ENERGY AUDIT REPORT

SANDIP FOUNDATION'S

SANDIP INSTITUTE OF PHARMACEUTICAL SCIENCES,

Nashik

SARVASHREE TECHNOGREEN PVT LTD

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Acknowledgement

We express our sincere gratitude to the management of Sandip foundation's Sandip Institute of Pharmaceutical Sciences, Nashik for giving us an opportunity to carry out the project of Energy Audit.

We are extremely thankful to all the staffs for their support in carrying out the studies and for input data, and measurements related to the project of Energy audit. We also congratulate our Energy audit team members for successfully completing the assignment in time and making their best efforts to add value.

We do hope that you will find the recommendations given in this report will be useful to save energy. We welcome any suggestions from your side as to serve you better.

Mr.Sujitkumar Pote
Sarvashree Technogreen Private Limited

DISCLAIMER

Energy Audit Team has prepared this report for **Sandip foundation's Sandip Institute of Pharmaceutical Sciences, Nashik** based on data submitted by the representatives of Campus complemented with the best judgment capacity of the expert team. The audit was conducted on the sample basis by visiting the campus and interacting with the various stakeholders. Audit was conducted by interviewing the concerned persons, observing on-site implementation and verifying the documents and records.

While all reasonable care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered.

It is further informed that the recommendations are arrived following best judgments and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

Mr.Sujitkumar Pote

Sarvashree Technogreen Private Limited

Contents

List of Tables

List of Figures

List of Abbreviations

SEC	-	Specific Energy Consumption

List of Units

^{o}C	-	Degree Celsius
CFM	-	Cubic Feet per Minute
CMH	-	Cubic Meter per Hour
LPM	-	Litres Per Minute
Kg/cm^{2}	-	Kilogram per centimetre square
kW	-	Kilo Watt
kWh	-	Kilowatt hour
KOE	-	Kg of Oil equivalent
m^{3} /hr.	-	Meter cube per hour
Nm^{3} /hr.	-	Normal Meter cube per hour
MW	-	Mega Watt
MWh	-	Megawatt hour

1. Introduction

The working details of assignment are as follows:

Project	Energy Audit
Client	Sandip Foundation's Sandip Institute of Pharmaceutical Sciences
Industry	Private Educational Engineering Institute
Contact	Dr. Anil Dube
Site	Sandip Foundation's Sandip Institute of Pharmaceutical Sciences ,Mahiravani Nashik.
Consultant	Sarvashree Technogreen Private Limited
Duration	April 2021 to March 2022
Project Work Scope	Detailed Energy Audit in the institute to study energy consumption and assess the loss in the system.
Report	This report gives Detail Energy consumption, suggestions to minimize energy losses

Table.1.Assignment

1.1 About SIPS

Sandip Institute of Engineering and Management (SIPS) is located in the scenic, eco-friendly and conductive-to-study campus at an elevation off the Trimbak Road (Mahiravani, Nasik) leading to one of the twelve renowned pilgrimages of jyotirlingas known as Trimbakeshwar (abode of Lord Shiva) at the foot hills of Brahmagiri mountain ranges.

SIPS is approved by All India Council for Technical Education, New Delhi Government of India and affiliated to Savitribai Phule University of Pune. SIPS is committed to imparting quality education in an atmosphere that will ensure that its students are confident, self-motivated and industry-ready. Towards this goal, we are giving importance to qualified and experienced faculty for effective teaching-learning process, equipping our laboratories with best-in-class machines and instrument and developing overall personality of our students.

1.2 Energy Sources

1. Electricity from MSEDCL:

Institute receives Electricity from Maharashtra State Electricity Distribution Company Limited, Nashik

2. High Speed Diesel Generator (HSDG):

HSD is used as a fuel for Diesel Generator which is run whenever power supply from MSEDCL is not available. Kirloskar Cummins 500 KVA.

Fig.1. MEDCL Electricity supply facility of SIPS Building

1.3 Following are the major consumers of electricity in the facility

- Computers
- Lighting
- Air-Conditioning units
- Fans
- Other Lab Equipment
- Printers
- Xerox machines
- CCTV
- UPS load (Computer + Printer + Projector + CCTV + Router + Scanner)
- Flood light/ Street Light
- Pumping motor
- Electrical Machines

2. Approach and Methodology

2.1 Approach

A team of 4 engineers were involved in carrying out the study; the scope of study was as follows:

- Identify areas of opportunity for energy saving and recommend an action plan to bring down total energy cost
- Conduct energy performance evaluate on and process optimization on study
- Conduct efficiency test of equipment and make recommendations for replacement (if required) by more efficient equipment with projected benefits
- Suggest improved opera on & maintenance practices
- Provide details of investment for all the proposals for improvement
- Evaluate benefits that accrue through investment and payback period
- Analyse various energy conservation on measures and to prioritize based on the maximum energy saving & investment i.e. short, medium and long term.

