Wax Deposition Rate Predictive Model for Two Phase Flow Using Supervised Machine Learning
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Abstract
Wax deposit is one of the major problems experienced in the process of oil production and transportation from subsurface to surface. There have been many models that define wax deposition in pipe streams for single-phase and multiphase flows. Nevertheless, large amounts of data are required to perform modeling using existing thermodynamic models such as carbon number data obtained from HGTC. In this paper, a supervised machine learning model, namely an artificial neural network (ANN), random forest, and support vector machine (SVM) will be implemented to determine the wax deposition rate in a two phase water in oil flow using unified model approach. Two types of input are implemented in order to simulate influence of feature selection used in training and testing machine learning which are input A consists of water volume fraction (fw), shear stress (\(\tau_w\)), effective viscosity (\(\mu_e\)), wax concentration gradient (\(dC/dT\)), and temperature gradient (\(dT/dR\)) and input B consists of water volume fraction (fw), shear stress (\(\tau_w\)), effective viscosity (\(\mu_e\)), wax concentration gradient (\(dC/dT\)), temperature gradient (\(dT/dR\)), shear stripping variable (SV) dan diffusion variable (DV). The random forest with Ntree = 500 known to be the best machine learning method compared to others. Based on accuracy parameter it achieves input A R^2 for training, testing and total data are 0.999, 0.992, 0.9975 and input B R^2 for training, testing and total data are 0.999, 0.993, 0.9977.

Keywords: wax deposit, machine learning, wax deposition rate, two-phase water in oil flow.