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SECTORD1,VASANTKUNJ, NEWDELHI-70

Energy & Environment/Green Audit **Date of Audit:** 19.05.2023

(2022-2023 ON 19.05.2023)

ENERGY & ENVIRONMENT/GREEN AUDIT REPORT

Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut, Uttar Uradesh -250110

Prepared by

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ENERGY & ENVIRONMENT/GREEN AUDIT REPORT (2022-23)

1. Acknowledgement

Institute of Liver & Biliary Sciences expresses sincere thanks to the management of **"Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut"** for giving the opportunity to conduct energy audit at their Facility and give the findings to them.

ILBS acknowledges and appreciates the commitment of the management towards conservation of Energy. On behalf of ILBS, I express my gratitude and acknowledge that the O&M of SVPUhas a positive attitude for safety, reliability, environment and energy conservation. They have an inclination for energy efficiency improvement and better utilization of installed energy monitoring system. It needs to be stated here that the **SVPUA&T, Meerut (U.P.)** has been very supportive and cooperative resulting in expeditious completion of the energy audit.

I, hereby express thanks to all other staff for their support during field study & data collection. Our Special thanks due to:

- Dr. B. R. Singh–Dean & Professor, College of Technology and Committee Members.
- Team of Colleagues

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Date of Audit: 19.05.2023

ENERGY & ENVIRONMENT/ GREEN AUDIT CERTIFICATE

This is to certify that the "Energy and Environment/ Green Audit" for Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, (UP) has been conducted on 19th May, 2023 to assess Energy Cost, availability and reliability of supply of energy conservation technology and ways to reduce energy consumption alongwith environment initiatives taken by the university.

The efforts and initiatives undertaken by the university to ensure that energy saving practices are implemented and followed and also to keep the environment friendly atmosphere in a satisfactory condition.

Place: Modipuram, Meerut, U P
Date: 19.05.2023

19.5.23

Er. Ved Prakash Siwach, FIE,
Chartered Engineer.
General Manager (Engineering), ILBS

Er. Rajeev Saxena
Sr. Deputy Chief Electrical Engineer, DMRC

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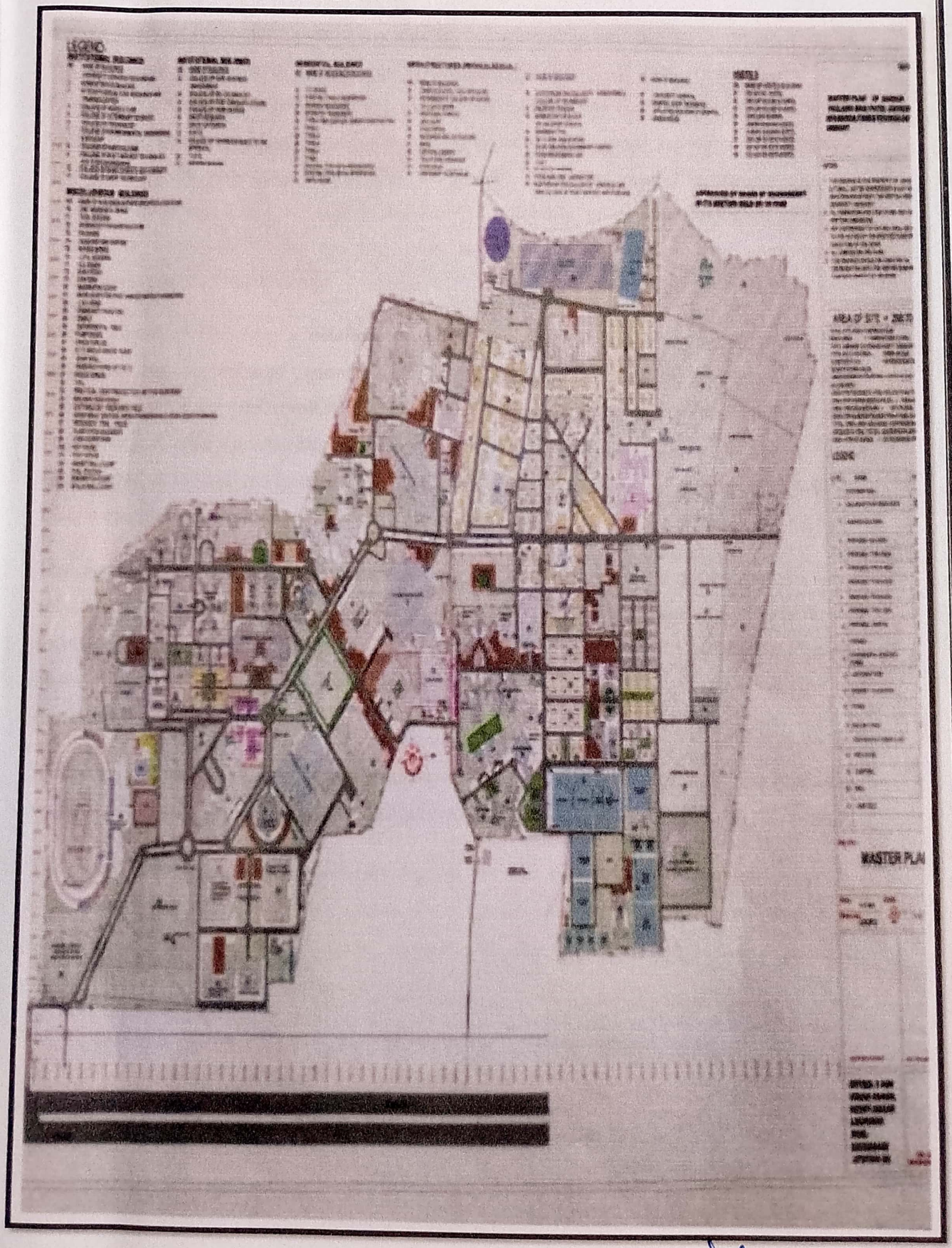
UNIVERSITY CAMPUS LAYOUT



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4. EXECUTIVE SUMMARY

Energy is one of the major inputs in any industry or commercial building and is the mainstay of the economic development of the country. Rising Electricity & fuel costs coupled with increased global competition is forcing players to slash the energy costs. Energy Audit helps in energy cost optimization, pollution control, safety aspects and suggests the methods to improve the operating &maintenance practices of the system. It is instrumental in coping with the situation of variation in energy cost availability, reliability of energy supply, decision on appropriate energy mix, decision on using improved energy conservation equipment's, instrumentation's and technology.

It was aimed at obtaining a detailed idea about the various end use energy consumption activities and identifying, enumerating and evaluating the possible energy savings opportunities. Energy conservation is a continuous process and there is always scope for further improvements, with this objective the Energy Audit team with the active involvement, **ILBS** have identified the various Energy Conservation Opportunities (ECO's). Implementation of the ECO's can further help reduce the energy consumption.

The purpose of the audit was to ensure that the practice followed in the campus is in accordance with the Green Policy & Energy policy by the University. The methodology included: preparation and filling up of questionnaire, physical inspection of the Campus, observation and review of the documentation, data analysis, measurement and recommendations.

