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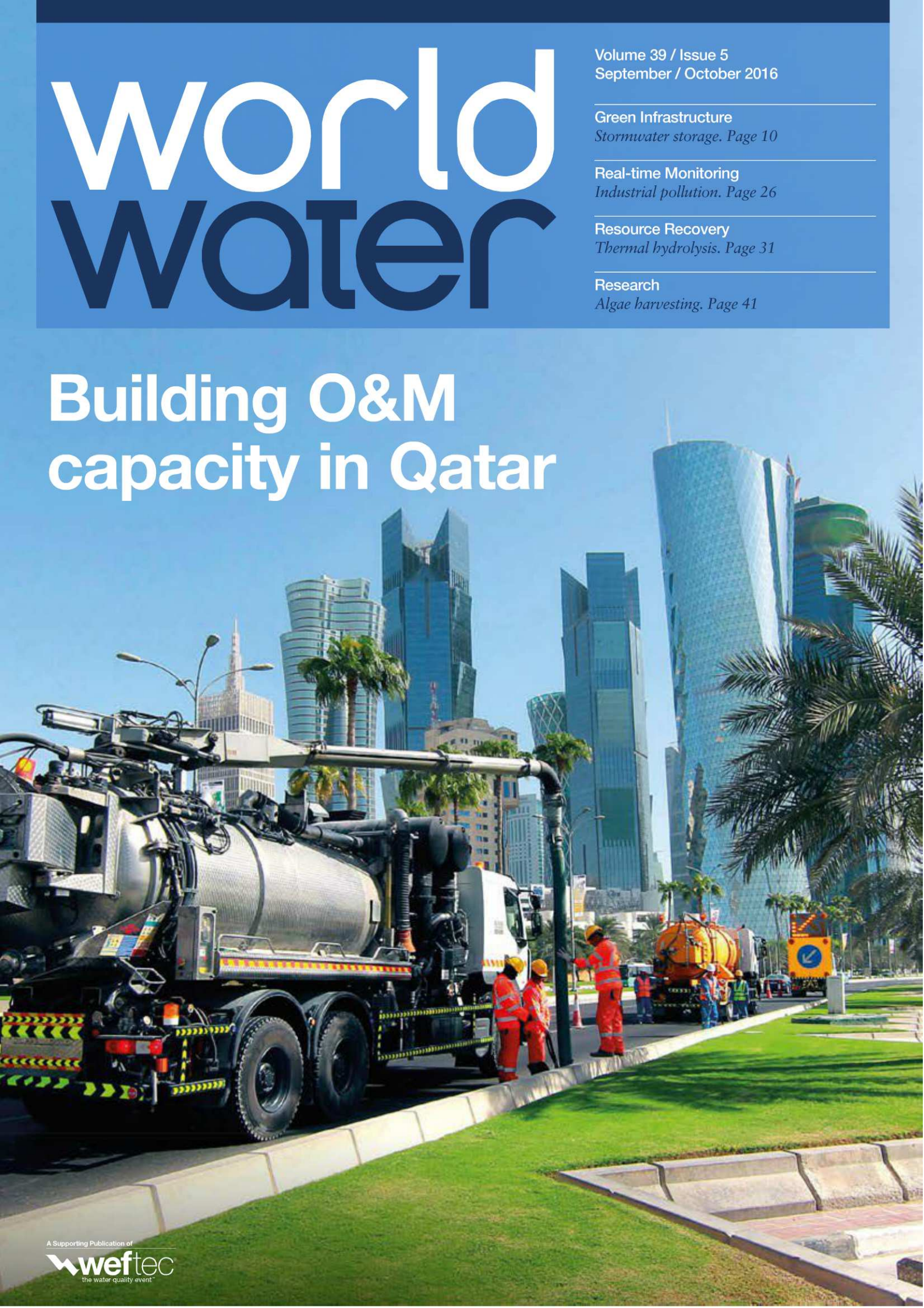
Building O&M capacity in Qatar



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the water quality event

The Sound of Silence

Detecting minor leakage in a water distribution network

A pipe inspection system detects a leak in a drinking water distribution pipeline after a conventional ground microphone method fails to detect leak-related noise. Sylvia Petschnig of MTA Messtechnik GmbH explains how the MTA Pipe-Inspector® helped the Dutch water supply utility PWN inspect its underground assets.

In early 2016, the Dutch consultancy Schmidt Watertechniek BV asked MTA Messtechnik to conduct a pipeline inspection project in Westfriesedijk for their customer PWN, a water supplier for 1.5 million private households, companies, and institutes in the Province of Noord-Holland, The Netherlands. MTA employed its Pipe-Inspector®, a free-swimming multi-sensor inspection tool, which combines closed-circuit television (CCTV) video inspection, pressure location, and acoustic leak detection, to inspect a PWN drinking water pipeline constructed in 1962.

