

## INTISARI

Penelitian ini mengkaji efektivitas *Helmholtz side branch resonator* dalam mereduksi kebisingan aliran pada perpipaan industri 2 inci sepanjang 4 meter melalui simulasi CFD ANSYS Fluent dan validasi eksperimental. Pengujian pada tiga variasi kecepatan (7,35 m/s, 10,53 m/s, dan 12,51 m/s) menggunakan dua *helmholtz resonators* 270 Hz dan 540 Hz dalam berbagai konfigurasi pemasangan di posisi 1, 2, dan 3 meter menunjukkan konfigurasi 2R 540 3M (L) memberikan reduksi kebisingan optimal 4,3 dB pada 7,35 m/s (SPL 61,2 dBA), 4,2 dB pada 10,53 m/s (SPL 61,5 dBA), dan 3,3 dB pada 12,51 m/s (SPL 61,0 dBA). Penambahan material *glass wool* meningkatkan performa signifikan hingga 5,5 dB maksimal pada kecepatan 10,53 m/s, menciptakan sistem redaman hibrida yang memperluas peredaman dari frekuensi resonansi 540 Hz ke rentang luas 100-1000 Hz.

**Kata kunci:** Kebisingan Aliran, *Side Branch Resonator*, *Glass wool Filled Resonator*, dan Pengurangan Kebisingan.

## ABSTRACT

This research investigates the effectiveness of Helmholtz side branch resonators in reducing flow noise in a 2-inch industrial piping system 4 meters long through CFD simulation using ANSYS Fluent and experimental validation. Testing at three velocity variations (7.35 m/s, 10.53 m/s, and 12.51 m/s) using two Helmholtz resonators at 270 Hz and 540 Hz in various mounting configurations at positions 1, 2, and 3 meters shows the 2R 540 3M (L) configuration achieved optimal noise reduction of 4.3 dB at 7.35 m/s (SPL 61.2 dBA), 4.2 dB at 10.53 m/s (SPL 61.5 dBA), and 3.3 dB at 12.51 m/s (SPL 61.0 dBA). Addition of glass wool material significantly enhanced performance up to 5.5 dB maximum at 10.53 m/s velocity, creating a hybrid damping system that expands attenuation from 540 Hz resonance frequency to broad 100-1000 Hz range.

**Keywords:** Flow Noise, Side Branch Resonator, Glass wool Filled Resonator, Noise Reduction.