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Applications of New Wireline Technology in a Mature Middle-East Oil Field

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SUMMARY

ExxonMobil is a partner with Shell and the Iraqi South Oil Company in developing the West Qurna 1 supergiant oil field in southern Iraq. In-place oil volumes in the main limestone reservoir are approximately 30 to 40 billion barrels. Other undeveloped clastic and limestone reservoirs include another 10 to 15 billion barrels. Although over 375 wells have been drilled in the field since the late 1970s, very few have advanced logs that are commonplace in most major field developments in which ExxonMobil participate.

This presentation will highlight applications of new logging technology including wireline formation pressure, nuclear magnetic resonance, cross-dipole sonic and micro-resistivity imaging. These new technologies are providing key insights into many aspects of reservoir properties including water saturation, pore size distribution, reservoir pressure and connectivity.

Latest generation formation pressure tools, provide accurate measurements of formation pressure in each reservoir subdivision. These pressures are related to original reservoir conditions, in currently unproduced reservoirs, whereas in produced reservoirs, they provide the amount of depletion from original conditions, which is related to reservoir connectivity. Nuclear magnetic resonance tools provide a measurement of porosity that is sub-divided into a pore-size distribution. This knowledge of pore-size can be related to several reservoir characteristics including water saturation, micro-porosity distribution and permeability. Cross-dipole sonic tools provide a fast and slow dipole-shear measurement which can be used to calculate formation anisotropy which is related to the presence of natural fractures and formation stress orientation. Micro-resistivity imaging tools provide a very high-resolution image of the borehole wall. These images can be related to formation properties including fractures, rock type and formation dip and direction. Insights from these latest generation wireline tools are helping to build better static and dynamic subsurface geological models.

Examples will show initial field logs, processed logs and interpreted results. Where available, interpretations are compared to and calibrated with routine and special core analysis.

In a difficult operating environment, the support and collaboration of South Oil Company staff has been crucial to the successful implementation of the West Qurna 1 Formation Evaluation strategy.

