ENERGY PROFILE

AHMEDABAD FOUNDRY CLUSTER

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The Energy and Resources Institute

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SUSTAINABLE ENERGY FOUNDATION

Promoting Energy Efficiency in SMEs
SAMEEEKSHA

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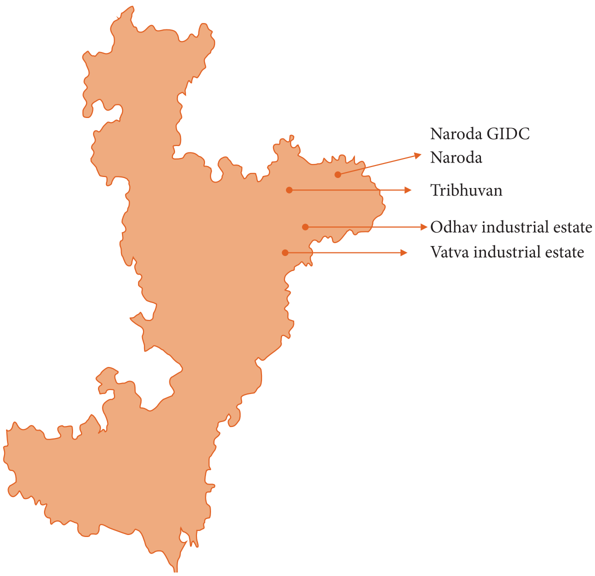
Ahmedabad Foundry Cluster

Overview of cluster

Ahmedabad, located on the banks of River Sabarmati in the state of Gujarat, is an important industrial cluster in India. Ahmedabad is largest city in Gujarat and one of the largest urban agglomerations in India. The industrial activities in the cluster developed in mid-19th century, with the setting up of many textile and garment industry. By early 20th century the city had 33 textile mills and was popularly called 'Manchester of India'. Subsequently, to support the machinery and spare parts requirements of textile mills, small foundries started flourishing in the region. Presently, Ahmedabad is home to various industrial sectors apart from textile and foundry, such as drug and pharmaceutical, agro and food processing, automobile, and engineering. The major industries in Ahmedabad include TATA Motors, Ford Motors, Adani Group, Reliance Industries, Nirma Group of Industries, Arvind Mills, Rasna, Wagh Bakri, Cadila Healthcare, Torrent Pharmaceuticals, Inductotherm India, Electrotherm.

There are about 500 medium and large industries apart from over 23,000 micro, small, and medium enterprises (MSME) in Ahmedabad cluster, of which majority are engineering, textile, chemical, paper products units. The cluster is spread within Ahmedabad and neighbouring Gujarat Industrial Development Corporation (GIDC) Industrial Estates, as shown in figure. The engineering industry is diverse in nature. Some of the major metal segments include foundry, forging, machine tools, auto components, sheet metal, packaging, and food machinery.



Major concentrations of foundry units in Ahmedabad

Foundry units in Ahmedabad traditionally use cupola furnace for melting metal, but over last decade, many foundries have shifted to induction furnace for melting. Though, still major volume of production comes from cupola furnace (~70% of total production). Ahmedabad had over 600 foundries when at its peak, but at present about 450 units are operational, producing 1,770 tonnes of casting every day, nearly 6% of the total casting produced in India.

The foundry units are scattered both within and outside the city. A few major geographical concentrations of foundry units in the cluster include Naroda, Naroda GIDC, Odhav Industrial Estate, Vatva Industrial Estate, Tribhuvan Industrial Estate, and Rakhial Industrial Estate. Smaller cupola-based foundries typically conduct melting once or twice a week. The large foundries with cupola and/or induction furnace conduct melting on daily basis, some of the leading foundries in the cluster include TKT Hightech Cast, C M Smith & Sons, Bhagwati Spherocast, Bhagwati Autocast, and Ahmedabad Induction Alloys.

Product, market, and production capacities

The raw materials for foundry include pig iron, metal scrap, coke, limestone and ferro-alloys such as ferro-silicon, ferro-manganese, etc. They are procured from distributors in local market. Typical raw material and their cost are given in table.

