

## ABSTRACT

Two-phase flow is one of a very simple form in multiphase flow. Two-phase flow is often used in tool heat exchangers, piping systems of petroleum industry geothermal, nuclear reactor, and a working system of blood vessels in humans. This research was conducted to find out the effect on the superficial gas velocity, superficial velocity of fluids and viscosity against the characteristics that occur in the flow pattern, the spread map flow pattern which is then used to compare with previous research.

This research was conducted at 1.6 mm diameter pipe that was installed with a slope angle of  $45^\circ$  against the horizontal position. Research material used is a mixture of air-water and Glycerin with variation concentration (0%, 10%, 20%, 30%). The use of an air-fluid water and Glycerin because of easy this fluid late and also due to the fluid viscosity on resembling human blood. Tools used in this research are glass pipes, mixers, compressors, air, and liquid flowmeter, pressure vessels, water pumps, sump, optical correction box, lamp test, camera. With superficial air velocity or  $J_G$  0.025 m/s – 66.3 m/s and at superficial velocity of fluids or  $J_L$  0.033 m/s-4,935 m/s. The fluid liquid that has been mixed and then pumped the vessel toward the press and streamed past the water flowmeter with  $J_L$  that already specified. Fluid gases coming from the compressor and streamed to the gas flowmeter with  $J_G$  an already defined. Both the fluid will be mixed in the mixer which would then flow into the test section and taken pictures of the flow pattern that is set up in the form of a video for 3 seconds.

Based on the results of the research that has been done there are five flow pattern derived, including plug, bubbly, slug annular, annular, churn. From the results, flow pattern plug and churn dominated on a map the flow pattern. The emergence pattern of the plug for any variation of the concentration of glycerol was first seen on  $J_G$  coordinates 0.025 m/s and  $J_L$  0.033 m/s. While the bubbly pattern in  $J_G$  0.025 m/s and  $J_L$  2.297 m/s. On the flow pattern of the annular slug first seen  $J_G$  3 m/s and  $J_L$  0.033 m/s. later in annular flow pattern seen on  $J_G$  50 m/s and  $J_L$  0.033 m/s to 0% glycerine and concentration of 10% glycerol at concentrations of 20% and 30% are seen on  $J_G$  22.6 m/s and  $J_L$  0.033 m/s. churn flow pattern seen on  $J_G$  3 m/s and  $J_L$  2.297 m/s for the concentration of glycerol 0% and 10% whereas 20% glycerol at concentrations at coordinates  $J_G$  1.941 m/s and and  $J_L$  4.935 m/s then 30% in  $J_G$  coordinates 1.941 m/s and  $J_L$  2.297 m/s. viscosity Influence on bubbly flow patterns visible in the concentration of Glycerin 0% emergence patterns dominates until bubbly  $J_G$  1.941 m/s and  $J_L$  4.935 m/s. and an annular flow pattern in concentrations of Glycerin 20% and 30% appears on  $J_G$  22.6 m/s and  $J_L$  0.033 m/s. a shape of plug flow pattern is becoming increasingly short along with the influence of the viscosity. Where as, in the form of bubbly flow patterns being formed almost perfectly round. The results of the comparison of the flow pattern map with previous studies showed results not much different.

**Keywords:** two-phase, flow pattern, fluid, the viscosity, flow pattern maps, superficial speed