INTISARI

Pola aliran *stratified* mempunyai tingkat keamanan operasi yang tinggi dan merupakan pola aliran yang paling sederhana jika dibandingkan dengan pola aliran *annular* dan *slug* yang lebih kompleks. Namun demikian, model atau korelasi aliran *stratified* yang ada, tidak selalu dapat dipakai untuk memprediksi karakterstik aliran (penurunan tekanan, *liquid hold-up* dan bentuk antar muka) dengan derajat yang memuaskan. Hal ini disebabkan oleh beberapa parameter yang ada pada suatu model dibangun berdasarkan proses *fitting* dengan data eksperimennya, oleh karena itu jika model tersebut dipakai untuk memprediksi aliran pada kondisi eksperimen yang berbeda akan bermasalah. Selain itu, model teoritis dan korelasi yang tersedia untuk memprediksi karakteristik gelombang antar muka masih jarang ditemukan. Tujuan dari penelitian ini adalah melakukan investigasi tentang karakterisasi aliran *stratified* gas-cairan searah pada pipa horizontal dan mengembangkan model korelasi untuk memprediksi properti dinamik gelombang antar muka aliran *stratified.*

Penelitian dilakukan pada pipa akrilik berdiameter dalam 26 mm dan 16 mm dengan panjang 9,5 m. Fenomena pola aliran yang terjadi dan karakteristik dinamik gelombang antar muka diselidiki menggunakan kamera video kecepatan tinggi Phanton Miro M310. Selanjutnya, *constant electric current method* (CECM) dipakai untuk mengukur *liquid holdup, pressure transducer* digunakan untuk mengukur gradien tekanan dan sensor *parallel wire* digunakan untuk mengukur *wall wetted fraction*. Daerah pengamatan diletakkan 280 – 210 D dari inlet untuk CECM, *pressure transducer* dan sensor *parallel wire* agar aliran yang terjadi sudah berkembang penuh. Penelitian ini menggunakan peta pola aliran Mandhane dkk. (1974) sebagai referensi, dengan range nilai J_L = 0,02 – 0,1 m/s dan J_G = 4 – 16 m/s.

Sebagai hasilnya, beberapa korelasi baru dari parameter aliran *stratified* telah dikembangkan. Korelasi ini meliputi : korelasi *liquid hold-up*, faktor gesekan antar muka, frekuensi, kecepatan, amplitudo dan panjang gelombang antar muka serta *wall wetted fraction*.

Kata kunci : aliran *stratified*, karakteristik gelombang antar muka, sub rezim, korelasi baru

ABSTRACT

Two-phase stratified flow frequently occurs on the industrial application such as oil transportation, nuclear reactor cooling, and distillation process.The comprehensive understanding of this flow is essential as the main consideration factor in designing the operational and security system. Stratified flow can be considered as a flow which brings the least safety issues and in comparison to the other two phase flow, this flow is relatively simpler. However, the existing model and correlation regarding to the stratified flow can't be applied to the wide range of flow condition with a satisfying result. In additional, the available theoretical of models, as well as the correlations to predict the wave interfacial characteristics, is quite rare. The discrepancy among researchers is often found. In the present work, the sub regimes and the wave characteristics of air-water stratified flow were investigated experimentally.

In the present experimental study, the sub regimes of air-water stratified flow were investigated experimentally by visual observation, pressure fluctuations, and liquid hold-up fluctuations. The behavior of stratified flow was recorded by using Phantom Miro M310 high speed video camera which was set on 300-1000 fps. To measure the pressure gradient, a pressure transducer Validyne was used. It was connected to the test section through the pressure tap which was located on the pipe bottom and installed on the 180 and 210D from the inlet section. To obtain the liquid hold-up data, 3 pairs of CECM (constant electric current method) were applied. The wall wetted fraction was measured by using parallel wire sensor. Furthermore, to investigate the dynamic properties of the interfacial wave, the image processing technique was used to obtain the quantitative parameter of the stratified flow data. Air and water were used as the working fluids. The inner pipe diameter was 26, and 16 mm. The water superficial velocity was between 0.02-0.1 m/s and the air superficial velocity were 4-16 m/s, respectively.

As results, the wave characteristics of stratified flow was successfully revealed. Furthermore, new correlations for the liquid hold-up, the interfacial friction factor, the wave frequency, the wave velocity, the wave amplitude and the wave length and the wall wetted fraction were developed.

Keywords : stratified flow, wave characteristics, subregimes, new correlation