Case Study

Fan upgrade supporting sinter plant emissions controls

Howden
A Chart Industries Company

Turnkey retrofit of high performance sinter main fan for 4m ton capacity steel plant in Turkey.

Erdemir Steel needed to bring their sinter plant emission control system into line with European standards while addressing performance issues. Howden's solution was a retrofitted new high performance fan and motor system that eliminates head losses for the electrostatic precipitator while delivering significant annual operational savings.

Product:

Induced Draft (ID) Centrifugal Fan

Application:

Metals

Customer:

Erdemir Steel

Region:

EMENA, Turkey

The challenge

Erdemir Steel, the main company of the OYAK Mining Metallurgy group, is the largest producer of flat steel in Turkey with a capacity of 4 million tons of crude steel and 5 million tons of finished products.

Steel production at the plant is based on the basic oxygen steel making process. High-quality sinter is key to consistent and stable furnace productivity, but its production is a major emissions source. The gases coming from the process pass through electrostatic precipitators (ESP) in order to remove dust particles prior to the treatment section.

The ESP at the plant was performing poorly and causing costly production outages. In addition, due to the need to operate to European environmental standards, Erdemir needed to rehabilitate the ESP.

An induced draft (ID) centrifugal fan was being used to draw large volumes of high temperature waste gases from the sintering machine through the ESP. The fan is exposed to highly erosive gases and had a number of issues impacting reliability. Howden conducted preliminary studies and found that in addition to the general wear that the motor was operating to full capacity with the dampers only able to open to 90%.

This analysis highlighted that the rehabilitated ESP would suffer potential head losses without addressing the fan and related motor performance.

The solution

In order to optimise the ESP system performance a new fan and motor was proposed that would offer the increase in performance, reduce the potential for fan failure and fit within the existing plant layout.

The fan design incorporated backward curved blades to achieve high critical speed ratios and increased fan efficiency. Deflector blades were added to provide increased protection from the erosive dust particles.

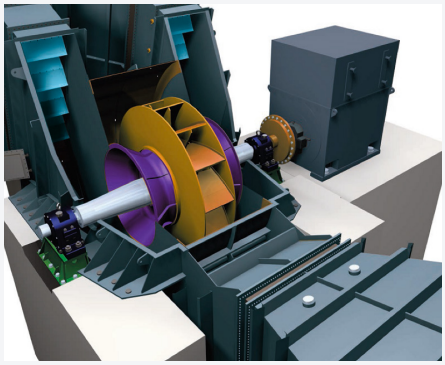
This required highly precise positioning and scaling of the deflectors to ensure correct performance.

Further erosion protection was provided with chromium carbide applied to the surface of the blades.

The design also took into consideration operation of the ESP chamber in isolation by having a double inlet with asymmetric flow of 35% and 65%. This configuration leads to additional forces on the impeller and required particular attention on the design of the bearings to cope.

The drive system involved two drive motors. A new drive motor with frequency converter on normal operation and the existing motor with hydraulic coupling available for emergency stand by.

The complete system with fan, motor and frequency converter was delivered in partnership with ABB. Howden delivered the project including basic design for the foundation, ducting system modification, design and sourcing of a new casing, supervision of erection, commissioning and start-up and performance testing.



The outcome

The ESP system is successfully performing to expectations allowing Erdemir to operate without production stoppages and satisfy environmental demands.

The fan has been operating at full capacity at 820 rpm, with absorbed power of 4100 KW. This has resulted in a significant increase in the speed and motor power capacity (1000 rpm, 5400 KW).

The backward curved blades give an efficiency gain of approximately 8% over the previous radial design. This has resulted in Erdemir realizing cost savings of almost $390,000 per year when combined with the improved motor with variable speed regulation.

The return on investment, based on lower running costs alone was less than 18 months. The fan has proved to be a significant enabler for the improved ESP system performance and will continue to provide future savings in cost as well as in lower CO_2 emissions.

For further information get in touch with our team today:

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