Replacing inefficient induction furnace by energy efficient induction furnace: iron foundry unit

Tags

Type: Unit case study

Sub-sector: Foundry

Location: Kolhapur

Partners: GEF, World Bank, SIDBI, BEE, TERI, IIF–Kolhapur chapter, Kolhapur Engineering Association

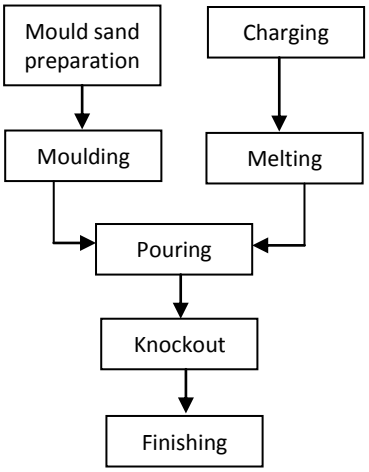
Year: 2012–14

Cluster background

Kolhapur (Maharashtra) is one of the important foundry clusters in India. The cluster has around 300 MSME foundries producing about 600,000 tonne of castings annually, primarily ferrous (iron) castings for the automotive sector, and accounting for about 7–8% of India's total castings production. The production capacity of these units varies from less than 1000 tonnes to over 10,000 tonnes per annum (tpa).

Unit profile

The MSME foundry unit K1manufactures graded cast iron (CI) castings. The average production of the unit is about 430 tpa. The annual energy bill of the unit was Rs 61 lakh, which was around 5% of total turnover. The major process steps involved in the production of castings include mould preparation, melting, pouring, knockout and finishing. Green sand is prepared using sand mixer and the moulding is done manually. The charge material is melted in an electrical induction furnace. The molten metal is poured into moulds, which are cooled down and knocked out manually to remove the castings. The castings are subjected to finishing operations such as shotblasting and machining. The sand from the moulds is sent for reuse in moulding process.



Production process in a foundry

Energy consumption

The major energy consuming equipment used in the unit include electrical induction furnace and electrical motors associated with equipment such as sand mixer and pumps. Electricity from grid is the major energy source used in the unit. The annual energy consumption of the unit was calculated to be 75 tonnes of oil equivalent (toe).

Intervention

The unit was operating an induction furnace for melting of iron, with rated capacity of 100 kW and crucible capacity of 100 kg. The specific energy consumption (SEC) of the induction furnace was calculated to be 850 kWh per tonne of molten metal, which was quite high for this category of furnaces.

L- EE induction furnace; R- EE cooling tower

The unit replaced its inefficient induction furnace and cooling tower with an energy efficient induction furnace and cooling tower

As per the recommendations of the energy audit, the foundry unit replaced the inefficient induction furnace with an energy efficient (EE) induction furnace of 175 kW capacity and 150 kg crucible capacity. The unit further replaced the inefficient cooling tower with an EE cooling tower. With these interventions, the SEC of the EE induction furnace system came down to 650 kWh per tonne of molten metal, thereby reducing the energy consumption for melting by about 23%. The annual energy saving was estimated to be 86,400 kWh of electricity, equivalent to about Rs 6.1 lakh. The investment made towards installation of EE induction furnace was Rs 12.7 lakh, with a simple payback period of 2.1 years. The GHG reductions with the EE induction furnace and cooling tower system are about 77 tonnes CO_2 per year.