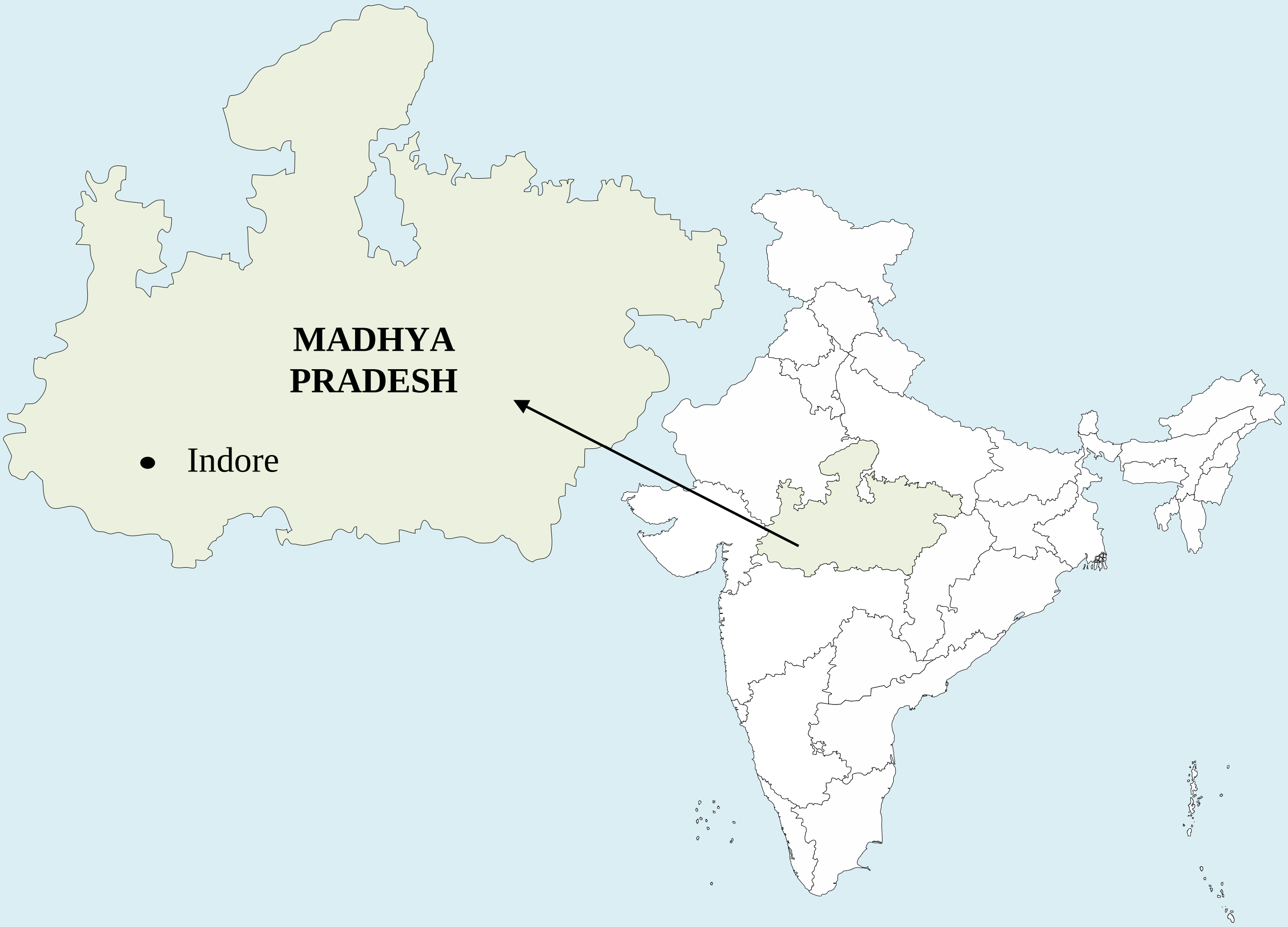
CLUSTER PROFILE
INDORE FOUNDRY



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Indore Foundry Cluster

Cluster background

Indore located in the state of Madhya Pradesh, is an important industrial cluster. A large number of small and medium enterprises manufacturing components for the automobile, engineering, railway and infrastructure sectors are located in and around Indore. Apart from foundry industry, large number units manufacturing pharmaceuticals are also located in Indore.

The foundry industry in Indore came up to cater to the textile machinery manufacturing units which were required by the cotton mills in the area. Subsequently, the foundry units started catering to the demands of the automobile industry (mainly commercial vehicles and construction equipment) which came-up in the Pithampur SEZ (Special Economic Zone). Indore cluster is also famous for the manufacture of ornamental castings, a substantial quantity of which is now being exported to overseas market.

Cluster size and turnover

There are about 45 foundry units in Indore cluster. Apart from the foundry units in Indore city, the foundry industry is spread across 4 industrial areas - Pithampur (30 km from Indore city), Devas (35 km from Indore city), Ujjain and Sanwar (very near the city).

There are about 6 foundry units in Pithampur SEZ. Powral Auto Components is one of the largest foundry unit in Pithampur and has a production of nearly 900 tonnes per month of cast iron and SG iron automobile castings. Other foundry units in Pithampur area are – MWP Mahalay (800 tonnes/month, chilled iron), Ranika Industries (500 tonnes/month, steel castings for railways), Sian (300 tonnes/month, steel castings for railways) and Technocast and Ananth Steel. There are 6-7 foundry units in Devas including Bagree Alloys and Kirlosker. Ujjain has about 3-4 foundry units while about 30 foundry units are there around Indore city.