Raw material and their costs (INR per tonne)

Raw material	Typical cost
Pig iron	26,000 – 28,000
Scrap	21,000 – 30,000
Coke (low ash)	15,000 – 16,000
Ferro-silicon	65,000 – 70,000
Ferro-manganese	72,000 – 76,000
Limestone	1,000 – 01,800

Ahmedabad foundry manufacturers traditionally cater to the requirements of textile sectors (~50% of total production). Castings for other sectors include agriculture machinery (~10%), sanitary (~10%), pump and valve body (~20%), etc. Based on their average production levels, categorization of foundry industries in the cluster is given in table below.

Categorization of units and estimated production

Category	Production capacity (tonne/month)	Employment (Nos.)	Turnover (Rs mn/year)
A—Small & Micro	50	25	15
B—Medium	100	75	45
C—Large	500	200	200

A majority of the foundry units fall under category A and category B: 150 and 250 respectively. Remaining 50 units fall under category C. The estimated production of the cluster is 1,770 tonnes per day (~0.531 million tonnes per annum). The foundries employ close to 30,000 direct employees. The estimated annual turnover of the foundry cluster is nearly ₹ 2,600 crore. Some of important products produced in the cluster are shown in the picture given below.

Major products from Ahmedabad foundries

Surat (Gujarat) and Bhiwandi (Maharashtra) are major textile hubs in India and Ahmedabad foundry cluster produce components for nearly 7,000 power looms to cater to these textile clusters' needs. Ahmedabad foundries are actively involved in supplying castings to Rajkot Pump Manufacturing Units, which is the largest pump manufacturing cluster in the country. It further meets the demands of food processing machinery manufacturers around Ahmedabad. Another important component manufactured by the cluster includes sanitary castings, which mainly caters to domestic market. A few foundry units in Ahmedabad are involved in producing high-value intricate castings for automotive and engineering sector.

Of 450 foundry units operating in Ahmedabad cluster, about 70% production is accounted by cupola furnace based units (250 foundries). The balance 30% production comes from induction furnace-based units (150 foundries) and pit furnace-based units (about 50 foundries). The foundry units have adopted green sand moulding technique, baring 25 units that use lost wax method to make precision castings.

Production process

Green sand moulding

The major steps of process are mould sand preparation, charge preparation followed by melting, pouring, knockout, and finishing. A simplified process flow diagram of a typical green sand moulding unit is given in figure. The process steps are explained below.

Mould sand preparation

Fresh sand is mixed with bentonite and other additives and mixed in muller to make green sand. Plants in general use sand mixers and sieves for mould sand preparation. Category A and Category B foundry units have 250–350 kg capacity sand mixers; category C foundries have bigger sand mixers, with typical size of about 500–800 kg capacity.

Moulding

The mould sand is pressed manually or using pneumatic machines on the pattern to prepare moulds. The mould is divided into two sections viz. upper half (cope) and bottom half (drag) which meet along a parting line. Both mould halves are enclosed inside a box, called flask, which is also divided along parting line. The mould cavity is formed by packing sand around the pattern (which is a replica of the external shape of the casting) in each half of the flask. The sand can be packed manually, but moulding machines that use pressure to pack sand are also commonly used. About 70% of foundries use hand moulding technique, remaining use pneumatic moulding lines, a few units have high pressure moulding lines (HPML) installed.

Charging of raw material

The raw material, such as pig iron, scrap, foundry returns, and other alloys are weighed in proper proportion and charged inside furnace for melting. About 80% of the cupola foundry units use manual charging technique while others use mechanical charging system. All induction furnaces use manual charging of raw material.

Melting

The charge is melted in cupola furnace. Initial chill metal is pigged and is about 5% of melting rate of cupola. The condition of molten metal is visually verified by the operator, after which pouring of molten metal begins. Charging of metal and coke keeps progressing in systematic manner. In case of induction furnace, melting is done in batches with each batch taking typically 40–60 minutes, depending on size of the furnace.

