

# Total E&P Angola Saves More Than USD 100 Million and Gains an Estimated 1,000,000 BOE of Incremental Production

Effective zonal isolation with OSMP packers for openhole gravel packs reduces well count and costs and increases ultimate recovery in deepwater wells

## CHALLENGE

Optimize completion of stacked deepwater reservoirs with an incompatible oil-bearing layer, a water zone, and the potential for early water breakthrough offshore Angola.

## SOLUTION

Use OptiPac\* openhole Alternate Path† gravel-pack service with zonal isolation provided by the new OSMP\* OptiPac service mechanical packers.

## RESULTS

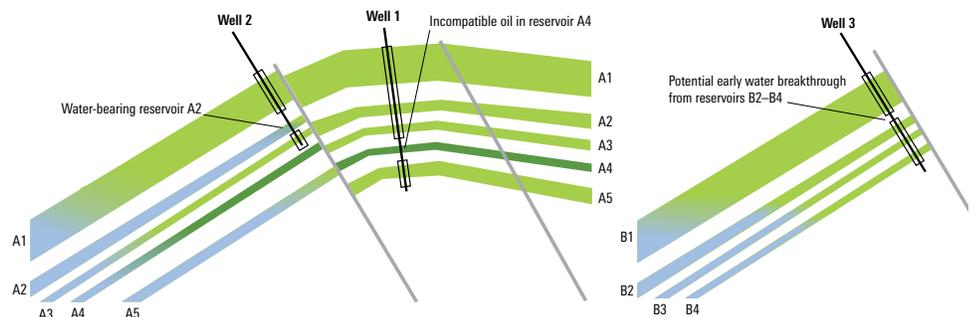
- Achieved target production with six wells instead of the planned eight via effective zonal isolation, saving more than USD 100 million in field A.
- Enhanced ultimate recovery by an estimated 1,000,000 BOE and enabled accelerated production by providing cost-effective future water shutoff capability in field B.



## Commingled production from stacked reservoirs presented challenges

Total E&P Angola had planned commingled production from stacked sedimentary layers located in the Kaombo deepwater development. Targeting multiple reservoir layers with each well would reduce well count and therefore capex. Field A consists of five layers; in one instance (Well 1), oil from one of the layers is incompatible with the rest and cannot be commingled because of the risk of asphaltene precipitation. In a second well (Well 2), a water-bearing layer is located between the oil layers. Both wells required isolation of the problematic layers while producing the layers above and below.

Water breakthrough in one or more reservoir layers is a risk associated with commingled production. The rate of production would have to be reduced to delay the event and costly remedial operations undertaken for water shutoff when the breakthrough eventually occurred. This was the challenge presented by the lower three of the four layers targeted by Well 3 in field B. Water shutoff capability was highly desirable in this well. Total's completion technique of choice was openhole gravel packing because the complexity of multizone frac-pack technology was deemed high risk and the cost was prohibitive.



Field A required zonal isolation in Wells 1 and 2. (Adapted from Hernandez et al., 2018. Copyright 2018 Society of Petroleum Engineers, reproduced with permission.)

Field B required water shutoff capability in Well 3. (Adapted from Hernandez et al., 2018. Copyright 2018 Society of Petroleum Engineers, reproduced with permission.)

## New openhole packer enabled isolation of unwanted zones

Alternate Path screens and shunted swell packers have traditionally provided a solution for multizone openhole gravel packing, but the packer swelling process is slow, increasing costs—especially in deepwater applications—while the rig waits. Pumping gravel before swelling is complete can cause the gravel to enter the packer element–wellbore annulus, preventing an effective seal.

The new OSMP OptiPac service mechanical packer addresses all these concerns. The mechanically activated packer is hydrostatically set in a matter of seconds as the setting tool moves through it. Gravel packing can begin immediately without affecting the seal, saving a significant amount of rig time. The packer is equipped with field-proven Alternate Path shunt tubes. Once the uppermost zone is packed, gravel is diverted through the shunt tubes to the next zone, and the process repeats until all the zones are packed.

**Operator saved more than USD 100 million and enhanced recovery**

OptiPac openhole gravel-pack service and OSMP packers delivered complete gravel packs in Wells 1 and 3, confirmed by downhole gauge data and mass balance analysis. Two OSMP packers straddling the unwanted zone in Well 1 and shunted blanks across the zone enabled isolation of the zone, reducing the well count by two and saving Total >USD 100 million.

A single packer in Well 3 provides the ability to seal off the lower reservoir layers by setting a high-expansion plug in a section of blank pipe when water breaks through in the future. Cost-effective water management gives Total the opportunity to produce at an accelerated rate and improves ultimate recovery. Reservoir simulations show that water shutoff can result in an incremental production of 1,000,000 BOE from field B.

Well 2 is scheduled for openhole gravel-pack completion at a later date; it will use two OSMP packers with shunted blanks in between to isolate the water zone. Total is currently evaluating the deployment of additional OSMP packers in future wells. For further details, read [SPE 189491](#).

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