DCS

TECHNICAL CASE STUDY

HAYNESVILLE BASIN, LOUISIANA · SEPTEMBER 2023

DF4 Dry FR Delivers Superior Pressure Reduction in Haynesville Trial

Side-by-side field trial validates DF4 performance over incumbent dry and liquid HVFR products across a three-well pad

378–641
PSI PRESSURE REDUCTION

3
WELLS TESTED

28
WELLS AWARDED POST-TRIAL

2.5MM
LBS DRY FR PUMPED TO DATE

>90%
HAYNESVILLE DRY FR MARKET SHARE

378–641 psi

DF4 delivered **immediate, repeatable pressure reductions** of 378–641 psi versus the incumbent dry HVFR at **identical PPT loadings** across all three tested stages. The operator awarded DCS **all 28 remaining wells on the pad** — and 2.5 million lbs of dry FR pumped — immediately after the trial.

DF4 | DRY FR | HVFR | HAYNESVILLE | PRESSURE RELIEF | COMPETITIVE TRIAL | SEPTEMBER 2023

01 Executive Summary

> DCS holds **over 90% of the Haynesville dry FR market as of April 2026**, driven by its proven DF4 technology and superior dispersion and mixing performance. DF4 consistently reaches design rate faster and at lower treating pressures than competing dry or liquid FR products, saving operators valuable pumping time and reducing total chemical costs.

In September 2023, DCS conducted its first trial with a new operator on their three-well pad. The operator had historically used the incumbent frac company's dry HVFR (FR-D) and liquid emulsion HVFR (FR-L). After a structured side-by-side test, DF4 demonstrated clear performance advantages. The client was so impressed with the results that they **immediately awarded DCS all future work on the pad** — a total of 28 wells and 2.5 MM lbs of dry FR pumped to date.

02 Trial Results

WELL #1 — STAGE 6

378 psi

DF4 at **2.7 PPT** — immediate treating-pressure drop after swap from FR-D at ~80 minutes

WELL #2 — STAGE 3

638 psi

DF4 at **2.2 PPT** — immediate treating-pressure drop after swap from FR-D at ~82 minutes

WELL #3 — STAGE 6

641 psi

DF4 at **2.7 PPT** — immediate treating-pressure drop after swap from FR-D at ~56 minutes

03 Trial Objective & Protocol

The trial was designed to validate DF4's claimed performance improvements over incumbent products in a real-world Haynesville environment. A rigorous protocol ensured a controlled, apples-to-apples comparison:

1. Each stage was **started with FR-D and FR-L** until rate and pressure stabilized — after approximately 1 ppg proppant had passed the perforations to eliminate perforation-cleanup effects.
2. Once a consistent pressure trend was established, **incumbent FR-D was switched off and DF4 was brought online at the exact same PPT loading**. All other parameters — rate, fluid volume, proppant schedule, and additives — remained constant.
3. **Pressure response was measured after pumping at least two wellbore volumes** to allow full fluid replacement and eliminate transient effects.

04 Well & Stage Information

WELLBORE PARAMETERS

- TVD: ~11,500 ft
- MD of tested stages: ~19,000–19,200 ft
- Casing: 5.5" × 5"

STAGE DESIGN (ALL THREE WELLS)

