

ABB drives maintain stable pressure in municipal water supply



Pressure boosting station upgraded with ABB industrial drives

Pietarsaari is a small town on Finland's west coast around 400 km north of the capital Helsinki. The town's water supply is taken from a local river. Following treatment at a waterworks located on the riverbank, the water is pumped around 7 km to a 1500 m³ above-ground storage tank and pressure boosting station. The pressure boosting station feeds water directly into the distribution system and seeks to maintain constant pressure in the pipes. A water tower, which was the main storage facility before construction of the tank and pressure boosting station, now serves as a back-up.

The pressure boosting station is equipped with 2 x 75 kW and 1 x 37 kW electric pumps, with a diesel-powered pump as back-up. The station was recently upgraded with ABB industrial drives to operate the pumps. The electrical work for the upgrade project was planned and

implemented by Pietec, a system integrator and ABB channel partner, for the utility company Pietarsaaren Vesi.

Intelligent software controls pumps

The drives at the pressure boosting station are provided with intelligent pump control (IPC), an optional software for ABB's industrial drives which incorporates all the functions generally required by pump users. In this case the functions used are multipump control, pump priority, and flow measurement.

Multipump control is used to operate several pumps together. Each pump is controlled by its own drive, with one being speed adjusted and the rest run at constant speed. This results in smooth control with no pressure peaks. Fail-safe operation can be achieved by implementing the control connections in a star configuration, which also provides instant system recovery capability.



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Case Notes

Pump priority control balances the operating time of all the pumps in the system over the long term. This facilitates maintenance planning, and can boost energy efficiency by operating pumps closer to their best efficiency point according to the required flow (duration curve or actual signal) and pump capacities. In water supply systems the consumption rate is generally greater during the day, so the drives are programmed to operate higher capacity pumps during daytime and smaller unit at night.

The flow measurement function enables the drives to act as flow meters. Sensorless flow measurement is possible, or pressure transmitters can be used to supply the necessary data for the calculation program. In the Pietarsaari installation no sensors are used, and this function is used as a back-up for the pressure boosting station's regular flow meters.

Effective pressure control

Pressure control is crucial in this application, as the pressure boosting station supplies water directly to the distribution system. The industrial drives with IPC maintain stable pressure without any 'hammer' effect. This reduces pipeline stresses, resulting in fewer leaks and reduced maintenance requirements. At the same time the use of drives avoids disturbance to the electrical network compared to direct-on-line starting.

According to Pietarsaaren Vesi, the upgrade has resulted in significant energy savings over the previous direct-on-line configuration: "Together with our new pumps, the drives have enabled us to reduce our energy consumption by about 30 percent. The pressure in the system is much more stable, which has reduced leaks, reduced maintenance needs, and increased end-user satisfaction," says Jan Snellman, Automation Engineer.

Additionally, the use of drives eliminates the need for a PLC and other external equipment, reducing maintenance requirements at the pressure boosting station. The payback time for the drives has been calculated at around six years.

Solved problem

- Need for pressure boosting station to maintain constant pressure in water distribution system.

Solution

- ABB industrial drives with intelligent pump control software installed to operate the pumps at the station.

Benefits

- Parallel drives and pumps provide system redundancy.
- IPC eliminates need for PLC, contactors and other external equipment.
- IPC operates the pumps in an energy-efficient way.
- Pressure is very stable, reducing system maintenance needs and increasing customer satisfaction.
- Drives operate pumps without causing disturbance to electrical network.



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