CASE STUDY

Steel components industry slashes energy bill by replacing oil-fired furnace with electrical induction heater, recovers investment in 10 months

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Background

Barjora, located near Durgapur in West Bengal, is an industrial hub with diverse manufacturing operations. One of the activities in the cluster involves reheating steel rods to produce coils and springs for rail wagons. The steel rods are usually heated in oil-fired furnaces for further processing and shaping. These oil-fired furnaces show poor performance due to factors such as:

- Suboptimal design of the combustion chamber
- High door opening losses due to direct flame escape
- Locally fabricated furnace structures
- Multiple air ingress points
- Poor insulation leading to high surface losses

Additionally, fuel storage and handling systems are susceptible to leaks and spills, further contributing to operational hazards. Replacing the traditional oil-fired furnaces with modern induction heating systems can address these challenges by enhancing energy efficiency and maintaining a cleaner working environment.

Baseline

The manufacturing facility was using a low sulphur heavy stock (LSHS) oil-fired furnace to heat the steel rods to about 900°C. There are no monitoring and control systems for fuel firing. The furnace operates for approximately 16 hours per day. High surface heat losses were also observed due to damaged insulation of the surfaces. The average consumption rate of the furnace was 144 kg per tonne of feed material.

Oil fired furnace

Energy Savings

During 2024–25, the unit replaced the oil-fired furnace with an induction heater of 350 kW capacity. The average electricity consumption of induction heater is about 420 kWh per tonne of feed material. The shift to electrical induction heater has led to a net energy saving of 166 tonnes of oil equivalent (toe). The investment made for induction heater was INR 60 lakh. The monetary benefits for the unit with the furnace replacement was estimated to be INR 79 lakh with a simple payback period of approximately 10 months.

Particulars	Units	LSHS fired furnace	Induction Heater
Feed material	TPY	1500	1500
Specific fuel consumption	kg/tonne	144	-
Specific electricity consumption	kWh/tonne	-	420
Annual fuel consumption	KL/year	225000	-
Annual fuel consumption	kg/year	216000	-
Annual electricity consumption	kWh/year	-	630000
Cost of fuel	INR in lakh/year	123.1	44.1
Annual cost savings	INR in lakh/year		79.0
Investment for 350 kW induction heater	INR in lakh		60.0
Simple payback period	years		0.8

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