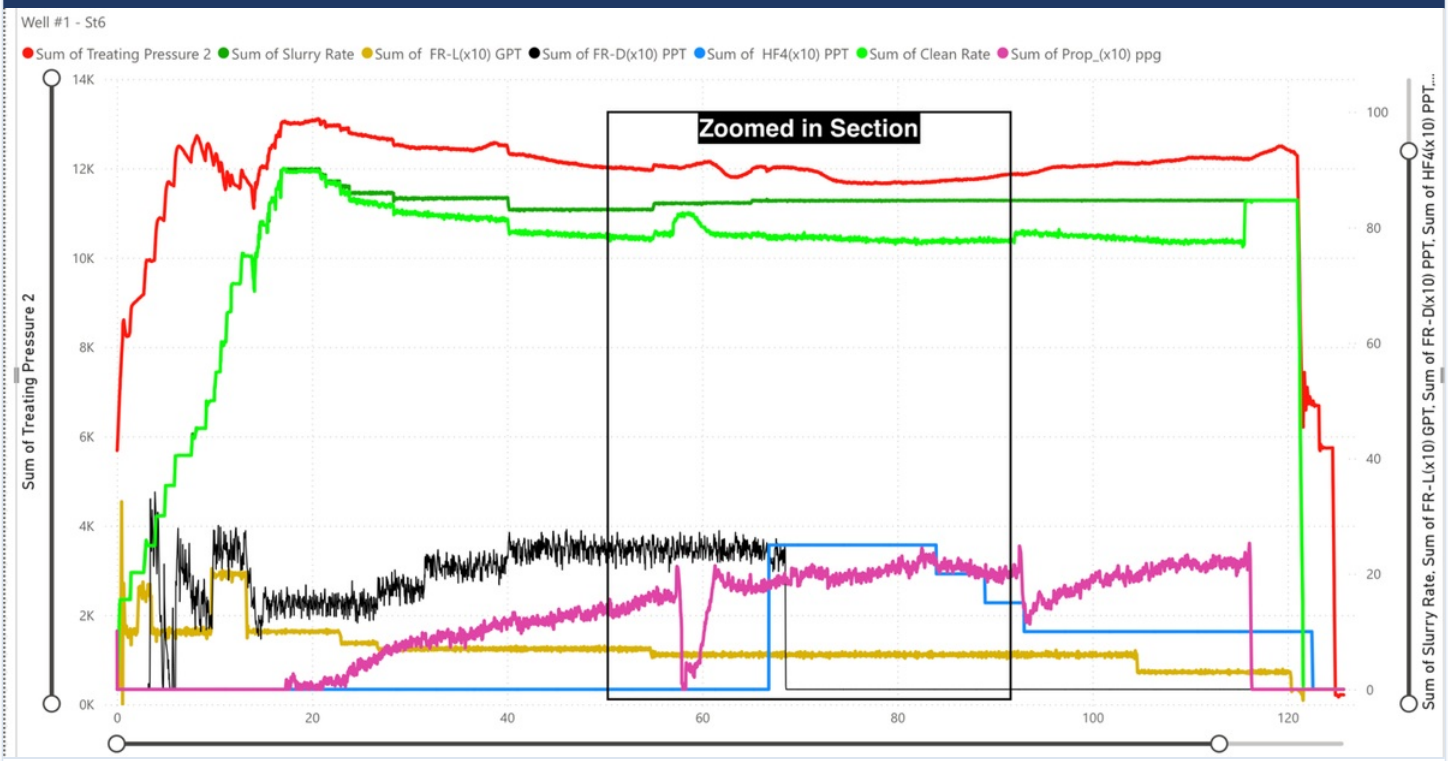
- 450,000 lbs proppant per stage
- 9,500 bbl fluid per stage · 3,500 lbs/ft
- 0.1–2.0 ppg ramp with 140/140 proppant
- 125 ft stages · 10 clusters at 17 ft spacing
- Far-field diverter dirty slug (0.5 ppg) after sand ramp reached 1.5 ppg

05 Job Plots — All Three Wells

Each well is shown as a full-stage overview plot followed by a zoomed view highlighting the treating-pressure drop at the point of DF4 transition. The black line in each overview represents FR-D (incumbent).

