Computational Fluid Dynamics (CFD) for Modelling Multiphase Flow in Hilly-Terrain Pipelines

425

Abstract:

The design and operation of subsea pipelines over the life-cycle of an asset is vital for continuous oil and gas production. Qualitative design and effective production operation of pipelines depend on fluid type(s) involved in the flow; and in the case of multiphase flow, the need to understand the behaviour of the fluids becomes more imperative. This work presented in this report is borne out of the need for more accurate ways of predicting multiphase flow parameters in subsea pipelines with hilly-terrain profiles by better understanding their flow behaviors. To this end, Computational Fluid Dynamics has been used as against existing experimental and mechanistic methods which have inherent shortcomings. The results showed that multiphase flow parameters including flow-regimes, liquid hold-up and pressure drop in hilly-terrain pipelines can be modelled without associated errors in existing techniques. Similarity in trend was found when results of pressure gradient in downward-incline pipe were compared with results from existing correlations and mechanistic method. CFD can be used as a design tool and also a research tool into the understanding of the complexities of multiphase flow in hilly-terrain pipelines towards qualitative design and effective operation of hilly-terrain pipelines.

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