PWN decided to carry out the pipe inspection before it began testing options for a possible pressure increase in selected pipelines. A pressure test had resulted in significant pressure loss, indicating the existence of leakages in a 70-centimeter (cm) diameter reinforced concrete pipeline, 3,260 meters (m) in length. Some leakages were identified by means of conventional methods using ground microphones and were successfully repaired.

Silent leakage

However, a repeated pressure test after reparation still indicated a leak, but the ground microphone method failed to deliver any more leak-related sounds. In response, MTA Pipe-Inspector's main aim was to identify and locate the leakage responsible for the ongoing pressure loss, providing optical status detection of the pipe interior at the same time.

High expectations were set on MTA Pipe-Inspector given the client's previous unsuccessful experience with other methods. The MTA Pipe-Inspector's acoustic capabilities can result in the detection of small leaks with accuracy down to at least 5 liters per hour (l/h) at 5-bar operating pressure. External acoustic impacts, created by interfering noises from other pipelines, cables, or traffic, or in some projects, even the device itself as it rolls along the pipe bottom, do not affect the leak detection capabilities of the MTA Pipe-Inspector. The system doesn't rely on the structure-borne sound of the pipe material in order to detect leaks with pinpoint precision. Rather, it passes any damaged location and records leakage sounds directly at the point of origin. These characteristics make MTA Pipe-Inspector particularly suitable for non-metallic and large diameter pipelines. These properties were essential for the customer's decision to choose MTA Pipe-Inspector as a preferred solution.

Insertion and retrieval

MTA Pipe-Inspector can be inserted into a pipeline in several ways. Where a pig station is available, the launching procedure is the same as launching a pig. The device is placed in the launcher, and then the launcher is closed and filled with water. The final step is to introduce

Left: Mobile flow measurement at inspection endpoint
Above: Insertion and retrieval sluice on existing fittings
Top right: Leakage after excavation
Photos by MTA Messtechnik GmbH

the device into the pipeline by pushing down the insertion piston where it moves onward toward the end of the section to be inspected, or the retrieval point.

To start the MTA Pipe-Inspector in pipelines without pig stations, any available fitting with a suitable diameter can be used. Once the necessary framework is in place at the launching point, the entry sluice is installed, and MTA Pipe-Inspector is sent on its way. On the end of the pipeline under inspection, the same conditions are required as at the starting point.

In Schoorldam, Netherlands, MTA deployed a 22-cm (DN 225) Pipe-Inspector, inserted respectively extracted at a service flange exposed by excavation. Since MTA Pipe-Inspector was launched and retrieved via existing fittings, the procedures required only minimal adaption in the form of a sluice mounted on existing flanges.

MTA detected an acoustic anomaly at a position of 1.087 m from the insertion point, indicating a leak that had remained unnoticed by the previous above-ground measurements.

Information range

Equipped with a 50-cm (DN 500) pulling parachute to ensure a constant forward movement as well as to overcome culverts, Pipe-Inspector delivered defect observation records, at a rate of 30 frames per second (fps) HD-quality video, over the entire pipeline length.

Combined with integrated distance recording, the system thus provides the complete range of information about potentially damaged spots, sediments, foreign objects, and their location.

A constant movement speed was adjusted and ensured by using Schmidt Watertechniek mobile flow measurement equipment at the inspection end point. The volume flow rate was recorded throughout the entire inspection time. Based on the continuously recorded pressure curve, four culverts were identified and precisely located.

Optical and acoustic results

During the inspection, MTA Pipe-Inspector produces a video and measures the travelled distance with an accuracy of approximately 1 m. Since culverts are particularly sensitive points, they were inspected with special attention, and the video revealed a small amount of sediment in one culvert. Apart from some gravel, small stones, and a foreign object in the form of a hammer, the recorded video data showed the pipeline in good general condition.

Leak detection from the interior of a pipe under operation is absolutely accurate at the level of ± 1 m, and since MTA Pipe-Inspector uses only the water flow to move forward, the device creates no disturbing imminent noises that could affect the measurement results.

MTA detected an acoustic anomaly at a position of 1.087 m from the insertion point, indicating a leak that had remained unnoticed by the previous above-ground measurements.

Based on MTA's inspection results, PWN commissioned a construction company to carry out excavation works. The leak was located exactly at the specified position and then repaired. Importantly, PWN gained a reliable data basis for the planned pressure increase as well as a reliable overview about the general pipeline condition.

Author's Note

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