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## **Screen Development to Withstand 4,000-psi Overbalance, Subhydrostatic Completion in Deepwater GOM Subsea Waterflood Injector Wells**

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### **Abstract**

This paper describes challenges, test equipment, test program and results in the development of a screen product and contingency fluid-loss control (FLC) pill formulation to withstand 4,600-psi burst resistance pressure.

In maturing deepwater fields, such as Shell Ursa/Princess where depleted reservoir pressures are significantly below the hydrostatic pressure of a seawater column, a modified screen design was required since screen products currently available were limited to <3,500 psi. FLC pill formulations also required modification because they were only validated to 1,000 psi in the current laboratory test apparatus.

A series of burst tests were conducted on a wire-wrap screen design direct wrapped to 4-in. base pipe. The objective was to determine if the screen could withstand at least 4,600 psi without damage. The wire-wrap design selected to improve the pressure rating was substantially heavier than what has been used in traditional sand-control completions. Initial burst tests with available 316L material averaged 4,600 psi. Two sets of additional burst tests were conducted with Alloy 625 screens on 25 Chrome base pipe to meet injector material requirements. The FLC formulation was modified from conventional design to enhance the pressure response. The last test results averaged over 5,100 psi.

Comprehensive before and after measurements and slot inspections were done; the data were used in Finite Element Analysis to finalize the detailed screen design. No traditional mechanical burst of the screen occurred. Most influential factors were slot size/geometry and pill formulation.

### **Introduction**

#### **Ursa-Princess Waterflood Development Overview**

The Ursa and Princess Fields, brought online in 1999 and 2003 respectively, are part of the Mars basin located in the Mississippi Canyon area, offshore Louisiana, Gulf of Mexico, in 3,850 ft of water (**Figure 1**).

The primary producing interval in both fields consists of an unconsolidated, turbidite amalgamated sheet sand with evidence of pressure communication through the hydrocarbon leg. Aquifer support does not exist within this sand; instead the primary recovery mechanisms are depletion drive and compaction. This lack of pressure support led the operator to develop plans for four high-rate subsea water injection wells (two in the Princess field and two in the Ursa field) to enhance production in the main producing sand.

Eight direct vertical access wells from the Ursa TLP and three subsea Princess Wells will directly benefit from the planned water flood. The current lack of pressure support in the reservoir sand results in relatively low recovery efficiencies. Under the proposed development plan, the four injectors are expected to maintain higher pressures and improve sweep efficiency, ultimately resulting in significant incremental recovery.

**Figure 2** shows the proposed subsea layout.