Pouring

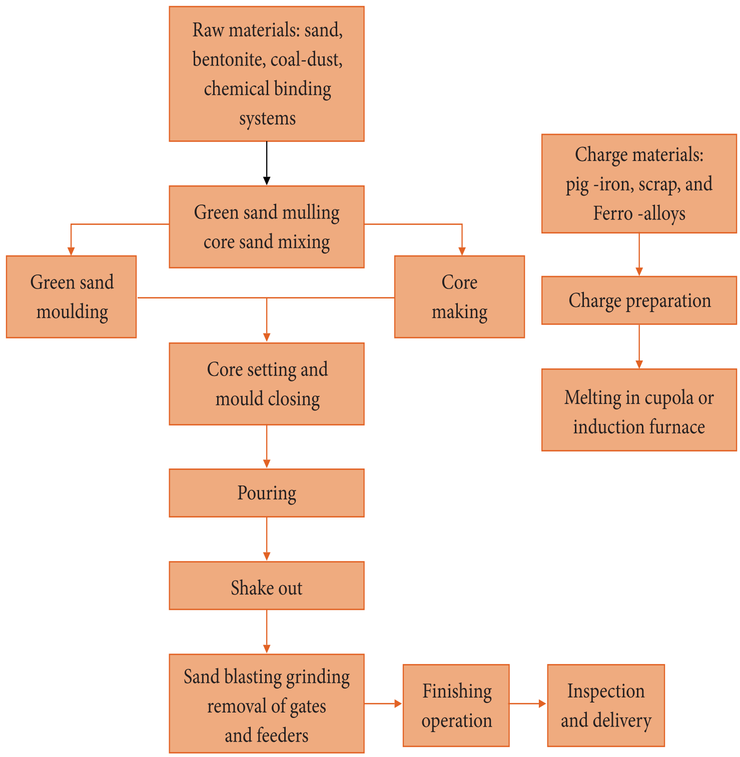
After melting, the molten metal is transferred and poured into the moulds using ladles manually. In induction furnace-based foundries, molten metal is poured using mono-rail system or using overhead cranes.

Knocking out of castings

The moulds are left to cool for certain time, after which the castings are knocked out from the mould either manually or using a vibratory knock-out machine.

Finishing

The finishing operation involves removal of runners/risers, shot blasting, and cleaning of castings. This is followed by fettling and machining. In case of steel casting, heat treatment is also an integral part finishing operations.



Manufacturing process of foundry

Investment casting

The major steps of process are wax injection, assembly, shell building, de-waxing, charge preparation followed by melting, pouring, knockout, and finishing. A simplified process flow diagram of a typical investment casting unit is given in the figure. The process steps are explained below.

Wax injection

The first step in investment casting process is fabrication of a pattern with the exact geometrical shape as that of anticipated casting component. Patterns are normally made of investment casting wax that is injected into a metal wax injection die at pressure created using hydraulic presses.

Assembly and shell building

The molten wax is allowed to cool and solidify. Once wax pattern is ready, multiple wax patterns are assembled to form a tree-like structure called 'wax sprue'. The pattern ends are slightly heated and fused together, which joins on solidification. Next step in shell building is coating, stuccoing, and hardening. This wax assembly is coated with ceramic material by dipping it in slurry of fine refractory material. Stuccoing applies granular ceramic particles by plunging pattern in a fluidized bed. Hardening allows the coating to cure. Typical refractory material used is silica or zirconium; ethyl silicate is used as binder to hold the refractory together.

De-waxing and shell baking

The process of shell building continues till it reaches the thickness of about 8 mm. On achieving the thickness, the shell is left to cool and then sent to a steam autoclave or electric oven for de-waxing. Most of the wax is removed in this process. The mould is sent for baking into a gas-fired furnace, maintained at about 1,050 °C. This removes moisture and the remaining wax. This process also helps in preheating the mould.

