan	40.00	0.20	40.80	35.70	215.63	1850.00	9250.00	42.9
Seminar Hall	Ceiling Fan	12	1	75	0	0.9	0	No Change	40.00	0.48	0.00	0.00	0.00	0.00	0.00	0.0
Chemistry Lab 2 & 3	Ceiling Fan	5	1	75	8	0.38	76.5	40W Ceiling Fan	40.00	0.20	40.80	35.70	215.63	1850.00	9250.00	42.9
Chemistry Lab 2 & 3	Exhaust fan	3	1	50	4	0.15	15.3	No Change	50.00	0.15	15.30	0.00	0.00	0.00	0.00	0.0
Chemistry Lab 1	Exhaust fan	1	1	150	7	0.15	26.775	No Change	150.00	0.15	26.78	0.00	0.00	0.00	0.00	0.0
Chemistry Lab 1	Exhaust fan	3	1	65	7	0.2	34.808	No Change	65.00	0.20	34.81	0.00	0.00	0.00	0.00	0.0
Principal cabin	Ceiling Fan	2	1	75	11	0.15	42.075	40W Ceiling Fan	40.00	0.08	22.44	19.64	118.60	1850.00	3700.00	31.2
Office Area	Ceiling Fan	3	1	75	8	0.23	45.9	40W Ceiling Fan	40.00	0.12	24.48	21.42	129.38	1850.00	5550.00	42.9
Examination Dept	Ceiling Fan	2	1	75	8	0.15	30.6	40W Ceiling Fan	40.00	0.08	16.32	14.28	86.25	1850.00	3700.00	42.9
1st floor BSR	Ceiling Fan	1	1	75	4	0.08	7.65	40W Ceiling Fan	40.00	0.04	4.08	3.57	21.56	1850.00	1850.00	85.8
Geology Lab	Ceiling Fan	2	1	75	8	0.15	30.6	40W Ceiling Fan	40.00	0.08	16.32	14.28	86.25	1850.00	3700.00	42.9
Botany Lab	Ceiling Fan	2	1	75	8	0.15	30.6	40W Ceiling Fan	40.00	0.08	16.32	14.28	86.25	1850.00	3700.00	42.9
Ladies	Ceiling	3	1	75	7	0.23	40.163	40W	40.00	0.12	21.42	18.74	113.20	1850.00	5550.00	49.0

Location	Fan Type	Qty	UF	Wattage	Op Hr	Load	Mthly Kwh	Change	New Wattage	New Load	Mthly Kwh	Saving Kwh	Saving Rs	Unit Rate	Inv	Payback (Months)
Room	Fan							Ceiling Fan								
VLC Room	Ceiling Fan	3	1	75	7	0.23	40.163	40W Ceiling Fan	40.00	0.12	21.42	18.74	113.20	1850.00	5550.00	49.0
Exam Room	Ceiling Fan	3	1	75	4	0.23	22.95	40W Ceiling Fan	40.00	0.12	12.24	10.71	64.69	1850.00	5550.00	85.8
Physical Lab	Ceiling Fan	3	1	75	4	0.23	22.95	40W Ceiling Fan	40.00	0.12	12.24	10.71	64.69	1850.00	5550.00	85.8
2nd floor class - 1	Ceiling Fan	2	1	75	6	0.15	22.95	40W Ceiling Fan	40.00	0.08	12.24	10.71	64.69	1850.00	3700.00	57.2
2nd floor class - 2 & 3	Ceiling Fan	4	1	75	6	0.3	45.9	40W Ceiling Fan	40.00	0.16	24.48	21.42	129.38	1850.00	7400.00	57.2
English Lab	Ceiling Fan	4	1	75	7	0.3	53.55	40W Ceiling Fan	40.00	0.16	28.56	24.99	150.94	1850.00	7400.00	49.0
HOD	Ceiling Fan	3	1	75	3	0.23	17.213	40W Ceiling Fan	40.00	0.12	9.18	8.03	48.52	1850.00	5550.00	114.4
3rd floor Library	Ceiling Fan	3	1	75	6	0.23	34.425	40W Ceiling Fan	40.00	0.12	18.36	16.07	97.03	1850.00	5550.00	57.2
3rd floor class room	Ceiling Fan	2	1	75	6	0.15	22.95	40W Ceiling Fan	40.00	0.08	12.24	10.71	64.69	1850.00	3700.00	57.2
Staff room	Ceiling Fan	2	1	75	6	0.15	22.95	40W Ceiling Fan	40.00	0.08	12.24	10.71	64.69	1850.00	3700.00	57.2
Class room block 1	Ceiling Fan	2	1	75	6	0.15	22.95	40W Ceiling Fan	40.00	0.08	12.24	10.71	64.69	1850.00	3700.00	57.2
Class room block 2	Ceiling Fan	2	1	75	6	0.15	22.95	40W Ceiling Fan	40.00	0.08	12.24	10.71	64.69	1850.00	3700.00	57.2
NSS	Ceiling	2	1	75	6	0.15	22.95	40W	40.00	0.08	12.24	10.71	64.69	1850.00	3700.00	57.2