It works on the several aspects of green campus including water conservation, tree plantation, waste management, paper less works, alternative energy etc.

The audit would give a positive orientation to the energy cost reduction, preventive maintenance and quality control programmed which are vital for production and utility activities. It can make a tremendous impact on student health and learning university operational costs and the environment.

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5. ENERGY AUDIT SUMMARY

Sl .No.	Equipment	Observation	Remarks
1	Transformer	Grass developed in the transformer and Water logging observed	Grass need to be removed and Suitable gravels/PCC to be placed
2	DG Sets	----	----
3	Lighting Equipment	Sufficient natural lights seen in the campus including LEDs	----
4	Fan System	Energy efficient fans seen in the campus	----
5	Pumping System	Energy efficient motors have been used in the campus	----
6	Air-Conditioning Units	Eco-friendly gases are being used in the ACs	----
7	Solar Energy	Solar Panels are installed in the campus	Need to be expanded for increased capacity

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6. INTRODUCTION

Energy and Environment audit is the key to a systematic approach for decision-making inthe area of energy management and gives a positive orientation to the energy resource cost reduction. The primary objective of the audit is to determine ways to reduce energy consumption to lower operating costs.

The Energy audit is conducted with the following objectives:

- Detailed studies of the intended energy consuming equipment including historical and present energy performance trends
- Quantification of energy losses and energy saving potential
- Presentations of energy efficiency measures with cost benefit analysis
- Identifying potential areas of electrical energy economy

6.1. About sardar vallabhbhai patel university of agriculture and technology.

Sardar Vallabhbhai Patel University of Agriculture and Technology established as a full-fledged University has unique honour of being called "First Agriculture University of the third millennium and the 21st century". It is committed to a unique mandate of integrating education research and extension so as to serve the rural people. It is recognized and funded by U.P. Govt. & ICAR, Govt. of India. It is included in the list of recognized universities maintained by the University Grants Commission (UGC), Govt. of India. The said university has been included in the list of universities maintained by the University Grants Commission under Section- 2 (f) of the UGC Act, 1956.

The University is making provision for the education of the rural people of Uttar Pradesh in different branches in study, particularly agriculture, rural industry and business, and other allied subjects. The core attributes of the university are teaching, research and extension which are vital for the development of skilled human resources to compete at global level for socio-economic up lift of rural community.

The university is gaining reputation through its able and dedicated faculty, sustainable education patterns, well defined scholastic protocols under the noteworthy guidance of its visionary Vice-Chancellors. The University is localized in the NCR region and is well connected by roads from all directions.

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7. OBJECTIVE OF THE STUDY

The main motive of the Energy and Environment/Green Audit is to promote the Environment & Energy management and conservation in the University campus. The goal of the audit program is to identify, quantify, describe and prioritize framework of environment sustainability in compliance with the applicable regulations, policies and standards. The main purposes of environment audit are:

- To introduce and aware students to real concerns of environment and its sustainability
- To secure the environment and cut down the threats posed to human health by analysing the pattern and extent of resource use if the campus.
- To establish a baseline data to assess future sustainability by avoiding the interruption in environment that are more difficult to handle and their corrections requiring high cost.
- To bring out a status report on environmental compliance.

The primary objectives of energy audit are to identify and evaluate opportunities to reduce energy consumption per unit of product output and reduce operating costs through energy conservation and planning. Energy audit provides a "bench-mark" for managing energy in the organization and also provides the basis for planning a more effective use of energy throughout the organization.

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8. SCOPE OF ENERGY AUDIT WORK:

Electrical Distribution System:

- Study of Reactive Power Management and option for power factor improvement.
- Study of power quality issues like Power Factors, Voltages, Currents, Active Powers, Reactive Powers, Apparent Powers, THD & Harmonics at various load feeders.
- Capacitor bank health check-up
- Exploring the Energy Conservation Options (ENCON) in electrical distribution system to optimize transformer loading & improvement in level metering.
- Exploring the solutions for improving the power quality.

HVAC System

- Review the performance of the refrigeration & air conditioning systems including AHU, Chillers, Cooling tower, Air conditioners, find out Energy Efficiency Ratio, kW/TR, Specific TR loading and Kwh Calculation, available TR in the area through measuring velocity of air flow & temp. & humidity requirement as per existing & the proposed recommendation to suggest energy conservations means to improve the same.
- Collection of Inventory data of Air conditioners/Sample size selection and testing of power consumption and capacity (TR) delivered under the existing weather conditions / Air-conditioned floor area.

Pumps & Motors

- Performance assessment of HVAC pumps via Head/pressure, flow, power and determination of pump/motor loading based on measured parameters.
- Exploring the Energy Conservation Options (ENCON) in water pumping system. All saving & recommendation.

DG Sets:

- Review of the operation and performance of DG set through units generated, diesel consumption.
- Specific fuel consumption in terms of KWh/Ltr and suggest for energy conservation opportunity.

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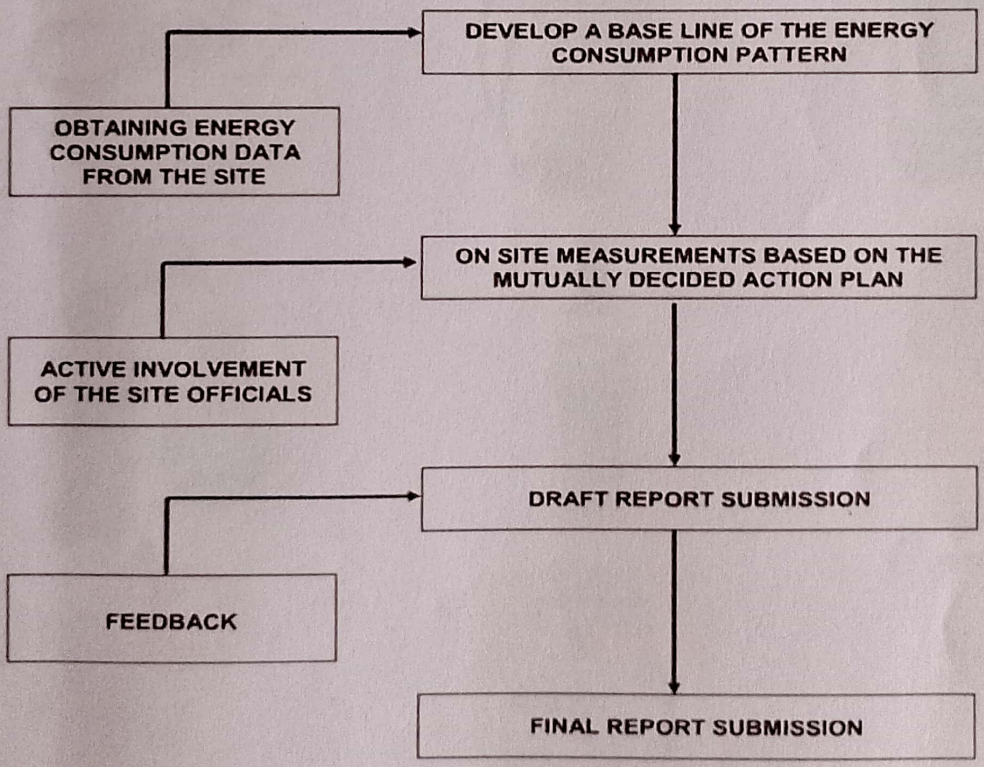
9. METHODOLOGY OF WORK:

