

Pipe leak diagnostic using high frequency piezoelectric pressure sensor and automatic selection of intrinsic mode function

Hanafi M Yusop, M F Ghazali, M.F.M. Yusof, M.A Pi Remli and M H Kamarulzaman

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In a recent study, the analysis of pressure transient signals could be seen as an accurate and low-cost method for leak and feature detection in water distribution systems. Transient phenomena occurs due to sudden changes in the fluid's propagation in pipelines system caused by rapid pressure and flow fluctuation due to events such as closing and opening valves rapidly or through pump failure. In this paper, the feasibility of the Hilbert-Huang transform (HHT) method/technique in analysing the pressure transient signals in presented and discussed. HHT is a way to decompose a signal into intrinsic mode functions (IMF). However, the advantage of HHT is its difficulty in selecting the suitable IMF for the next data postprocessing method which is Hilbert Transform (HT). This paper reveals that utilizing the application of an integrated kurtosis-based algorithm for a z-filter technique (I-Kaz) to kurtosis ratio (I-Kaz-Kurtosis) allows/contributes to/leads to automatic selection of the IMF that should be used. This technique is demonstrated on a 57.90-meter medium high-density polyethylene (MDPE) pipe installed with a single artificial leak. The analysis results using the I-Kaz-kurtosis ratio revealed/confirmed that the method can be used as an automatic selection of the IMF although the noise level ratio of the signal is low. Therefore, the I-Kaz-kurtosis ratio method is recommended as a means to implement an automatic selection technique of the IMF for HHT analysis.