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Operation of Multiphase Flow Meters in the Sour Environment of Qatif Field, A Case Study

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Abstract

Qatif field is the first intelligent field in Saudi Aramco equipped with measurement, communication, control and software enabling semi real-time and automated asset management and field rate optimization. Qatif is fully automated with remote controls, due to its complex reservoir characteristics and fluids with high H₂S concentration. Difficulties were experienced with one of the main intelligent components of the surveillance systems, the Multiphase Flow Meter (MPFM), due to the H₂S variations, which can reach up to 5% within the same reservoir.

Qatif field was developed with three producing reservoirs with API ranges from 28^o to 42^o due to the different reservoir characteristics and compartmentalization. The production from the three reservoirs is commingled inside the Gas Oil Separation Plant (GOSP) to produce blended Arab light crude. Measuring mechanism of the multiphase flow meters (MPFMs) is dependent on the accurate PVT properties of the fluids. PVT Reports based on black oil models were initially used. These reports did not match the fluid characteristics due to the H₂S presence in the produced gas in addition to the sulfur in the produced fluids, which has resulted in inaccurate water liquid ratio (WLR) measurements. The WLR measurements showing as high as 60% water cut on dry wells. Each MPFM is serving multiple wells from the three producing reservoirs. Without allocating the right rate for each single producing well utilizing the MPFM, it was very difficult to produce the blended Arab light crude that Saudi Aramco was committed to produce. To enhance the matching of fluid PVT characteristics and due to the limited number of wells with PVT analysis, generic PVT reports from simulation models were generated. These