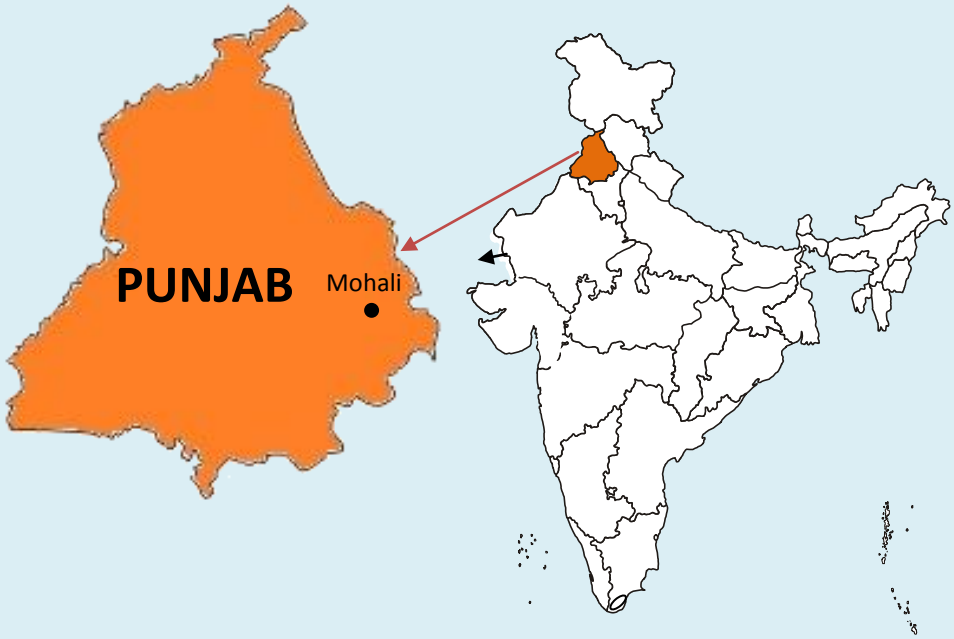
Cluster Profile
Mohali engineering industries



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Promoting Energy Efficiency in SMEs
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Last but not least, our sincere thanks to MSME entrepreneurs and other key stakeholders in the cluster for providing valuable data and inputs that helped in cluster analysis.

Mohali Engineering industries

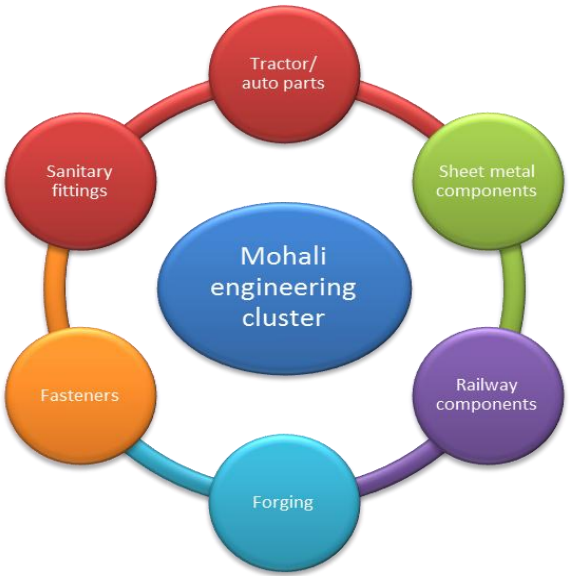
Overview of cluster

The engineering sector is an important contributor to the national economy. Mohali, a satellite town of Chandigarh is one of the prominent engineering clusters in the country. It is divided in nine different industrial zones. The setting up of major engineering plants such as Swaraj Enterprises (Punjab Tractors, Swaraj Mazda, Swaraj Engines, Swaraj Combines) in the region during 1970's led to the basic industrial development in the cluster. There are around 4000 MSME units in the cluster, out of which 900 are engineering units manufacturing tractor/auto parts, sheet metal components, forging and railway components, bathroom fittings, fasteners and so on. Many of the engineering units are ancillaries/vendors of large tractor/automobile manufacturers (Original Equipment Manufacturers) and Indian railways. The major OEMs being catered to by the engineering cluster include Mahindra & Mahindra (earlier Punjab Tractors), Swaraj Enterprises, Sonalika Tractors, Preet Tractors and Combines; other automobile and agricultural components manufacturers; and Indian Railways Rail Coach Factory (Kapurthala) and Diesel Loco Modernisation Works (Patiala). All these OEMs are based in Punjab, most of them in and around Mohali.

