Case Study

Energy savings and increased capacity for St Marys Cement

Howden
A Chart Industries Company

Howden team retrofit an existing Induced Draft (ID) fan resulting in annual savings of $200,000.

St Marys Cement, Charlevoix Plant is located in Michigan, US and is owned by Votorantim Cimentos. The plant has been in operation since 1967 and is a leading supplier of cement throughout the Great Lakes.

Product:

Kiln Inducted Draft (ID) Fan

Application:

Cement

Region:

Americas

Introduction

The original pre-heater tower was installed in 1978 and was equipped with a fan from the Green Fan Company (now part of Howden), and was retrofitted in 2002.

Performance studies by the customer in 2020 identified that although there were no technical issues, the fan was not performing at optimal efficiency and there was an opportunity to save power and increase capacity.

The challenge

The aim was to retrofit the existing kiln Induced Draft (ID) Fan and achieve energy savings with a future 10% capacity increase.

Key considerations were time, budget and the need to switch to anti-friction bearings since the existing fan was fitted with a bearing sleeve with a recirculating oil bath and heating system.

$200,000
annual savings

10%
capacity increase for energy savings

The solution

Howden completed several studies and created a proposal to retrofit the fan, which was agreed with St Marys.

Before proceeding with the project, Howden recommended a field performance test to ensure that the data obtained from the Distributed Control System (DCS) was accurate. US company Air Flow Science conducted Field performance testing of the Kiln ID Fan in July, 2020.

Based on the test results and subsequent discussions between Howden and St Marys process engineers, the new duties for the retrofit were defined.

During field testing, the Kiln load capacity was 5,500 tpd (tons per day) and the corrected figures were calculated based on the following considerations:

- Maximum mass flow of 310,327 kg/h, which, added to the water injection, becomes a flow of 497,371 m³/h.
- The required 10% increase in production, which according to the fan laws results in a 10% increase in flow and 22% increase in pressure.
- All corrections were made based on the Kiln Capacity.

Based on these considerations, the operating points were defined as follows:

Table 1:	tpd	6,000
Flow	CFM	314,634
Flow	m³/h	534,878
Temperature	°F	500
Temperature	°C	260
Inlet static pressure	"WG	-26.10
Outlet static pressure	"WG	-4.40
Pressure rise	"WG	-21.70

Using e-Technopal Software Technology, the data defined in Table 1 and considering the reuse of the existing Green Fan housing, Howden's proposal was based on the figures in Table 2. Howden selection software identified the best wheel to fit the existing casing to avoid any losses and maintain the best possible efficiency.

Using e-Technopal software and proven experience and knowledge, Howden's application engineering team identified the need to adapt the cutting area to avoid extra losses and noise. A cut-off modification was also supplied and installed by the customer.

Table 2:	tpd	6,000
Inlet static pressure	"WG	-26.10
Outlet static pressure	"WG	-4.40
Pressure rise	"WG	-21.70
Absorbed power	HP	1,330
Absorbed power	kW	992
Absorbed power with dust	HP	1,364
Absorbed power with dust	kW	1,017
Competitor absorbed power with dust	kW	1,305
Expected savings	**kW**	**288**

The outcome

The Retrofit Rotor set was installed in March 2021, and after 1 month of operation with the Kiln maximum capacity reached, the actual savings exceeded the expected savings as shown in table 3 below.

Table 3:	tpd	6,000
Expected savings	kW	288
Actual savings by customer	**kW**	**371**

The energy savings of 371 kWh translates to cost savings of approximately $200,000 USD per year. Based on this data, the customer's Return On Investment (ROI) will be less than 3 years.

Figure 1: Cut-off minor modification on the housing - important to achieve best efficiency.

