# Data-driven soft sensor for prediction of product quality of vacuum distillation unit based on recurrent neural network

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Product qualities of vacuum distillation unit (VDU), such as kinematic viscosity, are measured online for monitoring and controlling purpose. However, the measured values are biased from the actual experimental values, making quality control challenging. As an effective solution, we propose a data-driven soft sensor which infers the quality variable from the easily measured process variables. Kinematic viscosities at 100°C of VDU distillates are estimated from operating conditions of VDU and properties of inlet unconverted oil. Before developing the soft sensor model, the data goes through preprocessing to obtain the data in real time without missing values and outliers. A recurrent neural network (RNN) is used to properly model the dynamic behaviors of these sequential data. The proposed RNN-based soft sensor predicts the kinematic viscosities of three distillates within the mean relative errors of ±0.5%, ±0.4%, and ±0.7%, respectively, which is superior or similar to the plant as-is method. Based on this prediction model, an optimization problem to find the operating conditions that satisfy the desired product quality can be defined as a further study.