Prioritization	Payback Period
Short Term Project	Less than 6 months
Medium Term Project	Between 6 to 12 months
Long Term Project	More than 12 months

Table 2.Scope of Study

- Discuss with the plant personnel, the individual Energy Saving Projects (ESPs) for agreement for implementation.

2.2 Methodology

- The general methodology followed is captured in the following figure –

Figure 2. Methodology flow

The study was conducted in 3 stages:

- Stage 1: Walk through audit to understand process energy drivers, measurability and formula one of audit plan

- Stage 2: Detailed Energy audit
- Stage 3: Off-site work for data analysis and report preparation

2.3. List of Equipment & Instruments Used for Energy Audit

The following portable instruments were used for data measurement:

- 3 – phase Power Analyzer
- Single phase Power Analyzer
- Ultrasonic Water Flow Meter
- Anemometer
- Hygrometer
- Sling Hygrometer
- Digital Thermometer
- Infrared Thermometer
- Pressure gauge
- Thermal Imager
- Flue Gas Analyzer
- Lux Meter

3. Observation and analysis

3.1 Electricity supply and consumption

The electricity consumed through MSEDC is Charges: Rs.23,32,800.00/-

The Diesel as a thermal energy source is used mainly in DG Sets of

Total Consumption on of Diesel in the Apr-2021 to March-2022 was:

Total Diesel in Ltr. 1,209.00

Cost of Diesel: Rs.1,02,780.00/-

Electricity (INR)	Diesel (INR)	Solar Energy	Total Cost of Energy	% of electricity	% of Diesel	% of Solar
23,32,800.00	1,02,780.00	0	24,35,580	95.78	4.22	0.00

Table 3. **Total Cost of Energy Consumed by Institute in the Last 12 Months**

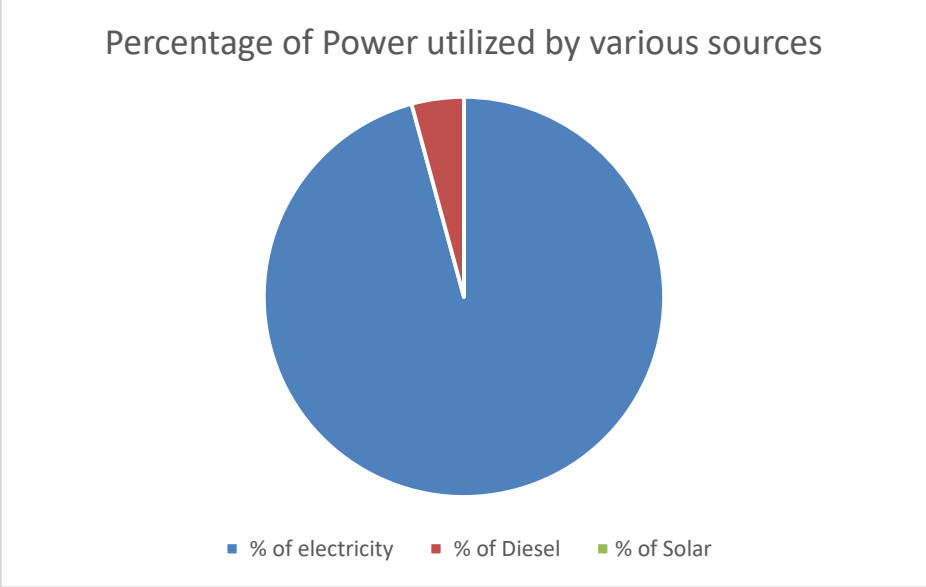

Fig.3 Percentage of Power utilized

3.2 Analysis of Electricity Bills: Apr-19 to Mar-20

In SIPS has only one electrical connection on with a total contract demand of 750 KVA. Power Supply is received from Maharashtra State Electricity Distribution Company Limited. Monthly Electricity Billing has been studied for a period of one year. All parameters have been studied & tabulated in Table 4.