Melting and pouring

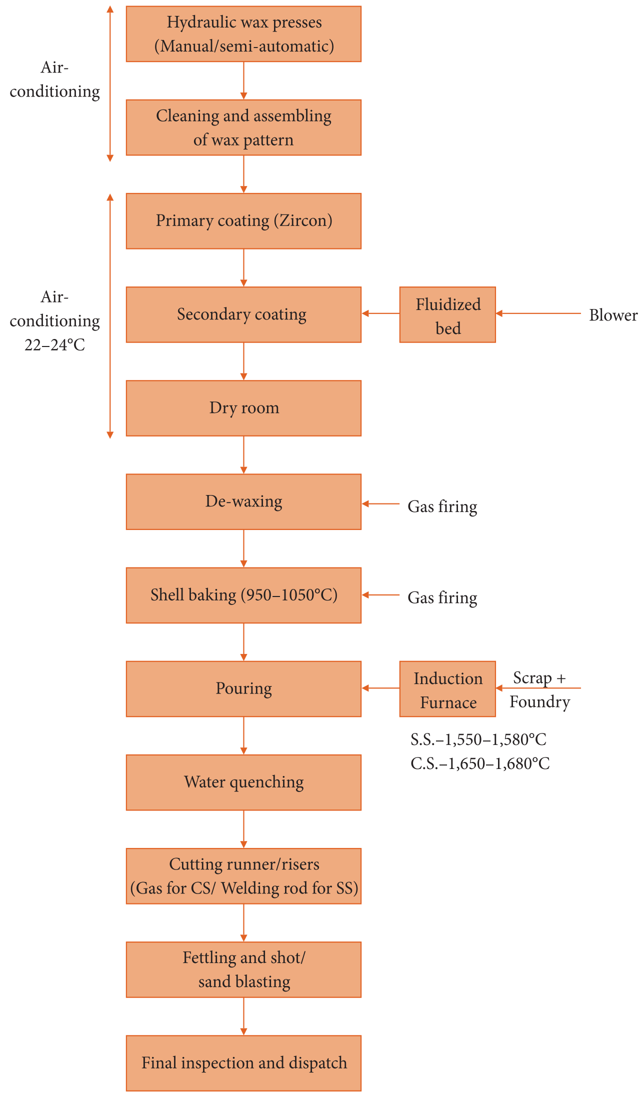
The metal charge is melted in induction furnace in batches. Each batch typically takes 50–70 minutes, depending on size of furnace. Once metal is ready for pouring, the shell moulds are taken out of shell moulding furnace and arranged in platform for pouring. The molten metal is transferred and poured manually into the shell moulds using ladles.

Knock out of castings

The moulds are left to cool for certain time after which the castings are knocked out from the mould, either manually or using a vibratory knock-out machine.

Heat treatment and finishing

The finishing operation involves removal of runners/ risers, shot blasting, and cleaning of castings.



Manufacturing process of investment casting

Grain structure, size, and composition are the most important factors in determining mechanical behaviour of the metal. Heat treatment achieves this by controlling the rate of diffusion and cooling. Depending on properties desired, the casting is subjected to either annealing (900°C) or normalizing (980°C). After heat treatment, the casting is allowed to cool down, and then it is followed by fettling and machining. Machined casting is sent for packing and dispatched.

Technologies employed

In green sand moulding and investment casting technique, a number of technologies are employed in the cluster, some of which are elaborated below:

Melting

Cupola furnace

The small and micro units use cupola furnace for melting. Majority of units have installed either single blast cupola or a crude design of divided blast cupola (DBC). These cupolas are of 18 inch, 21 inch, or 24 inch inner diameter (ID), with melt rate less than 2.5 tonne per hour (tph). A few medium units use better designs of DBC. These are large cupolas with ID over 30 inches with melt rate higher than 3 tph. The specific energy consumption (SEC) of cupola for melting varies in range of 80–130 kg coke per tonne for molten metal. In terms of coke to metal ratio, this translates into 1:12 to 1:8 equivalent to 14% of coke. All figures are on charging coke basis (i.e., total coke used during a batch except bed coke).

Cupola furnace

Induction furnace

Majority of foundry units have small induction furnaces of 150 or 300 kg crucible size. About 30 units have larger induction furnace of 500 kg or higher capacity crucibles. These furnaces are operated in batch mode, and the typical cycle time and SEC vary considerably depending on the type of metal melted (carbon steel, stainless steel, non-ferrous, etc.) and the size of castings. The SEC varies in range of 600–770 kWh per tonne and batch duration varies between 45 and 80 minutes.

