INTISARI

Aplikasi sistem transportasi fluida semakin berkembang pada saluran berdiameter kecil untuk mengalirkan aliran dua fase. Distribusi fase yang tidak merata ketika aliran dua fase melewati sebuah *T-Junction* dapat menyebabkan permasalahan pada performa di daerah *downstream*. Salah satu permasalahan yang diakibatkan penggunaan *T-Junction* adalah kemunculan *slug*. Ukuran panjang dan frekuensi pola aliran *slug* dapat mengakibatkan fluktuasi penurunan tekanan yang akan mempengaruhi kinerja sistem transportasi fluida.

Pengamatan visual dilakukan terhadap pola aliran yang muncul dan karakteristik pola aliran *slug* menggunakan *high speed video camera* yang kemudian diolah dengan metode *image processing* pada *software* Matlab R2020a. Seksi uji merupakan *T-Junction Minichannel* dengan penampang persegi panjang berukuran 1,25 x 2,25 mm dengan diameter hidraulik sebesar 1,6 mm yang dilewati oleh fluida kerja air dan udara. Variasi radius yang diaplikasikan pada belokan pertemuan cabang di *T-Junction* sebesar 0; 0,48; dan 0,80 mm.

Pola aliran yang terbentuk dari eksperimen ini adalah *bubbly, slug, churn*, dan pola aliran transisi *churn to elongated slug*. Kecepatan superfisial air dan udara mempunyai pengaruh pada karakteristik *slug*. Radius *T-Junction* tidak memberi pengaruh signifikan pada panjang rata-rata *slug* yang diamati di daerah *downstream*. Peningkatan radius *T-Junction* tidak memiliki tren yang linear apabila dibandingkan dengan kecepatan *slug* yang terjadi di daerah *downstream*. Frekuensi *slug* meningkat secara polinomial pada peningkatan kecepatan superfisial air dan udara.

Kata kunci: radius belokan, *T-Junction,* karakteristik pola aliran *slug*, *downstream*.

ABSTRACT

The development of fluid transportation systems is increasingly advancing in small-diameter channels for conveying two-phase flows. Uneven phase distribution when a two-phase flow passes through a T-Junction can lead to performance issues in the downstream area. One of the problems caused by using a T-Junction is the emergence of slugs. The length and frequency of slug flow patterns can result in fluctuations in pressure drop, which will affect the performance of the fluid transportation system.

Visual observations were carried out on the flow patterns that emerged, and the characteristics of slug flow patterns were analysed using a high-speed video camera. The recorded videos were then processed using image processing methods within the Matlab R2020a software. The test section consisted of a T-Junction Minichannel with a 1.25 x 2.25 mm rectangular cross-section and a hydraulic diameter of 1.6 mm, through which flows a mixture of air and water as the working fluid. Variations in radii were applied at the branching bend of the T-Junction, specifically 0 mm, 0.48 mm, and 0.80 mm.

The flow patterns formed from this experiment include bubbly, slug, churn, and the transitional flow pattern churn to elongated *slug*. The superficial velocities of water and air have an impact on slug characteristics. The radius of the T-Junction does not significantly influence the average length of the observed slugs in the downstream region. Increasing the T-Junction radius does not exhibit a linear trend when compared to the slug velocity occurring in the downstream area. The slug frequency increases with polynomial correlation as the superficial velocities of both water and air increases.

Keywords: *bend radii, T-Junction, slug flow pattern characteristics, downstream.*