

### Enviro-Syn<sup>®</sup> HCR-7000-WL<sup>®</sup> Modified Acid<sup>™</sup> system saves pumping time and mitigates HSE risk compared to HCl

DJ Basin, Niobrara Formation, Colorado

An E&P company operating in the DJ Basin was performing a multistage crosslink plug-and-perf completion project on a multi-well pad in the Niobrara formation. The goal was to increase operational efficiency by pumping Enviro-Syn<sup>®</sup> HCR-7000-WL<sup>®</sup> with the wireline tool as it was running in hole to complete perforation operations. The ultra-low corrosion and superior HSE properties of HCR-7000-WL enabled the crew to safely reduce pumping time by an average of 8 minutes per stage.

#### CHALLENGE

The operator had drilled 8 wells on two pads in the Niobrara formation and each well was completed with 83 stages for a total of 664 stages. The wells were stimulated in zipper groups, swapping wireline and frac operations between stages. The operator wanted to reduce the time to displace the acid spearhead to the perforations after wireline had exited the wellbore.

#### SOLUTION

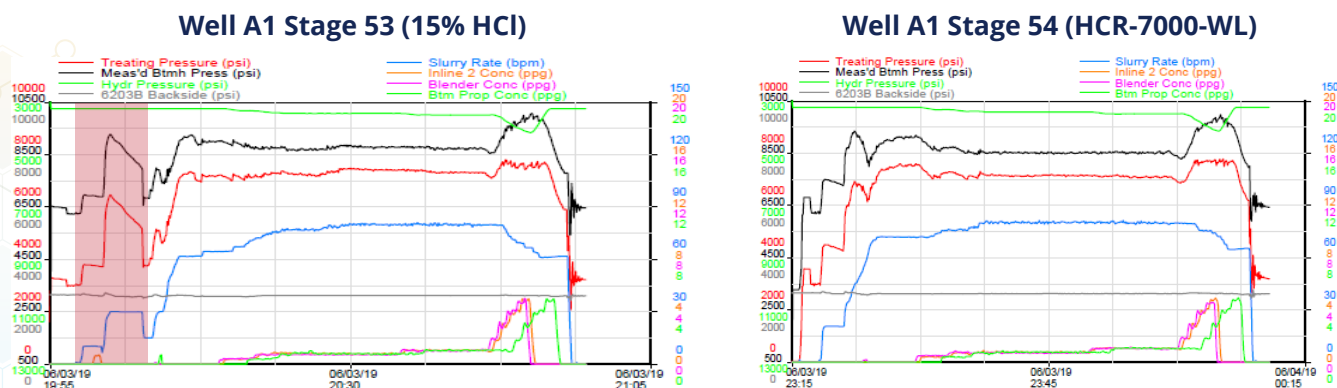
Enviro-Syn HCR-7000-WL was selected as a replacement for 15% HCl and was pumped on approximately half of the total stages to compare the operational efficiency. Concentrated HCR-7000-WL was diluted to 33% concentration with produced water and displaced to just above the perforations while the pump down crew was pumping the wireline perforating guns to depth. Ball-in-place plugs were used to isolate the HCR-7000-WL stages.

HCR-7000-WL is a strong modified acid specifically designed to efficiently spot acid on the perforations with wireline tools in hole. HCR-7000-WL also reduces precipitation issues prevalent with HCl, minimizing formation damage that can occur when used as a spearhead acid.

#### RESULTS

By pumping HCR-7000-WL while completing perforation operations, the operator achieved substantial cost savings and was able to bring production on line faster than previous pads. The benefits realized include:

- ✓ Reduced pump time by an average 8 minutes per stage, allowing two additional stages to be completed per day
- ✓ Increased efficiency leading to overall cost savings of ~20% on frac ticket due to day rate pricing structure
- ✓ Reduced time to get to designed frac rate
- ✓ Reduced water consumption by an average of 250 bbl per stage because no ball is dropped from surface and the acid is already at perforations
- ✓ Eliminated need for fresh water due to product compatibility with produced water
- ✓ Reduced acid cartage by ~65% for HCR-7000-WL
- ✓ Reduced HSE exposure compared to 15% HCl



**Figure 1.** 15% HCl was pumped on Stage 53 and compared to HCR-7000-WL pumped on Stage 54 of Well A1. The box on the left plot shows the pump time that is eliminated using HCR-7000-WL.

Compatibility of HCR-7000-WL with the wireline cable enabled the operator to spot acid with the wireline tool. This allowed the frac crew to start pumping acid into the formation immediately following a well swap, instead of displacing a wellbore volume of water prior to acid contacting the perforations. A good acid effect was observed and the designed frac rate was achieved faster than using conventional 15% HCl with an average rate that was 3 bpm higher at slightly lower average pressure (Fig. 1).

Based on the success of this pad, the operator used HCR-7000-WL on all stages of three additional multi-well pads targeting the Niobrara formation.