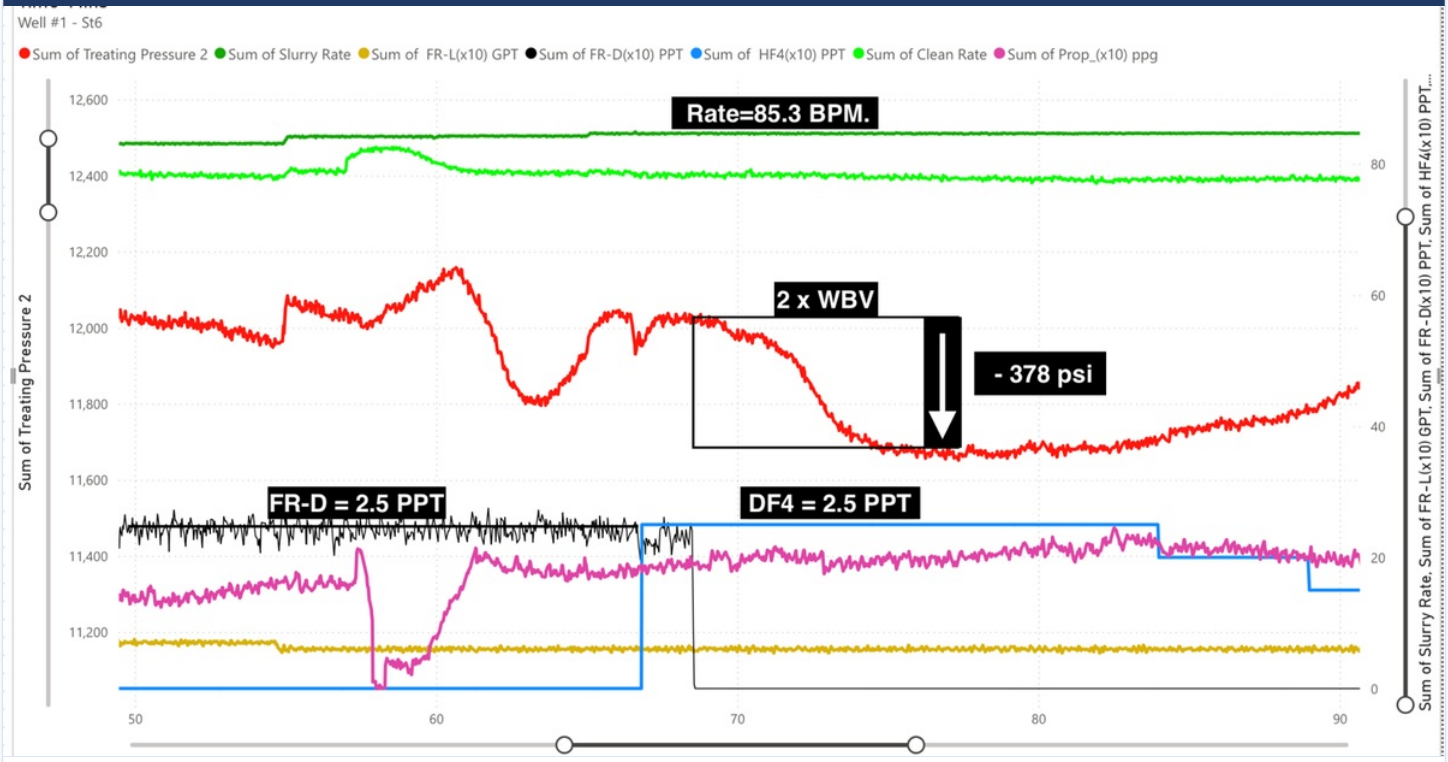
Well #1 — Stage 6

FIGURE 1 Treating Pressure vs. Rate — Full Stage



FR-D switched to DF4 at same 2.7 PPT after ~80 minutes. FR-D shown as black line. Zoomed view in Figure 2.