The industries in the cluster have formed an association (Mohali Industries Association), having over 400 members. The association address the issues related to the welfare and grievance redressal of their member industries.

Product types and production capacities

The units in Mohali manufacture a wide range of engineering products as shown in the figure. Most of the engineering units in the cluster are manufacturing tractor/auto components and are vendors to large OEMs based in and around the cluster. The sanitary fittings units are selling their products directly to developers and in the open market. There are about 900 MSME units in the cluster. The breakup is given in table.

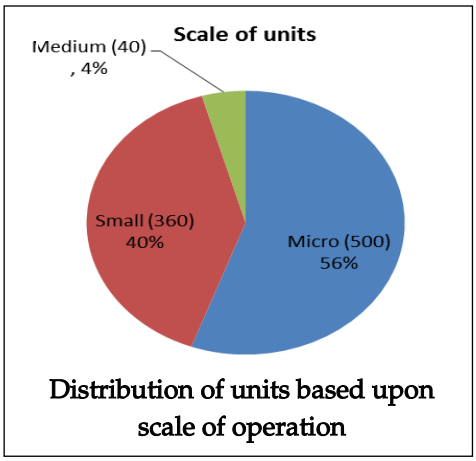


Product types in Mohali engineering cluster

Distribution of engineering units in Mohali cluster

Product category	No. of units	Micro (%)	Small (%)	Medium (%)
Tractor/auto parts	700	50	40	10
Steel fabrication	100	50	40	10
Railway components	50	30	40	30
Bathroom/sanitary fittings	40	40	50	10
Forging	10	0	40	60
TOTAL	900			

The engineering units in Mohali cluster can be classified into micro, small and medium. Micro units contribute for about 50% of total number or units as shown in the figure. Each unit manufactures around 50-100 different type of components. Some of the major components/products are given below.



Distribution of units based upon scale of operation

(i) Tractor/auto parts

These include axles, gears, fasteners (nuts, bolts, screws), transmission components, tie rod end, stub axle assembly, front axle bracket, bearing blocks, flange, block bushes, housings body parts, engine parts, engine mounting & compressor mounting brackets, steering assembly, brake systems, towing parts, combine harvester parts.

(ii) Steel fabrication

Steel fabrication comprises sheet cutting, railway coach fabrication, sheet metal fabrication, tractor equipment fabrication, combined body fabrication, sub-assemblies for earth moving equipment.

(iii) Railway components

Various parts produced include bogie (coach) booster, shims, water tanks, hydraulic lift assembly, fuel tanks, coach doors, railway track fittings.

(iv) Bathroom/sanitary fittings

Different type of bathroom fittings manufactures are taps (pillar and bib), brass valves, showers, cocks, mixers (single lever, basin, sink, wall), gravity cocks, shower panels, shower tray and enclosures, bath accessories, water fittings, water meter components, flushing systems (flush valves and cocks), plumbing fittings, waste couplings, urinal fittings, rail coach lavatory fittings (self-closing taps). The major brands of sanitary fittings manufactured in the cluster include JAL, Regal, GVI, Excel, Nova and Royal.



Bathroom/sanitary fittings

(v) Forging

The major product in forging industries in the cluster is Elastic Rail Clips (ERC)

The nature of the cluster and the type of products manufactured is such that it is difficult to estimate the quantum of production in terms of tonnes. The units only record the number of pieces manufactured of a particular type of product and hence only have the turnover figure. The total turnover of the cluster is estimated to be about Rs 6000 crores.

