



A Preliminary Energy Audit Report for

Unique Polypropylene (Pvt) Ltd.
Mirpur, Azad Kashmir

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Submitted by:

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1. Executive Summary

Unique Polypropylene (Pvt) Ltd., is situated in the industrial area of the Mirpur city in Azad Kashmir. The industry is working hard to reduce their energy consumption through the installation of new and efficient technologies. For the purpose of this plan, the Pakistan Industrial Technical Assistance Centre (PITAC) in collaboration with the Department of Mechanical Engineering of Mirpur University of Science and Technology (MUST) visited the industry on November 12, 2020 and conducted a preliminary energy audit to identify the potential energy saving opportunities.

Necessary data was collected and critically analysed. Based on the visit and the collected data, it has been observed that the average running load of Unique Polypropylene (Pvt) Ltd, is 127kW with maximum load as high as 200kW and minimum as low as 40kW. Daily electricity consumption remains between 3000kWh to 4000kWh. Electricity is being supplied from grid through a 450kVA transformer whereas there is no alternative/standby power system in the industry. Major loads are three phase motors and electrical heaters for the extruder barrels.

Major recommendations include the installation of sub-meters, installation of VSDs on all three phase motors, replacement of old motors with high efficiency motors and finally, to install a grid connected 500kVA system with net metering facility. The installation of this solar system will result in a yearly financial savings of PKR 17.6 million with a payback period of less than two years. It is further recommended to conduct a detailed energy audit to explore more energy savings opportunities.

2. Major Loads at Unique Polypropylene (Pvt) Ltd

The technical team of PITAC visited the Unique Polypropylene (Pvt) Ltd on November 12, 2020 and conducted a preliminary energy audit. It was observed that electricity is being supplied through a transformer of 450kVA rating. Major loads were identified as three phase motors and electrical heaters as shown in Fig.1. The onsite technical staff provided the amperes of various motors and heaters. Table-1 shows the load of various equipment in an ascending order.

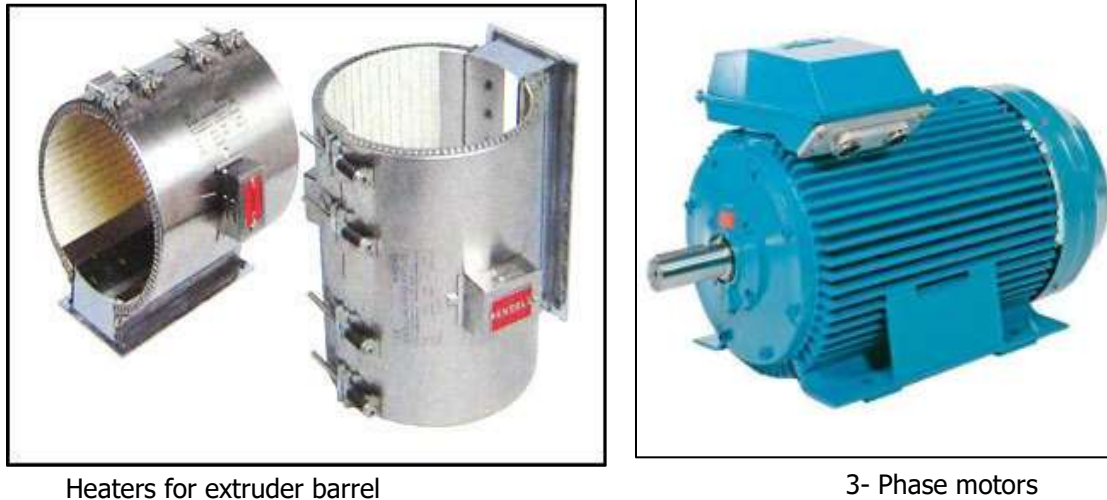


Fig.1. Major electrical loads

Table - 1 Running load of various motors/heaters

Equipment	Load, kW	% of total equipment load
Extruder motor	27.05	30%
R.C extruder motor	11.73	13%
Air compressor motor	7.04	8%
Air compressor motor	5.69	6%
R.C baby extruder motor	4.40	5%
Cooling tower motor	3.23	4%
Roller motor	2.64	3%
Plant extruder barrel	2.30	3%
BCS	2.03	2%
Loom main motor	1.70	2%
Others equipment	22.12	25%
Total equipment	89.94	100%

3. Average Daily Consumption and Load of Unique Polypropylene (Pvt) Ltd

Based on the data provided by the onsite staff, the detailed analysis was carried out. Fig.2 presents the daily electricity consumption (kWh) and daily average load (kW) for the period October 1, 2020 to October 31, 2020. It is apparent that the daily consumption remains between

3000 to 4000 kWh except on Sundays when the daily consumption drops to an average 1500 kWh. Similarly, the daily average running load remains in the range of 100kW to 164kW with an average value of 127kW. The load drops to 40kW on Sundays as one of the main machine is remains at stopped position on Sundays.

