# 150 MaxForce®-FRAC

2 3/4-in. 6-spf Perforating Gun System

Perforating charges traditionally have been designed for natural completions, which focus on depth of penetration, with little regard to hole size and consistency. Oil and gas reservoirs, including unconventionals, which require stimulation to be productive, benefit from consistent hole size to improve fracture placement.

Halliburton's 150 MaxForce®-FRAC engineered charge addresses perforating for stimulation. The charge is designed to maximize hole-size performance while maintaining entry-hole consistency in the casing, regardless of the gun's azimuth, orientation, and standoff.

## Benefits

- Provides hole-size consistency without centralization
- Ensures even distribution of fracture pumping pressure
- Highly suited for ball-seal applications
- Designed for stimulation or injection wells
- Improves injection rates
- Reduces treating pressures
- Increases flow efficiency

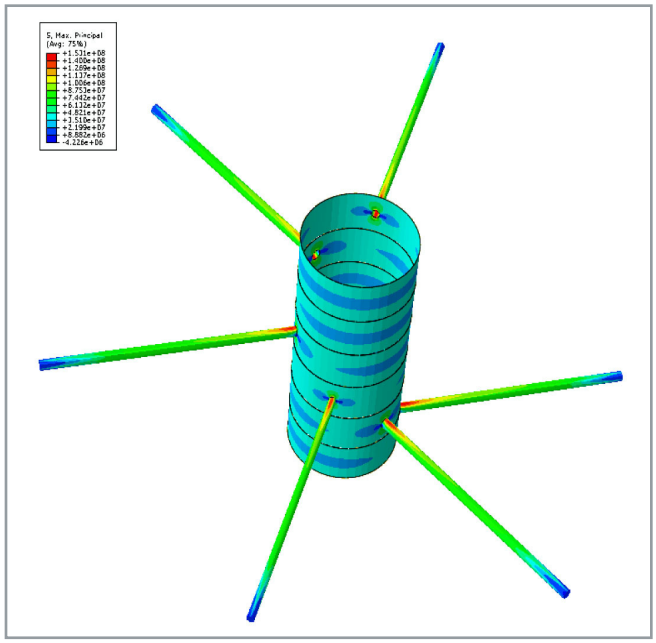
## Features

- Compatible with industry-standard perforating guns
- Designed for smaller gun systems to allow flexibility in completion design

## Modeling

Advanced fracture simulations using finite-element analysis support the performance improvements demonstrated by consistent hole sizes and observed during extensive field testing.

Results show that if the variation of the entrance-hole diameter of the neighboring perforation tunnels is too large, then the fracture can initiate at the edge of the larger holes, leaving the smaller hole-diameter perforations less effective during stimulation. Halliburton's MaxForce-FRAC charge provides less variance of the entrance hole diameters compared to conventional deep-penetrating (DP) and good-hole (GH) charges, thus providing improved pressure distribution, even treatment of perforations, and stimulation efficiency.

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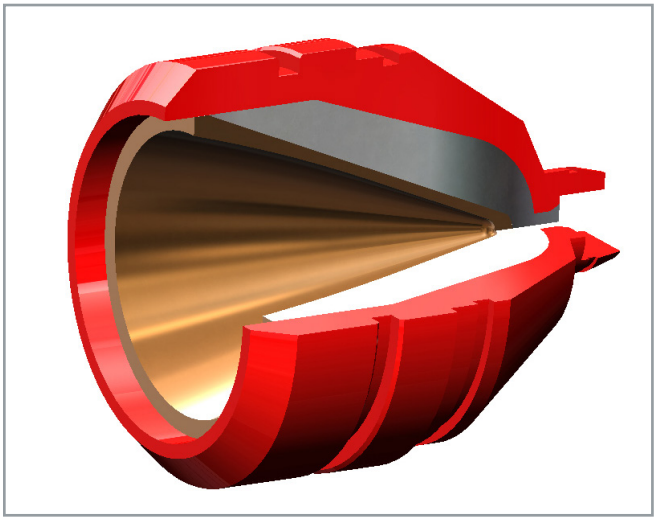
***Sample results from FEA model. Ideally, the average hole size that is published would be the result at every phase of the gun, but in the real world it varies significantly. The local maximum principal stress is always on the surface of the perforation tunnel near the entrance, so the entrance-hole diameter is the dominant parameter in fracture initiation,not the tunnel length.***



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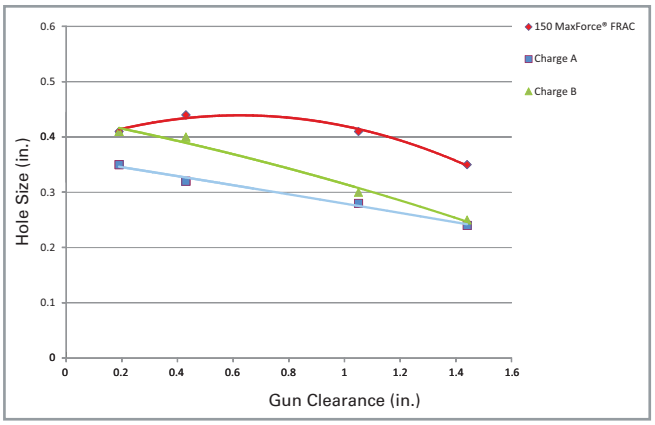
***MaxForce®-FRAC Charge***

| Hole Size Consistency (% Standard Deviation)* | |
|---|---|
| **Charge** | 2 3/4-in. System |
| **150 MaxForce-FRAC** | 22.0 |
| **A** | 36.7 |
| **B** | 47.1 |

*(Maximum – Minimum /Average Hole Size) x 100




*Hole Size vs. Gun Clearance of MaxForce®-FRAC compared to charges A and B.*

| 150 MaxForce®-FRAC Charge Specifications | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Gun Size (in.)** | **Explosive Type** | **P/N** | **Gun Type** | **Maxium Shot Density (per ft)** | **Explosive Mass (gram)** | **Casing Size Tested (in.)** | **Average Exit Hole Diameter (in.)** | **Hole Size Variation (percent)** |
| 2-3/4 | HMX | 102186883 | HSC | 6 | 15.0 | 4-1/2 | 0.41 | 22.0 |

**For additional information, please contact your local Halliburton Business Development Representative.**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