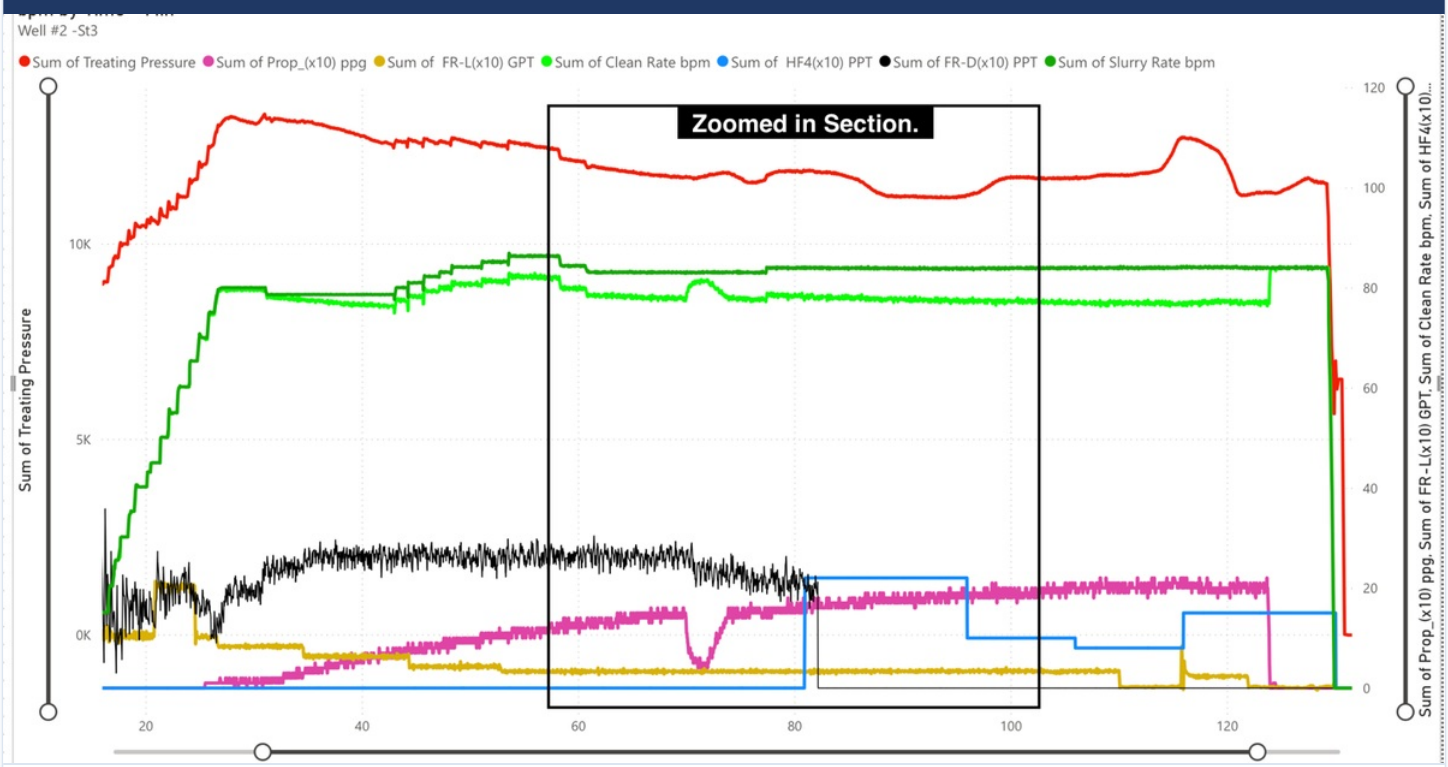
FIGURE 2 Treating Pressure — Zoomed (378 psi Drop)



Zoomed scale confirming the 378 psi treating-pressure drop after swapping to DF4 (after two wellbore volumes).