Induction furnace

Sand mixers

Sand preparation is done using sand mixers and sand sieves. Sand mixers have typical batch size of 100 to 500 kg. The mixers have two motors—mixer motor and blender motor. The connected load of these mixers is about 10–30 kW. These sand mixers operate in batch mode and do not have proper control over

Sand mixers

quantity of bentonite and water addition. There is no control of cycle time as well, which typically varies between six and nine minutes.

Air compressor

Compressed air in the foundries is used mainly in pneumatic grinders, shot blast, pneumatic rammers, and cleaning. Few units have semi-automated pneumatic line for moulding. The connected load of air compressor ranges from a few kW for category B unit and 45 kW for category C unit. The pressure requirement for all the applications is below 6.1 kg/cm^2. Typically, category A foundries do not use compressed air in the process as they follow hand moulding technique and send casting to third party for fettling and shot blasting.

Air compressor

Energy scenario in the cluster

Coke and electricity are the major sources of energy for the foundry industry. Depending on location of foundry grid electricity is supplied either by Torrent Power or by Uttar Gujarat Vij Company (UGVCL). Diesel is used in diesel generator (DG) sets only in case of emergency during unscheduled power outage and is procured from local market. Coke is used for melting in cupola and is procured from local market. Some steel foundries that have shell baking and heat-treatment processes use natural gas (NG) for firing furnaces. The details of major energy sources and tariffs are shown in the table given below.

Prices of major energy sources

Source	Remarks	Price
Electricity	Supplier: Torrent Power Connection type: HTMD 1	Energy charge: ₹ 4.45 per kWh (for first 400 units) ₹ 4.35 per kWh (for remaining units) Demand charge: ₹ 260 per kW (up to 1000 kW) ₹ 335 per kW (above 1000 kW)
Electricity	Supplier: Torrent Power Connection type: LTMD 2	Energy charge: ₹ 4.7 per kWh (for billing demand (BD) up to 50 kW) ₹ 4.9 per kWh (for BD >50 kW) Demand charge: ₹ 175 per kW (for first 50 kW) ₹ 230 per kW (next 30 kW) ₹ 300 per kW (rest demand) ₹ 425 per kW (for exceeding)

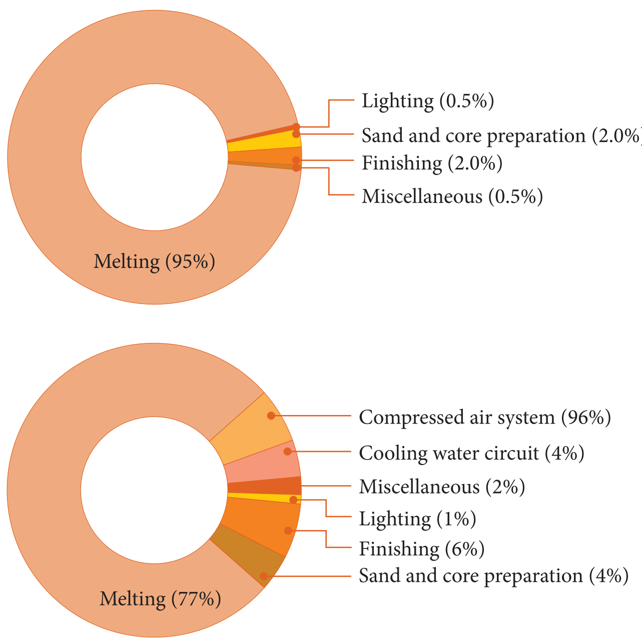
Source	Remarks	Price
Electricity	Supplier: UGVCL Connection type: HTP 1	Energy charge: ₹ 4.0 per kWh (for BD up to 500 kVA) ₹ 4.2 per kWh (for BD >500 up to 2500 kVA) ₹ 4.3 per kWh (for > 2,500 kVA) Demand charge: ₹ 150 per kVA (for first 500 kVA) ₹ 260 per kVA (next 500 kVA) ₹ 475 per kVA (rest demand) ₹ 555 per kVA (for exceeding CD)
Coke	Low ash coke (~14%)	₹ 15,000–16,000 per tonne
Natural gas	Supplier by Adani Gas	₹ 48–52 per SCM
Diesel	From local market	₹ 50 per litre (price subjected to market fluctuations)

