
Executive Summary

Background

DSD currently manages a number of rising mains. As any failure of them may lead to serious consequences of having untreated sewage spilling onto roads, buildings or water receiving bodies, it is important to maintain these rising mains under good service conditions.

In the past, it was difficult to inspect the rising mains due to technology limitations. Mainland South Division had adopted a new technique called “Sahara” in early 2012 to inspect the rising mains to see if there was leakage, trapped gas in them.

Aims

The aims of this review report are:

- i) to review the applicability of Sahara technology in assessing the service conditions of rising mains;
- ii) to recommend the circumstances under which the technology is applicable; and
- iii) to recommend the way forward in adopting similar technologies for routine survey of rising mains.

Sahara Technology

Sahara is an acoustic-based, non-destructive condition assessment technology that detects acoustic activity associated with leaks or pockets of trapped gas in pressurized water/wastewater pipeline of all materials. The Sahara system is composed of an acoustic sensor, a tracking receiver, an insertion assembly, a cable drum and electronic instrumentation for data processing. The sensor is inserted into a live pipeline through a tap with a minimum diameter of 50 mm using the insertion assembly. The sensor is carried by a drag chute propelled by the water flow. The drag chute may carry the sensor through the pipe for distance of up to 1,800m. Leaks, pockets of trapped gas and bends which produce distinctive acoustic signals are detected by the sensors and recorded by the processing unit. A processing unit is used for real-time data analysis of the audio and visual signals.

Survey Result

A total length of 5,339 m rising mains were surveyed during 16 nos. of insertions. Plan showing the locations of these rising mains is at **Appendix 1**. No leak was detected during the survey. Fourteen (14) gas pockets were identified, mainly along the Line B of the rising mains from Ma On Shan Sewage Pumping Station (MOSSPS) to Sha Tin Sewage Treatment Works (STSTW) (Ma On Shan Rising Mains). Thirteen (13) events /anomalies were identified in the Ma On Shan Rising Mains. Most of the anomalies identified were due to bends and air pockets, but one of them indicated that a section of rising mains might have a 15-20% decrease in pipe wall stiffness. Video images were also recorded during part of the survey but the video quality was very low due to turbidity of sewage.

Suitability of the Technology

The technology is suitable for identifying leaks in rising mains. The Pipe Wall Assessment (PWA) technology is still in the research & development stage and its accuracy has yet to be verified. If a deterioration model for rising mains is developed, the Sahara and PWA technology can be used to identify potential problematic areas such that remedial works can be carried out before failure occurs.

In applying this technology for future surveys, various issues have to be resolved which include site selection, site preparation, permit requirements, pipeline operating conditions, control of sewage supply and equipment selection.

Way Forward

Though there is no documented requirement regarding the inspection frequency of rising mains, there is a genuine need to inspect these rising mains regularly to make sure that they are under good service condition.

The Sahara technology is costly, in particular when our rising mains have not been designed to have insertion point to facilitate survey. However, in view of the absence of other suitable technologies for inspecting live rising mains, it is recommended to adopt this technology to inspect the critical live rising mains. A risk assessment of the rising mains should be carried out based on the age, diameter, depth and lining material of the pipe, operating mode of the pipes, repair history, surrounding site condition, environmental impact in case of pipe failure and the availability of the rescue plan.

It is also recommended to continue looking for other technologies to inspect the rising mains, including the less critical ones.