Billing Month	Units Consume d, kWh	Total Bill, Rs.
Apr-21	3325	252962
May-21	3145	239267
Jun-21	2845	216444
Jul-21	2714	206477
Aug-21	2148	163417
Sep-21	2450	186393
Oct-21	2145	163189
Nov-21	2298	174829
Dec-21	2278	173307
Jan-22	2645	201228
Feb-22	2456	186849
Mar-22	2214	168438
Sum	**30663**	**2332800**

Table 4. Month wise electrical energy consumption on (12 Months data)

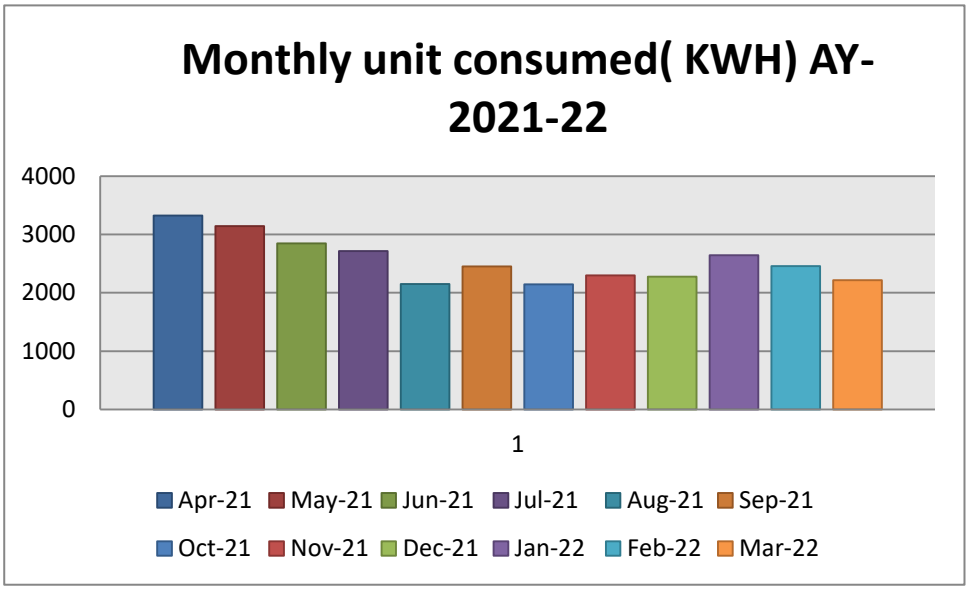

Figure 4. Electrical Energy Consumption monthwise

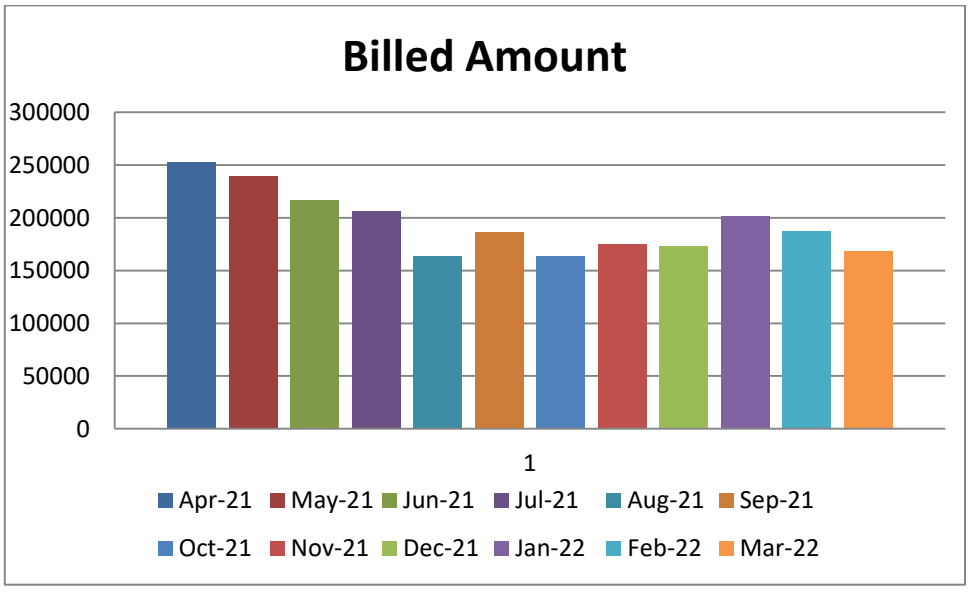

Figure 5 Billed Amount in last 12 months

- It can be seen from figure 1, that electricity consumption on in the month of April 21' is the highest. Average Power Factor in the period of Apr-21 to Mar-22 is 0.93. It is recommended to install Automatic Power Factor Control Panel to achieve Power Factor near to 1.00 .

