

Combining Real-time Downhole Telemetry and Diverting Agents Optimizes Milling and Intervention Operations in Low Pressure Wells

STEP Energy Services, (STEP) combines STEP-conneCT, a part of the STEP-IQ™ suite and STEP-PLEX™ diverter technology in coiled tubing interventions to reduce operational time and cost while improving reachable depth in low pressure wells. This customized solution provides clients with the confidence and technology required to perform intervention work in some of the most challenging wells in North America.

Challenge

During an underbalanced milling campaign in an area of the Montney formation in Canada, STEP Energy Services experienced a complete string immobilization in 1 of every 10 low pressure wells and an average of 9.5% of all lateral length was left untreated. An initiative was created between STEP and the well operator to address the growing challenges associated with underbalanced milling. The challenges included lost circulation leading to stuck in hole events, bottomhole assembly (BHA) failures resulting in frequent tool trips and inconsistent intervention costs due to increased operational time and nitrogen usage.

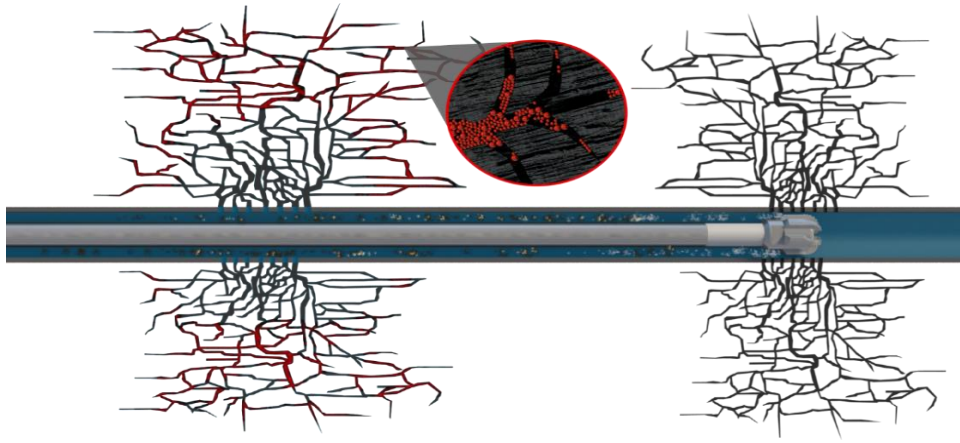
Solution

A new and unique approach to underbalanced coiled tubing interventions was developed that combined fluid loss agents to improve fluid returns, downhole telemetry to optimize milling performance and cloud based acquisition software to support collaborative problem solving. STEP-PLEX™ far field diverting agents were pumped through the cleanout or milling BHA to optimize fluid returns and reduce the required nitrogen volumes. STEP-conneCT™ Downhole telemetry was utilized to better understand motor performance, decrease motor damage and identify the key factors in lost circulation events. IDEX™ acquisition software then allowed all stakeholders to be remotely engaged in the operation to drive collective decision making in real-time.

Results

STEP-PLEX™

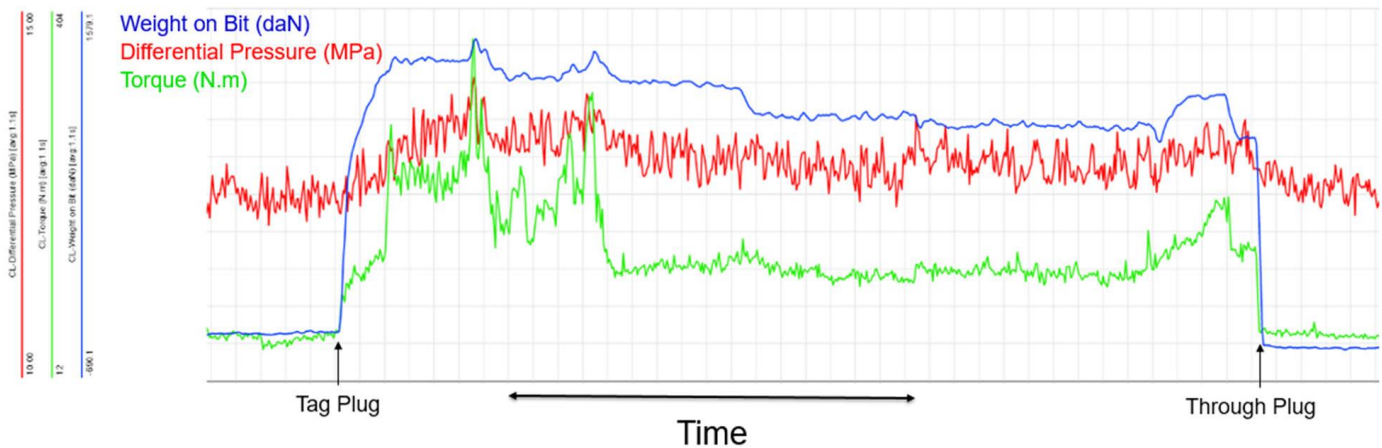
STEP-PLEX™ far field diverter proved to create temporarily blockages in areas of fluid loss which allowed the formation to support an increased hydrostatic pressure. This allowed the operator to decrease the nitrogen rates and perform the operation with a higher liquid ratio resulting in higher cleanout efficiencies, decreased motor wear and ultimately reduced cost.



STEP-PLEX™ far field diverter

STEP-conneCT™

STEP-conneCT™ offered real-time data such as circulation pressure, weight on bit (WOB), torque, inclination, temperature and vibration at the BHA. Access to this real-time downhole data provided the operator the ability to identify changes in well conditions and make faster decisions when encountering lost circulation events, motor stalls and BHA failures. The WOB and torque readout specifically allowed the operator to clearly see obstruction tags and adjust the WOB to control debris size, further increasing cleanout efficiency. Overall the accuracy of the data provided a clear picture of what happened downhole which was directly correlated to more efficient operations and cost savings.



Data provided during a milling event using STEP-ConneCT™ downhole telemetry

Post Initiative Evaluation

The operator's initial conventional coiled tubing milling operations were organized and compared to post efficiency initiative operations in total over 70 wells and 2 years of milling data were compared.

- The efficacy of diverting agents to create formation backpressure allowed for an increased liquid ratio in the hydrostatic column ultimately increasing cleanout efficiency.
- A better understanding of bottomhole conditions through downhole data telemetry allowed for the reduction of overall nitrogen rates and reduced stalls.
- Untreated lateral length was improved from 9.5% pre initiative implementation to an average 0.25% of laterals left previously untreated.
- Operating time per well was reduced by 14%.
- Complete pipe immobilization events were reduced to zero.
- Overall cost per well was reduced by 26%.