Raw material usage in cluster

The main raw materials and inputs used by the auto/tractor parts, steel fabrication, railway components and forging units for manufacturing their products is steel (essentially in the form of wire rods, rounds, castings, MS sheets, plates), stainless steel, alloy steel aluminium, copper, bakelite powder, plastics, etc. The raw material constitutes the major component (almost 70 %) of the cost of production. The average consumption of steel per unit is around 300 tonnes per annum. The main sources of procuring steel in the cluster are:-

(i) Rashtriya Ispat Nigam Limited (RINL), Vishakhapatnam

The main raw materials supplied by RINL in the cluster is wire rod and Si-Mn steel for ERC (elastic rail clip) i.e. Railway Components. The RINL has regional sales depot at Chandigarh, Faridabad and Ludhiana.

(ii) Steel Authority of India Limited (SAIL)

The main raw material supplied to cluster is MS Plates, Sheets, Round, and CR/HR Coils. SAIL has regional sales depot at Chandigarh, Faridabad, Mandi Gobindgarh and Ludhiana.

(iii) Local distributors

The local distributors are the main source of raw materials for units in Mohali. They supply special types of steel sheets of different grades such as EN-8, SAE-8620, SS-30n etc. The major raw material used by the bathroom fittings units is brass scrap. This is procured mainly by local scrap dealers. The average consumption by a unit is 25-35 tonne per annum of brass scrap.

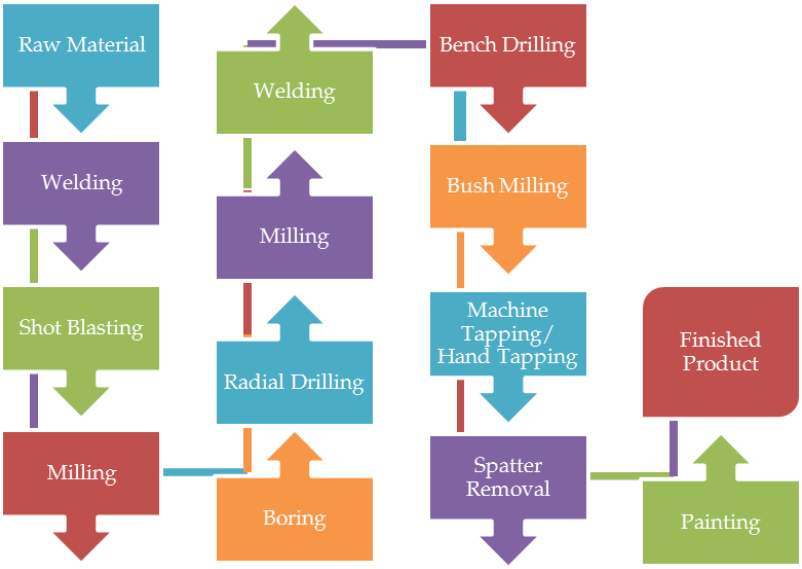
Production process

Various kinds of parts are manufactured by each category of units but process broadly remains the same. Most of the vendors manufacture the components based upon the

drawings received by the OEM. The production process for each category of engineering product is mentioned below:

(i) Tractor/auto/railway part units

The raw material is welded first in the welding section. If the material is having rust on its surface then it goes for shot blasting where the air and small iron particles are forced on the material to clean the surface. Then accordingly the processes such as milling, boring, radial drilling are done. Then if needed the process such as welding is carried out. Depending on the type of part to be manufactured the process of bench drilling and bush milling are done.