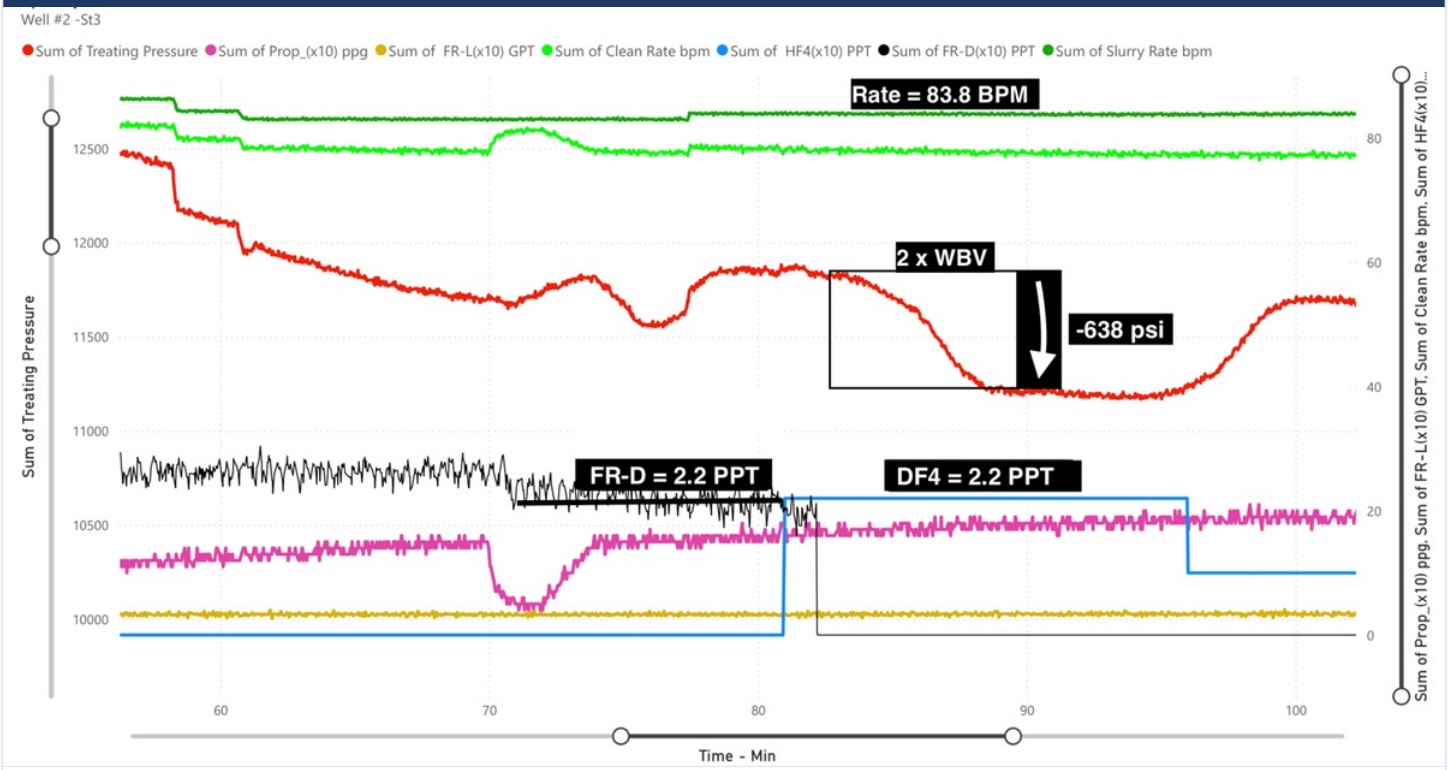
Well #2 — Stage 3

FIGURE 3 Treating Pressure vs. Rate — Full Stage



FR-D switched to DF4 at same 2.2 PPT after ~82 minutes. FR-D shown as black line. Zoomed view in Figure 4.

