# Energy Audit Report

**SANDIP FOUNDATION'S**

## SANDIP INSTITUTE OF PHARMACEUTICAL SCIENCES,

**Mahiravani Nashik**

**Audited by:**

SARVASHREE TECHNOGREEN PVT LTD

**Sarvashree Technogreen Private Limited,**
Plot No. 16, Link Road, Near Sawali, Bhushannagar, Kedgaon,
Ahmednagar - 414001
**Contact No. 7020756278**

# 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 input 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** | 09-04-2018 to 12-04-2019 |
| **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 Pharmaceutical Sciences(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 in following forms:

### 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. 25,41,240.00/-

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

Total Consumption on of Diesel in the Apr-2018 to March-2019 was:

Total Diesel in Ltr.2,827.65

Cost of Diesel: Rs. 2,40,350.00/-

| Electricity (INR) | Diesel (INR) | Solar Energy | Total Cost of Energy | % of electricity | % of Diesel | % of Solar |
|---|---|---|---|---|---|---|
| 25,41,240.00 | 2,40,350.00 | 0 | 27,81,590.00 | 91.36 | 8.64 | 0.00 |

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

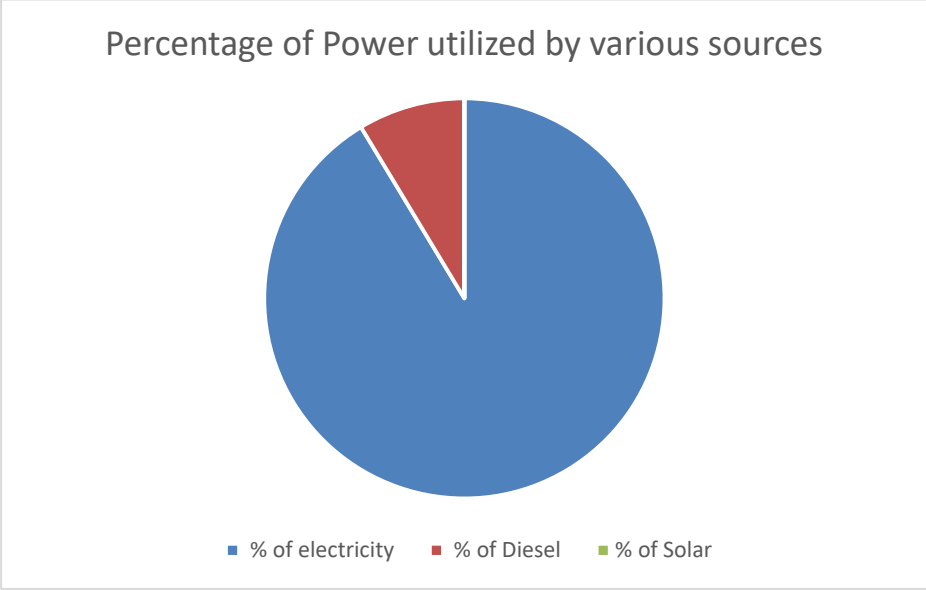


***Fig.3 Percentage of Power utilized***

### 3.2 Analysis of Electricity Bills: Apr-18 to Mar-19

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-18 | 9145 | 237770 |
| May-18 | 8674 | 225524 |
| Jun-18 | 8615 | 223990 |
| Jul-18 | 7145 | 185770 |
| Aug-18 | 7652 | 198952 |
| Sep-18 | 8325 | 216450 |
| Oct-18 | 7398 | 192348 |
| Nov-18 | 8469 | 220194 |
| Dec-18 | 7154 | 186004 |
| Jan-19 | 8941 | 232466 |
| Feb-19 | 7477 | 194402 |
| Mar-19 | 8745 | 227370 |
| **Sum** | **97740** | **2541240** |