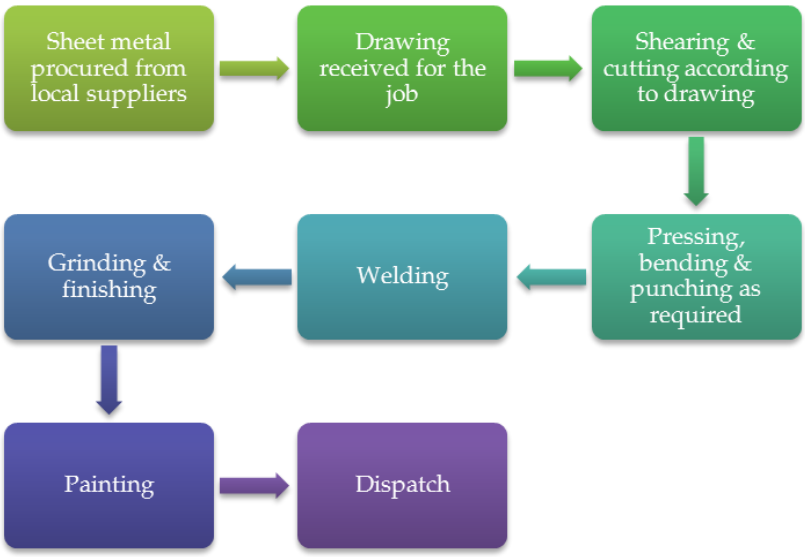


Process flow-chart for tractor/auto components

The materials which are welded a spare spots are developed on it. This spots are removed by hand filling. Then it goes to blower painting booth for painting and is then dispatched.

(ii) Sheet fabrication units

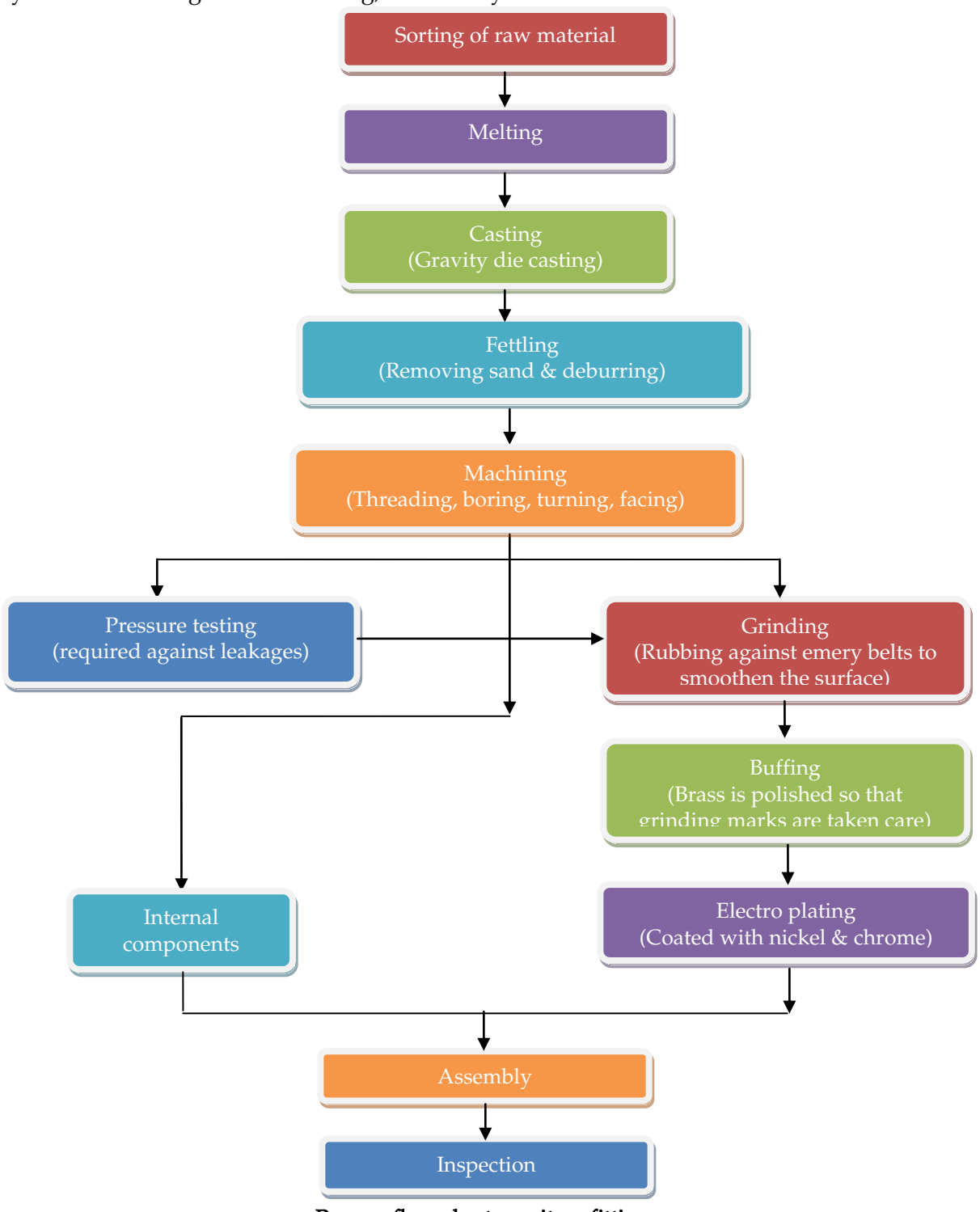
These units use metal sheets as raw materials (to produce different auto/ tractor/ railway components) which are bent into desired shapes according to the customer requirements. The production is carried though a number of processes. Shearing, bending, welding, punching, pressing, grinding and painting are the major processes that are carried out and are the ones that consume maximum amount of energy.



