INTISARI

Deteksi kebocoran pipa adalah komponen penting dari manajemen risiko pipa karena memungkinkan operator untuk merespons kebocoran pada waktunya untuk mencegah eskalasi insiden lebih lanjut. Berbagai teknologi tersedia untuk mendeteksi kebocoran dari jaringan pipa. Proses identifikasi kebocoran pada pipa berbasil sinyal getaran diharapkan dapat mempercepat aksi penanggulangan dampak akibat kebocoran. Penelitian ini akan memberikan informasi mengenai sinyal akustik (getaran) yang merambat pada dinding pipa plastik berisi air bertekanan dari titik kebocoran tunggal, untuk kemudian dianalisis dengan beberapa metode pemrosesan sinyal. Perbandingan output metode-metode tersebut dalam hal sensitivitasnya.

Model eksperimen yang dibuat ini menggunakan dua akselerometer yang dipasang di hulu dan hilir kebocoran. Eksperimen dilakukan pada pipa PVC berdiameter 1 inci dan hasil sinyal getaran diambil dengan *Testing Measurement Recording (TMR)* untuk kemudian ditampilkan dan direkam ke laptop dengan perangkat lunak *DEWEsoft X3*. Sinyal getaran yang berasal dari masing-masing akselerometer diukur dan dianalisis dengan metode *Fast Fourier Transformation (FFT), Cross-Power Spectral Density (CPSD)* dan *Wavelet Transform (WT).*

Hasil penelitian menunjukkan bahwa dengan menggunakan metode FFT dan CPSD frekuensi kebocoran dapat diidentifikasi, sedangkan Wavelet Transform efektif dalam mengkuantifikasi peningkatan energi aliran yang membawa sinyal kebocoran. Posisi sensor di bagian *(downstream)* memberikan sensitivitas yang lebih baik dalam mendeteksi kebocoran.

Kata Kunci: getaran, kebocoran pipa, pemrosesan sinyal, *Fast Fourier Transform, Cross-power Spectral Density, Wavelet Transform*.

ABSTRACT

Pipe leak detection is an essential component of pipeline risk management as it allows the operator to respond in time to the leaks to prevent further escalation of incidents. Different technologies are available to detect the leak from pipelines. Detecting leaks in the water supply network is a very interesting problem because the availability of clean water is a vital requirement in daily life and clean water has economic value. The process of identifying the leak in the vibration signal-generated pipeline is expected to expedite the action of mitigating the impact of the leak. This research will provide information about the acoustic signal (vibration) that propagates on the walls of plastic pipes filled with pressurized water from a single leakage point, and then analyzed with several signal processing methods. Comparison of the outputs of these methods in their sensitivity.

The experimental model created uses two accelerometers mounted upstream and downstream of the leak. Experiments were carried out on an inch diameter PVC pipe and the results of the vibration signal were taken with Testing Measurement Recording (TMR) to then be displayed and recorded to a laptop with *DEWEsoft X3* software. Vibration signals originating from each accelerometer are measured and analyzed by the methods of Fast Fourier Transformation (FFT), Cross-Power Spectral Density (CPSD) and Wavelet Transform (WT).

The results showed that by using the FFT and CPSD methods the frequency of leakage could be identified, whereas Wavelet Transform was effective in quantifying the increase in flow energy carrying the leak signal. Position sensors in the (downstream) section provide better sensitivity in detecting leaks.

Keyword: ***Vibration, pipe leak, signal processing, Fast Fourier Transform, Cross-power Spectral Density, Wavelet Transform.***