The methodology adopted for this audit was

- A preliminary energy audit has been conducted to establish the energy consumption of the organization by analyzing the available past energy consumption data, identification of the areas requiring more detailed study and measurements.
- Visual inspection and data collection.
- Identification/verification of energy consumption and other parameters by measurements
- Computation and in-depth analysis of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plans for improvements/reduction in specific energy consumption.
- Potential energy saving opportunities
- Flow chart for methodology for report preparation



This report is just first step, a mere mile marker towards our destination of achieving energy efficiency and we would like to emphasize that an energy audit is a continuous process. We have compiled a list of possible actions to conserve and efficiently utilize our scarce resources and identified their savings potential.

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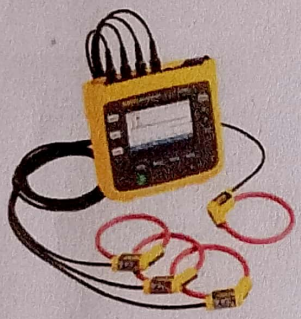
10. LIST OF INSTRUMENTS

- 3 Phase Power Analyzer-Fluke1736
- Black Box-G3500
- Power lamp
- Distance meter
- Anemometer
- Hygrometer
- Thermal camera









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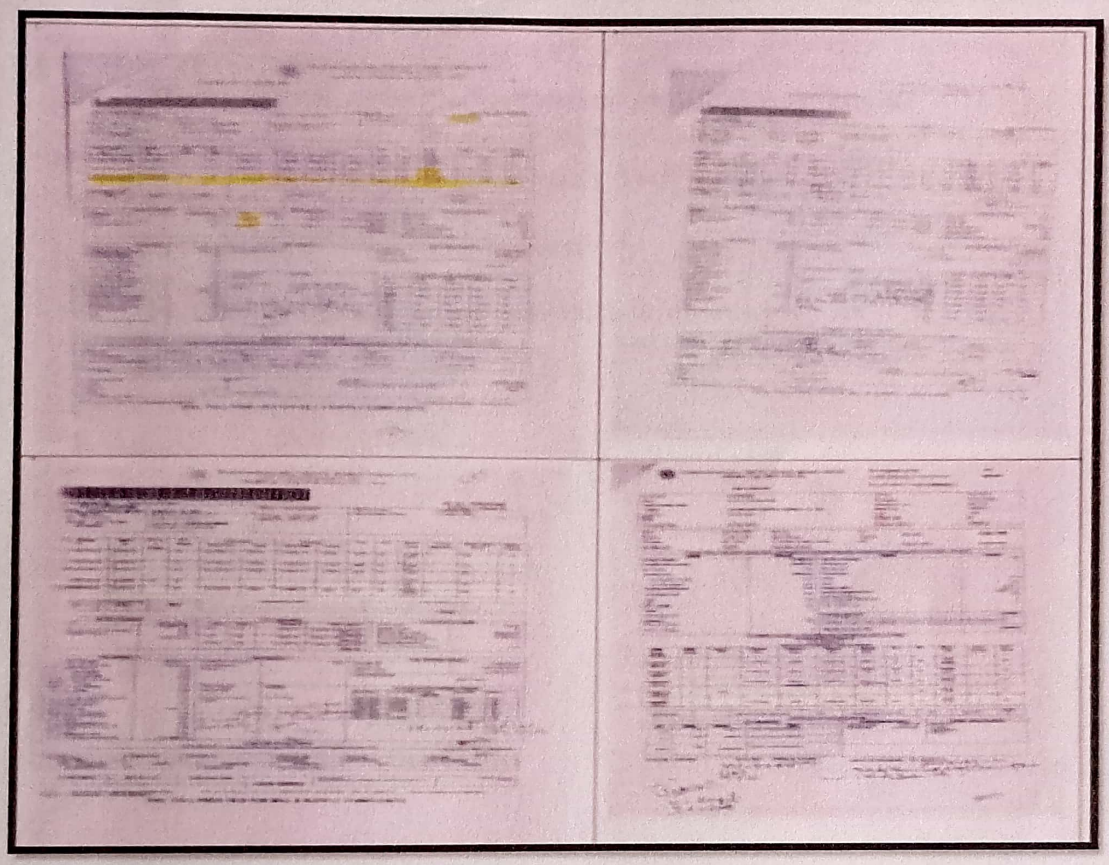
11. ELECTRICITY BILL ANALYSIS

Electricity bill details of 04 months has been presented below where we have observed the sanction load, contract load, maximum demand, billed units, power factor, fixed charges and the electricity amount imposed by electricity board followed by the amount paid by SVPUA&T.



To study the facility's investment on purchasing electricity from state electricity board and energy usage pattern at site, we have analyzed the electricity bill of the facility for the last 12 months. The total amount on the energy bill puts an upper limit on the amount of money that can be saved. We have studied the electricity bills (of last 04 months) of the facility for the connection and have presented trends for various parameters like monthly kWAh consumption, Power Factor, Maximum demand & Energy charge. A comparative study between sanction demand and maximum demand has been also done and presented in the upcoming sections. These presented data help us to analyze the unit consumption pattern at site and the scope of further energy saving.

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Observations:

1) Client is maintaining power factor nearly unit at both the connections which is a good practice.

2) We have observed that there is much variation in maximum demand in both connections for the year.

3) We have also observed that maximum demand is exceeding at 11 KV CA from last two months. Moreover, there is no penalty mentioned in electricity bill. We suggest client to please verify it with the distribution company.

4) Varying power factor was observed.

5) Capacitor panel is recommended to be installed.