Process flow chart for sheet metal fabrication

(iii) Bathroom fittings

The production of sanitary fittings does not involve highly technical operations. But it requires a degree of specialization and designing skills for manufacturing innovative products that are in accordance with the demand of customers. The process of designing is extremely critical in this industry. General purpose machineries such as furnaces, casting machines, lathes, grinding, buffing are required. The products that are visible to the naked eye have to undergo Electro Plating, where they are coated with nickel & chrome.



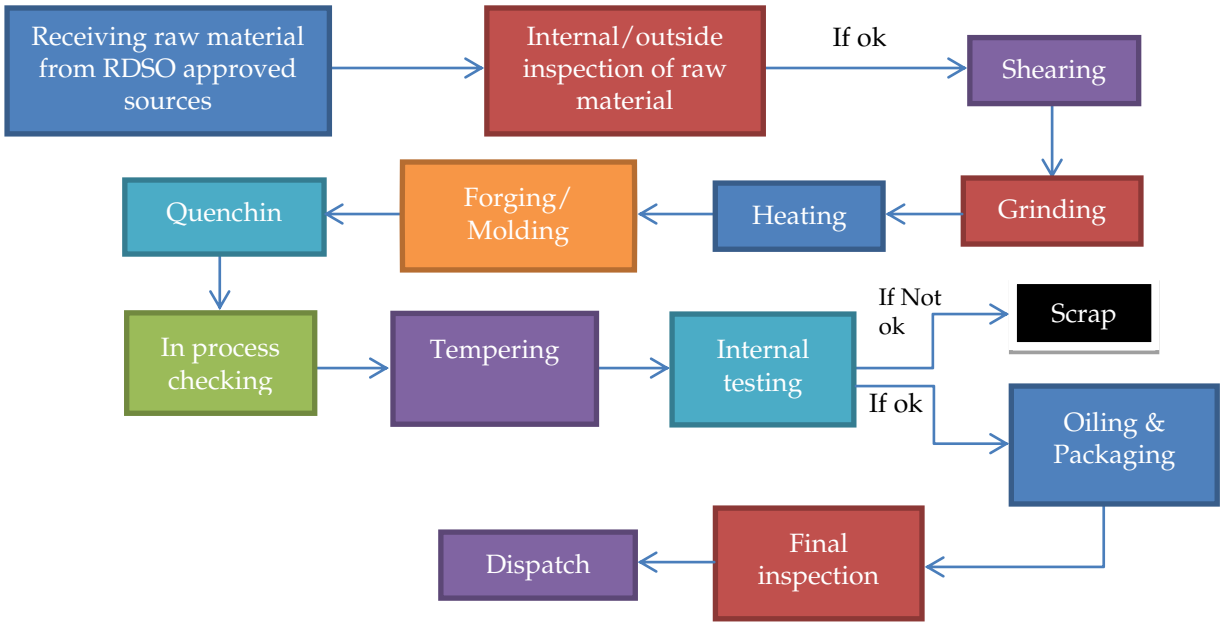
Process flow-chart –sanitary fittings

Only few of the units are composite manufacturing units having the entire production process under one roof, the micro and tiny units outsource some of the production processes to other units and also source components from other units to assemble as a finished product. Small Scale units are also outsourcing few of the rubber, plastic and small brass components from the suppliers. Specialized suppliers are available in Mohali for rubber and plastic components. .

