

ABSTRACT

The main objective of this research is to characterize the influence of T-junction bend radius on the two-phase flow characteristics in the downstream area. Experiments were performed with a mixture of air-water flowing through a horizontal rectangular cross section with width of 2.25 mm, height of 1.25 mm, and hydraulic diameter of 1.607 mm. Two sets of experiments were performed, one with sharp cornered T-junction and one with incorporated T-junction bend radius of 0.48 mm. The range of air and water superficial velocities were 0.592–2.963 m/s and 0.983–3.186 m/s, respectively. Flow pattern visualization was recorded using high speed camera. Pressure gradient in the downstream area was analyzed from data of pressure drop measured at two points along the flow direction.

Two-phase flow characteristics in this research include flow pattern identification and pressure gradient characteristics. Five flow patterns were identified: slug, elongated slug, bubbly, churn to elongated slug, and churn. This study confirmed that the pressure gradient increases with increasing fluid superficial velocities. The incorporation of bend radius also results in higher pressure gradient value. Pressure gradient analysis which includes time series, PDF, and PSD for each flow pattern are also discussed in this study.

Keywords: minichannel, superficial velocity, bend radius, time series, PSD, PDF

INTISARI

Tujuan utama dari penelitian ini adalah mengetahui pengaruh radius belokan T-junction terhadap karakteristik aliran dua fase pada area *downstream*. Eksperimen dilakukan dengan campuran fluida udara dan air pada pipa rectangular horizontal dengan lebar 2.25 mm, tinggi 1.25 mm, dan diameter hidraulik 1.607 mm. Dua set eksperimen dilakukan dengan dua seksi uji; yaitu seksi uji tanpa radius belokan dan seksi uji dengan radius belokan 0.48 mm. Rentang dari kecepatan superfisial udara dan kecepatan superfisial air secara berurutan adalah 0.593–2.963 m/s dan 0.983–3.186 m/s. Visualisasi pola aliran direkam dengan *high-speed camera*. Gradien tekanan pada daerah *downstream* dianalisis menggunakan data penurunan tekanan yang diukur pada dua titik sepanjang arah aliran.

Karakteristik aliran dua fase dalam penelitian ini meliputi identifikasi jenis pola aliran dan karakteristik gradien tekanan. Lima pola aliran yang teridentifikasi dalam penelitian ini adalah *slug*, *elongated slug*, *bubbly*, *churn to elongated slug*, dan *churn*. Berdasarkan hasil penelitian, didapatkan bahwa gradien tekanan meningkat seiring dengan meningkatnya kecepatan superfisial fluida. Penambahan radius belokan juga menghasilkan gradien tekanan yang lebih tinggi. Analisis gradien tekanan untuk tiap pola aliran yang mencakup *time series*, PDF, dan PSD juga dibahas dalam penelitian ini.

Kata kunci: minichannel, superficial velocity, radius belokan, *time series*, PSD, PDF