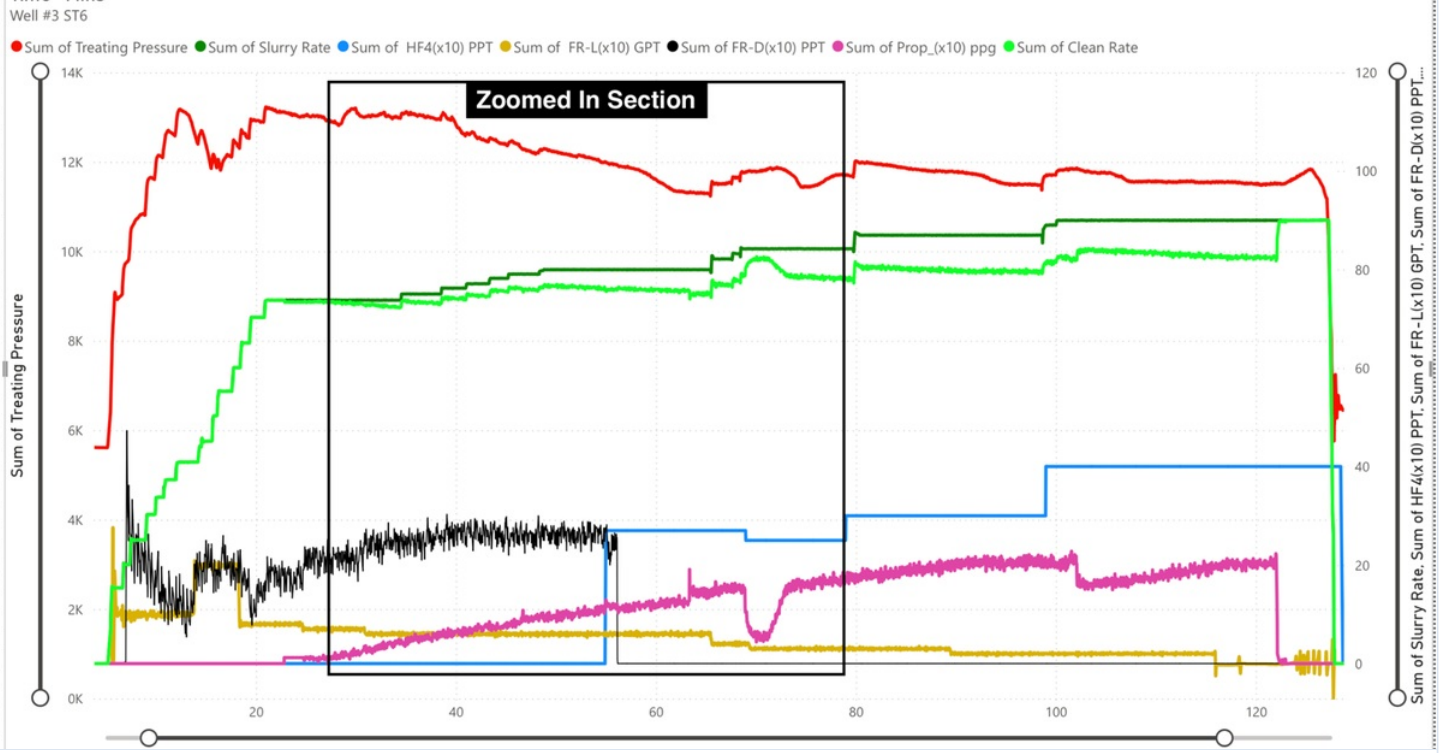
FIGURE 4 Treating Pressure — Zoomed (638 psi Drop)



Zoomed scale confirming the 638 psi treating-pressure drop after swapping to DF4 (after two wellbore volumes).