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12. PERFORMANCE ASSESMENT AND ENERGY SAVING SCOPE

12.1 Electrical Distribution System and Power Quality Study of Transformers

Clients have installed different distribution transformers at facility for stepping down the voltage to 415V and cater power to the downstream connected loads. Power quality study at transformers is presented below:

Observation:

- Plant in gravel area of transformer
- Risk/violation:NEC-2016
- Action required: Plant needs to be removed. Also, gravel needs to be placed

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HVAC (Heating/Ventilation/Air Conditioning) :

- Tune up the Air-Conditioning control system.
- Use appropriate AC thermostat setback.
- In winter during unoccupied periods, allow temperatures to fall as low as possible without freezing water lines or damaging stored materials.
- In summer during unoccupied periods, allow temperatures to rise as high as possible without damaging stored materials.
- Improve control and utilization of outside air.
- Use air-to-air heat exchangers to reduce energy requirements for heating and cooling of outside air.
- Reduce AC system operating hours(e.g. night, weekend).
- Optimize ventilation.
- Ventilate only when necessary. To allow some areas to be shut down when unoccupied, install dedicated AC systems on continuous loads (e.g. -- computer rooms).
- Use evaporative cooling in dry climates.
- Clean AC unit coils periodically and comb mashed fins.
- Upgradefilterbankstoreducepressuredropandthuslowerfanpowerrequirements.
- Check AC filters on a schedule (at least monthly)and clean/change if appropriate.
- Check pneumatic controls air compressors for proper operation, cycling, and maintenance.
- Isolate air-conditioned loading dock areas and cool storage areas using high-speed doors or clear PVC strip curtains.
- Install ceiling fans to minimize thermal stratification in high-bay areas.
- Re locate air diffusers to optimum heights in areas with high ceilings.
- Consider reducing ceiling heights.
- Use spot cooling and heating (e.g.—use ceiling fans for personnel rather than cooling the entire area).
- Purchase only high-efficiency models for AC units.
- Put AC window units on timer control.
- Don't over size cooling units. (Over sized units will "short cycle" which results in poor humidity control.)
- Consider dedicated make up air for exhaust hoods. (Why exhaust the air conditioning or heat if you don't need to?)

- Minimize AC fan speeds.
- Eliminate simultaneous heating and cooling during seasonal transition periods.
- Establish an AC efficiency-maintenance program. Start with an energy audit and follow-up, then make an HVAC efficiency-maintenance program a part of your continuous energy management program.

Lighting:

- Replace existing T8, CFL by LED.
- Reduce excessive illumination levels to standard levels using switching ;de-lamping, etc. (Know the electrical effects before doing de-lamping.)
- Aggressively control lighting with clock timers delay timers, photocells, and occupancy sensors.
- Install efficient alternatives to incandescent lighting, mercury vapour lighting, etc. Efficiency (lumen/watt) of various technologies range from best to worst approximately as follows: low pressure sodium, high pressure sodium, metal halide, fluorescent, mercury vapor, incandescent.
- Select ballasts and lamps carefully with high power factor and long-term efficiency in mind.
- Upgrade obsolete fluorescent systems to Compact fluorescents and electronic ballasts
- Consider lowering the fixtures to enable using less of them.
- Consider day lighting, sky lights, etc.
- Consider painting the walls a lighter color and using less lighting fixtures or lower wattages.
- Use task lighting and reduce background illumination.
- Re-evaluate exterior lighting strategy, type, and control. Control it aggressively.

DG sets:

- Optimize loading
- Use jacket and head cooling water for process needs
- Clean air filters regularly
- Insulate exhaust pipes to reduce DG set room temperatures
- Use cheaper heavy fuel oil for capacities more than 1 MW.

Buildings:

- Seal exterior cracks/openings/ gaps with caulk, gasketing, weather stripping, etc.
- Consider new thermal doors, thermal windows, roofing insulation, etc.
- Install wind breaks near exterior doors.
- Replace single-pane glass with insulating glass.

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- Consider covering some window and sky light areas with insulated wall panels inside the building.
- If visibility is not required but light is required, consider replacing exterior windows with insulated glass block.
- Consider tinted glass, reflective glass, coatings, awnings, over hangs, draperies, blinds, and shades for sunlit exterior windows.
- Use landscaping to advantage.
- Add vestibules or revolving doors to primary exterior personnel doors.
- Consider automatic doors, air curtains, strip doors, etc. at high-traffic passages between conditioned and non-conditioned spaces. Use self-closing doors if possible.
- Use intermediate doors in stairways and vertical passages to minimize buildings tack effect.
- Bring cleaning personnel in during the working day or as soon after as possible to minimize lighting and HVAC costs.

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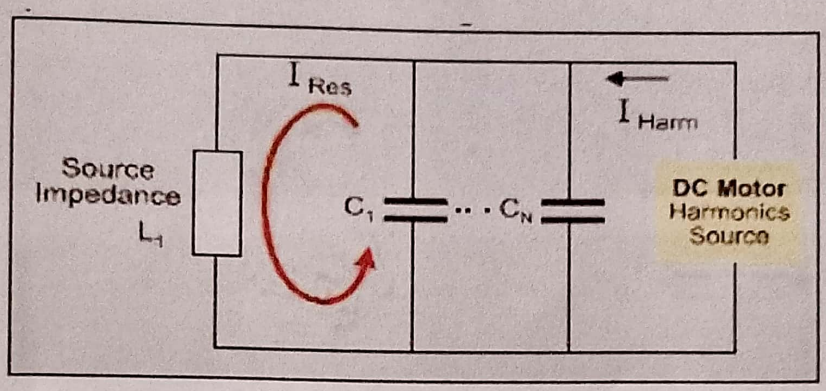
12.3 GENERAL INFORMATION ABOUT HARMONICS AND ITS STANDARDS HARMONIC RESONACE

Capacitors do not generate harmonics but application of the same in any network with adequate protection magnifies the existing harmonic content. Then there can be a problem of parallel resonance which takes place between Reactive impedance of capacitor bank and impedance of other network devices like Transformers, Cables etc. The Problem of resonance as explained below in the diagram.



Resonance conditions

The harmonic and resonance can create negative influence on capacitor bank andothernetworkdevices.Thiscancausepre-maturefailure/de-rating/busting ofcapacitorbankandotherfailureinthenetworkdeviceslikeelectroniccards/ parts, over heating of switch gear/cables/transformers etc.

Some other problems because of high harmonic distortions can be as follows:

1. Malfunctioning and failure in electronic equipment
2. Overheating and failure in transformer sand cables
3. Over load and failure in capacitor banks, contactors & switch gears in APFC System
4. Low efficiency of transformer sand cables
5. Tripping of protections without apparent reason
6. Over load and failure in motors
7. Interferences in communication network

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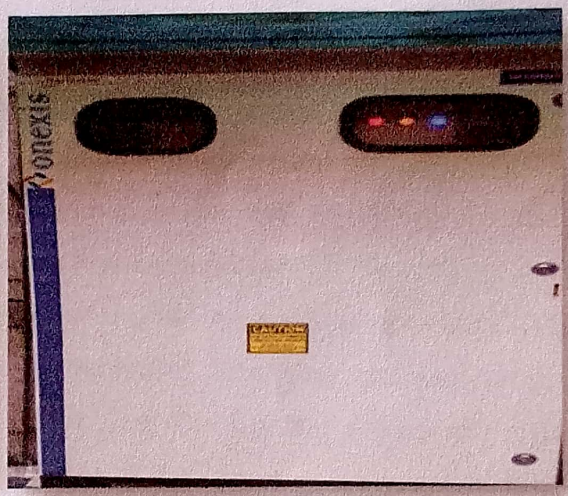
13. BEST PRACTICES ADOPTED BY THE UNIVERSITY



- 1000 KW Grid Connected Roof Top Solar PV System is installed on the roof of various colleges on the university campus.
- After the installation of net meter (January, 201 9) under Solar System in the University by June 2022,650656 Electricity Units have been exported to the grid

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14. ENVIRONMENT/GREEN AUDIT

14.1 About Environment/Green audit

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and in hospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Considering the present environmental problems of pollution and excess use of natural resources. University Grants Commission has mentioned "Green Campus, Clean Campus" mission mandatory for all higher educational institutes. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

Green audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environment activities are monitored within and outside of the University campus which have direct and indirect impact on surroundings.

