

CASE NOTE

ABB drives control pumps at the Changi Water Reclamation Plant



— Pumps in one of the two giant pump shafts at the Changi influent pumping station. The pumps are controlled by ABB's ACS1000 drives.

PUB, the national water agency in Singapore manages Singapore's water supply, water catchment and used water in an integrated way. A deep tunnel sewerage system, DTSS, was conceived by PUB as an efficient and cost-effective solution to meet Singapore's long-term needs for used water collection, treatment and disposal.

The Changi Water Reclamation Plant is at the heart of the DTSS. It has the capacity to treat 176 million gallons of used water per day. Provisions have been made to allow it to be expanded to treat 528 million gallons of water per day.

Used water is pumped to the influent pumping station, which consists of two giant shafts, each 35 meters in diameter and 70 meters deep. Each pump shaft has five pumps, which can each pump 88 million gallons of water per day. This is enough to fill an Olympic-sized swimming pool in five minutes.

Ten ACS1000 variable speed drives, each of 3500 kW (4690 hp), control pumps at the Changi influent pumping station in Singapore. The Changi Water Reclamation plant has the capacity to treat 176 million gallons of used water per day.

Challenge

The used water that flows into the Changi Water Reclamation Plant needs to be regulated to match the sewage inflow to the treatment capacity.

All equipments need to be integrated into the plant automation system.

Also, a soft starter is required for the pump motors. The motor shafts are 11 m long. If the motors are started direct-on-line (DOL), the torsional stress may cause the shafts to break.

Solution

ABB supplied ten ACS 1000 medium voltage variable speed drives to control the pumps of the influent pumping stations. Controlling the pumps' flow and pressure with variable speed drives, ensures they operate at best efficiency under a variety of flow conditions, considering the actual demand.



—
ACS1000 variable speed drives controlling the pumps.

ACS1000 key data	
Inverter type	Three-level Voltage Source Inverter (VSI)
Power range	Air-cooled: 315 kW - 2 MW Water-cooled: 1.8 MW - 5 MW
Output voltage	2.3 kV, 3.3 kV, 4.0 kV, 4.16 kV
Output frequency	0 to 82.5 Hz (higher on request)
Converter efficiency	> 98%, external transformer > 96%, integrated transformer
Type of motor	Induction motor

—
Benefits

Soft starting

 Due to the long motor shafts, DOL start is not possible. The ACS1000 act as soft starters reducing the stress on the motors. During the starting process, the ACS1000 progressively increases the motor speed and smoothly accelerates the load to its rated speed.

No water hammer

 Water hammer occurs when the flow of water in a pipe is stopped suddenly, causing a shock wave to ripple through the water. The impact on the structure of the pipes can lead to damage, which, over time, can result in burst pipes.

—
For more information, please contact your local ABB representative or visit

abb.com/drives
abb.com/drivespartners

—
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

The ACS1000 reduces sudden stops and starts which lead to water hammer.

Reduction of maintenance cost and longer lifetime of equipment

 The smooth starting and soft stopping protects the mechanical and electrical equipment, thus prolonging its lifetime and reducing maintenance cost.

Efficient flow regulation

 By controlling the pump motors with variable speed drives, pump speed can be matched to the used water inflow and treatment capacity.

Reduced energy consumption

 The regulation of the used water inflow using variable speed drives instead of other motor control methods improves the system performance and reduces the energy consumption.

Customer satisfaction

 Based on the drives' performance and their smooth system integration into the customer's process, another eight, 1800 kW, ACS1000 medium voltage variable speed drives have been ordered for the effluent pumping stations.

—
Acknowledgement is made to:
PUB, Singapore's national water agency

www.pub.gov.sg

—
We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB.
Copyright © 2019 ABB. All rights reserved.