

Computational Fluid Dynamics (CFD) Analysis Of Multiphase Flow In Crude Oil Pipelines Using Ansys Fluent

Prepared by: Hazwan Aizat Bin Ahmad

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. Hydrate formation are primarily governed with the presence of high pressure and fairly low temperature which are highly incorporated within flowline and riser area of the pipeline system. Specifically, the formation of hydrates and plugging phenomena within the internal areas of the pipeline system cast an impact towards the production rate credibility and leaving behind the pressure drop and flow rate issues into deepest concern. Therefore, this research investigates on the behaviours of a multiphase flow and prediction of possible location of hydrate formation within the pipeline system. In the succession of investigating the fluid flows and hydrate formation, modeling process of the multiphase flow uses the Computational Fluid Dynamics (CFD) method of approach by using the commercial software ANSYS Fluent. The favourable condition for hydrate to form was assigned in the pipeline system and was further investigated. Hydrate formation has two primary condition that need to be addressed into account of flow which is pressure and temperature. Therefore, based upon the results of pressure, temperature, turbulence and volume fraction obtained from the modeling process, the possible location for hydrate formation and decomposition to take place within the internal pipeline system was predicted and presented in detail. Within that, further improvement of the total production rate for the process of transporting oil and gas products can be maximized assuredly. Also, the achievement of this research upon securing a safe, reliable and economic developments can be achieve through the enforcement of hydrate plug-free pipeline system.