

PERFORATING

MaxForce[®]-FRAC perforating suite of charges

Improved flow distribution during hydraulic stimulation

BENEFITS

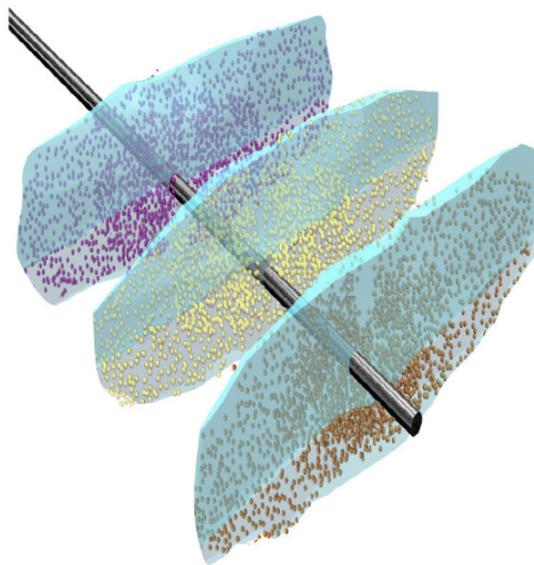
- Improved fluid and proppant distribution
- Increased likelihood of efficient fracture initiation
- Reduced near-wellbore tortuosity
- More effective diversion during stimulation
- Achieve greater stimulated reservoir volume

Successful hydraulic stimulation of reservoirs relies on efficient distribution of treatment fluids and proppant. In order to achieve the most even split of fluid flow between high-side and low-side perforations, consistent holes are required circumferentially around the inner wall of casing.

The Halliburton portfolio of MaxForce[®]-FRAC charges delivers superior consistent holes by providing reduced variance from shot to shot, regardless of fluid clearance and decentralization.

Fracture initiation is dominated in the near-wellbore region by localized stress fields. Achieving consistent holes on both the upper and lower sides of the well ensures that initial reservoir breakdown has the greatest chance of creating the most efficient, evenly distributed fractures.

During any pumping operation, the largest holes are more likely to see the most fluid bias. An inefficient fracture could be created due to the fracture initiation point being away from the preferred fracture plane, resulting in increased tortuosity. Applying even treating force to each perforation allows the formation to dictate fracture initiation and growth, while minimizing tortuosity in the near-wellbore region.



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Consistent casing exit holes promote even fracture growth.

MaxForce®-FRAC perforating charges

| GUN SIZE (IN.) | SHOT DENSITY, SPF (SPM) | PHASING | JRC PIN | CHARGE NAME | ENTRANCE HOLE, IN. (MM) | ENTRANCE HOLE, VARIANCE | TARGET CASING SPECIFICATION | EXPLOSIVE LOAD, GRAM |
|----------------|-------------------------|---------|-----------|-----------------------------|-------------------------|-------------------------|-----------------------------|----------------------|
| 2¾ | 6 (20) | 60 | 102740045 | 150 MaxForce®-FRAC, HMX, IS | 0.36 (9.1) | 2.4% | 4½-in. 13.5-lb P-110 | 15 |
| 2¾ | 6 (20) | 60 | 102745134 | 150 MaxForce®-FRAC, HMX, IS | 0.35 (8.9) | 2.4% | 4½-in. 13.5-lb P-110 | 15 |
| 3⅝ | 6 (20) | 60 | 102127122 | 210 MaxForce®-FRAC, HMX, IS | 0.49 (12.4) | 5.8% | 4½-in. 11.7-lb L-80 | 21 |
| 3⅝ | 6 (20) | 60 | 102045430 | 210 MaxForce®-FRAC, HMX, IS | 0.46 (11.7) | 4.7% | 4½-in. 11.7-lb L-80 | 21 |
| 3⅝ | 6 (20) | 60 | 102732983 | 230 MaxForce®-FRAC, HMX, IS | 0.42 (10.7) | 3.0% | 4½-in. 13.5-lb P-110 | 23 |
| 3⅝ | 6 (20) | 60 | 102736069 | 230 MaxForce®-FRAC, HMX, IS | 0.41 (10.4) | 2.3% | 4½-in. 13.5-lb P-110 | 23 |
| 3⅝ | 6 (20) | 60 | 102127122 | 210 MaxForce®-FRAC, HMX, IS | 0.45 (11.4) | 11.7% | 5½-in. 17-lb L-80 | 21 |
| 3⅝ | 6 (20) | 60 | 102045430 | 210 MaxForce®-FRAC, HMX, IS | 0.43 (10.9) | 13.1% | 5½-in. 17-lb L-80 | 21 |
| 3⅝ | 6 (20) | 60 | 102732983 | 230 MaxForce®-FRAC, HMX, IS | 0.40 (10.1) | 4.3% | 5½-in. 23-lb P-110 | 23 |
| 3⅝ | 6 (20) | 60 | 102736069 | 230 MaxForce®-FRAC, HMX, IS | 0.40 (10.1) | 3.5% | 5½-in. 23-lb P-110 | 23 |
| 3⅝ | 6 (20) | 60 | 102127122 | 210 MaxForce®-FRAC, HMX, IS | 0.45 (11.4) | 11.70% | 5½-in. 17-lb L-80 | 21 |
| 3⅝ | 6 (20) | 60 | 102045430 | 210 MaxForce®-FRAC, HMX, IS | 0.43 (10.9) | 13.10% | 5½-in. 17-lb L-80 | 21 |
| 3⅝ | 6 (20) | 60 | 102732983 | 230 MaxForce®-FRAC, HMX, IS | 0.40 (10.1) | 4.30% | 5½-in. 23-lb P-110 | 23 |
| 3⅝ | 6 (20) | 60 | 102736069 | 230 MaxForce®-FRAC, HMX, IS | 0.40 (10.1) | 3.50% | 5½-in. 23-lb P-110 | 23 |

