CLUSTER PROFILE

MOHALI-PANCHKULA-CHANDIGARH LIGHT ENGINEERING CLUSTER

Background

The Mohali-Panchkula-Chandigarh (MPC) cluster is one of the prominent light engineering clusters in the country, spread over an area of around 15 km^2. Also known as Chandigarh Tricity cluster, its development was spurred by the establishment in the region of major engineering plants like Swaraj Enterprises (Punjab Tractors, Swaraj Mazda, Swaraj Engines, Swaraj Combines) and HMT (Hindustan Machine Tools) during the 1970s. There are around 6000 MSME units in the MPC cluster, out of which around 2,600 are light engineering industries engaged in fields such as machining, manufacture of sheet metal components including ancillary products for railways and tractor industries, fastener manufacturing and steel fabrication. Furthermore, among these light engineering industries, about 1500 units are vendors that mainly cater to the demands of original equipment manufacturers (OEMs) like PTL (now Mahindra & Mahindra), Swaraj Mazda, Swaraj Combines, HMT, Sonalika, Eicher Tractors, automobile and agricultural components manufacturers, and the Rail Coach Factory (Kapurthala) of Indian Railways. The vendor units in the MPC cluster have an approximate annual turnover of over Rs 2000 crores.

The main products manufactured by the vendor units comprise tractor/auto parts and railway components including axles, gears, transmission components, and parts of housings, engines, chassis, steering assemblies, and brake assemblies.

View of a light engineering unit

There are four main industry associations active in the MPC Cluster: namely,

- Mohali Industries Association
- Industries Association of Chandigarh
- Chamber of Chandigarh Industries
- Haryana Chamber of Commerce & Industry, Panchkula

The MPC cluster is one of the 15 clusters covered under SIDBI Business Development Services (BDS) project which aims at bridging gap between services providers and the engineering industries. TERI is executing the SIDBI-BDS project in this cluster.

Technology status and energy use

The majority of the light engineering industries in the MPC cluster use conventional manufacturing technologies such as lathes, milling (horizontal and vertical) machines, drilling, shaping machines, MIG (metal inert gas) and TIG (tungsten inert gas) welding, and different kinds of grinding machines to manufacture their products. Lately, a few progressive entrepreneurs in the cluster have also started using modern machinery such as computerized numerical control (CNC) and VMC (vertical milling centre) machines.

The main raw materials and inputs used for the manufacturing of products in the cluster are steel (in the form of wire rods, rounds, MS sheets, plates), stainless steel, alloy steel, aluminium, copper, bakelite powder, plastics, etc.

Electricity provides the main source of energy for almost all of the tractor/auto/railway parts manufacturers in the cluster. The average connected load per unit is 80 kVA. The primary energy usage areas and the estimated total energy consumption by tractor/auto/railway component manufacturing units in the cluster are shown below (Tables 1, 2, and 3).

Table 1. Main energy usage areas in light engineering units

Energy/other inputs	*Areas/utilities*
Electricity	All equipment/machinery like motors, air compressors etc.
High speed diesel (HSD)	Diesel generator (DG) sets

Table 2. Electricity consumption areas in a typical auto/tractor/railway parts unit

Area	*Percentage of total electricity consumption*
Lighting	7%
Induction motors	85%
Air compressors	3%
Distribution & capacitor losses	5%

Table 3. Estimated annual energy consumption by all tractor/auto/railway parts manufacturing units in MPC cluster

Fuel /energy source	*Annual energy consumption*
Electricity	159.12 Million kWh
HSD	1.9 million liters

Most of the machining units are situated in Mohali and Panchkula areas, which face severe power shortages—during summer there is no power supply in these areas for two days a week. Hence, units have no option but to invest in alternate power sources like diesel generator (DG) sets. In such a scenario it is all the more important for these units to adopt energy efficient technologies and practices.

Options for energy saving

Under the SIDBI-BDS project, 48 detailed energy audits were conducted in the cluster by service providers empanelled with the project. Most of the units audited were manufacturers of tractor/auto parts/railway components; the units were identified for this purpose by the industry associations in the MPC cluster.

The following are among the critical observations made during the energy audits:

- Poor loaded electrical motors are used in the units
- Most of the drives are old, rewound and inefficient
- Poor power distribution systems lead to losses up to 6% of the total power consumption
- Inefficient and old types of lamps (incandescent lamps) and lighting (conventional ballast) are in use
- Inefficient use of air compressors and electrical ovens

Energy audit at a unit in Mohali

The energy audits pointed out a number of energy conservation measures that could be adopted to increase energy efficiency in the concerned units, including the following:

Lighting

- Replacement of conventional tube lights of 52W and 46W with energy efficient tube lights of 30W (energy savings potential: 34–42%)
- Replacement of conventional 150W high pressure sodium lamps (HPSV) and 200W bulbs with light emitting diodes (LEDs) of 45W and 65W respectively (energy savings potential: 67–70%).
- Use of LED-based task lighting instead of conventional lights [energy savings potential: 95–96%]
- Use of PVC corrugated sheets for day lighting instead of conventional lights
- Replacement of cathode ray tube (CRT) monitor with liquid crystal display (LCD) monitor

Heating, ventilation & air conditioning

- Replacement of conventional fans with energy efficient fans [energy savings potential: 37.5%)
- Evaporative cooling on the condenser side of the air conditioners

Electric induction Motors

- Installation of an Automatic Power Factor Controller (APFC) in the main panel.
- Increasing production, motor loading to improve operational efficiency.
- For consistently under-loaded motors, switch to permanent star connections.
- Replacement with more energy efficient IE3 motors.
- Installing Variable Frequency Drives (VFD) for energy conservation by reducing the motor rpm.
- Selection of proper size motor for an application.
- Replacement of old and worn-out V belt drives by synchronous belt drives (energy savings potential: up to 8%).

Air compressor

- Prevention of leakages in compressors.
- Installation of VFDs on screw type air compressors would save the no-load power consumption.

Capacitors

- The capacitors in many units have been used well beyond their normal life spans, and are hence not performing according to their rated capabilities. Their replacement is recommended.
- In some units the capacitor bank was inappropriately sized and hence the power factor was not being maintained even after installation of APFC. Hence, proper sizing of the capacitor bank is recommended.

Other energy conservation measures

- Operational efficiency can be increased on hacksaw machine by cutting 6 rods at a time instead of 4.
- Use of regenerative system to recover kinetic energy of braking in CNC.
- Installation of touch probes to quickly find datum for a task in CNC machines; optical encoders for efficient operation of servo-motors in CNC machines.

Overall energy savings potential

The measures suggested by the energy audits would reduce electrical energy consumption by up to 20%. The estimated total annual energy savings potential in the cluster is 16.35 gigawatt-hours (GWh) as shown in Table 4.

Table 4. Total annual energy savings potential in the MPC tractor/auto parts cluster through implementation of audit recommendations

Work area	*Potential annual energy savings (GWh)*

Lighting	3.30
Induction Motors	7.05
Installing APFCs	2.55
Prevention of leakage in compressors	2.10
Use of high frequency welding machine	1.35
Total	**16.35**