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HiWAY flow-channel fracturing technique

Create infinite fracture conductivity to improve production while reducing environmental impact

Aligned with United Nations Sustainable Development Goals: 6—Clean water and sanitation, 12—Responsible consumption and production, 13—Climate action, 14—Life below water.

Emissions Reduction:
Reduces carbon emissions by up to 25%†

Water Stewardship:
Reduces water requirements by up to 30%‡

Applications

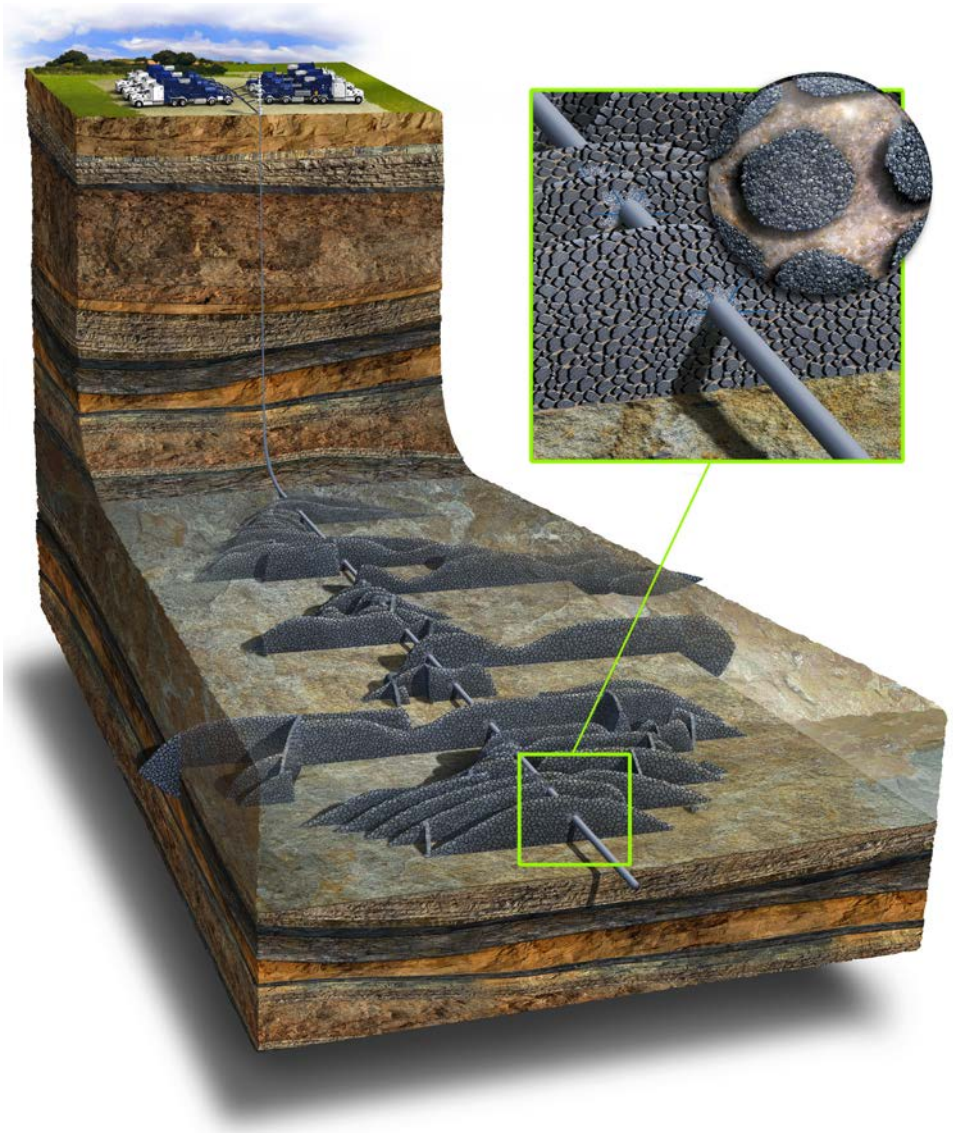
- Consolidated rock fracturing treatments
- Single-stage, multistage, vertical, and horizontal oil and gas wells
- Producer and injector wells
- Formation temperatures from 100 to 350 degF