Green audit can be one of the initiatives for universities to account their energy, water resource use as well as waste water, solid waste, E-waste, hazardous waste generation. Green audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

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14.2. Environment/Green Audit Summary

Sl No	Area	Particulars	Observation
1.	Solid Waste Management	Damaged Furniture, Paper waste, Food waste	University has adequate solid waste management policy and maintained the same
2.	Liquid Waste Management	Laboratory waste	University has adequate Liquid waste management policy and maintained the same
3.	E-Waste Management	Computers, Laptop, Electrical and Electronic parts	E-Management policy to be adopted
4.	Renewable Energy Management	Use of solar energy	1MW capacity Rooftop solar plants Installed in campus
5.	Rain water harvesting	Store and use of rain water	Rain water harvesting system is Installed

Facility available in the campus.

- Garden Area
- Playground
- Waste store Yard
- Canteen
- Hostel Facility
- Guest House, etc.

14.3 Objectives of Green audit:

The main objective of Green Audit at Sardar Vallabhbhai Patel University of Agriculture & Technology is to make a complete assessment of the environmental indicators in the campus and make recommendations for implementation in the campus for better environmental management.

- To assess the quality of the water and recycling of waste water in the university campus.
- Estimation of energy & fuel usage and evaluating the carbon foot print of the university on a full attendance day.
- Evaluation of the measures implemented by university in reducing the Carbon Footprint.
- To monitor the generation of solid waste and adopting strategies for it's recycling.
- To evaluate the biodiversity of flora and fauna of the campus and providing a database for corrective actions and future plans.

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- To verify compliance with the relevant national, local or other laws and regulations.
- To minimize human exposure to risks from environmental, health and safety problems.
- More efficient resource management
- To create green plastic free campus and evolve health consciousness among the stakeholders.
- To recognize the cost saving methods through waste minimizing
- Impart environmental education through systematic environmental management approach and improving environmental standards.
- Developing an environmental ethic and value systems in students.

14.4 Goals of Green audit:

University has conducted a green audit with specific goals as:

- Identification and documentation of green practices followed by university.
- Identify strength and weakness in green practices.
- Conduct a survey to know the ground reality about green practices.
- Analyze and suggest solution for problems identified from survey.
- Assess facility of different types of waste management.
- Increase environmental awareness throughout campus.
- Identify and assess environmental risk.
- Motivates staff for optimized sustainable use of available resources.
- The long-term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

14.5 Target Areas of Green Audit

Green Audit focuses on the green campus, waste management, water management, Air Pollution, Animal Welfare, Energy Management, Carbon Footprint, environmental compliances etc.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, rain water harvesting, etc. will make the students good citizen of the country. Through green audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through carbon footprint reduction measures.

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14.6 Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications.
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

Consequently, the Honorable Prime Minister, Narendra Modi, initiated the National Mission on Water Conservation, known as 'Jal Shakti Abhiyan,' urging all citizens to collectively tackle the issue of water scarcity. The campaign encouraged the preservation of every drop of water and proposed the implementation of water audits across all sectors of water consumption. A water audit entails a comprehensive qualitative and quantitative assessment of water usage, aiming to identify strategies for reducing, reusing, and recycling water. Its application proves effective in minimizing losses, optimizing usage, and consequently fostering significant water conservation in various sectors including irrigation, domestic, power, and industrial usage. The essence of a water audit lies in its capacity to identify inefficiencies within the water distribution system, thereby serving as a vital tool for implementing water conservation measures within any establishment.

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15. UNIVERSITY INITIATIVES

15.1 List of Plants in University Campus

Table: List of tree species of the university

S.No.	Botanical Name	Family	Common Name	Total
1	*Mangiferaindica*	Anacardiaceae	Mango	471
2	*Alstoniascholaris*	Apocynaceae	Alstonia	72
3	*Tabernaemontana*	Apocynaceae	Chandni	133
4	*Syzygiumcumini*	Myrtaceae	Jamun	39
5	*Azadirachtaindica*	Meliaceae	Neem	58
6	*Neolamarckiacadamba*	Rubiaceae	Kadamb	02
7	*Phyllanthusemblica*	Phyllanthaceae	Amla	57
8	*Kigeliaafricana*	Bignonias	BalamKheera	04
9	*Terminaliabellirica*	Combretaceae	Bahera	46
10	*DelonixRegia*	Royal poinciana	Red Gulmohar	63
11	*Jacaranda mimosifolia*	Bignoniaceae	Blue gulmohar	12
12	*Saracaasoca*	Fabaceae	Ashoka	290
13	*Eucalyptus globulus*	Myrtaceae	Eucalyptus	01
14	*Roystonearegia*	Arecaceae	Royal plam	27
15	*Allagteraarenaria*	Arecaceae	Coastal plam	08
16	*Nariumindicum / Thevetianerifolia*	Dogbanes	Kaner	540
17	*Tamarindusindica*	Fabaceae	Tamarind	32
18	*Prunuspersica*	Rosaceae	Peach	38
19	*Punicagranatum*	Lythraceae	Pomegranate	115
20	*Swieteniamacrophylla*	Meliaceae	Mahogany	16
21	*Magnolia champaca*	Magnolia	Kanak Champa	127
22	*Callistemon citrinus*	Myrtaceae	Bottle brush	139
23	*Toonaciliate*	Meliaceae	Tun	12
24	Palms	Arecaceae	Palm	174
25	*Melaleuca bracteata*	Myrtaceae	Golden Bottle brush	20
26	*Nyctanthes arbor- tristis*	Oleaceae	Harsingar	59
27	*Morus alba*	Moraceae	Mullbery tree / Sehtoot	14
28	*Lagerstroemia speciosa*	Lythraceae	Pride of India	07
29	Ficus	Moraceae	Ficus	23
30	*Psidiumguajava*	Myrtaceae	Gauva	211
31	*Ficusracemosa*	Moraceae	Gular	06
32	*Moringaoleifera*	Moringaceae	Sahjan	30
33	*Araucaria araucana*	Araucariaceae	Arocaria	20

