

## Chapter 8

# Method H: Acoustic correlation using accelerometers on large diameter pipe or non-metallic pipes

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### 8.1 THEORY OF OPERATION

For large diameter or non-metallic pipes, the leak sound is attenuated more rapidly and particularly at higher frequencies. This principle is as described in Chapter 3.4, *Acoustic Principles – Attenuation*. Higher frequencies are always attenuated more strongly with distance than lower frequencies and this is much worse with softer pipe materials and larger diameter pipes.

As a result, conventional leak noise correlators have not been so effective when working on pipes of larger diameter, typically above 400 mm diameter, and on plastic pipes. They will locate some leaks, but the percentage success rate is greatly reduced.

Correlation devices optimised for large diameter or plastic pipes differ in that the sensors are more sensitive, the processing power of the correlator is much greater (Figure 8.1), they can often continue to correlate for a longer period, and they are optimised to detect very low frequency sounds (Figure 8.2).

It should be noted that for best performance on large diameter and non-metallic pipes hydrophone sensors are strongly recommended (see Chapter 9).

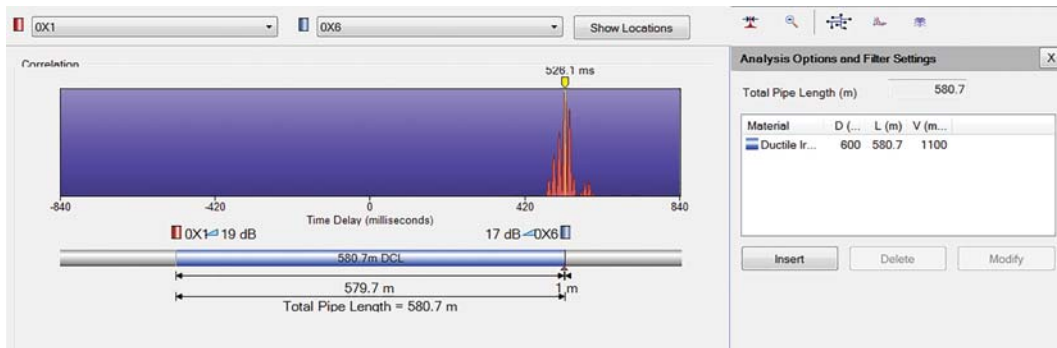
### 8.2 THE TECHNOLOGY

The principle of operation of correlation technologies is described in Chapter 4.3. Additionally, correlation devices for large diameter pipes and plastic pipes correlators can include advanced functionality such as:

- (a) Auto filter – automatically selects the most relevant frequencies to generate an optimized correlation peak, even in situations with very weak signals.
- (b) Automatic multi-frequency band correlation – allowing the user to easily detect multiple leaks on the same pipe section.
- (c) Narrow band filtering – automatically filters in narrow filter ranges



**Figure 8.1** Trunk main correlator components and software. (Source: Gutermann)



**Figure 8.2** Leak location on 600 mm concrete lined ductile iron pipe over 580 metres. (Source: Primayer)

- (d) Notch filter – function removes fixed frequency interference, such as 50/60Hz electrical mains noise, from the sound spectrum, including higher harmonics.
- (e) Filtered listening – allows the operator to listen to the leak sound with selected filters applied. This is ideal for suppressing ambient noise like road traffic or electrical interferences.

On large diameter mains the correlation devices often have to operate over longer distances without access to pipe fittings. There are two solutions to this problem: (a) use transmitters that are considerably more powerful as well as the option to use antenna stands. This enables the user to correlate leaks over distances of 1 km or more; or (b) use correlating noise loggers.