Location	Fan Type	Qty	UF	Wattage	Op Hr	Load	Mthly Kwh	Change	New Wattage	New Load	Mthly Kwh	Saving Kwh	Saving Rs	Unit Rate	Inv	Payback (Months)
	Fan							Ceiling Fan								
Geography Dept	Ceiling Fan	3	1	75	6	0.23	34.425	40W Ceiling Fan	40.00	0.12	18.36	16.07	97.03	1850.00	5550.00	57.2
Total		83.00				6.20	876.31			3.54	503.24	373.07	2253.31		118400.00	52.54

Fan Recommendation 1

Replace existing 75 watt conventional ceiling fans with 40 watt energy efficient fans

- . Total No. of ceiling fans present = 83 Nos.
- Total No. of ceiling fans presently operated= 83 Nos.
- Total No. of ceiling fans to be replace= 83 Nos.
- Present Energy Consumption = 448 kWh
- Expected Energy Consumption = 239 kWh
- Total Energy Saved per Month = 209 kWh
- Monetary Savings = Rs.1909
- Investment = Rs.149400
- Simple Payback period = 78.23 Months

7 Requirements of NAAC

7.1 Alternative Energy Initiative

Percentage of power requirement met by renewable energy sources

= (Power requirement met by renewable energy sources / Total power requirement) X 100

= (7295/11451) X 100

= 157 % (Energy generated from Solar PV system is more than energy required for college campus)

7.2 Percentage of lighting power requirement met through LED bulbs

7.2.1 Percentage of lighting power requirement met through LED bulbs

= (Lighting power requirement met through LED bulbs / Total lighting power requirement) X 100

= (2.85 / 2.85)

= 100 %

8 Green Audit

Green audit was initiated with the beginning of 1970s with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. It exposes the authenticity of the proclamations made by multinational companies, armies and national governments with the concern of health issues as the consequences of environmental pollution. It is the duty of organizations to carry out the Green Audits of their ongoing processes for various reasons such as; to make sure whether they are performing in accordance with relevant rules and regulations, to improve the procedures and ability of materials, to analyze the potential duties and to determine a way which can lower the cost and add to the revenue. Through Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit. Some of the incidents like Bhopal Gas Tragedy (Bhopal; 1984), Chernobyl Catastrophe (Ukraine; 1986) and Exxon-Valdez Oil Spill (Alaska; 1989) have cautioned the industries that setting corporate strategies for environmental security elements have no meaning until they are implemented.

Green Audit is assigned to the Criteria 7 of NAAC, National Assessment and Accreditation Council which is a self-governing organization of India that declares the institutions as Grade a, Grade B or Grade C according to the scores assigned at the time of accreditation.

The intention of organizing Green Audit is to upgrade the environment condition in and around the institutes, colleges, companies and other organizations. It is carried out with the aid of performing tasks like waste management, energy saving and others to turn into a better environmental friendly institute.

8.1 Goals of Green Audit

- The objective of carrying out Green Audit is securing the environment and cut down the threats posed to human health.
- To make sure that rules and regulations are taken care of
- To avoid the interruptions in environment that are more difficult to handle and their correction requires high cost.
- To suggest the best protocols for adding to sustainable development

8.2 Benefits of Green Audit

- It would help to shield the environment
- Recognize the cost saving methods through waste minimizing and managing
- Point out the prevailing and forthcoming complications
- Authenticate conformity with the implemented laws
- Empower the organizations to frame a better environmental performance
- It portrays a good image of a company which helps building better relationships with the group of stakeholders
- Enhance the alertness for environmental guidelines and duties

9 Initiatives by College towards Sustainable Environment

9.1 Dripping System and New Tree Plantation

Complete Campus has been under dripping system, which helps college to minimize the water uses and spread awareness of water management and water distribution in the students.

The college has independent plant nursery to nurture the various types of plants which helps to control green house gases and temperature. The student of the plant spread awareness in nearby villages about plantation and green house gases emissions. The college and students also donated lakhs of plants to the villagers.





9.2 Vermicompost Plant

Vermicompost (or vermi-compost) is the product of the composting process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a mixture of decomposing vegetable or food waste, bedding materials, and vermicast.

