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## Effect of flow patterns on two-phase flow rate in vertical pipes (Article)

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### Abstract

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During two-phase gas-liquid flow in pipelines, the fluids may take up different flow patterns. The exact nature of the flow pattern varies according to conduit size and geometry, fluids' properties, and each phase's velocity. When the conduit size and fluid properties are constant, then any changes in individual flow rates will result in changes to the flow regime. Predicting the flow patterns within a pipe is essential as it is a critical parameter that determines the pressure gradient and liquid holdup in the conduit. This paper presents the results in predicting the multiphase flow patterns and their effects on flow measurements in vertical pipes. The study was conducted on vertical upward multiphase flow using well and reservoir properties. OLGA dynamic simulator was used to predict flow pattern in a vertical pipeline for 35 oil wells using electrical submersible pumps (ESP) with external pipe diameters of 3.5 inch. The predicted oil flow rates of 35 ESP oil wells were compared with measured flow rates and a good agreement was observed. Indeed, the results indicated that the variation of the flow pattern had insignificant impact and it was insensitive to the accuracy of the flow rate values of the ESP oil wells where the average overall flow rates accuracy was lower than +/-10%. Additionally, simulation results demonstrated a promising model performance and showed the magnitude of possible variation between the oil rates measured with different methods. © 2019 Penerbit Akademia Baru.

### Author keywords

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- 1 Cleon, D.  
Gas Lift: The State of the Art  
(2005) *Russian Oil & Gas Technologies (ROGTEC)*, 4, pp. 66-72.

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C.

(2018) *11th North American  
Conference on Multiphase  
Technology*

Prediction of liquid slug length  
and frequency along a horizontal  
pipeline using slug tracking  
model

Wang, X. , He, L.-M. , Guo, L.-J.

(2010) *Kung Cheng Je Wu Li  
Hsueh Pao/Journal of  
Engineering Thermophysics*

Development of Liquid Slug  
Length in Gas-Liquid Slug Flow  
along Horizontal Pipeline:  
Experiment and Simulation<sup>1</sup> 1  
Supported by the National  
Natural Science Foundation of  
China (No.50536020 and  
50323001).

WANG, X. , GUO, L. , ZHANG, X.  
(2006) *Chinese Journal of  
Chemical Engineering*

- 
- 2 Brito, R., Pereyra, E., Sarica, C.  
Effect of medium oil viscosity on two-phase oil-gas flow behavior in horizontal pipes

(2013) *Offshore Technology Conference, Proceedings, 2*, pp. 1458-1475. Cited 15 times.  
ISBN: 978-162748339-1

- 
- 3 Kora, C., Sarica, C., Zhang, H.-Q., Al-sarkhi, A., Alsafran, E.M.  
Effects of high oil viscosity on slug liquid holdup in horizontal pipes

(2011) *Society of Petroleum Engineers - Canadian Unconventional Resources Conference 2011, CURC 2011*, 1, pp. 338-352. Cited 14 times.  
ISBN: 978-161839421-7

- 
- 4 Brito, R., Pereyra, E., Sarica, C.  
Effect of medium oil viscosity on two-phase oil-gas flow behavior in horizontal pipes

(2013) *Offshore Technology Conference, Proceedings, 2*, pp. 1458-1475. Cited 15 times.  
ISBN: 978-162748339-1

- 
- 5 Bahadir, G.  
An Experimental and Theoretical Investigation of Slug Flow for High Oil Viscosity in Horizontal Pipes (Ph. D. Dissertation)  
(2008) *The University of Tulsa, Tulsa, Oklahoma, USA*

- 
- 6 Eskerud Smith, I., Krampa, F.N., Fossen, M., Brekken, C., Unander, T.E.  
Investigation of horizontal two-phase gas-liquid pipe flow using high viscosity oil: Comparison with experiments using low viscosity oil and simulations

(2011) *BHR Group - 15th International Conference on Multiphase Production Technology*, pp. 293-307. Cited 11 times.  
ISBN: 978-185598125-6

- 
- 7 Pan, L.-M., Zhang, M., Ju, P., He, H., Ishii, M.  
Vertical co-current two-phase flow regime identification using fuzzy C-means clustering algorithm and ReliefF attribute weighting technique

(2016) *International Journal of Heat and Mass Transfer*, 95, pp. 393-404. Cited 20 times.  
<http://www.journals.elsevier.com/international-journal-of-heat-and-mass-transfer/>  
doi: 10.1016/j.ijheatmasstransfer.2015.11.081

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- 
- 8 Jeyachandra, B.C., Gokcal, B., Al-Sarkhi, A., Sarica, C., Sharma, A.K.  
Drift-velocity closure relationships for slug two-phase high-viscosity oil flow in pipes

(2012) *SPE Journal*, 17 (2), pp. 593-601. Cited 20 times.  
<http://www.spe.org/ejournals/app/ejournaldownload.do?jid=ESJ&pageType=ViewCart&docid=09014762802661c3&chronid=0901476280256126&societyCode=spe>  
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