Energy consumption

Unit level consumption

The units under category A and some unit under category B have Low tension (LT) electricity connections whereas majority of category B units have HT electricity connections. The power supplied at 11 or 33 kV is stepped down to 433 V using transformer and is fed to the respective power distribution board (PDB) via LT switchgear located at main distribution. Coke is purchased in bulk and stored within factory premises.

The major energy consuming process in a foundry is melting. In cupola-based units, melting accounts for about 95% of total energy consumption, whereas in induction furnace based units it is between 75–85%. In cupola based foundry other major energy consuming areas include blower, sand and core preparation, finishing and lighting; whereas in induction furnace-based foundry its compressed air system and cooling water system. Compressed air system is an important utility in a category C foundry. It accounts for about 4–10% of total energy depending on how well it is utilized. A few units using investment casting method have air conditioning load, but its share of energy consumption at cluster level is negligible. A typical energy use share in cupola and induction furnace based foundry is given in the figure.



Typical energy use in a foundry

The total energy consumption of a foundry unit varies widely based on the size of units (table below). The SEC varies considerably in a foundry depending on the type and grade of casting manufactured and degree of mechanization in unit. On an average, the Specific Energy Consumption (SEC) varies between 95–125 kgoe per tonne.

Typical energy consumption of a foundry

Production category	Electricity	Coke	Total energy	Total CO_2 emissions	Annual energy bill
	(kWh/yr)	(tpy)	(toe/yr)	(t CO_2/yr)	(million INR)
Cupola based foundry					
A	20,000	85	57	270	1.5
B	45,000	155	105	500	2.8
C	150,000	475	322	1,520	8.8
Induction furnace based foundry					
B	1,020,000	0	88	910	8.2
C	7,200,000	0	662	6,410	60.1
Pit furnace based foundry					
A	8,500	70	46	220	1.2

Cluster level consumption

Electrical energy consumption of foundry units at cluster level is estimated to be 270 million kWh per annum. The coke and NG consumptions are 52,250 tpy and 1.25 million SCM, respectively. The overall energy consumption of the cluster is estimated to be 58,325 tonne of oil equivalent (toe) per annum equivalent to GHG emissions of 394,640 tonnes of CO_2. The overall energy bill of cluster is estimated to be ₹ 3,110 million, which is about 12% of cluster turnover.

Energy consumption of the Ahmedabad foundry cluster (2015-16)

Energy type	Annual consumption	Equivalent energy (toe)	Equivalent CO_2 emissions (tonne)	Annual energy bill (million INR)
Electricity	270 million kWh	23,300	240,300	2,180
Thermal Coke NG	52,250 tonne 1.25 million SCM	35,025	154,340	930
	Total	**58,325**	**394,640**	**3,110**

Potential energy efficient technologies

Some of the major energy efficient technologies for the pump set units in the cluster are discussed below.

Divided blast cupola


Divided blast cupola

About 250 foundries in the cluster use cupola for melting. The average SEC of these cupolas varies in range of 80–130 kg coke per tonne of molten metal. The existing designs of the cupola are crude and there is no proper sizing of blowers.

Replacing conventional cupola with proper designed energy efficient divided blast cupola (DBC), the coke consumption is expected to be about 80 kg per tonne of melt. The investment for a DBC is expected to pay back within one year on account of coke saving alone (table). The saving can be achieved around 25–35%.

Cost-benefit analysis of DBC

Particular	Unit	Value
Investments in 21 inch DBC	₹	800,000
SEC of existing cupola	kg coke/t metal	130
New SEC of proposed DBC	kg coke/t metal	80
Coke saving	kg/t	50
Total annual monetary saving (@ 100tpm)	₹/year	960,000
Simple payback period	year	0.8

Induction furnace

Replacement by IGBT type induction furnace


IGBT induction furnace

About 150 foundries in the cluster use induction furnace for melting. Of these 95% use silicon-controlled rectifier (SCR) type furnace and are about a decade old. The typical SEC of SCR type furnace is about 700 kWh per tonne for metal. The units do not follow standards operating procedures and are crudely operated.

