Application of Ikaz and Direct Quadrature for Solving Leakage in Pipeline Distribution by using Transmission Line Modelling

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Abstract. A new transient-based advance towards single leak detection is proposed which requires a measurement station with an end at the pipe system. The method use the frequency response and gives adequate results using low frequency bandwidth. This research apply Empirical Mode Decomposition (EMD) as the method denoising the noisy pressure transient signal before the signal further analyze using instantaneous frequency analysis. Therefore EMD is the way to decompose into Intrinsic Mode Function (IMF) from the signal. However it is difficult to select suitable IMF. Thus the paper proposed the implementation of Integrated Kurtosis-based algorithm Z-filter technique for that allows automatic selection of relevant and appropriates IMF. This work demonstrated the synthetic pressure transient signal generates using transmission line modelling (TLM) in order to test the effectiveness of Ikaz as the autonomous selection of IMF. This paper implement the Direct Quadrature as the instantaneous frequency analysis. A straight fluid network was designed using TLM fixing with higher resistance at some point act as a leak and connecting to the pipe feature (junction, pipefitting or blockage). The analysis results using Ikaz revealed that the method can be utilized as an automatic selection of intrinsic mode function (IMF) although the noise level ratio of the signal is lower. Ikaz-kurtosis ratio is recommended and advised to be implemented as automatic selection of intrinsic mode function (IMF) through DQ analysis.

Keywords: EMD, IMF, Pressure Transient, Ikaz, Direct Quadrature, TLM.