

Data Validation And Reconciliation: An Innovative Solution To The Challenges In Multiphase Production Metering

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Abstract

Mature oil fields are characterized by a high water cut (ratio of water over the total liquid) with the water production sometimes reaching nine times the oil production. Under such extreme conditions, current monitoring technologies such as multiphase flow meters have a decreased accuracy and reliability. The safe and cost-effective operations of fields with high water cut - and/or high gas volume fraction - requires cutting-edge technologies with a strict compliance with international procedures and standards.

The solution tested by TOTAL E&P Qatar is based on a Data Validation and Reconciliation (DVR) approach. A well-known approach in hydrocarbon downstream sector and power plants, its expected result is an improvement of output data accuracy and robustness, for all three phases (oil, water and gas) and their relevant ratios: Gas-Oil ratio (GOR), Water Cut or Water Liquid Ratio (WLR). A DVR pilot integrated within the existing process monitoring system has been implemented locally for multiphase flow determination. This pilot consists in three fully automated components: online data acquisition from the metering instruments, data processing and daily reporting. In addition to production metering, this approach enables the operator to gain real-time access to valuable information for the maintenance of the instruments such as instrumental drifts, while maintaining reliable production figures.

This paper intends to present the latest findings obtained from the DVR approach, which was validated and benchmarked against two different metering technologies. The most important input parameters and their impact on oil, water and gas production rates obtained from the DVR algorithm have been highlighted through sensitivity analysis. These findings are of high importance for trouble-shooting diagnostic. Oil and water production data, with their relative uncertainties will be presented to illustrate the benefits of the DVR approach in challenging production conditions. Another benefit from the DVR approach and its user interface lies mainly on the time saving in data post-processing to obtain automatically reconciled data and associated accuracy.