

## Case note

# ACS 1000 variable speed drive improves energy efficiency of coal fired power plant

Abbott Power Plant improved its energy efficiency and reduced maintenance costs by installing ABB's ACS 1000 variable speed drive system to control a fixed speed scrubber booster fan motor (750 kW). The fan was previously regulated by inlet vanes.



The 20 year old fixed speed fan motor, now controlled by the ACS 1000, operates more efficiently and quieter.

### Challenge

The University of Illinois, with its 48,000 students on several campuses, generates enough power through its coal fired Abbott Power Plant to heat and air condition its buildings.

In order to reduce the plant's operational costs, Abbott Power Plant engineers selected ABB's ACS 1000 medium voltage (MV) drive to control a 1000 hp fixed speed scrubber booster fan that was previously regulated by inlet vanes. By installing the ACS 1000 the overall efficiency was improved and maintenance costs reduced as follows:

- energy savings of USD 63,000 p.a., an improvement by 25% on inlet vanes
- reduced maintenance and hardware USD 10,000 p.a.

Additional benefits of the variable speed drive include:

- no motor start-up problems
- total process controllability.

The customer is particularly pleased with ABB's MV drive because of its excellent performance and reliability and the ease and speed with which the unit was commissioned.

### Highlights

Energy savings: USD 63,000 p.a.

Maintenance reduced by USD 10,000 p.a.

Total process controllability

No motor start-up problems

Payback on investment period: 24 months



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## Solution

### Energy efficient control

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

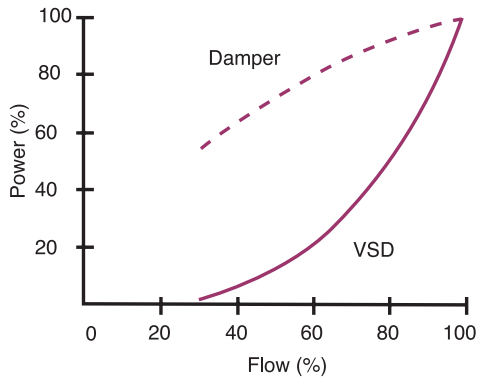


Fig. 1: Graph showing fan power requirements for damper and VSD.

### 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.

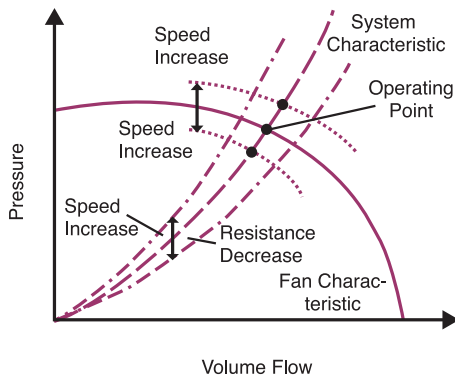


Fig. 2: Typical fan characteristic showing operating point.

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 affects 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

The University of Illinois' Abbott Power Plant engineers selected ABB's ACS 1000 medium voltage drive above other competing products because of the ACS 1000's leading performance and reliability.

The smooth integration of the drive into the plant particularly pleased the customer along with the short commissioning period of two days. Fast commissioning minimized site disruption and expensive downtime. Apart from the attractive energy savings, the ACS 1000 provides additional benefits including:

- virtually nil drive maintenance
- simple and easy motor starting
- quieter and smoother motor operation
- easier process control via the drive's interactive control panel that displays full diagnostic and preventative information.

### 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:

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