



PETROLIZE® Recombinant Enzymatic System Frees Stuck Pipe in 5 Hours, Preventing Several Days NPT in a Leading Asia Gas Operator Well.

SPE-222951

Location: Asia

A leading gas operator in Asia faced a severe stuck pipe incident during drilling of a deep gas exploration well at approximately 10,000 ft in the 8½-inch hole section. After nine consecutive days of unsuccessful fishing and spotting fluid attempts, including caustic, acid-based, and mechanical jarring techniques, the operator faced escalating costs, lost circulation, and the potential abandonment of the well. Epygen Labs intervened with its advanced Recombinant Petrolize® Enzyme System, which successfully freed the stuck pipe within five hours, eliminating further non-productive time (NPT) and preserving downhole assets valued at millions of dollars.

This represented deployment of a modified enzyme-based system for stuck pipe remediation under high-temperature, high-pressure (HTHP) gas well conditions in the region. The field trial confirmed the system's ability to hydrolyze polymeric filter cakes and release trapped strings where conventional chemical systems had failed.

CHALLENGE

The operator was drilling through a tight, clay-rich gas-bearing formation with a synthetic-based mud system of 1.15 SG. Severe differential sticking occurred at ~10,000 ft after a trip was initiated with minimal hole cleaning circulation. Attempts using multiple spotting fluids, acid soaks, and caustic-based treatments were ineffective. Torque and drag values indicated full immobilization, and pressure readings suggested a high probability of mud cake polymer compaction against the BHA.

The risk of tool loss and potential sidetracking grew as the operation extended beyond nine days, accumulating over 200 rig hours of NPT. Conventional chemical solutions could no longer be pumped without risking corrosion of sensitive MWD/LWD components and elastomer seals.

SOLUTION

Epygen Labs proposed a Modified Recombinant Enzyme System, developed to target organic and polymeric residues within the mud cake structure.

The system was formulated with a blend of recombinant hydrolases, compatible stabilizers, and surface-active bio-dispersants that break down polymer chains into water-soluble fragments without altering wellbore integrity. Prior to field deployment, laboratory validation was conducted at high temperature and pressure to ensure enzyme thermal stability and activity.

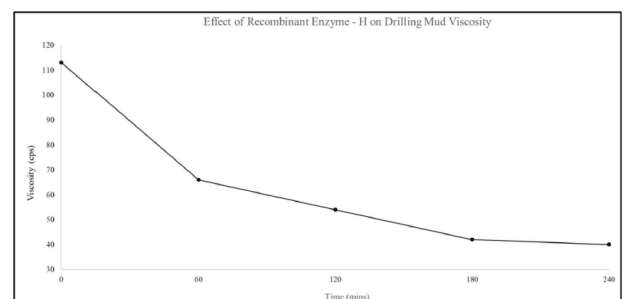


Figure 1- Viscosity reduction experiments conducted using Recombinant Enzyme – H on Drilling Mud



Figure 2- Drilling Mud standard filter-cake on 50-micron disc.



Figure 3- Mud cake after cleanup with Petrolize® Enzyme solution @ 100°C in 8 hours

Exp. No.	Test Detail	Time (Hrs.)	Filtrate Volume (ml)	Standard Cake weight (grams)	Blank Disc weight (grams)	Disc wt. with cake (grams)	Wt. of dry cake (grams)	Clean Up (percentage)
1	Petrolize® Enzyme Treatment	8	14	4.403	42.117	42.461	0.344	92.18%

Table 1—Summary of Lab results evaluating drilling fluid cake clean-up efficiency of Petrolize® Enzyme single-step treatment by using HPHT filtration unit.

RESULTS

The stuck string was fully freed after five hours of soak and gradual circulation, without mechanical jarring or pipe severing. Torque and drag readings confirmed smooth release, and subsequent flowback analysis indicated significant degradation of organic matter in the mud cake.

- **Stuck pipe freed in 5 hours following enzyme soak.**
- **Reduction of 9 rig days of NPT, preventing tool loss and sidetrack.**
- **No corrosion or elastomer degradation observed on retrieved BHA components.**
- **Safe to MWD/LWD tools, validated up to 120°C.**
- **100% replication success in two additional gas wells in the region.**

CONCLUSION

Petrolize® Enzyme System demonstrated a reliable and repeatable solution for differential sticking remediation under high-pressure and high-temperature gas well conditions. Unlike conventional acid or caustic-based treatments, the enzymatic approach actively degraded polymeric components of the mud cake while preserving the metallurgical and elastomeric integrity of downhole tools.

This achievement marked a step change in drilling efficiency, with the system now qualified for broader field use across multiple regional gas developments.

**This success is documented in SPE-222951, presented at the 2024 SPE Middle East Oil & Gas Conference.*