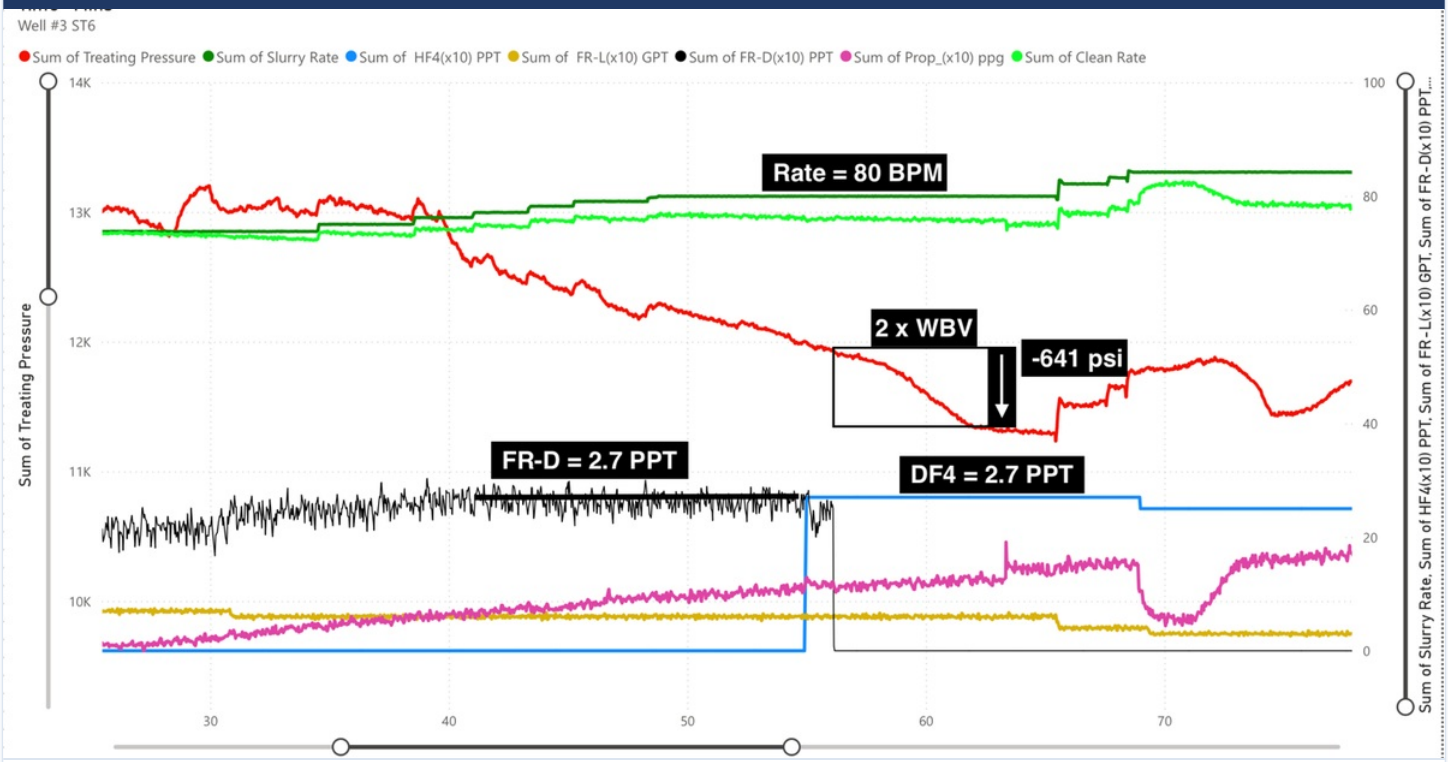
Well #3 — Stage 6

FIGURE 5 Treating Pressure vs. Rate — Full Stage



FR-D switched to DF4 at same 2.7 PPT after ~56 minutes. FR-D shown as black line. Zoomed view in Figure 6.

FIGURE 6 **Treating Pressure — Zoomed (641 psi Drop)**



Zoomed scale confirming the 641 psi treating-pressure drop after swapping to DF4 (after two wellbore volumes).

06 Key Takeaways

- **Consistent, significant pressure reductions of 378–641 psi** versus the incumbent dry HVFR at identical PPT loadings — replicated across all three tested wells.

- **Faster rate achievement and lower treating pressures** translate directly into reduced pumping time and lower total FR chemical costs per stage.

The operator's **immediate decision to award all 28 remaining wells** — and 2.5 million lbs of dry FR pumped — confirms the operational and economic advantage of DF4.

DF4's **proven dispersion technology continues to set the standard** for performance in the Haynesville basin, contributing to DCS holding over 90% of the dry FR market as of April 2026.

Why DF4 Wins in the Haynesville

The September 2023 trial established what operators across the basin have since confirmed: DF4's patented dispersion technology and high-molecular-weight polymer formulation consistently outperform both dry and liquid incumbent HVFR products — not by a small margin, but by hundreds of psi, at the same loading.

- Same PPT loading — dramatically lower treating pressure, every time
- Reaches design rate faster, reducing total pumping time per stage
- Results replicated across multiple wells, stages, and PPT loadings
- >90% Haynesville dry FR market share — validated by operators choosing to stay