

# OptiPac Openhole Screens Enable 100% Gravel Packs and Sand-Free Production in 27 Deepwater Wells

Integrated approach optimizes operations and prevents premature screenouts in long horizontal sections with reactive shale and depleted zones, offshore Malaysia

## CHALLENGE

Optimize openhole gravel packing in deepwater wells with long horizontal sections across laminated, unconsolidated sand reservoirs incorporating intervals of highly sensitive shale and depleted zones, offshore Malaysia.

## SOLUTION

Use an application-specific system that includes

- OptiPac\* Alternate Path† openhole gravel-pack screens and the QUANTUM MAX\* HPHT gravel- and frac-pack packer
- ClearPAC XD\* polymer-free VES gravel-pack fluid
- K240 shale inhibition system
- FIV-II\* formation isolation valves
- DeepSTIM II stimulation vessel designed for hostile and deepwater operations.

## RESULTS

Achieved 100% gravel packs with sand-free production and low skin in 27 wells.



## Long horizontal wells with reactive shales posed challenges for gravel packing

Openhole gravel packs are the completion technique of choice in the laminated, unconsolidated sands of two deepwater fields offshore Malaysia. The goal is to maximize hydrocarbon productivity while minimizing formation drawdown and hence unwanted sand production.

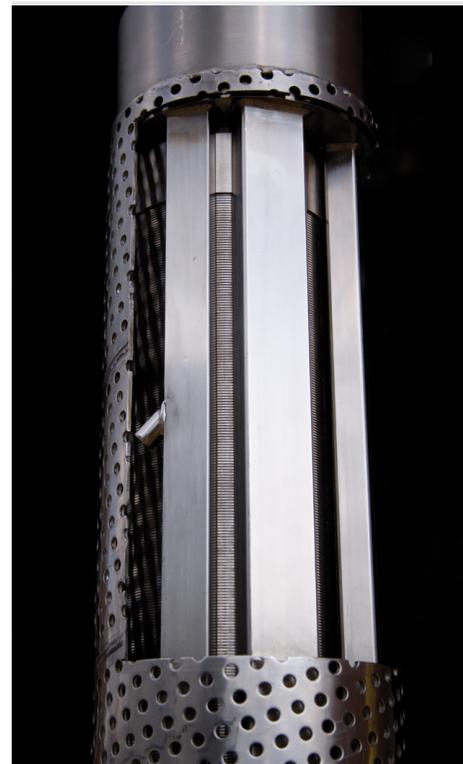
The long horizontal sections—some in excess of 2,000 ft—and the presence of depleted zones increase the risk of fluid losses, which can create gravel bridges that restrict slurry transport to the toe of the well, leading to premature screenout or even fracturing of the formation.

Large sections of reactive shale between the pay zones pose an additional threat. Water-based fluids can cause shale to quickly swell, deteriorate, or both, resulting in an unstable wellbore that can collapse and prevent a complete gravel pack. Water-induced spalling—or breaking up—of the shale can also cause premature screenout, impair pack porosity and permeability, or plug the screen. Incomplete placement of the gravel pack has undesirable consequences, ranging from higher completion costs to erosion hot spots, sand in surface facilities, and long-term completion reliability issues.

## Integrated system enhanced efficiency and reduced cost and risk

Schlumberger used a comprehensive approach to gravel packing to achieve a successful outcome. OptiPac Alternate Path openhole gravel-pack screens provided a redundant mechanism with shunt tubes and nozzles that enabled slurry to bypass bridges and resume packing downstream of the bridge, progressively packing toward the toe. The screens were used with a nondamaging carrier fluid, state-of-the-art modeling software, and a customized pumping design.

The viscous ClearPAC XD fluid was used to carry high concentrations of gravel. This fluid is a water-based system composed of a viscoelastic surfactant (VES) and a completion brine. It exhibits low friction pressure during pumping, making it ideal for gravel packing long horizontal intervals with Alternate Path technology. Higher gravel concentrations in a viscous carrier fluid meant that the job could be pumped quickly and with relatively small fluid volumes, a significant advantage for deepwater operations, where both time and space are at a premium.



*The nonported transport tubes of the OptiPac screens that moved the slurry from joint to joint were tied into two packing tubes at the top of the joint via a manifold. The packing tubes were equipped with nozzles that diverted the slurry to the open annulus between the screen and wellbore when bridges formed, filling the empty spaces.*

## CASE STUDY: 100% annular packing achieved in 27 horizontal deepwater wells offshore Malaysia

Nondamaging K240 shale stabilizer was added to the gravel-pack fluid to reduce the spalling risks associated with exposed reactive shales in the openhole intervals.

FIV-II formation isolation valves minimized loss of completion fluids. The valves were compatible with the operator's upper completion design and allowed one-time interventionless opening using pressure cycles (instead of downhole mechanical intervention), saving further rig time.

### **Operator completed 27 wells with 100% annular packing**

Designed for endurance and efficiency, the *DeepSTIM II* stimulation vessel enabled quick deployment of reliable equipment and experienced personnel to the remote deepwater locations. Blending and pumping systems on board handled the gravel-pack fluid while continuous monitoring and control of critical parameters provided the highest degree of quality assurance. Twenty-seven wells were gravel packed with 100% success and are producing sand free. The complete annular packs extend completion life and together with the low skin, improve production and recovery.



*The DeepSTIM II vessel's dynamic positioning system kept the vessel on station, even in adverse weather conditions.*

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