Hornet Gravel-Pack Blender Optimizes Proppant in Highly Deviated Fishhook Well

Precise proppant mixture and delivery help prevent bridging and ensure 100% gravel pack in openhole offshore oil well

**CHALLENGE**
Ensure complete annular gravel pack in openhole fishhook well.

**SOLUTION**
Use Hornet® skid-mounted gravel-pack blender to control in real time the ClearPAC® polymer-free gravel-pack fluid and to help place the gravel pack.

**RESULTS**
Achieved 100% annular pack that enabled the well to flow beyond expectations at a stable, expected rate without sand production.

**“The Hornet blender gave a much more accurate total sand measurement. The gravel concentration was spot-on the first minute in the sand stage, and it was nicely maintained during step-down toward screenout.”**

Production Engineer

**Fishhook trajectory poses specific challenges for gravel packing**
An operator was developing a field along the coastline offshore southeast Asia. Targeting this marginal oil required drilling into multiple hydrocarbon prospects with stacked shale and water zones. Drilling the wells from offshore was deemed uneconomical. Accessing the oil from land wells that tied into existing onshore infrastructure would be more efficient and allow immediate production.

The operator planned an openhole “fishhook” well with an upward trajectory of 136°. The openhole interval was to be more than 700 meters long and have six zones. Gravel packing had to be accomplished at the steep angle without exceeding the fracture pressure. The upward trajectory would make it difficult to keep the proppant from sliding and prematurely bridging in the wellbore, which would prevent a full annular pack.

**Blender and gravel-pack fluid are selected for steep angle**
To help ensure a proper slurry mixture and complete annular pack, Schlumberger recommended the use of two technologies that would allow the slurry to be efficiently pumped from the toe of the completion so that gravel would work with gravity from the toe to the heel of the open hole: the Hornet skid-mounted gravel-pack blender and the ClearPAC fluid system for gravel packing.

Optimal gravel packing relies on precise pumping and mixing procedures. Rate fluctuations and spikes in proppant concentration can compromise the job. The Hornet skid-mounted gravel-pack blender was selected because of its precise real-time control of proppant concentrations. The blender’s loss-in-weight measurement system allowed for continuous checks of the slurry to identify variances in the flow so that the proppant concentration could be automatically optimized.

The ClearPAC gravel-pack fluid was chosen as the optimal proppant-carrier fluid because of its capabilities to reduce friction and its effectiveness in both open and cased holes. The fluid uses viscoelastic surfactants for excellent suspension properties even at very low shear rates. Low friction and compatibility with enzyme and chelating agents make this fluid useful for simultaneous gravel packing and filtercake cleanup.

**Full annular gravel pack is set with 100% accuracy**
Use of the Hornet blender and the ClearPAC fluid enabled the gravel-pack job to be completed successfully. A sand totalizer of 74,704 lbm pumped inside the open hole confirmed that the gravel packing was 100% successful. The constant proppant reading throughout the job confirmed the delivery of the designed slurry mixture of 4 lbm of proppant added.

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Completions