CLUSTER PROFILE
JALANDHAR HAND TOOLS INDUSTRIES

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Jalandhar Hand tools Cluster

Cluster background

Hand tools are predominately produced in the small scale sector in India. Jalandhar, in Punjab is one of the prominent hand tools clusters in the country. The cluster came into existence around the time of Indian independence in 1947, when skilled labourers from Pakistan came and settled there and started manufacturing hand tools. Subsequently, the government of Punjab through Punjab State Industrial Development Corporation (PSIDC) set up an industrial estate on the outskirts of city which is today a hub of hand tools.

A substantial quantity of the hand tools production is exported to countries like USA, UK, Germany, Italy, Australia and Russia.

Cluster size and turnover

There are around 950 units manufacturing hand tools in the cluster. Out of this, about 900 are in the micro and small scale units and 50 units are in the medium scale.

As per industry estimates, the cluster produces about 50,000 tonne of hand tools per annum. Most of the units manufacture an array of hand tools like spanners, screw driver, pliers, bench vices, tyre levers and hammers and so on. A medium scale unit produces around 50-70 tonne of material per month. The production of the unit depends upon the number of hammers installed in the unit. The production of the clusters is presently affected because of frequent power cuts, ranging from 4-6 hours in a day.

The estimated turnover of the cluster is approximately Rs 1,000 crores (Rs 10 billion) per annum. The cluster employs about 60,000 direct employees.

Industry associations

There are a number of industry associations in the cluster. The major associations are listed below:

- Hand Tools Manufacturers Association
- Jalandhar Hand Tools Manufacturers Association & Steel Fabricators Association
- Jalandhar Forgings & Engineering Association
- Federation of Jalandhar Engineering Association
- Focal Point Industries Association.

These associations play an active role in taking up issues pertaining to the industry with the government.

In addition, the Central Institute of Hand Tools (CIHT) set up by Government of India with assistance of UNDP and Government of Punjab in Jalandhar, has played a pivotal role in the development of hand tools industry in the cluster. The institute offers wide variety of services to the industry in the area of design and manufacture of various tools and improvement of the manufacturing processes. The institute is equipped with CNC machines, heat treatment shop and forging shop.

Technology status and energy use

The units in Jalandhar use the typical forging, hardening and baking process to manufacture hand tools. The typical production process used to manufacture hand tools includes the following:

- Raw material cutting using power presses
- Heating in oil fired forging furnace
- Forging using drop hammer
- Blanking using power press
- Hardening – heating to 835 oC (oil fired furnace) followed by quenching
- Tempering (electrical operated furnace)
- Shot blasting
- Electroplating (if applicable)
- Packing, inspection & dispatch

Energy accounts for nearly 20% of the total cost of production. Electricity and oil (mainly furnace oil and light diesel oil or LDO) are the main forms of energy used in the cluster. Electric energy is used to operate electric motors, pumps, air compressors, blowers, hammers, broaching machine, shot blasting machine and in the tempering furnace. Oil is used in the forging furnaces and hardening furnaces. The annual energy consumption of the cluster is 19,829 toe per year (table below).

Energy consumption in Jalandhar cluster

Energy form	Quantity (per year)	toe/yr	Share
Electricity	113.5 million kWh	9,761	49%
Oil - forging	81,60,000 lit	6,936	35%
Oil – heat treatment	31,20,000 lit	2,652	13%
Firewood	1500 tonnes	480	3%
	Total	19,829	100%

Energy and environmental performance

The specific energy consumption (SEC) of the hand tool units in the cluster is vary with the manufacturing processes deployed. For example, the larger units carry out all the operations such as forging, heat treatment, machining and electroplating in-house. Many smaller units are acting as vendors of large units can hence carry out only a few of the operations.

Typically, the specific electricity consumption in the units varies between 1900 to 2225 kWh/tonne (0.163 to 0.191 toe/tonne); the specific oil consumption in the forging furnaces varies between 139 to 179 lit/tonne (0.139 to 0.179 toe/tonne); and the specific oil consumption of heat treatment furnaces, if existing, is about 120 lit/tonne (0.120 toe/tonne) on an average. Hence the final energy intensity in the cluster varies between 0.303 and 0.487 GJ/tonne. The performance of the cluster calculated in terms of specific energy consumption (SEC) and the emission intensity (EI) are given in table below.

Specific energy consumption of Jalandhar hand tools cluster

Total energy consumption	19,829 toe per year
Specific energy consumption (average)	0.399 toe/tonne
Total CO_2 generation	0.114 million tonne
Emission intensity	2.3 t CO_2/ t product

Options to enhance energy efficiency

Interactions with the units in the cluster revealed that there is a preference towards smaller incremental changes in equipment and/or operating practices because of lower capital expenditure involved in such changes. The following energy saving options were identified for the cluster.

(i) Use of solar water heater in place of boiler

For electroplating, hot water at 55-60 ^{o}C is need. Presently the hot water is produced in outmoded boilers fired by wood. Typically about 2.5 tonnes of firewood is consumed per month. It is possible to meet the hot water requirements in the electroplating section by through solar water heating systems which are available in the market. This would lead to a saving of about 1500 tonne of firewood.

(ii) Redesign of forging furnaces and switch-over to natural gas

The forging furnace consumed about 80% of the oil consumption of a typical unit. The oil-fired forging furnaces used in the cluster are of outmoded designs leading to very high fuel consumption. Recently, natural gas is available in the cluster. Redesigning and changeover from the oil-fired conventional forging furnaces to gas-fired efficient furnaces would lead to an energy saving of upto 30%.

(iii) Adoption of best operating practices in heat treatment furnaces

At present, there a heat loss takes place due to poor insulation and lack of good temperature controllers in heat treatment furnaces. In places where the temperature controllers are installed, the units face a problem with their malfunctioning. There is a good possibility to save energy in the heat treatment furnaces by adoption of best operating practices like improve insulation, adoption of good thermocouples and temperature controllers and by adopting other measures to prevent heat losses. Adoption of best operating practices in heat treatment furnaces is likely to result in energy saving of about 10%.

(iv) Adoption of energy efficient motors

A large number of motors are used in hand tools industry for various operations. Electrical energy cost is almost 10% of the total cost of production. Most of the electrical motors which are being used in the cluster have been rewound several times leading to a drop in their efficiencies. Typically, energy efficiency goes down by 3 to 5% after each rewinding. In addition, there is a possibility to adopt variable voltage drives (VVDs) in many of the applications such as grinding, lathe machine, cutting machines and so on.

Adoption of energy efficient motors of the proper size along with VVDs and other control mechanisms would lead to an energy saving of about 10% of the electrical energy consumption.

References

- Visits of TERI team in the cluster (Dec 2010)
- Consolidated report - Energy audit of 20 hand tool units in Jalandhar, prepared by NITRA Ltd.