Benefits

- Reduces proppant by up to 40%‡
- Reduces water consumption by up to 30%‡
- Reduces carbon emissions and operational footprint from
  - reduction in proppant and water transportation, equipment mobilization and demobilization
  - reduction in hydraulic horsepower requirements
  - reduction in operating time
- Improves production through infinite fracture conductivity and greater effective contact area
- Reduces screenout risk to improve operational performance
- Simplifies logistics to enable remote operations
- Improves operational safety
- Enables faster completions and turnover to production
- Reduces well completion time and cost
- Lowers cost per barrel
- Improves return on investment

Features

- Longer effective fracture half-length
- Lower pressure along the fracture for higher reservoir pressure to the wellbore
- Enhanced fluid and polymer recovery
- Less fracture face damage



The first of its kind, the HiWAY technique creates open pathways inside the fracture, enabling hydrocarbons to flow through the stable channels rather than the proppant. This optimizes connectivity between the reservoir and the wellbore—resulting in infinite fracture conductivity.

Strategies to improve fracture production by optimizing conductivity have traditionally included

- enhancing proppant roundness and strength
- lowering proppant crush and gel loadings
- improving gel breakers.

These strategies are all based on improving flow through a porous proppant or sand pack.

HiWAY

HiWAY* flow-channel fracturing technique, however, redefines hydraulic fracturing by removing the link between fracture flow and proppant conductivity and achieves what other fracture techniques cannot—infinite fracture conductivity.

Flow-channel creation

The HiWAY flow-channel fracturing technique is a proven Schlumberger technology that fundamentally changes the way proppant fractures generate conductivity. It decouples fracture productivity from proppant permeability and creates flow channels. Instead of flowing through the proppant in the pack, hydrocarbons flow through channels, increasing conductivity by orders of magnitude.

Conductivity extends all the way to the tip of the fracture, allowing for longer effective fracture half-length, higher effective contact area, better fluid and polymer recovery, and less fracture face damage. These effects all mean optimized production and superior hydrocarbon recovery.

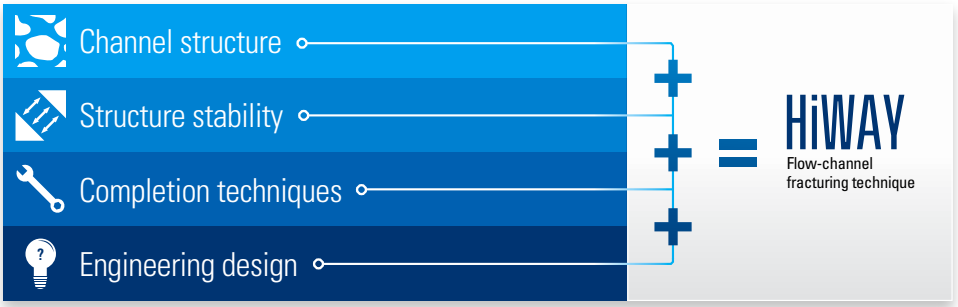
No conductivity losses

By changing the way hydrocarbons flow, the HiWAY technique ensures that traditional proppant pack conductivity losses are eliminated, including crushing, fines, fluid damage, multiphase flow, and non-Darcy effects.

