INTEGRATION OF DYNAMIC DATA INTO THE CHARACTERIZATION OF THE TENGIZ RESERVOIR: TENGIZ PLATFORM

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Integration of dynamic data has improved our characterization of the platform area of the Tengiz Field, a giant carbonate reservoir in western Kazakhstan. This improvement in characterization has occurred across several key reservoir parameters such as the assessment of heterogeneity, permeability characterization, and the evaluation of inter-well connectivity.

Reservoir heterogeneity is the controlling factor in determining sweep efficiency during gas injection. Characterization of heterogeneity has improved dramatically through the use of a number of heterogeneity measures which include Static/Dynamic Lorenz and Dykstra Parsons Coefficients. Evaluation of these coefficients help to ensure that heterogeneity of the platform is properly represented during construction of the fine-grid earth model and is preserved in the coarse-grid simulation model after scale-up. Heterogeneity of current reservoir models is thought to be appropriate and is validated by predicted vs. actual gas breakthrough related to a Sour Gas Injection (SGI) project.

Permeability characterization has been improved through the use of apparent permeability (APERM), which is based on flow rate from production (PLT) logs and calibrated to well permeability-height (kh) from pressure transient tests. MDT data and selective inflow performance (SIP) pressures help to better characterize the vertical permeability of the reservoir. Pulse tests and tracer injection provide a qualitative validation of the inter-well connectivity represented in the model.

Flow simulation of reservoir models show that the use of APERM and vertical baffles defined from MDTs and SIP data have resulted in a better match of well test kh and production / injection profiles from PLTs ,This, in turn, provides higher confidence estimates of the future movement of injected gas in the Tengiz platform.

The valuable information from tracer injection, GORand time-lapseRST logs will help in flow characterization and in narrowing uncertainties of the platform SGI area (heterogeneity, saturation change, breakthrough interval, breakthrough well). Integration of static and dynamic data in combination with tracer injection, GOR, and time-lapse RST logs will support building, history matching, validating, and assessing the reservoir simulation model and a fit for purpose reservoir monitoring model.