Demand Driven Distribution helps reduce leakages and energy costs in Ploesti, Romania

TOPIC:

In Ploesti Nord Gagani, Demand Driven Distribution saves 50,000 kW/h energy per year and 150,000 m3 water in reduced leakages per year

LOCATION:

Ploesti, Romania

COMPANY:

Grundfos Romania

GRUNDFOS DEMAND DRIVEN DISTRIBUTION PROVIDES SUBSTANTIAL REDUCTIONS IN LEAKAGE LOSSES AND ENERGY COSTS

Proportional pressure management saves energy and reduces leakages in the Municipality of Ploesti, Romania.

The city of Ploesti, just 60 km from the city of Bucharest capital of Romania, has implemented a Grundfos Demand Driven Distribution solution for proportional pressure management of their water supply. Initially, proportional pressure is implemented at the Ploesti Nord Gageni water supply zone, one of four water supply zones in this city of over 230,000 inhabitants.

Owned and managed by Veolia Apa, the Ploesti Nord Gageni pumping station operates two 110 kW Grundfos Horizontal Split-case HS pumps with Control MPC-EF integrated into the water utility's SCADA system.

THE SITUATION AT PLOESTI NORD GAGENI

The Ploesti Nord Gageni zone supplies water to 60,000 consumers at 13,000 households. The weekly pumped volume is approximately 100,000 m3 per week, or 5 million m3 per year. Pump pressure was 2.9 Bar during the day and 2.6 Bar at night. Non-Revenue Water (NRW) losses were at 30%, meaning 1.5 million m3 water is lost per year.

Over the previous two years, Apa Nova and Veolia had invested in new Horizontal Splitcase HS pumps with Control MPC-EF for the Ploesti Nord Gageni pumping station. In addition, repairs to pipes in the network had also been carried out.

Following this period of new investment with various flow reduction and energy saving measures, the owners of the Ploesti Nord Gageni pumping station agreed to implement a Grundfos Demand Driven Distribution proportional pressure management solution, in an attempt to gain even greater reductions in energy consumption and NRW. To accomplish this, a basis for comparison needed to be made.

CALCULATING A BASIS FOR COMPARISON

Flow and energy consumption were monitored for varying periods on two occasions in the second half of 2010. The reason for two periods of monitoring was the unforeseen consequences of seasonal variations in air temperature.

The first period of monitoring was in August and September 2010 and covered the following situations:

Constant pressure at 2.9 Bar during the day and reducing the pressure to 2.6 Bar at nights (between midnight and 6am). Constant pressure 2.9 Bar 24 h/day
As expected, when the existing constant pressure model with reduced pressure at night was compared with the results for the same pressure 24 hours a day, there were savings on water flow. However, simply reducing the pressure during night time did not provide a significant benefit of reduced energy consumption, because during night time the pumps operate at low flow and consequently have a low energy consumption at any pressure.

The second period of monitoring was in October 2010 and covered the following situations:

Constant pressure 2.9 Bar Demand Driven Distribution
As we shall see below, comparing the existing constant pressure model with a Grundfos Demand Driven Distribution model showed that a pressure management system generated substantially higher savings for energy consumption and reductions in leakage loss.

Ploesti Nord Gageni had reduced water losses from 50% to 30% over the last 10 years, by installing new pumps, replacing pipes and dropping pressure at nights.

“Following our efforts over the years to reduce leakage and energy consumption, we didn’t really expect we could achieve substantial further savings,” says Alina Mihalache, Directeur Exploitation, Apa Nova Ploesti, Veolia Apa). “We were therefore surprised and delighted by the results achieved with the Grundfos Demand Driven Distribution solution.”

A further reduction of water loss of almost 7% is realised by using Demand Driven Distribution, and the substantial energy savings accrued when the pumps run flexibly according to consumer demand proved to be over 7%.

ABOUT THE CALCULATIONS

Energy savings are based on the measured specific energy (kWh/m3) from the test periods outlined above.

Savings on reduced NRW are calculated from accepted international calculations of leakage rates and estimated reductions, using FAVAD (Fixed and Variable Area Discharges) methodology, developed by the International Water Association (IWA). FAVAD equations are able to take account of pressure and flow, even where precise figures are not available due to insufficient knowledge of the network. These calculations are based on the following assumptions:

The number of connections Legitimate consumption, meaning the expected consumption in the given population i.e. number of households multiplied with the expected average night consumption Exceptional users, meaning known users that exceed the legitimate flow Minimum night flow, averaged over one hour, based on 15 minutes samplings between 3am and 4am.
For the Ploesti Nord Gageni zone calculations, the following equation was applied:

NRW (Leakage) = Minimum Night Flow - (Exceptional User + Legitimate Consumption)

Leakage rates and possible reductions are calculated from estimated yearly flow, based on the figures from the test periods outlined above.

RESULTS – AND BENEFITS

Presented below are the percentage deviations for Annual Energy Consumption and Total Leakage according to FAVAD. Percentage deviations are shown for, respectively, running at constant pressure with reduced flow at night and for constant pressure 24 hours per day.

Results from test 1 – Constant Pressure versus night time duty:

Night time lowering of pressure reduced NRW (leakage) losses by 2.5%. Night time lowering of pressure reduced specific energy (kWh/m3) by 3%.
Results from test 2 – Constant Pressure versus Demand Driven Distribution:

Demand Driven Distribution reduced NRW (leakage) losses by 6.6% ≈ 146,000 M3/year.
Demand Driven Distribution reduced Specific Energy (kWh/m3) by 7.4% ≈ 48,000 kWh/year.

Reducing pressure at night resulted in reductions in NRW (leakage) losses and energy consumption, when compared to Constant Pressure (Test 1).

Demand Driven Distribution doubled the reductions for both measurements, when compared with Constant Pressure (Test 2).

Over the previous couple of years, Ploesti Nord Gageni had already upgraded with Grundfos pumps and MPC controller. The task was to upgrade the control unit further to the latest version, and to implement Grundfos Remote Management (GRM), which enables communication, remote monitoring and control. For other installations, the best solution may be a new Control MPC – or even a completely new pumping solution.

The triple benefits of Demand Driven Distribution are savings with energy consumption, reduced leakage losses, and reduced repair and maintenance costs, all of which prolong asset lifetime.

THE NEXT STEP FOR PLOESTI

The Demand Driven Distribution is easily installed at the waterworks or pumping station and helps reduce costs and limit water loss in a water distribution system by effective pressure control. This is done by compensating for surplus pressure in the pipe system and by reducing water hammer which causes new leakages.

Ongoing optimisation of the Demand Driven Distribution solution means the system effectively becomes self-learning, and measures for optimising the control curve for friction loss compensation can continue.

The Demand Driven Distribution operation can be further optimised by means of sensors in the pipe network, for example using pumps with Grundfos unique AutoAdapt technology. Changing from 1 Duty Pump to 2-3 smaller Duty Pumps would also have a beneficial effect, as would a general lowering of system pressure and introduction of discrete boosters.

Related Products

HS
Split case, single-stage, non-self-priming, centrifugal, double volute pumps

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CONTROL MPC - MANAGING BOOSTER AND CIRCULATION SYSTEMS
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