

Case note

ACS 2000 variable speed drive reduces electricity and maintenance costs at Chinese water plant



Binhai water plant in Tianjin, China

A 30 percent reduction in energy consumption is achieved with the installation of a 315 kW medium voltage drive to replace mechanical throttle control on a pump at Binhai water plant in Tianjin, China. In addition water losses are reduced by some 10 percent.

Highlights

Energy savings of about 30 percent

Longer equipment lifetime

Some 10 percent water loss reduction

Background

The Binhai water plant, located in Tianjin Dagang Oilfield, supplies water to the employee residence compound. In December 2009, Tianjin Dagang Oilfield Utilities, the parent company of Binhai water plant, decided to retrofit pump No. 5 (motor parameters: rated voltage 6 kV, rated power 315 kW, rated speed 450 rpm, rated current 37 A) of the Binhai water plant in order to save energy. After careful comparison of available medium voltage drives, ABB's ACS 2000 was selected for the retrofit project.



The ACS 2000's small footprint allowed the drive to be fitted within the control room's limited space.



The ACS 2000 controls pump No. 5's motor, resulting in some 30 percent annual energy savings.

Challenges

Binhai water plant's pump No. 5 was started direct-on-line with water flow regulated manually using a mechanical control valve. Although the capital cost for this option is low, it suffers from high energy costs, unstable water supply pressure and high maintenance costs as equipment failure resulted in frequent overhaul.

Solution

By replacing the throttle control valve with a 315 kW, ACS 2000 medium voltage drive, all the challenges were overcome including an annual 30 percent reduction in electricity consumption. While the drive is more costly than the mechanical control valve, the initial capital outlay is recouped through energy savings, high reliability, easy installation and lower maintenance requirements.

According to Binhai water plant's chief electrical engineer, "the ACS 2000 greatly reduces equipment failure rate and maximizes operating efficiency of the system."

The ACS 2000 features local and remote control. The latter communicates directly with the overriding control PC via MODBUS-RTU (fieldbus option) installed on the drive. Start, stop, pressure setting and monitoring of water pumps can be directly controlled via the PC.

Benefits

Energy savings

The required power for the pumps varies greatly throughout the day, with the operating current ranging from 11 A to 22 A. The peak load is from 6:30 to 9:00 AM and from 19:00 to 22:00 PM. Off-peak hours are from midnight to dawn. After installation of the ACS 2000, energy consumption is only 30 percent of the rated power during off-peak hours and 60 percent for a whole day, resulting in average energy savings of up to 30 percent.

Longer equipment lifetime

The ACS 2000 reduces bearing wear and valve pipe fitting damage thereby extending equipment life. By automatically controlling water pressure through a PID control loop, there is less need to manually open valves thereby reducing the operator workload.

Reduction of water loss

The use of a variable speed drive provides a soft start which reduces pressure on piping and any subsequent stress on joints or valves. The result is less water loss through leakage. As such the drive mitigates the water leakage along the pipeline saving some 10 percent of water for the severely water-deficient Dagang area.

Key data of ACS 2000 product family

Inverter type	Multilevel Voltage Source Inverter (VSI)
Power range	250 - 2,600 kW
Output voltage	4.0 - 6.9 kV
Maximum output frequency	75 Hz
Converter efficiency	Typically 97.5 %
Special feature	Available for direct-to-line connection, for operation with external transformer or with integrated transformer
Type of motor	Induction motor

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