

40 % energy saving in Colombian wastewater pumping station

Danfoss Water & Wastewater division's expertise in the application of variable speed drives to pump systems, provided major dividends in offering a cost-effective, efficient pumping solution to a wastewater treatment plant retrofit in South America.

Huge energy savings and a significant carbon reduction were achieved in the preliminary water treatment stage, where solids are separated from the sewage inflow. By applying Danfoss VLT AQUA drives to control the levels in the holding tanks, variable speed operation of the 4 x 370kW pumps realised a return-on-investment within 6 months, and ongoing energy and carbon savings for the future. The additional operational benefit is a more constant flow through the subsequent processes, improving overall process efficiency.

The project

Pumps are the major electrical load in any wastewater treatment station and the plant is designed to handle not only the day-to-day wastewater loading but also the peak load imposed by the run-off water in the rainy season. For this reason the pumps installed run most of the time below peak capacity. The initial plant design was for a simple level control scheme with soft-starters controlling the pumps in cascade mode. Danfoss approached the end user, Aguas de Catagena S.A. ESP and explained to them the wide range of benefits to be obtained from constant operation of the pumps in speed control mode. By using VLT AQUA drives to control pump speed proportional to the water level in the tanks, energy usage is reduced dramatically as the level of water in the tanks is reduced and the operation of the whole system is smoothed.



Energy savings

Conventional control of three 370kW pumps in a 50-50 duty cycle:

$$370 \text{ kW} \times 12\text{hrs} \times 3 \times 365 \text{ days} \times 0.12 \text{ USD/kW} = \mathbf{583,410 \text{ USD/yr}}$$

Cascade (master follower) control of four 370kW pumps @ 75% full speed:

$$370 \text{ kW} \times 12\text{hrs} \times 4 \times 365 \text{ days} \times 0.12 \text{ USD/kW} \times 0.75^3 = 328,170 \text{ USD/yr, Rounded up to}$$

350,000 USD/yr

Total Energy Savings:

233,410 USD/yr

Based on energy savings alone, the pay-back time can be estimated to be about six months

There are five pumps in total (4 cascade plus a reserve) all of them discharging into a common manifold. The pumps must maintain a minimum head of 15 metres of water column to ensure flow to the treatment plant. The Homa pump units installed are designed to generate 33 m head peak.

Other key benefits:

- Maintenance advantages
- Longer life of the pumps
- Precise level control