

## Case note

# ACS 1000 variable speed drives improve profitability of cement plant

Cementos Cruz Azul improved the profitability of its cement plant by replacing the damper fan control of two 735 kW fixed speed ID fans with ACS 1000 variable speed drives from ABB.



The 10 year old fixed speed fan motor, now controlled by the ACS 1000, operates more efficiently and quieter than before.

### Challenge

Cementos Cruz Azul, Mexico, is part of a large cooperative enterprise. It has produced quality Portland cement at several of its plants in Mexico for over a hundred years at competitive prices. At its facility in Cruz Azul, near Mexico City, it generates 9,500 tons of cement per day, from 4 kilns.

By installing ABB's ACS 1000 medium voltage (MV) drives on two 1000 hp fixed speed "ID fans", profitability has been improved through increased system availability, energy savings and reduced maintenance as follows:

- productivity up by 42,400 tons p.a. equating to USD 900,000 in increased revenue
- energy savings of USD 260,000 p.a.
- maintenance reduced from 12 days to 8 hours p.a.

Additional benefits of the variable speed drives include:

- total process controllability
- elimination of fan vibration

Based on the success and benefits of the initial project, Cementos Cruz Azul is considering additional ACS 1000 drives to help reduce its energy costs and boost production.

### Highlights

Revenue up - USD 900,000 through increased productivity  
Energy savings USD 260,000  
Maintenance reduced by 97 %  
Reduced motor noise and elimination of fan vibration  
Payback on investment period: 6 months



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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 figure 1.

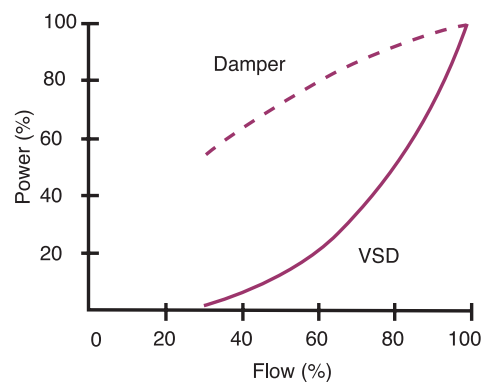


Fig. 1: Graph showing fan power requirements for damper and VSD.

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.

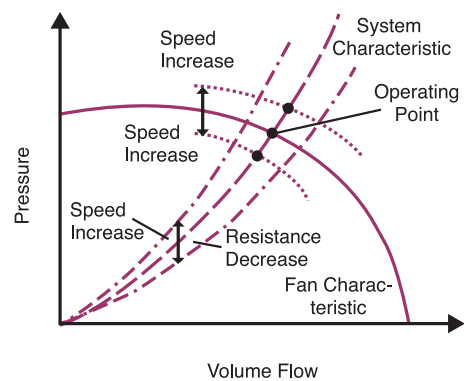


Fig. 2: Typical fan characteristic showing operating point.

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 % but efficiency in excess of 98 %, inclusive of the sine filter.

Benefits

Initial studies conducted by Cementos Cruz Azul, convinced them of substantial energy savings and productivity potential by changing the existing damper fan control method to ABB's ACS 1000 MV variable speed drive.

The ACS 1000 drives were commissioned in May 1998, as a test case. The measured results have exceeded the customer's original estimates in terms of:

- energy savings
- productivity increase
- process control
- payback period

Based on these results, the drives' faultless operation and smooth system integration into the customer's process, Cruz Azul has purchased additional drives for their plants.

ACS 1000 key data	
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](http://www.abb.com/drives)