Vermicast (also called worm castings, worm humus, worm manure, or worm feces) is the end-product of the breakdown of organic matter by earthworms. These castings have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than the organic materials before vermicomposting.

Vermicompost contains water-soluble nutrients and is an excellent, nutrient-rich organic fertilizer and soil conditioner. It is used in farming and small scale sustainable, organic farming.

Vermicomposting can also be applied for treatment of sewage sludge. Furthermore, a variation of the process is vermifiltration (or vermidigestion) which is used to remove organic matter, pathogens and oxygen demand from wastewater or directly from blackwater of flush toilets

College has vermicompost plant with following specifications

- Pit Size = 8' X 4' X 3'
- Total Area = 576 Sq.ft

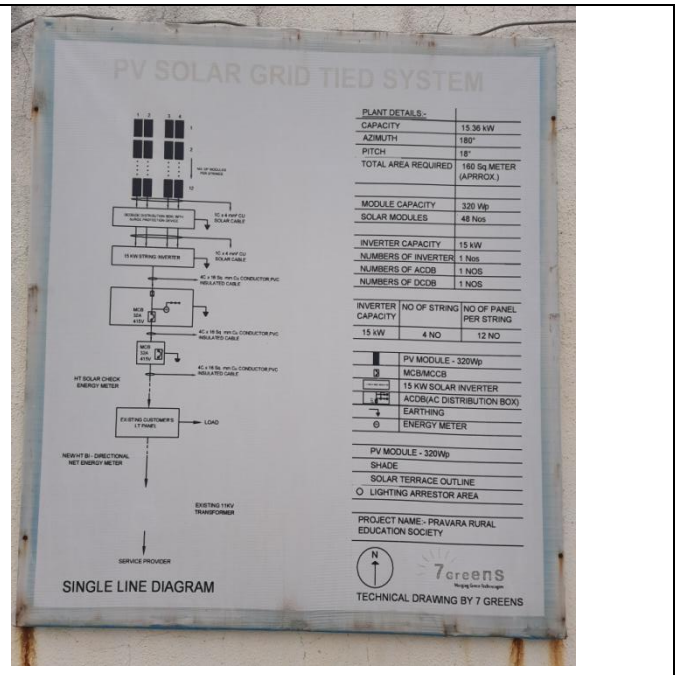
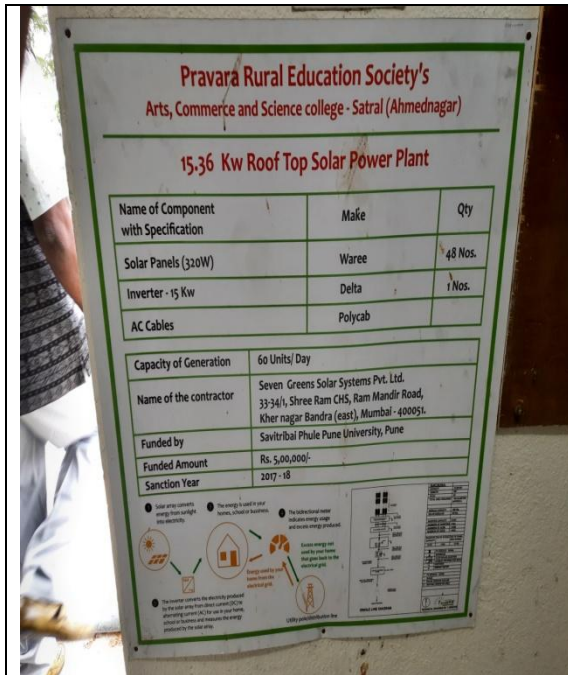
Green waste such as dung, grass, etc has been used for this plant. Period of approximate 2 months is required for generation of vermicompost. Around 2.5 Tons of vermicompost is generated from this plant

