Case note ABB drives improve productivity and increase energy savings at iron mine

Peña Colorada, one of the largest iron mining operations in Mexico, installed ABB's ACS 1000 variable speed drive on a 1,250 kW fixed speed "pellet cooling fan".

The upgrade resulted in considerable energy savings and improved productivity.





Peña Colorada pelletization plant; the once fixed speed fan motor was upgraded with an ACS 1000 medium voltage AC drive; ACS 1000 controlling the pelletizing cooling fan motor

Challenge

Peña Colorada is one of the largest iron mining operations in Mexico.

With an installed capacity of approx. 4 million tons, it is committed to continually increasing productivity and improving quality.

By installing ABB's ACS 1000 medium voltage (MV) drive on a 1,250 kW fixed speed "pellet cooling fan", productivity is expected to rise by 151,000 tons p.a. through increased system availability.

Along with improved productivity, energy savings are projected at \$121,000 p.a., based on the customer's own calculations.

Additional benefits of the drive:

- total process controllability
- diminished motor noise and vibration
- reduced service and maintenance costs

Based on the success and benefits of the initial project, Peña Colorada purchased additional ACS 1000 drives to help reduce its energy costs and boost production.

Highlights

23 percent energy savings Reduction in service and maintenance costs Reduced motor noise and vibration Return on investment period: 34 months



Solution

Energy efficient control

The need for flow rate control is widespread. Atmospheric conditions, process and ventilation needs, greatly effect the flow requirements. The control method employed has a major effect on the running costs. Furthermore, the control system's availability will effect productivity.

Of the available controls that can be retrofitted, the least energy efficient is a damper and the most energy efficient is the variable speed drive (VSD). See Fig. 1.



Fig. 1: Graph showing fan power requirements for damper and VSD.

Fan characteristics

The majority of fans in use are centrifugal. The performance of such fans is controlled by a set of rules known as the fan laws, which state that:

- flow is proportional to speed
- pressure varies with the square of the speed
- power varies as the cube of the speed

All fans are provided with their own pressure / volume characteristics, which when plotted graphically, are known as the fan characteristics. Figure 2 shows a typical fan characteristic as a function of pressure and volume flow. Also shown is a typical system characteristic; the point of intersection with the fan characteristic is termed the operating point. If the required volume of air is not as designed, the fan or system characteristic must be changed.

Traditionally, the most common way of changing the operating point is by using a damper which alters the system characteristic (shown by the longer broken lines in Fig. 2). However, increasing or decreasing the fan speed will change the fan characteristic and hence the operating point.

Apart from energy savings, system availability effects productivity and therefore profitability. In the case of ABB's ACS 1000 drive, it offers not only highest availability at 99.9 percent but efficiency in excess of 98 percent, inclusive of the sine filter.



Fig. 2: Typical fan characteristic showing operating point.

Benefits

Initial studies conducted by ABB for Peña Colorada, convinced the customer of substantial energy savings and productivity potential by changing the existing damper fan control method to ABB's new ACS 1000 MV variable speed drive.

The first ACS 1000 unit was commissioned in February 1998, as a test case.

The measured results have exceeded the customer's original estimates in terms of:

- energy savings
- productivity increase
- reduced noise
- process control
- payback period.

Based on these results and the drive's smooth system integration into the customer's process, Peña Colorada purchased additional drives.

Key data ACS 1000 product family	
Inverter type	Three-level Voltage Source Inverter (VSI)
Power range	Air cooling: 315 kW - 2 MW
	Water cooling: 1.8 MW - 5 MW
Output voltage	2.3 kV, 3.3 kV, 4.0 kV, 4.16 kV
	(optional: 6.0 kV - 6.6 kV with
	step-up transformer)
Maximum output frequency	66 Hz (optional: 82.5 Hz)
Converter efficiency	Typically > 98%
Type of motor	Induction motor

For more information please contact:

www.abb.com/drives

