FLYGT
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Case study
Wastewater transport. flash flooding

Xylem helps design first-of-a-kind tunnel to manage flood water in Kuala Lumpur

The award winning 'Storm Water Management and Road Tunnel' (SMART) in the Malaysian capital Kuala Lumpur has been successfully diverting fl ash floods in the city since it was opened in 2007. The 9.7 kilometre (km) tunnel is an inventive solution to frequent fl ash floods and congestion in the city.

The water challenge:
Xylem was brought on board to help design the tunnel in an effort to manage a notorious flash-flooding problem particularly impacting the city's central business district. Following a series of devastating storms, the $600 million SMART project was commissioned by the Malaysian Government as a solution to control unwanted water.

William Choong, Transport Lead Manager, for Xylem Greater Asia, who was involved in developing the very first flood control pump stations in Kuala Lumpur, said. "The 'Twin Towers' in Kuala Lumpur were frequently subjected to flash flooding – almost on an annual basis."

"Due to the high density of the city we needed a solution that didn't involve constructing large drains and extensive pipe work criss-crossing the city."

Widening or deepening rivers was also ruled out as an option. Due to the cost of land, going underground had to be seriously considered.

Xylem's solution:
The first of its kind in the world, the innovative design incorporates a tunnel which diverts storm water preventing it from entering the city centre, while also acting as a double-decker motorway link during dry periods, relieving traffic congestion on the city's main highways.

The system incorporates a holding basin with a floodwater storage capacity of 600,000 cubic meters, a reservoir with a capacity of 1.4 million cubic meters, and the bypass tunnel. The 13 meter diameter tunnel, can hold up to one million cubic meters of water, which is released into the river downstream from the city, preventing flooding. Since its installation, the solution has controlled multiple flooding events, preventing serious damage to the city.

At Kuala Lumpur's Stormwater Control Center the team closely monitors the weather, especially when it is raining within the catchment area.

The SMART tunnel is 9.7 kilometers long, 13 meters in diameter and can hold 1 million cubic meters of water.

Customer: City of Kuala Lumpur, Malaysia

Challenge: to manage a notorious flash-flooding problem impacting the city's central business district.

Products: Flygt pumps and SonTek analytical instruments

Results: an ingenious solution that has received several international engineering awards. City managers from Jakarta and Singapore are studying the design to see how they can mirror the system to manage storm water issues.

Choong explains, "Xylem's strength is that we provide 'end-to-end' support. Our involvement in the SMART tunnel is a good example of this – we developed a complete solution based on in-depth local knowledge and expertise."

Xylem analytical instruments provide flow and depth data
The SMART project's nerve system is a network of flood detection equipment and automated management machinery linked to a Supervisory Data Acquisition and Control (SCADA) 'brain' that uses the information to automatically engage flood management gates and pumps. A key part of this nerve system are 16 Xylem SonTek Argonaut acoustic Doppler current meters which provide near real-time flowanddepthdatatotheSCADAsystem.

Flygt pumps for reliable dewatering
Xylem also provides the pumps that transports the water from a 'holding pond' at the base of the tunnel out into the river. More than 20 pump stations, each equipped with high-tech pumping solutions, including 76 of Xylem's Flygt brand pumps capable of dewatering all floodwater in the tunnel within 24 hours, comprise the innovative storm water management solution. The system also incorporates a control centre for managing, operating and maintaining the SMART system.

It is crucial that the pumps function accurately in order for the tunnel to be drained efficiently. If the pumps fail then tunnel capacity will be reached within minutes and flood waters will be pushed upstream. As the storm waters usually contain a significant amount of sediment it is important that the pumps do not clog.

Four main Flygt pumps are installed right next to the tunnel gate. Strong turbulent flow is created when floodwaters hit the tunnel gate, so the strength and efficiency of these pumps is crucial. In addition, special concrete walls and inlet openings – designed with the help of Xylem technical support – protect the main pumps while large inlet pumps are installed in the long tunnel to dry the installed dewatering pumps.

Xylem also manages all maintenance for pumps in the tunnel. Choong explains, "We have a very strong partnership with the customer and work closely with them, providing training and maintenance know-how for their staff."

The result:
The ingenious project has received several international engineering awards for its innovation and functionality. The National Geographic Channel dedicated an episode of its "Megastructures" series to the SMART system, and Discovery Channel Asia also featured a broadcast about the project.

The SMART tunnel has proved such a success that city managers from Jakarta and Singapore are studying the design to see how they can mirror the system to manage storm water issues in their own communities. "When the idea for the tunnel was first suggested there were a lot of skeptical voices but it has since proven to be a model that works and supports the resilience of this dynamic city," concluded Choong.

Xylem's Flygt brand pumps are capable of dewatering all floodwater in the tunnel within 24 hours.

Xylem's non-clog Flygt pumps are key to the success of the system.