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

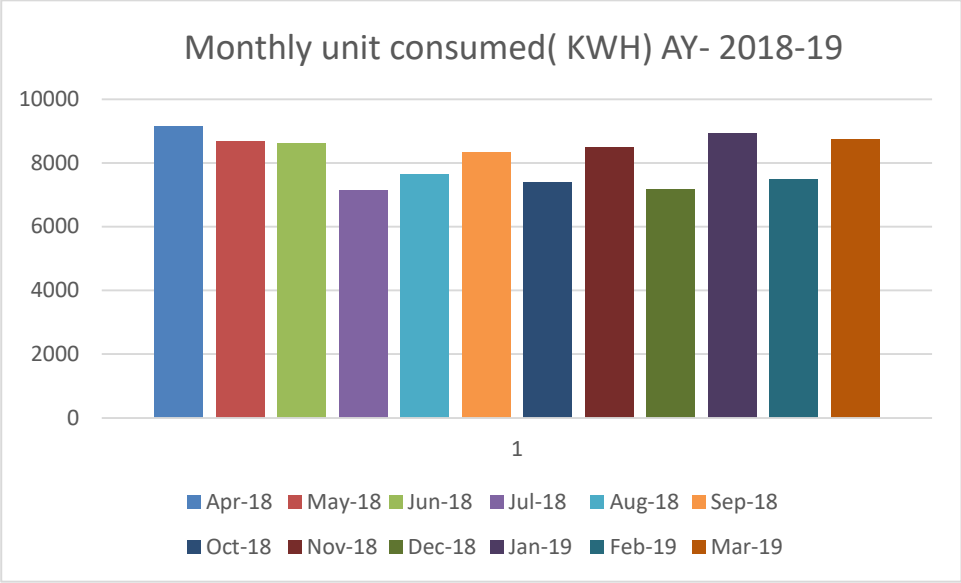


*Figure 4. Electrical Energy Consumption monthwise*

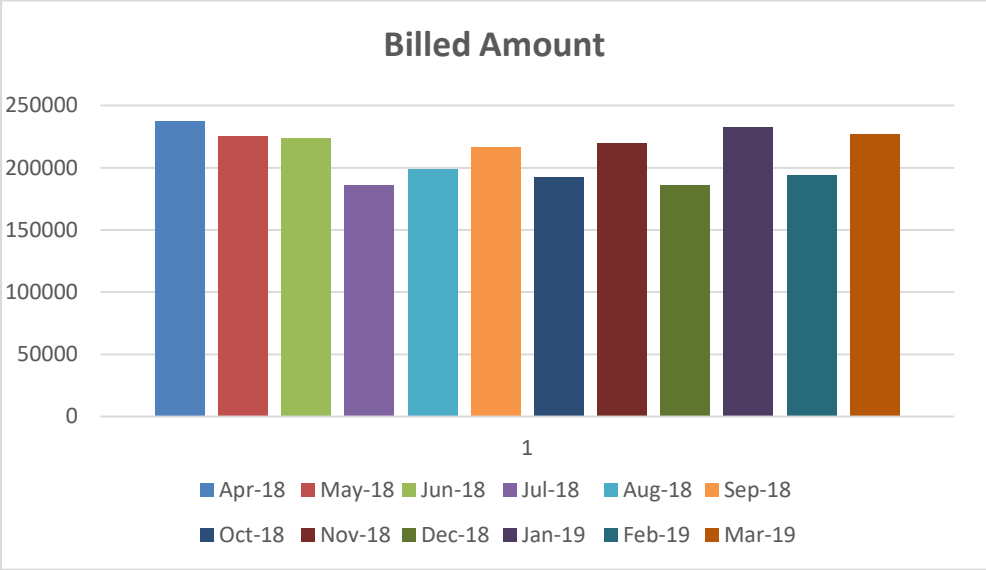


*Figure 5. Billed Amount in last 12 months*

- It can be seen from figure 1, that electricity consumption on in the month of Apr18' is the highest. Average Power Factor in the period of Apr-18 to Mar-19 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.26.00 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 2018 to March 2019 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 of electrical 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 hard discs, 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 to get the benefit of the same as soon as possible.

## 6. Executive Recommendations:

1. There has to be Institute level student community that keeps track of the energy consumption. Parameters of the various departments, class rooms, halls, areas, meters, etc
2. Energy audit report should be made available to stakeholders to generate awareness about energy conservation.
3. Need to create energy efficiency/ renewable energy awareness among the college campus and stakeholders i.e. solar, wind, Biogas energy. College should take initiative to arrange seminars, lectures for staff members and stakeholders.

## 7. Study of Effects of High and Low Voltage

- Wide Voltage fluctuations on is a common phenomenon all over the country. Generally, the voltage is very low during the day me and high during night hours. Therefore, Industrial Units running round the clock, face the problem of both Low and High Input Voltage. Also, voltage fluctuations on is a seasonal phenomenon and increases in the summer season. Moreover, on holidays, peak hours, rainy days and when the agricultural load is switched off, the voltage rises sharply in the feeder lines. There are few consumers of electricity, during such days, leading to comparatively lower voltage drop in the feeder lines; as a result consumers suffer from high voltage which is more dangerous.

- Most electrical equipment is designed for 230 volts ( single-phase) or 410 volts (3-phase) and operates with op mum efficiency at its rated voltage. 50% of industrial load consists of motors. Due to continuously varying voltage and especially during peaks, electric motors draw considerably high current at high voltage **which increases energy consumption**, increases MDI and reduces power factor etc. These excessive power losses of motors generated at higher voltage results in premature failure of electrical equipment's.

- Similar is the case with single-phase equipment such as bulbs and tubes, when voltage increases above 230 volts. For example, at 270 volts, the power consumption on of 60 W bulb increase by almost 40% and the life of the bulb reduces from normal 1000 Hours to mere 100 Hours only (as per analysis report of ISI marked bulb manufacturers)