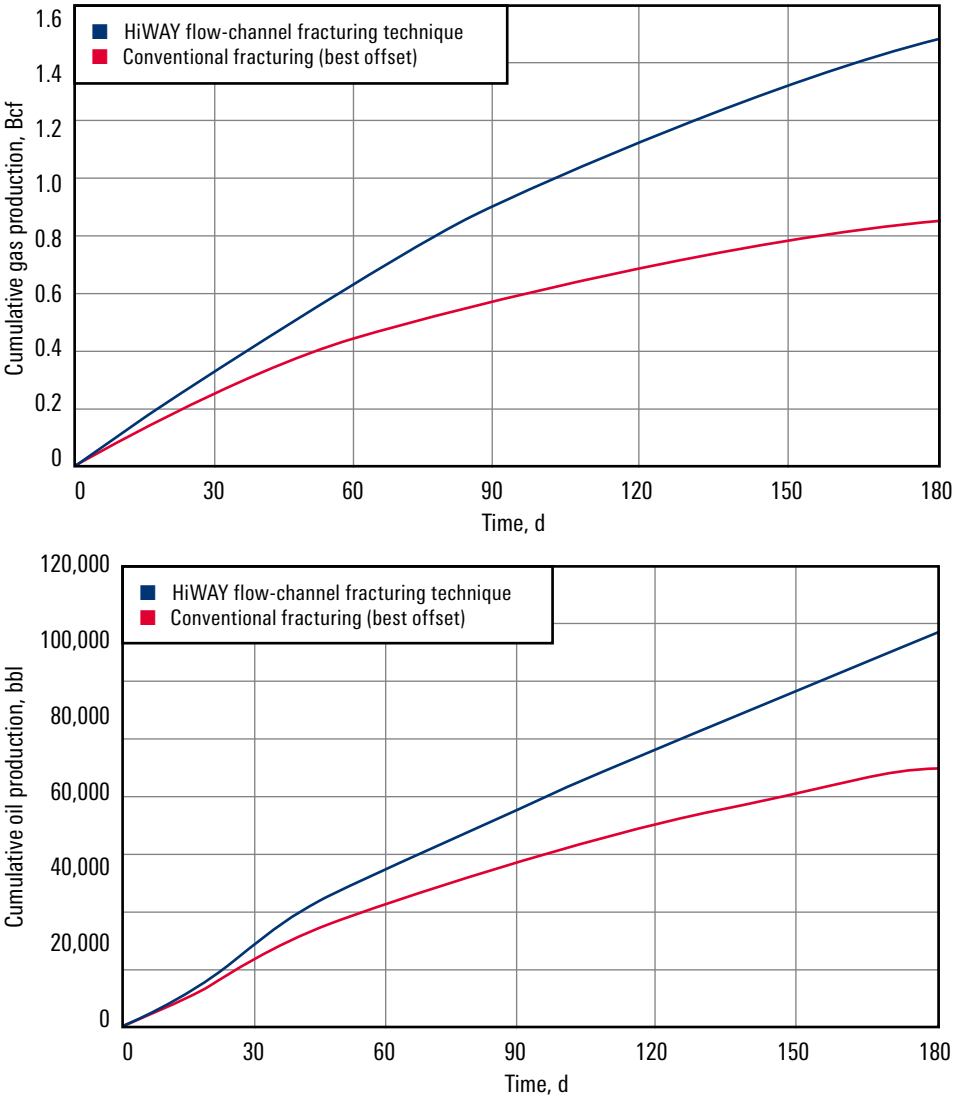
How it reduces carbon emissions

In fracturing operations, carbon emissions are mainly generated from

- proppant raw material sourcing, manufacturing, and transportation
- water sourcing and transportation
- fracturing operation itself
- equipment mobilization and demobilization.



A unique combination of placement, materials, and engineering allows the HiWAY technique to completely change conventional hydraulic fracturing.



With the HiWAY flow-channel fracturing technique, production increases significantly as compared with conventional techniques.

HiWAY

The HiWAY technique enables reduction of up to 40% proppant and 30% water requirements, resulting in a significant reduction in carbon emissions. Considering only emissions from proppant and water transportation from the base to the location, equipment mobilization and demobilization, and the fracturing operation itself, the HiWAY technique reduces carbon emissions by up to 25% compared with the conventional fracturing technique.† The emissions reduction is even higher if proppant raw material sourcing, manufacturing, and transportation to the country are factored in the quantification calculation.

How it improves water consumption

As deeper and longer laterals and more stages are completed to optimize hydrocarbon drainage, the HiWAY technique plays a crucial part in reducing the volume of water required in hydraulic fracturing operations. Through engineered designs using less proppant, water consumption can be reduced by up to 30%. And the risk of screenout is significantly minimized. Currently, HiWAY technique has a placement success rate of more than 99%—eliminating contingency cleanouts, repeat fracturing jobs, and their associated emissions and water consumption.

Combination of disciplines

The HiWAY technique is rooted in a unique integration of placement and materials engineering, surface equipment, geomechanical modeling, fiber material expertise, and decades of fracturing experience.

Specialized completions strategies and process control equipment enable the HiWAY technique to provide optimal recovery.

The stability of the flow channels is maintained by using a proprietary fiber that protects the structure from surface to reservoir until the fracture closes and the in situ stress takes over.

† Emissions from proppant and water transportation from the base to the location, equipment mobilization and demobilization, and the fracturing operation itself
‡ Max. based on analysis completed on various job completion strategies including
- 8-stage conventional well completed with HiWAY technique compared with conventional job design
- single-stage conventional well completed with HiWAY technique compared with conventional job design
- 20-stage unconventional well completed with HiWAY technique compared with conventional slickwater

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