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34	*Ficusbenghalensis*	Moraceae	Banyan tree	02
35	*Ficusreligiosa*	Moraceae	Peepal	03
36	*Ficusvirens*	Moraceae	Pakad	12
37	*Grevillea robusta*	Proteaceae	Silver Oak	50
38	*Ziziphusmauritiana*	Rhamnaceae	Ber	56
39	*Prunuspersica*	Rosaceae	Pears	129
40	*Pyruspyrifolia*	Rosaceae	Nakh	20
41	*Madhucalongifolia*	Sapotaceae	Mahua	06
42	*Rosaidica*	Rosaceae	Rose	114
43	*Tecomastans*	Bignonias	Yellow bells	01
44	*Citrus Spp*	Rutaceae	Citrus	155
45	*Murrayakoenigii*	Rutaceae	Curry Leaf	22
46	*Populus*	salicaceae	Poplar	150
47	*Litchi chinensis*	Sapindaceae	Litchi	08
48	*Mimusopselengi*	Sapotaceae	Maulsari	06
49	*Bauhinia variegata*	Legumes	Kachnar	08
50	*Dalbergiasissoo*	Legumes	Sheesham	06
51	*Terminalia arjuna*	Combretaceae	Arjun	04
52	*Casia fistula*	Legumes	Amaltas	18
53	*Aegle marmelos*	Rutaceae	Bel	136
54	*Vitisvinifera*	Vitaceae	Grapes	50
55			Aonla	57
56	*Artocarpusheterophyllus*	Moraceae	Jack Fruit	05
57	*Eriobotrya japonica*	Rosaceae	Loquat	14
58	Kinnow	Rutacae	Kinnow	45
59			Plum	05
60	*Carissa carandas*	Apocynaceae	Karonda	153
61			Mulbery	02
62			Moringa	08
63			Ber	20
			Total Number of Plants	**4131**

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15.2 Landscaping In The University Campus

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16. RENEWABLE ENERGY

Solar power plant of capacity 1MW is installed on building roof of University colleges.

Fig: Showing 1000 KW solar PV System

17. Water and Wastewater Resource Management

As universities continue to grapple with the challenge of sustainability, the necessity for comprehensive wastewater audits has become increasingly apparent. Institutions, being hubs of knowledge dissemination and research, generate significant volumes of wastewater stemming from various sources such as laboratories, research facilities, and residential areas. Understanding the intricate composition and flow of this wastewater is critical in devising effective strategies for its management and treatment.

Ultimately, through the implementation of water audits, universities can set an example for their students and the broader community, highlighting the importance of responsible water use and the role of educational institutions in mitigating the impact of water scarcity and promoting sustainable water management practices.

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17.1 University water resources

The Main water uses in the campus includes drinking, cleaning, toilets and gardening. The University campus has continuous water supply of 09 hours per day through Sardar Vallabbhai Patel University of Agriculture and Technology, Modipuram, Meerut Completed water supply scheme including overhead tank 25 K Liter, UGR, Borewell and Distribution in Girls and boys Hostels, Colleges, residential campus and university gardens. The campus has several water harvesting units to recharge ground water. The water requirement is calculated based on per person utility per day. Toilet usage- 20 lts, Shower- 20 lts, clothes washing- 20 lts, utensil washing – 10 lts, mopping and washing rooms– 10 lts, cooking – 5 litres, drinking -2.5 lts and gardening – 30 lts.

Fig : university water Tank

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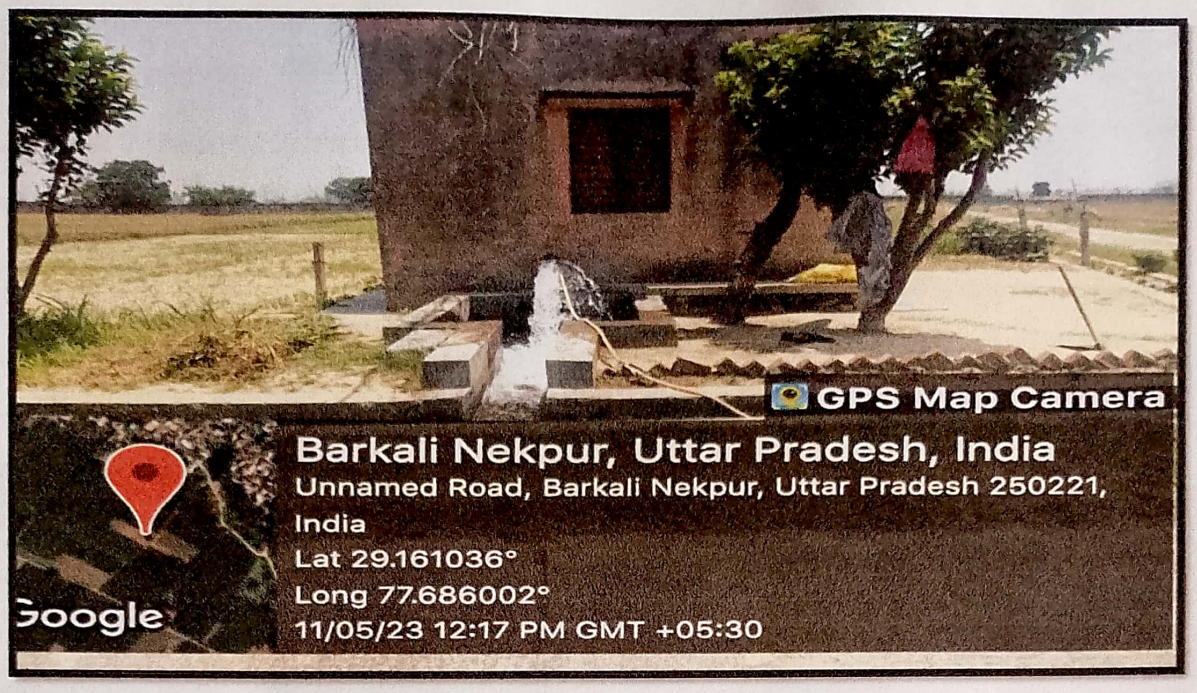

