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## **Integrated Approach to Optimize Material Selection for North Field High-Rate Gas Wells**

W.A. Sorem, RasGas Company Limited; E.J. Wright, J.L. Pacheco, ExxonMobil Development Company; and D.A. Norman, ExxonMobil Upstream Research Company

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### **Abstract**

The RasGas Company Limited (RasGas) North Field wells typically have a TVD of 9,000+ ft (2750+ m) with a sail angle up to 70 degrees. The combination of 7-in. monobore and 9-5/8-in. big-bore wells are designed to handle H<sub>2</sub>S and CO<sub>2</sub> corrosion, HCl acid stimulation, and environmental cracking. The wells must accommodate high flow rates and through-tubing intervention. This paper describes the technical development of an optimized operational envelope for L80 carbon steel tubulars for these North Field high-rate gas wells in Qatar. This requires corrosion testing under downhole conditions including CO<sub>2</sub> and H<sub>2</sub>S partial pressures, field condensate, water chemistry, and accurately simulated wellbore flow conditions. The program also includes potential effects of water salinity, acidizing treatments, and completion fluids.

This approach to corrosion engineering can enable the use of carbon steel in corrosive service. Well designs have been optimized to take advantage of carbon steel tubing in conjunction with corrosion resistant alloy (CRA) liners. The use of carbon steel production tubing in lieu of CRAs has significantly reduced the cost of these wells and enabled the development of 9-5/8-in. large bore completions to increase production capacity. This integrated corrosion engineering approach can be used for virtually any application to optimize the life-cycle material and corrosion mitigation costs, with the potential to minimize costly alloy use and/or eliminate facilities. Application of the integrated approach to materials selection resulted in well designs unique to the North Field by incorporating the use of carbon steel production tubing.