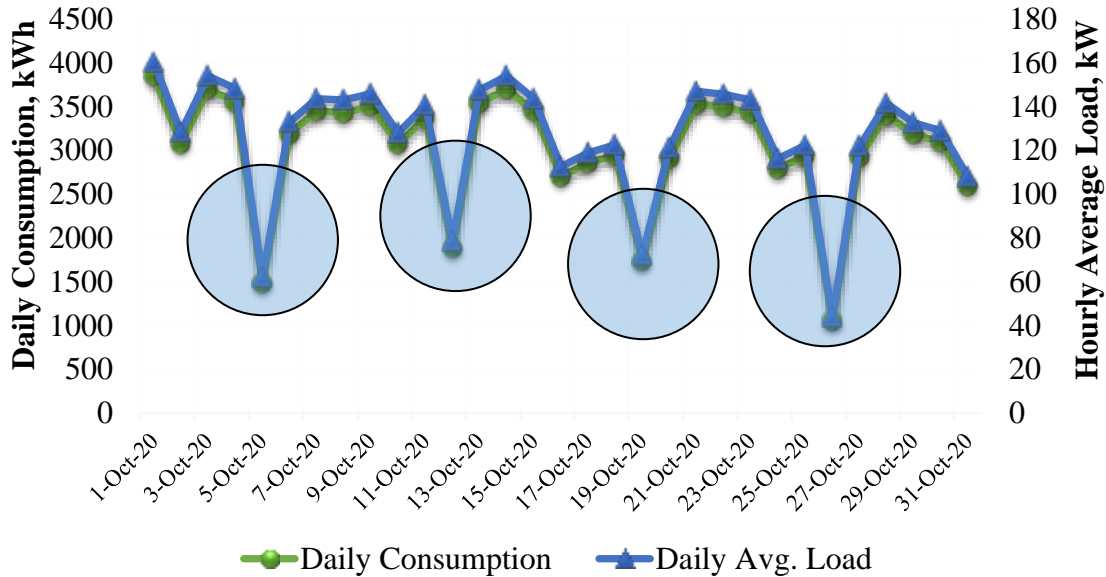


Fig.2. Daily consumption and load profiles

A load duration curve as shown in Fig.3. was developed based on the data from December 20, 2018 to November 14, 2020. A base load of 40kW. is observed with a peak load of 230kW.

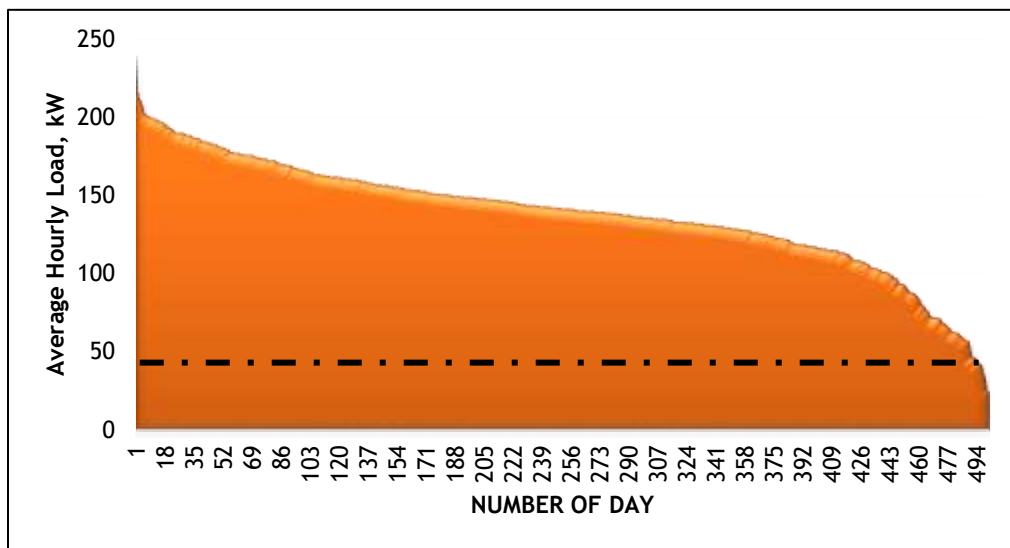


Fig.3. Load Duration Curve

4. Energy Saving Opportunities

There are various energy savings opportunities through which the energy management could be properly implemented and electricity consumption could be reduced effectively. These include the followings:

- i. Installation of sub-meters at major loads
- ii. Recording and monitoring of electricity consumption data on regular basis
- iii. Replacement of old three phase motors with high efficiency motors
- iv. Installation of Variable Speed Drives (VSDs) on all three phase motors
- v. Installation of a 500kW Solar PV grid connected system
- vi. Regular cleaning and removal of dust from the equipment

5. Solar System Economics

Initially, a 500kW solar PV grid connected system seems feasible at this stage. This solar system will generate 750, 929kWh of electricity and will reduce the grid dependence by 66% as shown in Fig. 4.

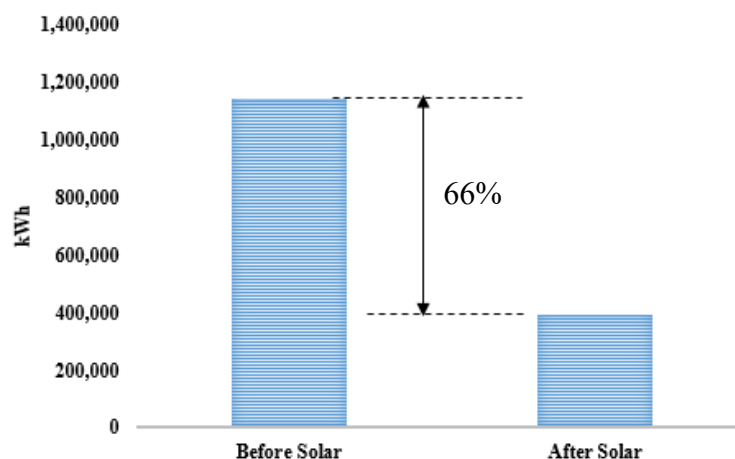


Fig.4. Grid electricity requirement before and after solar PV system

It is expected that the installation of this PV plant will generate a yearly financial savings of PKR 17.6 million with a payback period of 1.91 years.

6. Conclusions

There is a strong potential for reducing electricity consumption in the Unique Polypropylene (Pvt) Ltd industry in Mirpur. Installation of a grid connected solar PV system could result in a yearly financial savings as high as PKR 17.6 million. To explore energy saving options in detail, it is recommended to conduct a detailed energy audit.