Replacing SCR-based induction furnace with insulated-gate bipolar transistor (IGBT) type induction furnace would help in reducing SEC level to about 550 kWh per tonne of metal. The potential energy saving is about 15–25%. The investment for IGBT furnace is expected to pay back within one year on account of energy saving alone (see table below).

Cost-benefit analysis of IGBT induction furnace

Particular	Unit	Value
Investments in IGBT furnace	₹	3,500,000
SEC of existing induction furnace	kWh/t	700
New SEC of proposed furnace	kWh/t	550
Electricity saving	kWh/t	150
Total annual monetary saving (@ 250 t/m)	₹/year	3,375,000
Simple payback period	year	1

Retrofit of lid mechanism for furnace crucible

All induction furnaces use crucibles for melting with crucible size varying between 150 and 2,000 kg. In all units, the mouth of crucible is kept open during operation resulting in substantial radiation losses (6–8% of total energy input).

Retrofitting induction furnace crucible with lid mechanism will lead to an energy saving of up to 3%. The saving would depend on size of crucible and operating practices. The investment for lid mechanism is expected to pay back within few months. The cost benefit of lid mechanism is given in table.

Lid mechanism

Cost-benefit analysis of lid mechanism

Particular	Unit	Value
Investments in lid mechanism	₹	250,000
Radiation loss without lid mechanism	kWh/t	35
Losses with lid mechanism	kWh/t	20
Electricity saving	kWh/t	15
Total annual monetary saving (@ 250 t/m)	₹/year	360,000
Simple payback period	year	0.7

Sand mixer

A typical sand mixer used in category A and category B foundries is of 250 kg capacity. In mixer, 11 kW (15 hp) motor is used for mixing and 3.7 kW (5 hp) motor for blending. The mixer is manually operated with the cycle time varying between six and nine minutes.

The conventional sand mixer can be replaced with an automatic sand mixer. The automatic sand mixer will have skip charger, automatic control for water addition, and a timer circuit. These features help in saving energy as well as improving quality of sand processed. The investment on sand mixer is generally paid back in about 2–3 years (see table below).

Sand mixer

Cost-benefit analysis for automatic sand mixer

Particular	Unit	Value
Investment in new sand mixer	₹	430,000
Average power consumption of old mixer	kW	10.7
Cycle time	Min	7.0
Average power consumption of new mixer	kW	12.3
Cycle time	Min	2.5
Monetary saving (@ 100 cycles per day)	₹/year	176,600
Simple payback period	Year	2.4

Compressed air system

VFD air compressor

Compressed air system is one of the important utilities in a foundry. Air compressors are highly energy intensive. The foundry units use conventional reciprocating air compressors. State-of-the-art variable frequency drive (VFD) based screw-type air compressors may replace existing air compressors in category B and category C foundries, which are energy efficient. The cost-benefit analysis of VFD screw air compressor is given in table below.

Cost-benefit analysis of VFD screw air compressor

Particular	Unit	Value
Investment	₹	750,000
Base case: Reciprocating air compressor of 120 cfm capacity		
Unload power consumption	kW	12.5
Typical unload period	hours/year	2,880
Annual energy cost saving	₹/year	288,000
Simple payback period	year	2.6

Major cluster actors and cluster development activities

Industry associations

There are a number of industry associations in Ahmedabad foundry cluster. The major industry associations, related to foundries are the following:

Ahmedabad Engineering Manufacturers Association

Ahmedabad Engineering Manufacturers Association (AEMA) is one of the oldest associations in the cluster set up in 1959. Although an association for engineering industry, most of the members are foundry units of micro small and medium size. AEMA is affiliated to various apex organizations, like Confederation of Indian Industry, Federation of Associations of Small Industries of India, Gujarat Chamber of Commerce & Industry, Indian Diesel engine Manufacturers Associations, Indian Coal Merchants Association, Gujarat International Trade Promotion Council, etc. It also works in close coordination with Bureau of Indian Standards.