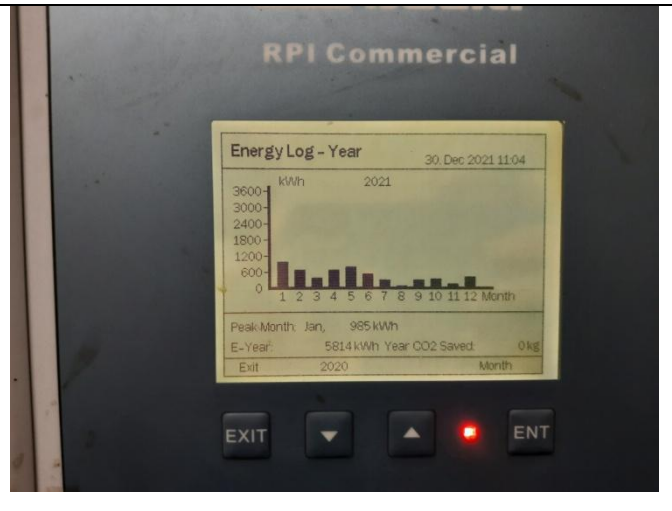
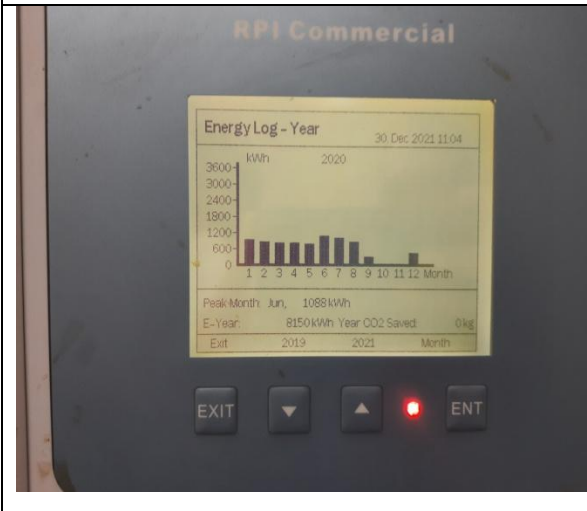
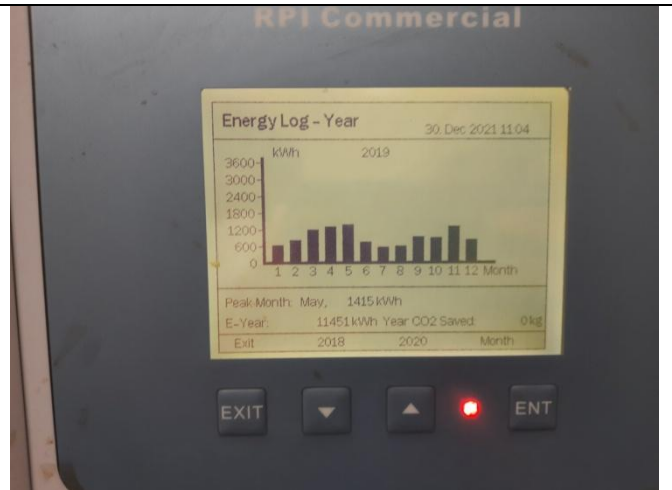
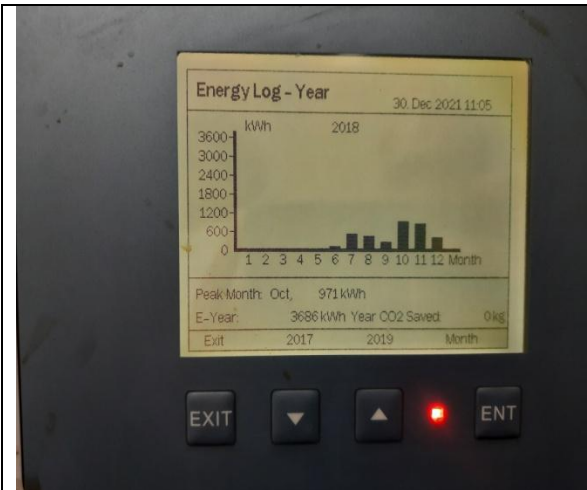
Following are the some actual images of vermicompost plant



9.3 Solar PV System

The college had installed 15.36 kW Rooftop Solar PV System in July 2018. Per month unit generation has been listed below.





9.4 Rain Water Harvesting

The College successfully installed and run the “Rain Water Harvesting System”. Currently the have total 3 tanks to store the rain water. One is installed near the chemistry lab which used this water in their laboratory. Other two tanks are installed near to Main Building having capacities of 1500 liters each, overflow of water then transferred to nearby well by 4 inch underground pipeline to refilling ground-water



9.5 Awareness of Renewable Energy

College has been taking efforts to create the awareness of solar energy among the students and in nearby villages. Department of Physics organized seminars, workshops, rallies to promote the benefits of solar energy. A department has some own solar equipments such as solar cooker, solar lamp, etc for practical purpose.

Following are the some images showing initiative taken by college to create the awareness of renewable energy such as solar, biogas, etc



9.6 LED Lighting System

The college has 100 % LED Lighting in the campus. This is good initiative by college towards conservation of energy



10 Scope for Improvement

10.1 Liquid Waste Management

The proper disposal of liquid waste is a must in order to maintain a good human and animal health. Because liquid waste has a high amount of dangerous compounds such as salts and metals, it is important for companies to get rid of it in a timely manner. Industrial wastes, including dangerous and hazardous liquids, can be disposed of by using a wide variety of techniques and methods.