As per industry estimates, the annual production of casting in the cluster is around 42,000 tonnes. Most of the small foundry units in Indore, Ujjain and Devas use cupola furnaces, while the larger automotive and steel foundry units use induction furnaces. Although the number of foundries using cupolas is higher (about 30 nos.), due to their smaller size, they account for just 20% of the clusters production. Majority (80%) of the castings in the cluster are produced using electric induction route by 20% of the large foundry units in the cluster.

The annual turnover of foundries in Indore is approximately Rs. 250 crores. The industry provides direct employment to nearly 2,000 people.

Industry associations

Most of the foundry units in the large and medium scale are members of Institute of Indian Foundrymen (IIF). Indore is under the Western Region of IIF and the local foundry units interact with each other regularly during meetings of IIF.

Energy mix and performance details

Electricity, coke and firewood are the major fuels used in the foundry units. The annual quantity of the fuels consumed by the foundry industry, their energy equivalent and percentage share are given in the table. The total amount of energy consumed in the cluster is about 5,516 toe/yr.

Energy mix, 2007/8

Energy form	Energy consumption per year	Total energy consumed (toe/yr)	Share (%)
Electricity	56 million kWh	4,816	87
Coke	625 tonnes	406	7
Firewood	450 tonnes	162	3
Diesel	95 kL	81	1
Natural Gas	60000 scm	51	2
	Total	5,516	100.0

Final energy intensity

The medium and small enterprises predominantly use electric induction furnace. The micro scale units are however using cupolas. In most cases the transition from cupola to electric furnace occurred in recent years due to environmental pressures coupled with the inherent limitation of cupolas to produce multiple grades. Mostly, SG iron and mild steel castings are produced using induction furnaces. The specific energy consumption of these furnaces varies from 560 kWh to about 750 kWh per tonne. Smaller foundry units manufacturing grey iron castings use conventional cupolas, which are energy-inefficient. The specific energy consumption of cupola furnaces varies from 2.0 to 5.4 GJ/tonne (0.048-0.129 toe/t). Very few foundry units have converted to energy efficient “Divided Blast Cupola” (DBC). One foundry in the cluster has converted to cokeless (gas-fired) cupola provided by Westman, Kolkata. The gas consumption in the cokeless cupola is about 75 cu m / tonne. However, the molten metal temperature from the coke-less cupola is low (about 1300^{o}C) and hence the metal needs to be transferred to electric induction furnace for superheating.

CO_2 emissions: 43 kt/yr (est. 2008/9)

CO_2 emissions intensity: 1.08 t CO_2/t product

(i) Feedstock quality

For alloy grade casting, charge materials like pig iron, iron scrap, foundry returns and ferro manganese and ferro silicon alloys are added in the right proportions. The most common furnace equipment used in Indore cluster is the electric induction furnace. The capacity of the induction furnaces varies between 500 kg to 2 tonnes per hour for small enterprises and 2 to 3 tonnes per hour for medium enterprises.

(ii) Key energy consuming activities

Energy cost accounts for about 15% of the total production cost in a foundry. Melting is the most energy intensive operation in a foundry and accounts for nearly 70% of the total energy consumption. The liquid metal is poured into the sand moulds, which are then cooled and knocked out. The castings are then exposed to shot blast for improving the surface finish, and thereafter sent for grinding, painting and finally for packing and dispatch. The other energy consuming equipment in the foundry are sand Mullers, moulding machines, shot blasting machines and sand dryers.

Because of the predominant use of energy in melting process the focus of saving energy in a foundry is around melting equipment.

Options to enhance energy efficiency

(i) Adoption of energy efficient induction furnaces

The specific energy consumption of electric induction furnaces in the cluster is quite high (about 700 kWh or 0.072 toe/t). This is about 10% more than design values of good induction furnace manufacturers. Hence it is possible to save at least 10% energy by adoption of energy efficient induction furnaces in the cluster.

(ii) Other energy saving opportunities

Adoption of energy saving operating practices for induction furnaces would also lead to reduction in energy consumption by about 5%. The possible options are discussed below.

- Reduction in cycle time through better weighing and charging of raw material
- Online monitoring of melt temperature
- Control on cooling water flow rate and temperature
- Ladle preheating
- Harmonics ad power factor control
- Solid state converters for medium and high frequency furnaces.
- Improved refractory linings

(iii) Increasing capacity utilisation

The capacity utilization of the plants varies upon market conditions and but typically ranges between 70 to 85% for most units. There is a good scope to improve the specific energy consumption by simply improving the capacity utilization in most cases.

(iv) Reduction in rejection levels

The typical rejection percentage range is around 10% for the cluster. There is a good possibility to bring down the specific energy consumption by reducing rejections to 4-5%.

(v) Improvements in operating practices

Some of the other options to improve energy efficiency of foundries in Indore are the following:

- Having a larger holding furnace to store molten metal
- Redesigning the gating system to increase the yield of the casting
- Avoiding partial load operations, as far as possible, through proper production planning & control (PPC) required.
- Install proper energy measurement equipment and train the staff on energy and emission control & monitoring system

References

Taft R. L., Assessment of the Economics of Cokeless Melting in India, Proceedings of the 57th Indian Foundry Congress, February 13-15, 2009, Kolkata, India