Fig.showing bore well

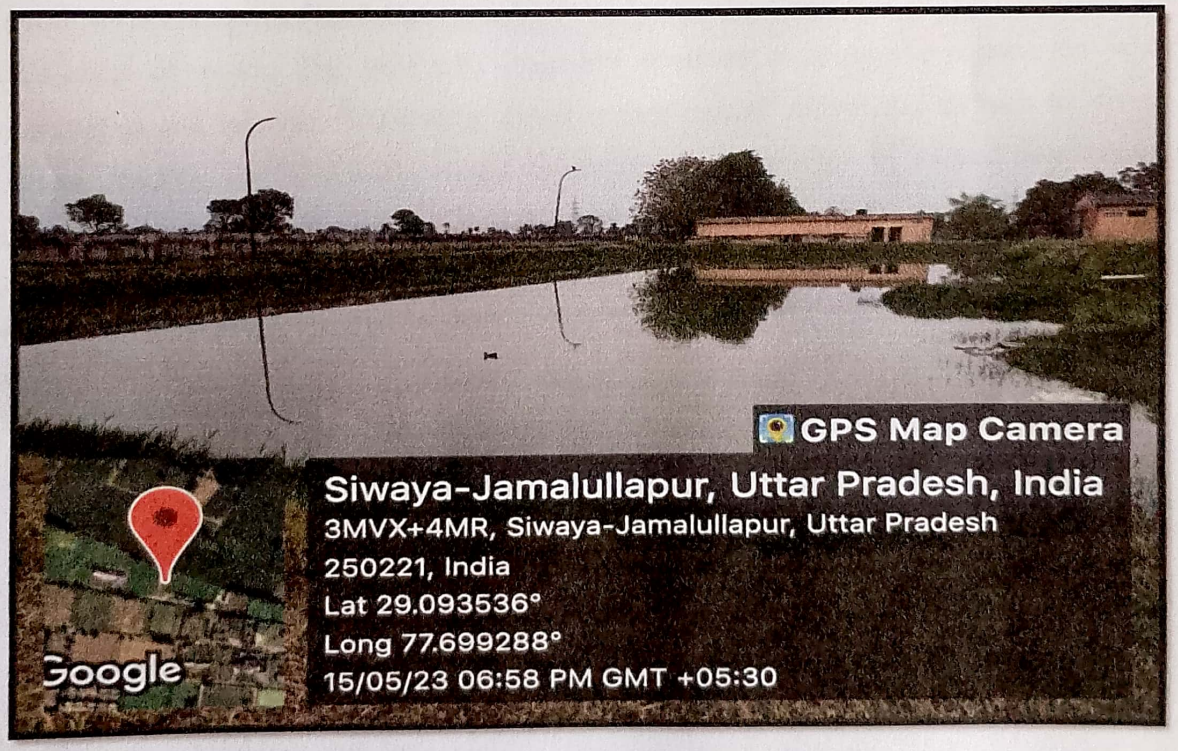

Fig. showing pond for fishery

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17.3 Rain water harvesting

Rainwater harvesting, a technique employed at **Sardar Vallabhbhai Patel University of Agriculture and Technology,** involves the collection of rainwater at its point of fall or the interception of rainwater runoff. This process, also referred to as a rainwater collection system or rainwater catchment system, encompasses a technology designed to gather and preserve rainwater for subsequent use. To maintain the purity of the collected water, effective filtration methods are employed, and the system is engineered to prevent the contamination of the stored water by pollutants. Rainwater is harvested from both rooftops and ground surfaces to be reused for the irrigation of lawns. Runoff from diverse ground sources and rooftops is gathered, purified, and subsequently reused for the purposes of gardening and washing. In addition to utilizing natural percolation tanks, the construction of concrete storage tanks has been undertaken, facilitating the storage of rainwater post-filtration. Notably, the university has refrained from covering open spaces with concrete roads, allowing for the natural percolation of rainwater. The practice of rainwater harvesting not only conserves water from conventional sources but also reduces the energy expenditure and costs associated with the transportation and distribution of water. The university regularly conducts awareness programs on water conservation and rainwater harvesting, disseminating crucial information through its diverse services. Notably, one of the rain waters harvesting pits is prominently located near the area admistrative building, colleges and hostels with similar structures dispersed throughout the university premises.

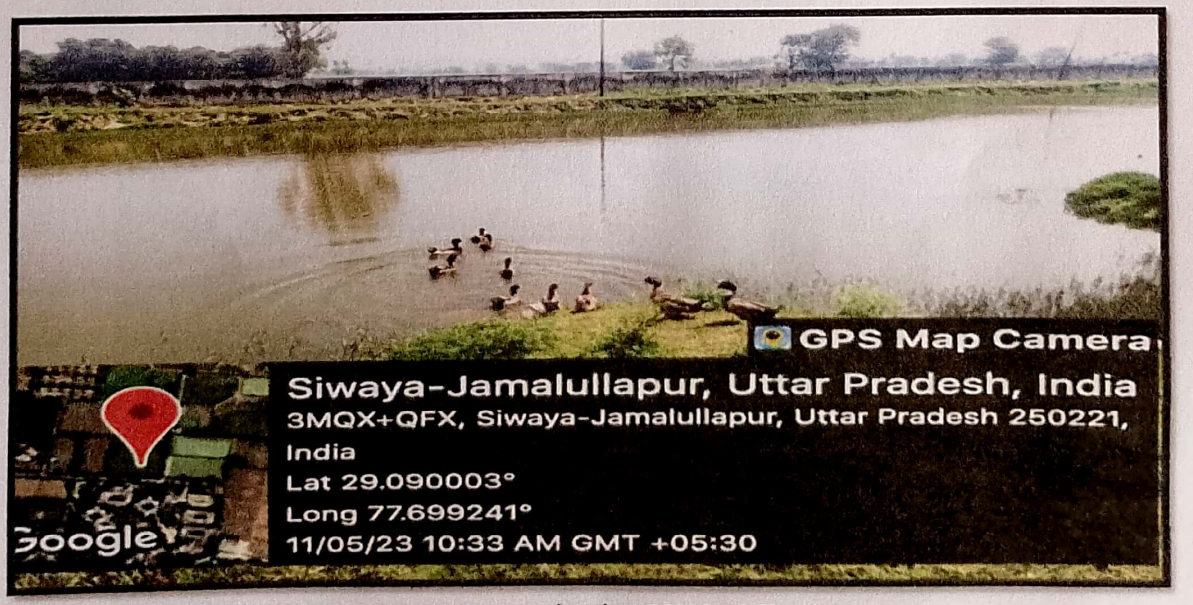

Fig showing rainwater harvesting in SVPUA&T university campus

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Fig: Showing rain water collection and harvesting and rain water collection tanks

17.4 Reusage of waste water

Wastewater recycling is widely regarded as the most favorable approach to water utilization. After undergoing filtration, the resulting wastewater is employed for the purpose of irrigating outdoor lawns, gardens, potted plants, as well as for the cleaning of staircases, verandas, pavements, and driveways.

Fig showing reuse of waste water

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18. ENVIRONMENTAL AWARENESS PROGRAMS

18.1. Wildlife week-2020

The NSS volunteers of the university showed their empathy towards wildlife by actively participating in various virtual events for the celebration of Wildlife week from 2nd to 8th October, 2020. On the theme "Sustaining all Life on Earth" Volunteers exemplified their thoughts through wildlife photography, sketches, paintings and essays

Wildlife week-2021

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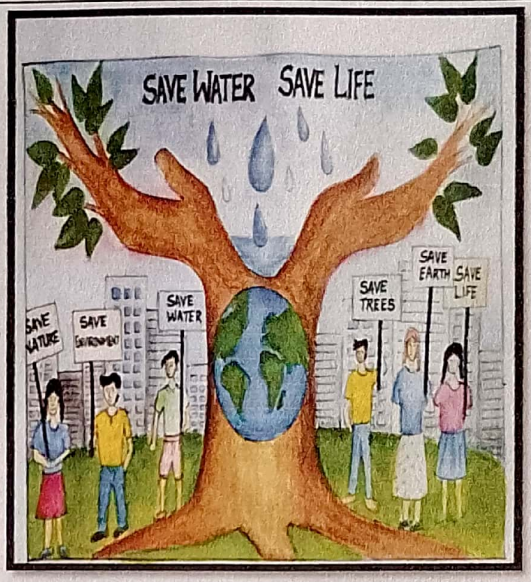
18.2. Water conservation day

The water conservation day was observed on 22nd March 2022. A total of 126 NSS volunteers participated in various activities including action photography, online events and quiz.