Present Condition

There is an improvement opportunity for college. Sewage treatment facility can be provided to re-use the waste water for applications other than drinking. It is recommended that to make standard operating procedure (SOP) for disposal of chemicals which has been used in laboratories for practical purpose

Following details are given for guidance to dispose the laboratory chemical waste

Solution

Disposal Procedures for Laboratory Chemicals

It is the clear responsibility of all research workers to ensure the safe and correct disposal of all wastes produced in the course of their work. Improper and irresponsible disposal of chemical wastes down drains, to the Local Authority refuse collection, or into the atmosphere is forbidden by law.

Wash down drains with excess water

- Concentrated and dilute acids and alkalis
- Harmless soluble inorganic salts (including all drying agents such as CaCl_2 , MgSO_4 , Na_2SO_4 , P_2O_5)
- Alcohols containing salts (e.g. from destroying sodium)
- Hypochlorite solutions from destroying cyanids, phosphines, etc.
- Fine (tlc grade) silica and alumina

It should be noted in particular that no material on the "Red List" should ever be washed down a drain. This list is as follows:

- compounds of the following elements:- antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, tellurium, thallium, tin, titanium, uranium, vanadium and zinc.
- organohalogen, organophosphorus or organonitrogen pesticides, triazine herbicides, any other biocides.
- cyanides
- mineral oils and hydrocarbons
- poisonous organosilicon compounds, metal phosphides and phosphorus element
- fluorides and nitrites

Incineration (Solvent Waste collection)

- all organic solvents including water miscible ones
- soluble organic waste including most organic solids
- paraffin and mineral oil (from oil baths and pumps)

Laboratory waste bins and controlled waste

All waste suitable for the Local Authority refuse collection, except recyclable paper and glass, is termed 'controlled waste'. Items in this category which includes dirty paper, plastic, rubber and wood, should generally be placed in the waste bins available in each laboratory and will be collected by the cleaners. However, each laboratory must also have a container for certain items which are not allowed to be put in the normal waste bins. In this special controlled waste container should be put:- all broken laboratory glassware, any sharp objects of metal or glass, all fine powders (preferably inside a bottle or jar) and dirty sample tubes or other items lightly contaminated with chemicals (but not any syringes or needles). Laboratory controlled waste containers must be emptied regularly and never allowed to overflow. Under no circumstances must any item of glass, sharp metal or fine powder ever be put in a normal laboratory waste bin. The tops must be removed from all bottles put out for disposal and there should be no detectable smell of chemicals from any bottle put for disposal.

For more information, please visit

<https://www.standrews.ac.uk/staff/policy/healthandsafety/publications/waste/waste-disposaloflaboratorywastesguidance/>

10.2 E Waste Management

Electronic waste or e-waste describes discarded electrical or electronic devices. Used electronics which are destined for reuse, resale, salvage, recycling, or disposal are also considered e-waste. Informal processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution.

Electronic scrap components, such as CPUs, contain potentially harmful components such as lead, cadmium, beryllium, or brominated flame retardants. Recycling and disposal of e-waste may involve significant risk to health of workers and communities in developed countries and great care must be taken to avoid unsafe exposure in recycling operations and leaking of materials such as heavy metals from landfills and incinerator ashes.

College need to have E-waste management policy and all the E-waste disposals generated in the college campus should be disposed/ reuse as per standard procedures/norms

The environmental impact of the processing of different electronic waste components

E-Waste Component	Process Used	Potential Environmental Hazard
Cathode ray tubes (used in TVs, computer monitors, ATM, video cameras, and more)	Breaking and removal of yoke, then dumping	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor
Printed circuit board (image behind table – a thin plate on which chips and other electronic components are placed)	De-soldering and removal of computer chips; open burning and acid baths to remove metals after chips are removed.	Air emissions and discharge into rivers of glass dust, tin, lead, brominated dioxin, beryllium cadmium, and mercury
Chips and other gold plated components	Chemical stripping using nitric and hydrochloric acid and burning of chips	PAHs, heavy metals, brominated flame retardants discharged directly into rivers acidifying fish and flora. Tin and lead contamination of surface and groundwater. Air emissions of brominated dioxins, heavy metals, and PAHs
Plastics from printers, keyboards, monitors, etc.	Shredding and low temp melting to be reused	Emissions of brominated dioxins, heavy metals, and hydrocarbons
Computer wires	Open burning and stripping to remove copper	PAHs released into air, water, and soil.