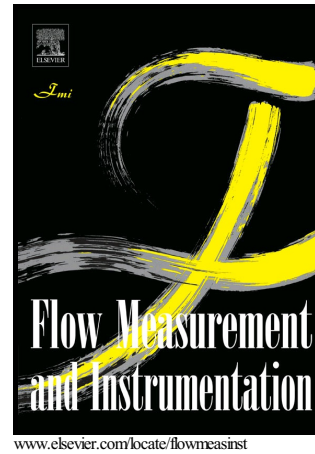


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Slug Frequency in High Viscosity Oil-Gas Two-Phase Flow: Experiment and Prediction

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Abstract

The number of slug units that traverses a particular point at a given time within a defined pipe cross-section is known as slug frequency. The behaviour of this critical parameter for two-phase flow in high viscosity oils is significantly different from those of conventional oils (of less than 1 Pa.s). In this experimental investigation, new data on slugging frequency in high viscosity oil-gas flow are reported. Scaled experiments were carried out using a mixture of air and mineral oil in a 17 m long horizontal pipe of 0.0762 m ID. A high-speed Gamma Densitometer of frequency of 250 Hz was used for data acquisition over a time interval of 30 seconds. For the range of flow conditions investigated, increase in oil viscosity was observed to strongly influence the slug frequency. Comparison of the present data with prediction models available in the literature revealed discrepancies. A new correlation incorporating the effect of viscosity on slug frequency has been proposed for horizontal flow. The proposed correlation will improve the prediction of slug frequency in high viscosity oils.

Keywords: High viscosity oil, gamma densitometer, slug flow, slug frequency.

Nomenclature

Symbol	Denotes	Unit
A	Area	m^2
C	Constants	
D	Pipe diameter	m
Fr	Froude number	
f_s	Slug Frequency	s^{-1}
g	Acceleration due to gravity	$m \cdot s^{-2}$
L	length	m
N_μ	Viscosity number	
H_L	Holdup	
N_f	Inverse viscosity number	
Re	Reynolds number	
St	Strouhal number	
V	Velocity	m/s

Greek letters

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