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18.3 World environment day

The World Environment Day is celebrated on 5th June every year. The NSS volunteers participated in various activities including action photography, poster and sketch.

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18.4. Plastic free campus

The usage of plastic in university is prohibited. The staff and the students are not encouraged to use one time use plastic, plastic bags and disposable plastic things throughout the campus.

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19. GREEN ENVIRONMENT PROGRAM IN UNIVERSITY CAMPUS

The campus is spread over an area of 250.00 acres of land with the green belt area of around 40 acres. The college offers B.Sc. (Hons.) Horticulture to the Undergraduate students and masters and Ph. Degree in 03 disciplines namely Fruit Science, Vegetable Science and Floriculture and Landscape Architecture. Beside theses, a separate section of land scaping is also run under the college which bears the major responsibilities for campus beautification and makes the whole campus clean and green. There are 1959 students and 252 teaching and non-teaching staff in the university which is promising to grow rapidly.

Environmental programme reflects evaluations that help us to identify environmental compliance and management system, implementation gaps, along with related corrective actions. Green audit is a useful tool to determine how and where the most energy is being used. Overall, it plays a vital role in imparting a better understanding of Green impact on campus to staff and students.

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19.1 Plantation Program

This includes the plants, greenery and sustainability of the campus to ensure that the buildings conform to green standards. This also helps in ensuring that the Environmental Policy enacted, enforced and reviewed using various environmental awareness programmes. Observations Many trees are maintained in the campus (around 60 Species) to maintain the biodiversity. Various tree plantation programmes are being organized at university campus through NSS (National Service Scheme) unit and staff of landscaping section. These programs help in encouraging eco- friendly environment which provides pure oxygen within the campus and creates awareness among campus students. The plantation program includes various types of indigenous species of ornamental and medicinal wild plant species.

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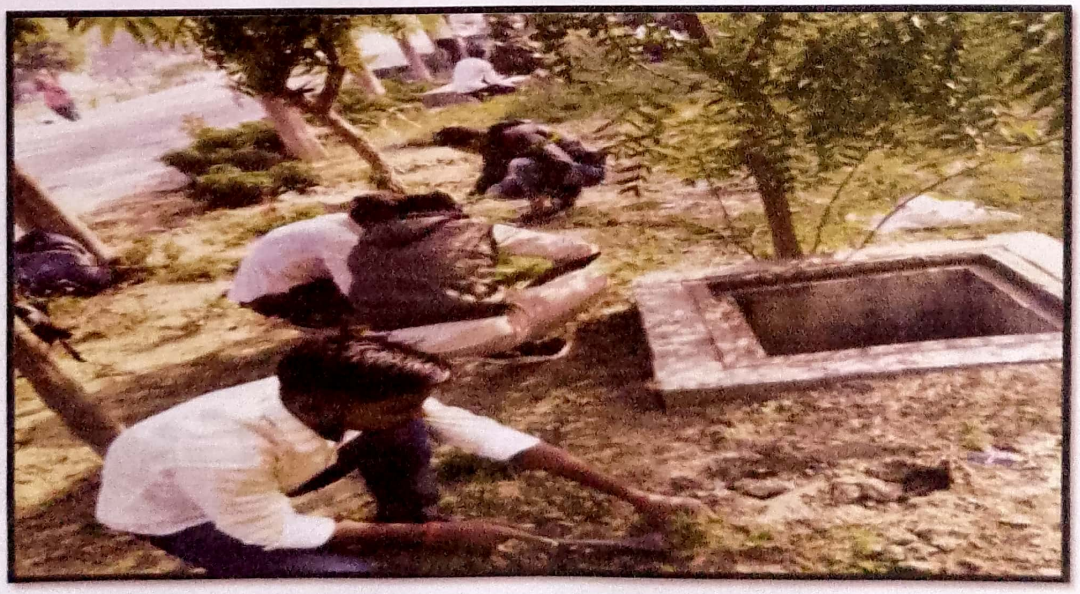
19.2. Campus cleaning campaign

Clean Campus promotes Hygiene. It improves hygiene level in campus and also helps to reduce the spread of sickness, maintaining a clean university environment sets a good example to students. Cleanliness encourages learners to take pride in their college, which makes them less likely to drop litter and as such they will potentially make a bigger effort to maintain their environment. Cleanliness gives rise to a good character by keeping body, mind, and soul clean and peaceful. Maintaining cleanliness is the essential part of healthy living.



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Recommendations:

Recommendations for solid waste management in an agricultural university should be tailored to the unique characteristics of the campus, including the types of waste generated and the specific environmental considerations of agricultural activities. Here are some key recommendations:

1. Waste Segregation and Recycling: Implement a comprehensive waste segregation program to categorize different types of waste, including organic agricultural waste, plastic materials, paper, and other non-biodegradable waste. Establish dedicated recycling centers for the collection and processing of recyclable materials, promoting the reuse of resources within the campus.
2. Composting Facilities for Agricultural Waste: Set up on-campus composting facilities specifically designed to handle agricultural waste, such as crop residues, plant matter, and other organic materials. This can provide a sustainable way to manage agricultural by-products and generate nutrient-rich compost for use in the university's gardens, agricultural fields, or landscaping projects.
3. Research on Bio-waste Management Technologies: Encourage research initiatives focused on the development of innovative bio-waste management technologies that can effectively handle agricultural waste. This may include exploring bio-digestion systems, bio-thermal conversion technologies, and other environmentally friendly methods for processing agricultural waste and minimizing its environmental impact.
4. Awareness and Educational Programs: Launch awareness campaigns and educational programs to promote sustainable waste management practices among students, faculty, and staff. Organize workshops, seminars, and training sessions to educate the campus community about the importance of waste reduction, recycling, and proper disposal techniques, emphasizing the role of the agricultural sector in environmental conservation.
5. Collaboration with Agricultural Research Institutions and Local Farmers: Foster partnerships with agricultural research institutions, local farmers, and agricultural cooperatives to explore collaborative approaches for managing agricultural waste. Encourage knowledge sharing and the exchange of best practices in sustainable agricultural waste management, facilitating the implementation of effective and context-specific solutions.
6. Integration of Sustainable Farming Practices: Integrate sustainable farming practices, such as organic farming and integrated pest management, to minimize the use of chemical inputs and reduce the generation of hazardous agricultural waste. Promote the adoption of eco-friendly alternatives and the implementation of waste reduction strategies in agricultural production processes across the university's farms and research facilities.
7. Regular Monitoring and Assessment: Establish a systematic monitoring and assessment framework to track the effectiveness of the solid waste management practices implemented on the campus. Regularly evaluate the waste management processes, measure the impact of the initiatives, and identify areas for improvement, ensuring continuous refinement of the waste management strategies based on the evolving needs of the agricultural university.

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Thanks to all the following committee members for their close cooperation and contribution.

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Assoc. Professor-Member

Dr. Manoj Kumar
Assoc. Professor Member

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