

## Computational fluid dynamics analysis of multiphase flow in crude oil pipelines

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### ABSTRACT

The presence of gas, oil and water in one system triggers complications in the process of transporting products of the oil and gas exploration. Upon handling a multiphase flow, formation of hydrate and plugging of the pipeline system causes a severe problem significantly. Hence, this research investigates on the behaviours of a multiphase flow and prediction of possible location of hydrate formation within the pipeline system using Computational Fluid Dynamics (CFD) modeling approach. The favourable condition for hydrate to form is assigned in the pipeline system and is further investigated. The results of pressure, temperature, turbulence and volume fraction obtained from the modeling process are used to predict the possible location for hydrate formation and decomposition within the internal pipeline system. The result shows a rapid change in pressure gradient observed in the area of the bending section of the pipeline and an obvious pressure difference seen within the outer wall (11 bar) and inner wall (40 bar) section of the bending pipe. Furthermore, the results indicates the area that are highly incorporated with the turbulence is at the ending part of the bending section. Hence, this phenomena enhances the chance of the formation of hydrate and decomposition within the pipeline system. Hence, having a bending in pipeline system increases the risk of the hydrate formation and deposition.

### KEYWORDS:

computational fluid dynamics (CFD); hydrate formation; multiphase flow; gas and oil; pipeline system