The Institute of Indian Foundrymen, Ahmedabad Chapter

The Institute of Indian Foundrymen (IIF) was set up in 1950 to promote education, research, training, and development to Indian foundrymen and serve as a nodal point of reference between the customers and suppliers of the Indian foundry industry on a global scale. The Ahmedabad chapter of the IIF is one of the most vibrant chapters in western region.

District Industries Centre

The District Industries Centre (DIC), Ahmedabad, provides incentives to MSMEs, such as capital investment subsidy, interest subsidy, venture capital quality certification, energy and water audits, and so on. The office of the MSME Development Institute (DI), Ahmedabad provides assistance for the promotion and development of MSMEs.

Cluster development activities

Ahmedabad Foundry and Engineering Cluster was formed as a 'special purpose vehicle' (SPV) to setup an industrial park in Changodha. The industrial park is developed in three lakhs square yard area. About 175 foundries will be relocated from city premises to the industrial park. About 20 foundries have already relocated and started operation. The major delay in relocation of units is problems due to delay in land acquisition.

Another important cluster development has taken place in Odhav Industrial Estate, where a 'Centre for Foundry Education and Research' has been set up. The land was contributed by Bhagwati Group and building cost was borne by government. The facility developed is excellent but presently it is under utilized.

Ahmedabad Engineering and Servicing Society is a society that procures molasses in bulk for foundry. It is used in sand moulding, but it is a restricted item and requires license for purchase. The society takes order from member foundries (typically micro and small foundry units). In Ahmedabad about 80% of the foundries use molasses in sand moulding remaining 20% use chemicals.

TERI with support from the Swiss Agency for Development and Cooperation (SDC) is conducting energy study of select foundry units. The focus of study is to improve existing operating practices, achieve energy saving and enhance production efficiency.

Abbreviations

Abbreviation	Full form
CODISSIA	Coimbatore District Small Industries Association
cfm	cubic feet per minute
CNC	Computerized Numerical Control
COFIOA	Coimbatore Foundry & Industry Owners Association
COINDIA	Coimbatore Industrial Infrastructure Association
COSMAFAN	Coimbatore Tiny & Small Foundry Owners Association
DI	Development Institute
DIC	District Industries Centre
HT	High Tension
IDBI	Industrial Development Bank of India
IIF	Institute of Indian Foundrymen
IIUS	Industrial Infrastructure Upgradation Scheme
kL	Kilolitre
kWh	kilowatt-hour
Lit	Litre
LT	Low Tension
MSME	Micro Small and Medium Enterprises
NPSH	Net Pressure Suction Head
OEM	Original Equipment Supplier
PDB	Power Distribution Board
SEC	Specific Energy Consumption
SIEMA	Southern India Engineering Manufacturers' Association
SiTarc	Scientific and Industrial Testing and Research Centre
SPC	Specific Power Consumption
SPV	Special Purpose Vehicle
t	tonne
TANGEDCO	Tamil Nadu Generation and Distribution Corporation
toe	tonne of oil equivalent
VFD	Variable Frequency Drive
VMC	Vertical Machining Centre

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.

About SSEF

Shakti Sustainable Energy Foundation (SSEF), established in 2009, is a section-25 not-for-profit company, which aids design and implementation of clean energy policies that support promotion of air quality, energy efficiency, energy access, renewable energy and sustainable transportation solutions. The energy choices that India makes in the coming years will be of profound importance. Meaningful policy action on India's energy challenges will strengthen national security, stimulate economic and social development, and keep the environment clean.

Apart from this, SSEF actively partners with industry and key industry associations on sub-sector specific interventions towards energy conservation and improvements in industrial energy efficiency.

About 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 of SAMEEEKSHA platform are: (i) Swiss Agency for Development and Cooperation: (ii) Bureau of Energy Efficiency: (iii) Ministry of MSME, Government of India and: (iv) The Energy and Resources Institute.

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**

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Promoting Energy Efficiency in SMEs
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