- It is recommended to have a regular check on the Power Factor to maintain it. Capacitors shall be tested every quarter and replaced if not working properly.

4. Maximum Demand Control

4.1 Critical load analysis

Based on the data obtained, a study for determining the most critical load at any point of the day was done (In Zone B & C). Based on this report, during peak load when the maximum demand exceeds the preset value the non-critical loads at that point of time can be switched off thereby reducing the maximum demand or that load is shifted in (In Zone A & D) Off peak hours.

- Power factor is already improved beyond 0.9 and maximum demand is already under limit. Also the penalties due to excess maximum demand can be saved by continuous monitoring of maximum demand.
- Variation of PF the Power Factor to reduce the utility power bill. Most utility bills are influenced by KVAR usage. A good Power Factor provides a better voltage. Reducing the pressure on electrical distribution network. Reducing cable heating, cable over loading and cable losses. Reducing over loadings of control gears and switch-gears etc.
- Power factor is already improved beyond 0.9 and maximum demand is already under limit.

4.2 General Observations based on Electricity Bill

For SIPS College Campus the Contract Demand (CD) is 750 kVA and minimum billing Demand is less than 50% of the Contract Demand, Maximum Demand recorded whichever is maintained. The average electricity cost per unit (kWh) is Rs.26.01 considering the last twelve months average units and bill excluding charges.
Average monthly Power Factor is maintained that is P.F. 0.9
Power factor is maintained during April 2021 to March 2022 is 0.9 and above.

4.3 Merits of Existing Features of Energy Saving

1. Screen savers facility implemented for every computer.
2. AC's used are of three STARS.
3. Incandescent Bulbs are now here also CFL lamps are used here in corridor, they are replaced by LED lamps.
4. Maximum use of natural light during working hours.
5. Cross Ventilation is provided in laboratory & class rooms, which reduced number of fans.
6. Most of the practical's are scheduled in noon time where Billing Rate in normal.
7. Walls are painted with off white color to have sufficient brightness.
8. Solar powered street lamp is used.
9. LED light is used in Seminar hall.

5. ENERGY CONSERVATION PROPOSALS

Providing Energy Saver Circuit to the Air Conditioners The energy saver circuits for the air conditioners intelligently reduces the operating hours of the compressors either by timing or temperature difference logic without affecting the human comfort. This can save around 15%to 30% of the electricity depending on the weather conditions and temperature settings.
It is Recommended that the old air conditioners are being replaced with new energy efficient BEE STAR labeled (3 Star and above) air conditioners in a phased manner.

- Replacing Fluorescent Tube **Lights (FTL) with LED Tube** Lights, the CFLS and FTLs can be replaced with the LED tube lights 18 W. These changes can be made at the places where the life is higher. Usually minimum of 3 years warranty is given and approximate burning hours is 40 000. (15 years considering hours per day running).
- All Class Rooms and labs to have **Display** Messages regarding optimum use ofelectrical appliances in the room like lights, fans, computers and projectors. Save electricity. **Display the stickers of save electricity,** save nature everywhere in the campus. So that all stakeholders encouraged to save the electricity.
- Most of the time, all the tube lights in a class room are kept ON, even though, there is sufficient light level near the window opening. In such cases, the light row near the window may be kept OFF.
- Trying to get the benefit of 01.50 rate in addition to actual rate for per unit consumption of electric motor pumping during 22:00 to 06:00 Hrs. during off peak load
- All projectors to be kept OFF or in idle mode if there will be no presentation slides.
- All computers to have power saving settings to turn off monitors and harddiscs, say after l0 minutes/30 minutes.
- The comfort/Default air conditioning temperature to be set between 24‘C to26‘C.
- Lights in toilet area may be kept OFF during daytime.
- Use AUTOMATIC POWER FACTOR CORRECTION (APFC) Panel FOR PF improvement
- Need to use power saver circuits for AC.
- Need to replace FTL by smart LED Tube.
- Need to replace ordinary bulb by LED bulb. Need to replace ordinary
- Need to replace corridor CFL lights by LED.
- Out of total electricity bill paid, 53 percentages are actual energy utilized charges remaining expense belongs to additional taxes on energy consumption. Recently govt. has declared the exemption on electricity duty charges for school and colleges trying toget the benefit of the same as soon as possible.

6. General Tips for Energy Conservation in Different Utilities

Electricity

- Schedule your operations to maintain a high load factor
- Minimize maximum demand by tripping loads through a demand controller.
- Use standby electric generation equipment for on-peak high load periods.
- Correct power factor to at least 0.99 under rated load conditions.
- Set transformer taps to optimum
- Shut off unnecessary computers, printers, and copiers at night.

