

Process Case Study

Leak Detection with FELL-41

The Problem

In a highly populated city like Singapore, clients and consultants alike are constantly looking for solutions that are faster, accurate, convenient, and reliable with the least disturbance to the public.

When the Public Utilities Board became concerned with the water quality of Singapore, they started looking for quick ways to ascertain any sewer leaks. Remedial actions can then be taken to prevent future leaks into the waterways.

Traditional methods of faecal coliform sampling can be inconclusive particularly if the sub-catchments under study are too big. Intensive sampling carried out gives a more reliable result, but is too costly and time-consuming to undertake. The success of dye test exfiltration surveys depends largely on soil conditions and the prevailing tide level. CCTV surveys, although capable of giving a clear picture of the structural condition of the sewer, cannot detect leaks through joints and cracks in a pipe located above the water table.

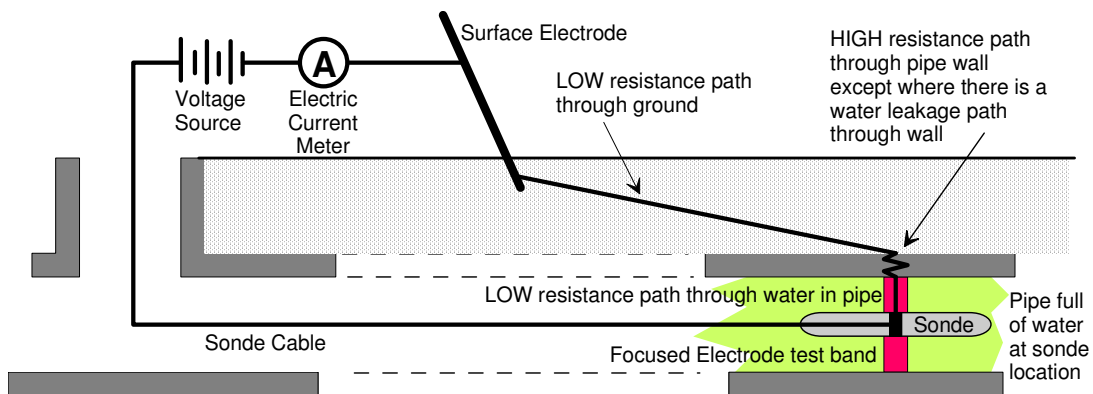
Pipeline Services Pte Ltd, together with Leak Busters Inc, utilized a quick and efficient solution for the Public Utilities Board of Singapore - An electro-scan study of approximately 4km of 150mm to 600mm sewers using the Metrotech Focused Electrode Leak Location System (FELL-41™) to assist with leakage assessment.

The Solution

The sewer electro-scan test carried out by the FELL-41™ utilizes the variation of electric current flow through a sewer pipe wall to locate defects that are potential water leakage paths either into or out of the pipe.

Most sewer pipe materials such as clay, plastic, concrete, reinforced concrete and brick are electrical insulators and thus have high resistance to electrical current. A defect in the pipe that leaks water will also leak electrical current, whether or not water infiltration is occurring at the time of the test.

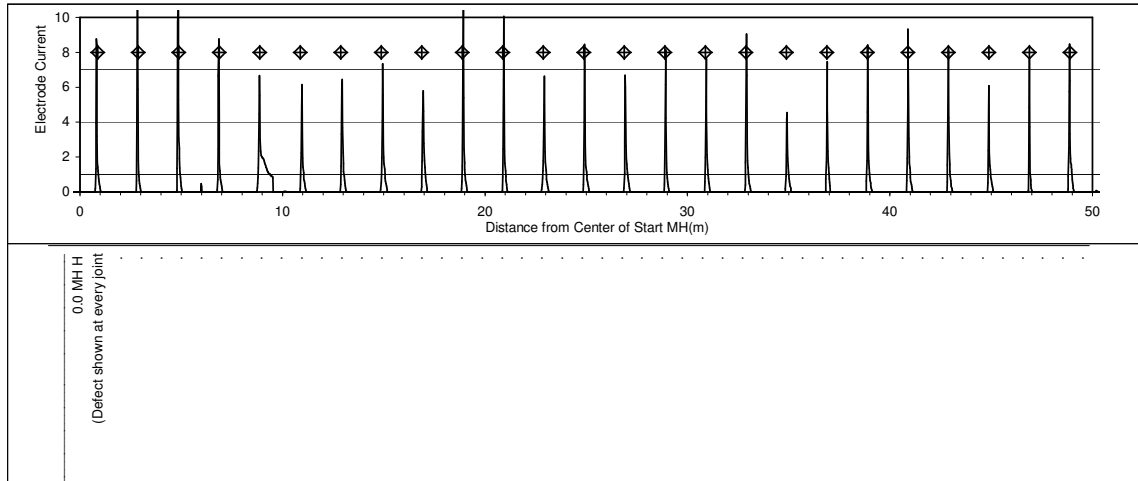
The electro-scan test is carried out by applying an electric voltage between an electrode in the pipe, called a sonde, and an electrode on the surface, which is usually a metal stake driven into the ground. A simplified electrical circuit for this procedure is shown in Figure 1. The water in the pipe is at a level that ensures that the pipe is full at the sonde location. The electrical resistance of the current path between the sonde and the surface electrode is very low except for through the pipe wall. The high electrical resistance of the pipe wall prevents electrical current from flowing between the two electrodes unless there is a defect in the pipe, such as a crack, defective joint or faulty service connection.



Electro-Scan Electrical Schematic

To detect defects around the complete circumference of the pipe wall the sewer needs to be completely full of water in the region of the sonde. If the pipe is only partly full in the region of the sonde then only that part of the pipe that is covered with water is tested.

The FELL-41 test is carried out by pulling the sonde through a pipe at a speed of 10 m/min. The current flow between the surface electrode and the sonde is recorded at approximately 1 cm intervals along the pipe. Most sewer pipe materials have high resistance to electrical current and there is only a small current flow except where there is a pipe defect. As the center of the sonde approaches within about an inch of a pipe defect, the current from the focused electrode increases, reaching a maximum when the center of the sonde is aligned with a defect.



Example of Electroscan Output

The Conclusion

The electro-scan survey of 4km of sewers was completed in just 7 days. Results when compared to CCTV reports were consistent and reliable. Electro-scan survey of recently CIPP lined pipes shows no defects at joints, whereas survey of sewers in Bishan Park, of which is known to have high faecal coliform counts in the waterways, shows that every joint is defective. There were no access problems due to the small footprint of the FELL-41™ System.

Overall, electro-scan surveying of pipes with the FELL-41™ System provided a quick, easy, and reliable solution to leak assessment problems.