Brass components are grinded, polished and then protected with a Nickel & Chrome coating to prevent tarnishing. The entire production process which includes melting of scrap, casting, machining, electroplating, powder coating, painting, assembling etc. is provided in figure below.

(iv) Forging

The major product manufactured by the forging units is the Electric Rail Clip (ERC) for Indian Railways. The production process is highlighted below:



Process flow-chart –Forging

Technologies employed

The majority of the light engineering industries in the cluster uses conventional manufacturing technologies such as lathes, milling (horizontal and vertical) machines, drilling, shaping/ shearing machines, power press, MIG (metal inert gas) and TIG (tungsten inert gas) welding, and different kinds of grinding machines to manufacture their products (for operations like gas cutting, shearing, bending, punching, milling, boring, welding).

With the increase in the market size, it is becoming difficult for these units to achieve the desired production and quality using conventional technologies. Consequently, few progressive units (about 30%) have adopted modern technologies such as computerized

numerical control (CNC) and vertical milling centre (VMC) machines. The remaining units still rely on conventional manufacturing technologies; in the absence of financial assistance without collateral security they are finding it difficult to modernize their production process. The sheet metal fabricators are dependent on manual practices for sheet cutting in the absence of any high technological automatic sheet cutting facilities.

In recent years, most of the sanitary fitting units in the cluster have shifted from FO based furnaces to electric heating system developed by a local vendor. About 35 units have adopted the electric furnace; five units still continue to use the oil fired system. The cost of melting in an FO fired furnace is around units 20 per kg, whereas in an electric furnace, it is only Rs 5 per kg.

Energy consumption

Electricity is the main source of energy for most of the engineering units in the Mohali cluster (85%). Almost all the units in the tractor/auto parts steel fabrication, railway components, bathroom fittings category are dependent on electricity from grid to meet their energy needs. The average connected load per unit is about 90 kVA. The other types of energy used in the cluster are Furnace Oil (FO) and High Speed Diesel (HSD). FO is mainly used by a few sanitary fittings and forging units in the melting furnace. HSD is used in DG sets, only during power failure. The power situation has significantly improved in Mohali over the past few years. Consequently, the dependence on DG sets has reduced considerably and at present they are used for about 25-30 hours in a month.

Average connected load in units

Segment	Connected Load (kVA)
Micro	50-80
Small	80-120
Medium	120-200

The details of energy consumption in the cluster are highlighted in tables below.

Details of energy consumption in Mohali cluster

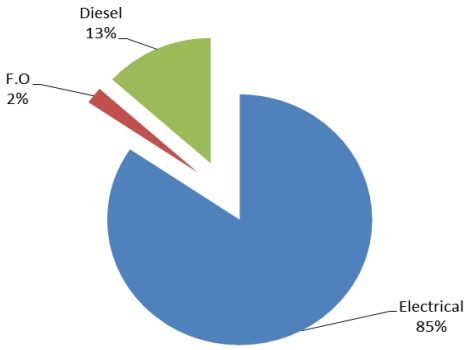
Energy consumption (unit/month)	Tractor/ auto parts	Steel fabrication	Railway components	Bathroom/ sanitary fittings	Forging
Electrical (million kWh)	13.18	1.88	1.17	0.69	0.24
F.O (litres)	0	0	0	6.2	30
Diesel (litres)	188.2	26.9	16.7	9.9	3.4

Share of energy consumption by primary industries in Mohali cluster

Industry sector	Consumption (toe/yr)	Share (%)
Tractor/auto parts	15,744	75%
Steel fabrication	2,249	11%
Railway components	1,398	7%
Bathroom/sanitary fittings	910	4%
Forging	667	3%
Total consumption (toe/year)	20,968	

It is evident that the tractor/auto part segment contributes to about 75% (15744 toe) of total energy consumption in the cluster. The contribution of all the industry segments to total energy consumption is presented in figure below.

