Insulating Packer Fluid Reduces Annular Pressure Buildup in Deepwater Well
Location: Gulf of Mexico

OPERATOR’S CHALLENGE – Halliburton’s WELLCAT™ casing design software indicated a potential for annular pressure build up (APB) on a Gulf of Mexico deepwater well. Pressure buildup from uncontrolled heat loss to the outer casing annuli could potentially cause casing or well head equipment failure. Heat transfer occurring between the production tubing and the A and B annulus would subject the casing string to more stress than it could withstand. The 7 5/8-inch production casing was too small to utilize vacuum insulated tubing (VIT); therefore, a thermal insulating packer fluid (IPF) was chosen to reduce the risk of APB. Controlling downhole pressures during IPF placement was also a priority.

HALLIBURTON’S SOLUTION – Baroid engineers recommended the use of 10.1 lb/gal N-SOLATE™ 275 insulating packer fluid. The system can be placed in any annulus and provides superior insulating properties, effectively reducing the amount of heat loss from the production tubing for the life of the well. With N-SOLATE packer fluids, APB is significantly reduced, protecting the integrity of the casing and well head equipment.

Parameters required for the N-SOLATE packer fluid system on this well were:
- Aqueous-based and solids free
- Thermal conductivity less than 0.17 BTU/Hrft°F
- Easily pumpable and removable from the annulus
- Meet LC-50 and oil and grease requirements
- Hydrate inhibitive at 40°F
- Have a true crystallization temperature of less than 20°F at ambient pressure and a PCT less than 40°F at 10,000 psi
- Durable enough to be functional for the life of the well
- Pre-mixed because of limited pit space on the rig

The N-SOLATE fluid was pre-mixed and shipped to the rig. The 4 ½-inch production tubing was run and set inside the 7 5/8-inch production casing to a depth of nearly 31,000 feet.

The N-SOLATE 275 fluid along with appropriate spacers was reverse circulated into the A annulus, with the insulating packer fluid spotted opposite the at-risk outer casing strings from 2,532 to 7,253 feet. Because there was no risk of APB below this depth, a non-insulating 11.0 lb/gal sodium bromide brine was placed below the N-SOLATE 275 fluid to the production packer.

ECONOMIC VALUE CREATED – The operator had used VIT on previous wells, but only after introducing the N-SOLATE 275 packer fluid were they able to significantly reduce costs in the following ways:
- Reduced insulating cost compared to VIT
- Reduced rig time by not running VIT
- Ease of placement of N-SOLATE 275 fluid
- Extended life of N-SOLATE 275 fluid
- Reduced pressure on sub surface well head
- Reduced APB in outer casing annuli