

Trunk main leak location

Distance 2615 metres in Slovakia

Case Study E01

Enigma

Leak detection on trunk mains using correlation techniques has always been viewed as being of potentially limited success for the basic reasons of poor sound propagation, scarcity of accessible fittings and limited signal recording and process capabilities. With the recent introduction of Enigma digital noise correlation and signal coherence frequency analysis processing these previous limitations have been far exceeded.

Client

The Bratislava Water Company (BVS) have purchased two Enigma systems for preventive leak detection in rural areas. They have been using Enigma for one year, making 3 - 4 daylight deployments and have found circa 160 leaks so far. They have even found 6 leaks in one deployment.

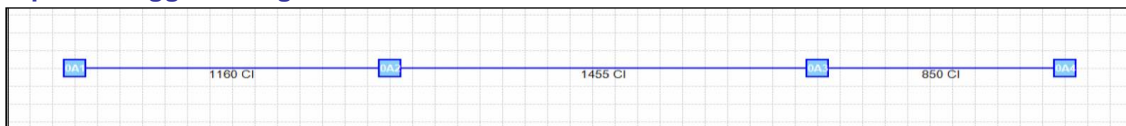
BVS had a suspected leak in Brezova Pod Bradlom, on a 300mm diameter cast iron main. There was no indication of where the leak might be. The distance between fittings was considerable. The leak was found due to systematic Enigma deployment along the trunk main.



Courtesy of Google Maps

Four access points onto the main were available to which loggers 1, 2, 3 and 4 were attached. Accelerometer sensors were used as no hydrophone access was available. The Enigma loggers were collected and data transferred to a PC for post processing.

Pipe and logger configuration



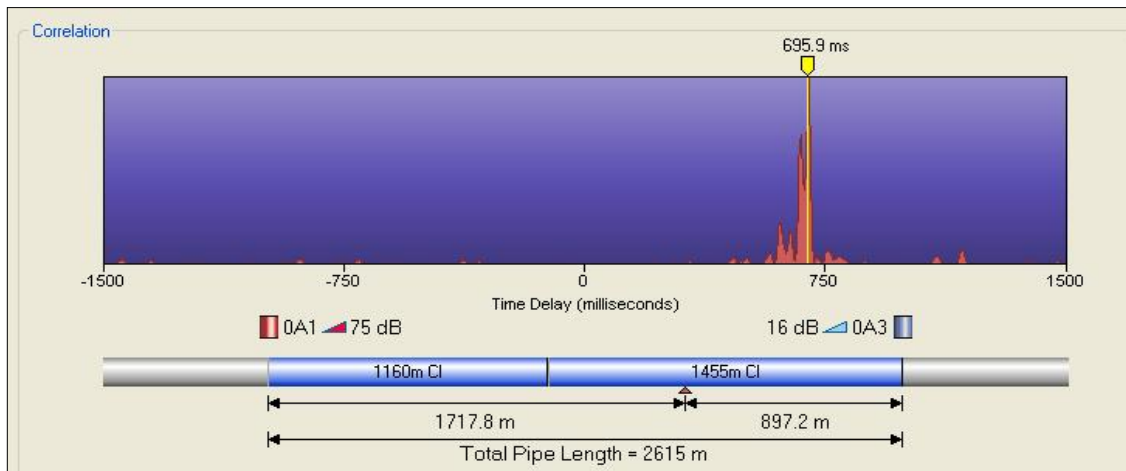
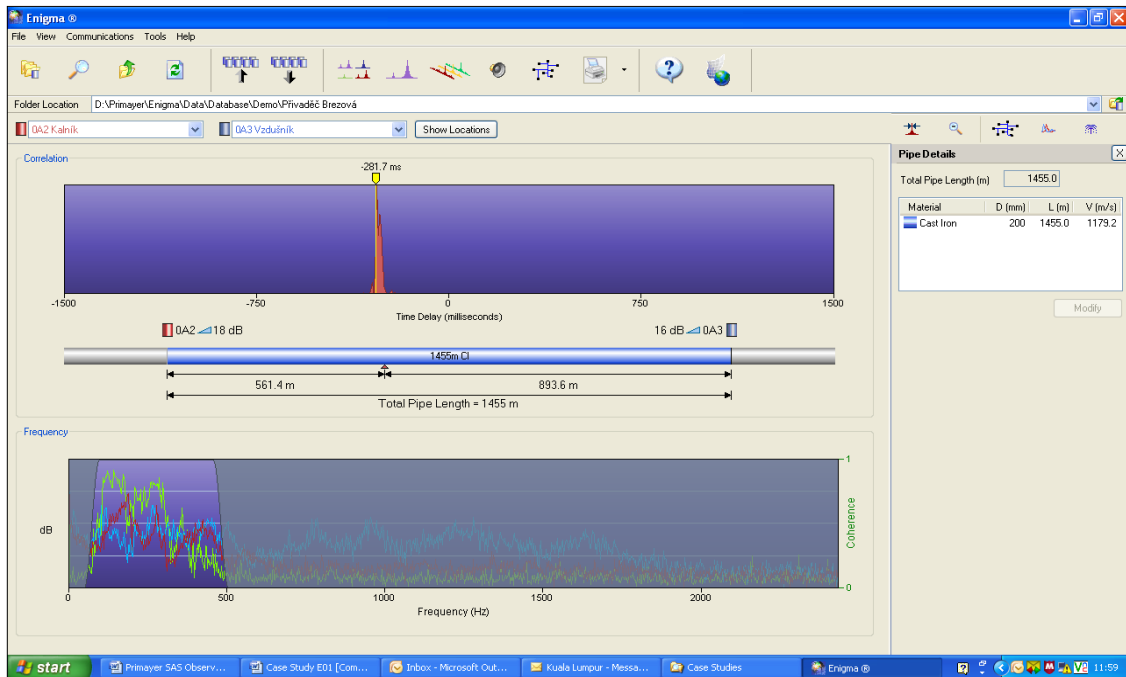
Results

The raw data provided a strong and conclusive correlation result between loggers 2 and 3 over 1455 metres, without any additional post processing. Additional post processing also revealed the cross correlation between loggers 1 and 3 was able to pin-point the leak even over the total distance of 2615 metres. Even over such long distances the result was accurate. Leak size was approximately 1.5 litres/second.

The correlation results are included overleaf for reference.

Note: These exceptional results are based on using Enigma accelerometer sensors only (sensors attached to the external fittings of the mains). If hydrophones were employed (acoustic sensors fitted into the water) even greater correlation distances would expect to be achieved with the Enigma.

The following shows the actual correlation results achieved:



Velocity Measurement

The very large pipe distances involved in trunk main operation mean that any small error in the velocity of sound used can lead to large errors in the resultant leak position. It is therefore essential that the velocity is measured over the section of pipe where the leak is located. The velocity measurement carried out is shown opposite with a velocity of 1179 metres per second. Even with velocity measurement some error may remain due to difficulty in measuring distances accurately.

