

Breaking Records by Optimizing Custom-Designed Strings

STEP Energy Services (STEP) continues to consistently break coiled tubing depth records with minimal downtime and custom top-of-the line technology, all the while keeping safety in the forefront. STEP has managed to achieve records in consecutive years, persevering through challenging 15k, deep horizontal wells presented by clients throughout North America.

March 2017: 47 plugs were to be milled in a 7,200 meter (23,622 feet) horizontal well.

August 2018: STEP performed a milling operation with a measured depth of 7,325 meters (24,032 feet).

July 2019: The client provided STEP with a challenging, yet exciting new feat. Like the others mentioned, it was an extended-reach, high pressure well, yet the target depth of 7,445 meters (24,426 feet), milling almost 80 plugs would supersede the previous record by 120 meters (394 feet). STEP efficiently completed all three wells by optimizing the operations of each 2-3/8" (60.3mm) custom string design that allowed the reach to the challenging depths. The varying walls of the tapered strings combined with the high-grade, high pressure steel enabled STEP to maneuver downhole and withstand the persistent plug debris while milling.

Results: A look into the most recent case

Well Conditions:

Formation:	Duvernay
Measured Depth:	7, 475 meters (24,524 feet)
Total Vertical Depth:	3,440 meters (11,286 feet)
BHP:	65.0 MPa (9,425 psi)
BHT:	110°C (230°F)
Cross-over:	5.5 inches - 4.5 inches

Coil Properties:

Outer Diameter:	2-3/8" (60.3mm)
Grade:	HT-125
Length:	7, 714 meters (25,308 feet)

7,445.14	68.67	36.56	25.80	-19,513.80	46,996.50	550.59	127
Deepest Depth	Max Press. (MPa)	Avg. Press. (MPa)	Avg. WHP (MPa)	Min Weight (daN)	Max Weight (daN)	Max Fluid Rate (L/min)	Open to Close Master (Hr)

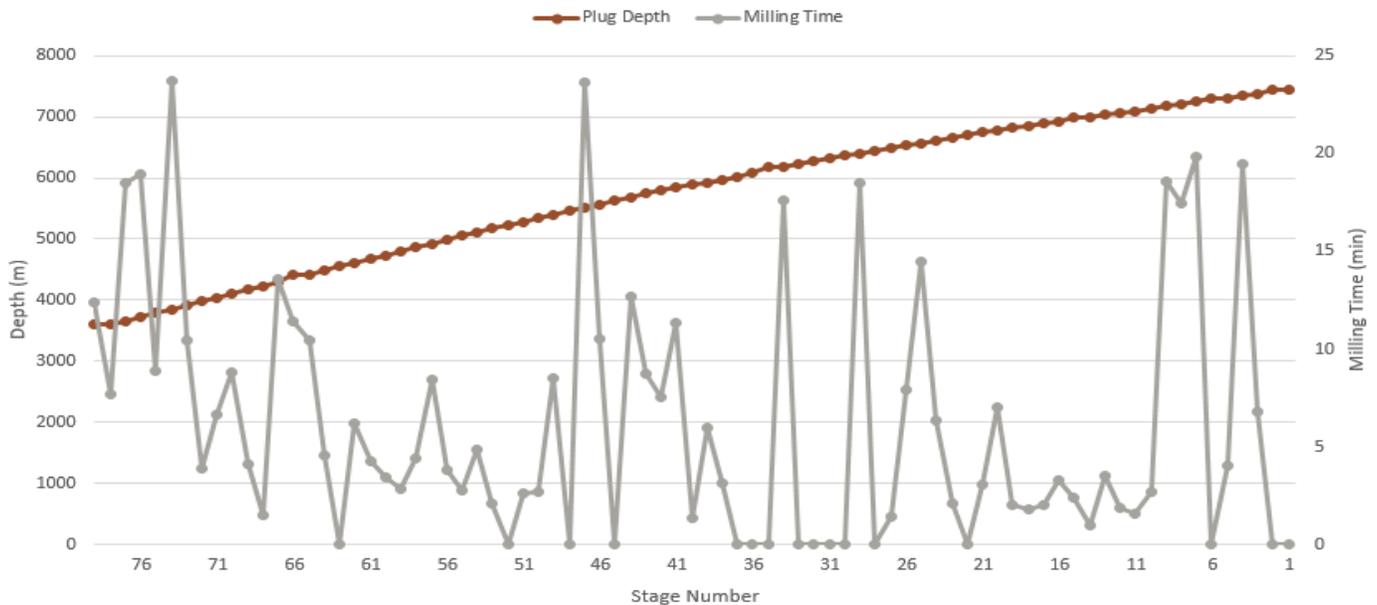


Figure 1: Depth and Milling Time per Stage

The Operation:

- The operation comprised of recovering a wireline retrievable (“WR”) plug, a fishing run, one tool trip, and an average of 7.8 minutes of treatment time per plug.
- Stages 79-41 were bridge plugs, while stages 40-1 were dissolvable plugs (63 of 79 stages were tagged and treated)
- The maximum treatment time spent on a single stage did not exceed 25 minutes.
- After retrieving the WR plug and bringing it to surface, STEP was set to mill until tagging a fish, where a tool trip would occur.
- The fish that was approximately 5,700 meters (18,700 feet) into the well was successfully latched and brought to surface.
- At surface, the BHA was swapped to mill the remaining plugs in the well.
- An agitation tool was utilized and the run in hole friction factor was measured at 0.21.
- The usage of STEP’s chemical inventory including friction reducer and metal-to-metal lubricant also aided in reaching the bottom of the well.
- No recorded incidents on site.

Throughout this complex operation, STEP performed with precision, keeping NPT under 2%; the final plug measured at a depth of 7,445 meters (24,524 feet) was successfully milled by the crew.