

ENGINEERING
TOMORROW

Danfoss

Case story | VLT® AQUA Drive FC 202

22% reduction in energy consumption at wastewater treatment plant

The situation

Since water and wastewater treatment processes account for 4% of global electricity consumption, it's vital that reducing energy consumption is in focus for industrial and domestic wastewater treatment. Fortunately, there are cost-effective and energy-efficient solutions that can reduce energy consumption in the water sector, especially at wastewater treatment plants.

In Chennai, India, the Koyambedu Tertiary Treatment Reverse Osmosis (TRRO) plant, which was designed and built by VA Tech WABAG Ltd, is one of the most advanced wastewater treatment plants in India. Advanced pre-treatment with dual media rapid gravity filter, wastewater polishing using state-of-the-art ultrafiltration system, and a 3-stage reverse osmosis system are all key to achieving the excellent overall recovery of 80%. These measures all help save over 16 billion liters of fresh water every year.

With throughput of up to 45 million liters a day, this also means that the plant faces high energy consumption. Therefore, to improve energy efficiency of its operations, Koyambedu wastewater treatment plant implemented variable speed control using VLT® AQUA Drive FC 202 units from Danfoss. This has resulted in more than 700,000 USD – or 59 million INR – savings in running costs over 15 years of operation.

**11 million
INR**

**in CAPEX savings
with payback
in less than
15 months**

The challenge

Harsh temperature and high energy bills

Even in the best conditions, wastewater treatment requires energy intensive processes. At Koyambedu wastewater treatment plant, this includes aeration for removing dissolved organic matter and nutrients. Because of that, aeration is the principal energy-guzzling process in wastewater treatment, representing half the cost of total wastewater treatment, followed by biosolids processing and pumping. Due to the high pumping requirement of the plant, the energy consumption is already high.

To make matters even more complicated, the extreme temperature and humidity in Chennai also lead to high heat dissipation from the motor panel room, contributing to high load on the control room cooling system. This required a bigger HVAC-system which consumed more energy, resulting in higher energy bills.

The solution

VLT® AQUA Drive and back-channel cooling

To become more energy-efficient, Koyambedu wastewater treatment plant selected Danfoss to install drives specifically designed for water and wastewater applications.

Danfoss installed VLT® AQUA Drive FC 202 units with IP42 protection rating, in the power range 0.37 kW to 560 kW. The total drive capacity was 6 MW. These drives ensure optimal energy-efficient speed control of the pump, while adapting the voltage exactly to the current load situation to reduce energy consumption.

At the same time, the intelligent heat management of these VLT® drives removes 85% of the heat losses via rear heat sinks, which transfers the heat to the back-channel cooling air. This back-channel is separated from the electronics area by an IP54/NEMA 12 seal.

The outcome

Improving performance and efficiency

This method of cooling greatly reduces ingress of airborne contaminants in the control electronics area resulting in longer life and higher reliability. The remaining 15% of heat losses are removed from the control electronics area using lower-volume door fans. The robust design and efficient monitoring significantly reduce maintenance requirements.

Due to the back-channel cooling, the Koyambedu wastewater treatment plant selected 30 a tonne air conditioning unit, instead of using an air conditioning unit with capacity of more than 80 tonnes. This reduced the CAPEX of the plant by more than 130,000 USD – or 11 million INR – and reduced the energy bills leading to the reduction in operational expenses.

Back-channel cooling reduces energy consumption by 22%, leading to more than 700,000 USD – or 59 million INR – savings over the application lifetime.

>59 million
INR

in savings for
operational
expenses over 15
years in operation
and maintenance

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