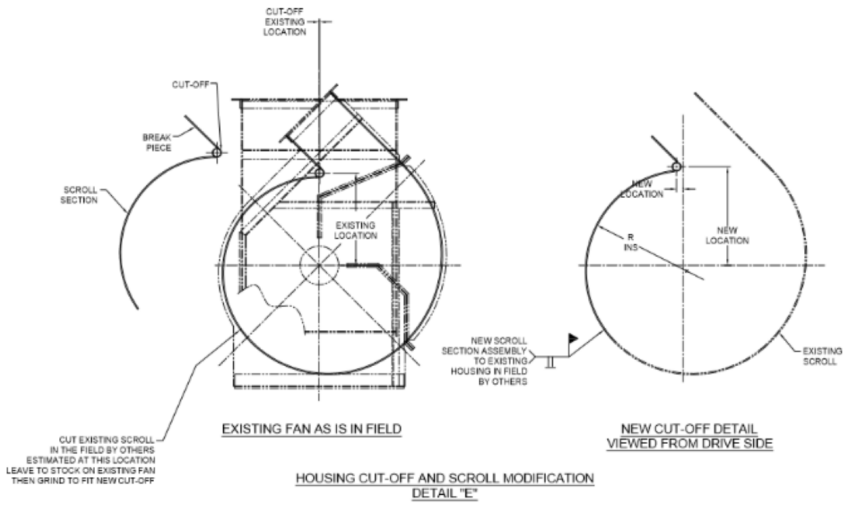
Figure 2: Cut-off section after wheel installation in perfect match.

In addition to the energy and cost savings, the Howden solution resulted in other benefits for the customer:

- With the new Variable Frequency Drive (VFD) installed, the customer can control the fan flow via speed control. This will maintain almost the same efficiency for all tasks, resulting in savings throughout the process, even with the increased capacity.
- Response time was critical to the success of the project, and Howden specialists in South America were able to reduce the lead time and allow the customer to install the fan as scheduled during the winter outage.
- The wheel was supplied with specially welded Chrome Carbide wear plates to ensure protection against abrasionand to minimize build-up on the back of the blades.
- Howden provided a Technical Consultant to be on site and supervise the installation, helping the customer to make mechanical adjustments and ensure alignment. Combining Howden expertise and the customer's experience, the fan is operating in a low vibration range with low bearing temperature.
- Based on the new performance, the customer can switch from a 4,000HP motor, to a smaller 2,500HP motor, including VFD, to ensure full motor shaft load and best efficiency.

Contact us to find out more about how we can help you make cost savings while improving efficiency.

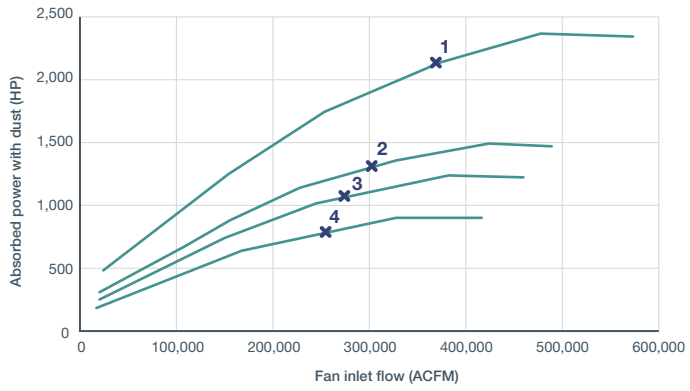
Product cut-off diagram

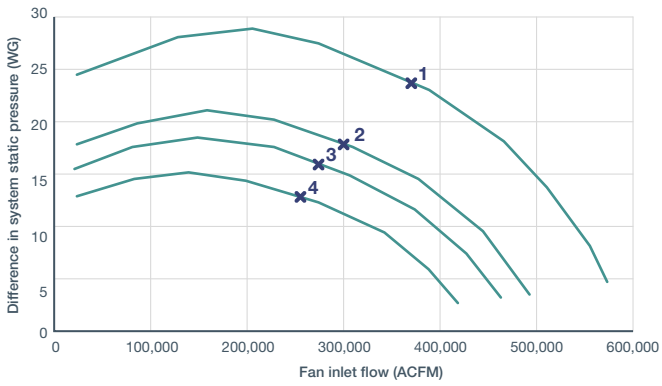


Votorantim Cimentos North America and St Marys Cement are extremely satisfied with the performance of the retrofitted fan, and the energy and cost savings have exceeded expectations.

Fans account for a significant portion of the power consumption in a cement plant, and Howden can diagnose and offer the most efficient fan for each specific application. Regardless of flow, pressure, temperature or dust load, we always have an exact solution for our customers' needs to achieve energy savings and process changing.

Fan performance curves





For further information get in touch with our team today:

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