

# A COMPLETION FLUIDS SOLUTION

## UNIQUE SELF-SPOTTING BUFFER FLUID SAVES OPERATOR \$15 MILLION

THE CUSTOMIZED TETRA FLUID MAINTAINS SEPARATION WHILE GRAVITATIONALLY DISPLACING A DENSE ZINC-BROMIDE PACKER FLUID

### THE NEED FOR A SELF SPOTTING FLUID THAT IS COMPATIBLE WITH CONTROL LINE FLUID AND ZINC BROMIDE

A major operator in deepwater Gulf of Mexico required a solution to prevent incompatible control-line fluid from comingling with a 15.5 lb/gal zinc-bromide packer fluid. The job entailed displacing the packer fluid using a buffer fluid at a measured depth of 5,021 feet (1530 meters) and a mudline temperature of 38°F (3.33°C) in 5,000 feet (1524 m) of water. Among the challenges were the 20,000 PSI ultra-deepwater environment, making no alterations to wellbore construction, and preventing the comingling of incompatible fluids, control-line plugging, or damage to the filter in the surface-controlled sub-surface safety valve.

### DEVELOPING & DEPLOYING A CUSTOMIZED FLUID

Scientists of the TETRA Innovation Group developed a customized TETRA CS Neptune buffer fluid with a density of 16.5 lb/gal and a rheology optimal for self-spotting with minimal interface. Additionally, the scientists engineered a unique flow-apparatus to test the fluid's ability to gravitationally displace residual packer fluid while maintaining maximum separation from the control-line fluid. This apparatus also enabled testing for the optimal rate of fluid exchange in the representative non-flow areas of the wellbore. Third-party fluid dynamics modeling verified the efficacy of the customized fluid to displace the zinc-bromide packer fluid.

At the offshore jobsite, a remotely operated vehicle with bladders was used to connect to the hot stab inlet of the blowout preventer and inject the buffer fluid. Approximately 10.5 gallons of the dense TETRA CS Neptune fluid was pumped in to thoroughly displace the zinc-bromide brine. Afterward, the tubing-hanger running tool was disconnected from the permanent tubing hanger to ensure the brine did not contact the latter or the exposed safety-valve couplers. The job also entailed care during circulation to minimize pressure applied on top of the couplers.

### A CLEAN DISPLACEMENT & FIRST OIL WITHOUT INCIDENT

After the vertical tree was installed, the safety valve was opened to allow flow. The ensuing appearance of 'first oil' confirmed success: the TETRA CS Neptune fluid thoroughly displaced the dense zinc-bromide packer fluid while maintaining separation from the incompatible control-line fluid and preventing incidents like control-line plugging or damage to the safety valve filter.

### OVERVIEW

TETRA scientists developed a 16.5 lb/gal TETRA Neptune naturally swapping fluid to successfully displace a 15.5 lb/gal packer fluid in an ultra-deepwater well without any costly or time-consuming incidents.

### Challenge

- ▶ Design a fluid that was compatible with both the control line fluid and the zinc bromide packer fluid
- ▶ Gravitationally displace a 15.5 lb/gal zinc-bromide packer fluid in an ultra-deepwater environment with pressures of 20,000 PSI
- ▶ Prevent comingling of incompatible packer and control-line fluids, control-line plugging, or damage to the filter in the safety valve

### SOLUTION

- ▶ A customized self-spotting TETRA CS Neptune fluid with a density of 16.5 lb/gal
- ▶ A specially designed apparatus to test the TETRA fluid's displacement and separation efficacy

### RESULTS

- ▶ A clean and through displacement using 10.5 gallons of customized TETRA CS Neptune fluid to displace the zinc-bromide packer fluid
- ▶ No comingling between the packer fluid and the incompatible control-line fluid
- ▶ No incidents of control-line plugging or damage to the safety valve filter



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