In terms of energy source, electricity is the single major source (84% of energy in the cluster. The details of annual consumption of various energy sources are shown in the table.



Share of energy source in Mohali cluster

Share of energy source in Mohali cluster

Energy type	Consumption (toe/yr)	Share (%)
Electrical	17,716	84%
Furnace oil	457	2%
Diesel	2,796	13%
Total	20,969	100%

Energy saving opportunities and potential

The Mohali cluster offers significant scope for energy efficiency improvements both in thermal (fuel switchover to electrical) and electrical areas. With power contributing a major share (85%) of energy consumption in the engineering units in Mohali, most of the recommendations focus on reducing electrical load. The energy savings measures suggested above can lead to a reduction of 10-15% in electrical consumption. Some of the options available for Mohali engineering cluster are discussed below.

i) Switch over to energy efficient electrical furnace from FO fired furnace

There are around 5-10 bathroom/sanitary fittings manufacturing units who are still using FO based melting furnace to produce melt for pouring. This is not only energy inefficient but polluting in nature due to incomplete combustion. Switch over to electrical furnace will improve energy efficiency in the range of 25-35% as well as improve workplace environment. About 30 units have already adopted the electrical furnace. For this purpose, they had tied up with a vendor who provides the electrical furnace at a very reasonable price.

ii) Proper recycling of waste generated from polishing brass fittings

Instead of scrapping the waste generated during polishing/finishing operation in bathroom fitting units, the same could be converted into biscuits (using furnace) and used as raw material during subsequent melting operation. A Common Facility Centre (CFC) could be established by installing smaller capacity electrical furnace for this purpose. Cluster level scrap could be mobilized to this CFC as job work. Processed waste could be value added product, which will reduce the raw material costs for production.

iii) Air compressor

A number of options are available to enhance the use of compressed air system. These include (1) minimising compressed air leakages, (2) installation of VFDs on screw type air compressors, and (3) reduce maximum pressure setting for compressed air.

iv) Electric induction motors

Some of the energy saving options available for improving the performance of induction motors used in the cluster are given below:

- Installation of an 'Automatic Power Factor Controller' (APFC) in the main panel
- Selection of proper size motor for an application.
- Switch over to permanent star connections in case of consistently under-loaded motors
- Installing 'Variable Frequency Drives' (VFD) to take care of load variations in the processes
- Replacement of inefficient motors with energy efficient motors e.g. IE3
- Replacement of old and worn-out V belt drives by synchronous belt drives

v) 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. These capacitors need replacement. In some of the units, capacitor banks were inappropriately sized and hence the power factor is not being maintained even after installation of APFC. Correct size of capacitor banks would help in improving the power factor.

vi) Heating, ventilation and air conditioning

The units use conventional fans that are inefficient. These fans may be replaced with energy efficient fans that have an energy savings potential of 30-40%

vii) Lighting

The engineering units use a variety of inefficient lighting system such as conventional tube lights (52W & 46W), high pressure sodium vapour lamps, etc. These lighting can be replaced with efficient lighting system such as LEDs, effective use of day light facility, etc.

viii) Other energy saving measures

- Operational efficiency of hacksaw machine can be improved by increasing the number of rods available for cutting e.g. 4 numbers to 6 numbers.
- Use of regenerative braking system to recover kinetic energy in CNC machines
- 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.

A list of energy efficiency options applicable for the cluster is provided below.

Energy efficiency options in Mohali Engineering cluster	Energy saving potential
Use of proper sized motors to replace under-loaded motors	15 – 20%
Replacement of inefficient drives with efficient drives	15 – 20%
Efficient use of compressor	20 – 30%
Improved insulation of melting furnaces to reduce surface heat loss	5 – 10%
Improved design for lids in melting furnaces	5 – 10%
Enhanced recycling from machining of bath room fittings of brass material	reduction in raw material cost
Switch over from inefficient lighting to efficient lighting system	10 - 15%

Major stakeholders

The primary stakeholders in the cluster are the engineering units based in Mohali and the leading industry association of the region- Mohali Industries Association. The other key stakeholders include Original Equipment Manufacturers (OEMs), District Industries Centre (DIC), machinery suppliers, various government agencies, regulatory bodies, research and academic institutions, testing and training institutes and BDS providers. These cluster actors provide various services to the cluster units, such as training of workers, testing facilities, financial services, technical know-how, regulatory and advisory services, raw materials supply, supply of technologies etc.

