MATURE FIELDS

UNCONVENTIONALS

# Managed Pressure Services Successfully Executes First Autonomous Managed Pressure Cementing Operation

## NEW HALLIBURTON SOFTWARE USED TO SAFELY EXTEND PRODUCTION INTERVAL FOR OPERATOR WHILE REDUCING PERSONNEL AND ENVIRONMENTAL RISK

OHIO

### CHALLENGE

- Improve bottomhole pressure control during MPC operations in historically difficult Utica Shale

### SOLUTION

- Use Halliburton's innovative software service to safely automate MPC operations, integrating measured flow rate and fluid densities from the cement unit into a real-time hydraulic model

### RESULT

- Automating MPC operations with a statically underbalanced fluid extended the drilling window, allowing safe completion of longer production-hole sections while improving safety and reducing risk during complex operations.
- Real-time results provided the rig team improved visibility of the current state of operations, allowing them to proactively adjust and optimize the cementing program, as necessary.
- Complex prejob contingency engineering that is necessary with premodeled pumping schedules was reduced

### OVERVIEW

Halliburton's Managed Pressure Services (MPS) team successfully completed its first autonomous managed pressure cementing (MPC) operation in the Utica Shale using a proprietary software service new to the industry. By integrating measured flow rate and fluid densities from the cement unit into a real time hydraulic model, the MPS team effectively performed autonomous MPC operations. This innovative application allowed the operator to safely extend the production interval while reducing risk to personnel and the environment. Operational flexibility improved as a result, and real-time data provided to the rig team enhanced visibility, allowing proactive adjustment and optimization of the cementing program. This flexibility also reduced complex pre job contingency engineering necessary with premodeled pumping schedules customary to conventional techniques.

Upon completion, the operator chose to extend its partnership with Halliburton. The successful execution of this novel automated MPC service adds to an increasingly elevated service portfolio.

### CHALLENGES OF THE UTICA SHALE

The Utica Shale has been called the natural gas giant below the Marcellus. While capable of producing large amounts of natural gas, natural gas liquid, and crude oil, this basin has historically been economically difficult to develop. The depth of this shale combined with pore pressure uncertainty and pressurized fractures culminate in drilling challenges that often result in costly nonproductive time (NPT). Employing conventional drilling techniques to address these challenges has led to large influxes and poor wellbore stability, significantly increasing operational risk.

### WHY AUTOMATION IS IMPORTANT

MPC is currently primarily a manual process, heavily reliant on user configuration and interaction for safe execution. With multiple fluids of various densities being pumped in sequential order, MPC operations have traditionally relied on pre-engineered pressure ramp

schedules where surface back pressure (SBP) is adjusted based on the volume pumped from the cement unit. These pre-engineered plans are error-prone because the accuracy of the BHP control is completely dependent on the preplanned pumping schedule and proper communication between all parties throughout the operation. Discrepancies in density or volume of fluid pumped, pump time, and the rate at which fluid is pumped all affect the pressure schedule, which is not easily adjusted during real-time operations. Any error during the execution of these manual processes can result in poor bottomhole pressure control and increased risk of influx during a time when it is extremely difficult to detect.

## INNOVATIVE DATA AUTOMATION

Halliburton successfully integrated measured fluid data from the cement pump into a real-time hydraulic model. Using this data ensured that the hydraulic model performed calculations based on actual well conditions, not a premodeled plan. With the measured pump rate and fluid density readings from the cement pump's advanced meter, the hydraulic model accurately tracked actual mud density throughout the annulus. This automated data input into the software and eliminated all manual entry usually necessary during each stage of cementing.

This advanced automation allowed Halliburton software to operate completely autonomously without any user input, configuration, or interaction throughout the entirety of cementing operations. Removing manual interaction eliminated risks associated with poor communication amongst the rig team, third-party cementers, and the MPD team. Using the software to calculate results in real time with actual data also reduced potential risks associated with poor pressure management. This risk reduction allowed the operator to complete MPC operations using a statically underbalanced fluid and successfully extend the drilling window.


*Graphic shows hydraulic model accurately tracked actual mud density throughout the annulus. This automated data input into the software and eliminated all manual entry usually necessary during each stage of cementing.*





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