Use of VFD based air compressor to meet variable load condition in a foundry unit

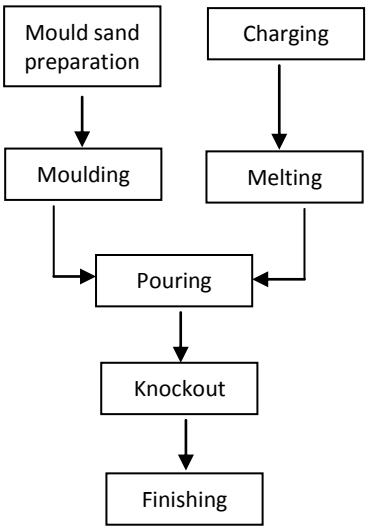
Tags
Type: Unit case study
Sub-sector: Foundry
Location: Kolhapur
Partners: GEF, World Bank, SIDBI, BEE, TERI, IIF–Kolhapur chapter, Kolhapur Engineering Association
Year: 2012–14

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 **K10** manufactures graded cast iron (CI) and spheroidal graphite iron (SGI) castings. The annual production is about 5939 tonnes. The total annual energy bill of the unit was about Rs 369 lakhs, which was around 10% 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 were the two electrical induction furnaces. The other equipment in the unit include cooling tower, pump, and air compressor. The annual energy consumption was around 493 tonnes of oil equivalent (toe) in the form of grid electricity.

Intervention

During the energy audit, it was found that the motor in the existing air compressor had been rewound thrice, reducing its energy efficiency. The low efficiency of the motor was reflected in the high specific energy consumption (SEC) of the air compressor, which was measured at 0.414 kW/cfm. In addition to this inefficient air compressor, the unit had a 127 cfm capacity air compressor, which was generally kept as standby.

The unit replaced its inefficient air compressor with an energy efficient VFD-based air compressor

Based on the recommendation of the energy audit, the unit replaced its inefficient air compressor with an energy efficient variable frequency drive (VFD) based air compressor of 225 cfm capacity for meeting variable load. The standby 127 cfm air compressor is used for base load requirements. Against an investment of Rs 8.5 lakhs for the energy efficient VFD -based air compressor, the unit is saving 108,930 kWh annually, equivalent to Rs 8.9 lakhs. The simple payback period is one year. The estimated annual greenhouse gas (GHG) reductions are 97 tonnes of CO_2.