Cluster development activities

The Mohali cluster has not received much attention from donors or government agencies. Not many interventions have taken place in the cluster. Some of the initiatives that are on-going/have been conducted in the cluster are mentioned below:

- *Mohali Hi-tech metal cluster project:* It is an on-going initiative undertaken by the sanitary fittings units of Mohali. The sanitary fittings units of Mohali joined hands to form a 'special purpose vehicle' (SPV) and got the cluster approved under DC-MSME CDP (Cluster Development Program) scheme. Grant has been sanctioned by the government to establish a 'Common Facility Centre' (CFC) with modern manufacturing facilities for sanitary fittings. The cluster also has got approval for a plot of land from the Punjab Government. The facility is under construction at present in Mohali Industrial area.
- *TERI-SIDBI BDS project:* TERI with support from SIDBI executed a BDS development project in MPC engineering cluster (MSMEFDP) during 2009-2011. The project objective was to strengthen the access to BDS of SMEs by designing and implementing strategies to (i) develop the market for BDS (ii) strengthen the access to BDS providers (iii) assist BDS providers in the cluster to become self-sustainable. The aim of the project was development of MPC cluster units by providing them an access to quality BDS. Various activities such as skill development and employment to unemployed youth, energy efficiency studies, implementation of lean manufacturing tools, marketing/outreach activities were conducted in the cluster on a pilot basis.
- GIZ provided support to MIA to strengthen their infrastructure facilities.
- The sanitary fittings industry in Mohali being the most proactive, it had completed a lean manufacturing project under 'Lean Manufacturing Competitive Scheme' of DC-MSME being implemented through NPC.

About TERI

A dynamic and flexible not-for-profit organization with a global vision and a local focus, TERI (The Energy and Resources Institute) is deeply committed to every aspect of sustainable development. From providing environment-friendly solutions to rural energy problems to tackling issues of global climate change across many continents and advancing solutions to growing urban transport and air pollution problems, TERI's activities range from formulating local and national level strategies to suggesting global solutions to critical energy and environmental issues. The Industrial Energy Efficiency Division of TERI works closely with both large industries and energy intensive Micro Small and Medium Enterprises (MSMEs) to improve their energy and environmental performance.

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Swiss Agency for Development and Cooperation SDC

SDC (Swiss Agency for Development and Cooperation) has been working in India since 1961. In 1991, SDC established a Global Environment Programme to support developing countries in implementing measures aimed at protecting the global environment. In pursuance of this goal, SDC India, in collaboration with Indian institutions such as TERI, conducted a study of the small-scale industry sector in India to identify areas in which to introduce technologies that would yield greater energy savings and reduce greenhouse gas emissions. SDC strives to find ways by which the MSME sector can meet the challenges of the new era by means of improved technology, increased productivity and competitiveness, and measures aimed at improving the socio-economic conditions of the workforce.

About SAMEEEKSHA

Promoting Energy Efficiency in SMEs
SAMEEEKSHA

SAMEEEKSHA (Small and Medium Enterprises: Energy Efficiency Knowledge Sharing) is a collaborative platform set up with the aim of pooling knowledge and synergizing the efforts of various organizations and institutions - Indian and international, public and private - that are working towards the development of the MSME sector in India through the promotion and adoption of clean, energy-efficient technologies and practices. The key partners are of SAMEEEKSHA platform are (1) SDC (2) Bureau of Energy Efficiency (BEE) (3) Ministry of MSME, Government of India and (4) TERI.

As part of its activities, SAMEEEKSHA collates energy consumption and related information from various energy intensive MSME sub-sectors in India. For further details about SAMEEEKSHA, visit http://www.sameeeksha.org