Motors

- Proper size to the load for optimum efficiency.
- Check alignment.
- Provide proper ventilation
- For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved.
- Check for under-voltage and overvoltage conditions.
- Balance the three-phase power supply.
- An Imbalanced voltage can reduce 3 - 5% in motor input power.
- Demand efficiency restoration motor rewinding.

Fans

- Use smooth, well-rounded air inlet cones for fan air intakes.
- Avoid poor flow distribution at the fan inlet.
- Minimize fan inlet and outlet obstructions.
- Clean screens, filters, and fan blades regularly.
- Use aero foil-shaped fan blades.
- Minimize fan speed.
- Use low-slip or flat belts.
- Check belt tension regularly.

- Eliminate variable pitch pulleys.
- Use variable speed drives for large variable fan loads.
- Use energy-efficient motors
- Eliminate leaks in ductwork.
- Minimize bends in ductwork
- Turn fans off when not needed.

Pumps

- Operate pumping near the best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of smaller units.
- Stop running both pumps -- add an auto-start for an on-line spare or add a booster pump in the problem area.
- Use booster pumps for small loads requiring higher pressures.
- Increase fluid temperature differentials to reduce pumping rates.
- Repair seals and packing to minimize water waste.
- Balance the system to minimize flows and reduce pump power requirements.
- Use siphon effect to advantage: don't waste pumping head with a free-fall (gravity) return.

HVAC (Heating / Ventilation / Air Conditioning)

- Tune up the HVAC control system.
- Consider installing a Plant automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
- Balance the system to minimize flows and reduce blower/fan/pump power requirements.
- Eliminate or reduce reheat whenever possible.

- Use appropriate HVAC thermostat setback.
- Use Plant thermal lag to minimize HVAC equipment operating me.
- 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 HVAC system operating hours (e.g. -- night, weekend).
- Ventilate only when necessary. To allow some areas to be shut down when unoccupied, install dedicated HVAC systems on continuous loads (e.g. -- computer rooms).

- Provide dedicated outside air supply to kitchens, cleaning rooms, combustion equipment, etc. to avoid excessive exhausting of conditioned air.
- Use evaporative cooling in dry climates.
- Clean HVAC unit coils periodically and comb mashed fins.
- Upgrade filter banks to reduce pressure drop and thus lower fan power requirements.
- Check HVAC filters on a schedule (at least monthly) and clean/change if appropriate.
- Check pneumatic controls for air compressors for proper operation, cycling, andmaintenance.
- Isolate air-conditioned loading dock areas and cool storage areas using high-speeddoors or clear PVC strip curtains.
- Install ceiling fans to minimize thermal stratification in high-bay areas.
- Relocate air diffusers to optimum heights in areas with high ceilings.
- Consider reducing ceiling heights.
- Check reflectors on infrared heaters for cleanliness and proper beam direction.
- Use professionally-designed industrial ventilation hoods for dust and vapor control.

Lighting

- 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 meters, delay meters, photocells, and/or Occupancy sensors.
- 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 painting the walls a lighter colour and using less lighting fixtures
- Use task lighting and reduce background illumination.
- Re-evaluate exterior lighting strategy, type, and control. Control it aggressively.
- Change exit signs from incandescent to LED.

SARVASHREE TECHNOGREEN PVT LTD
Environmental and Agricultural Engineering Consultancy Services

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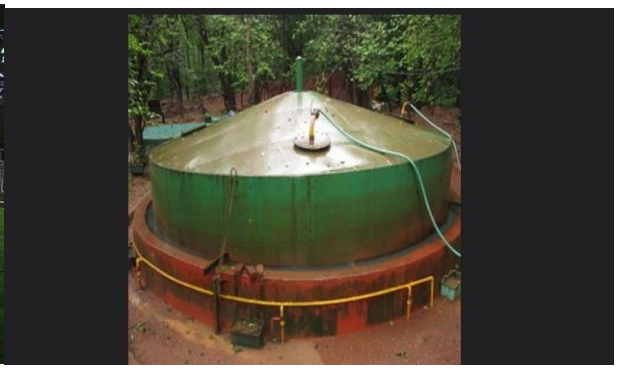

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✓ **Water Cess (Form I)**

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✓ **Green Audit for School and Institutes**
✓ **Energy Audit**

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Date of Expiry	: 11/08/2024		
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3rd Surve. Due	: 12/07/2023		

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Date of Expiry	: 18/08/2024		
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3rd Surve. Due	: 19/07/2023		

Director

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