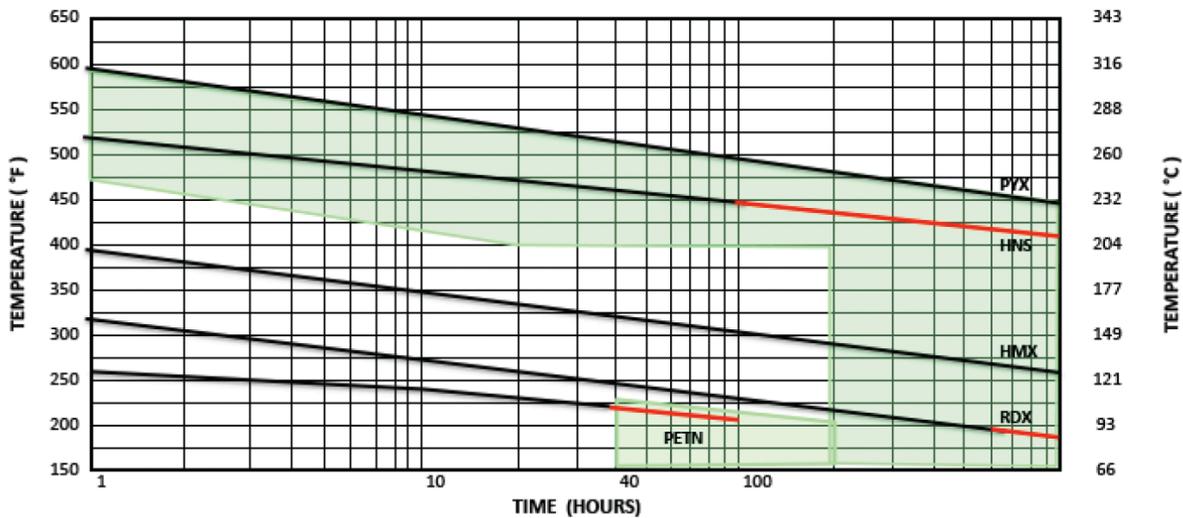
Introducing FracJET™ shaped charges

A charge designed for pumpdowns

Complementing the line of premium frac charges, Halliburton now offers strong performance with its 210 FracJET™ shaped charge, featuring PETN main load powder. The FracJET charge is a drop-in replacement for existing 21- to 23-g charges and will fit most industry-standard 3.125-in. and 3.375-in. hollow steel carriers.

FracJET™ shaped charges

| GUN SIZE (IN.) | SHOT DENSITY, SPF (SPM) | PHASING | JRC PIN | CHARGE NAME | ENTRANCE HOLE, IN. (MM) | ENTRANCE HOLE, VARIANCE | TARGET CASING SPECIFICATION | EXPLOSIVE LOAD, GRAM |
|----------------|-------------------------|---------|-----------|------------------------|-------------------------|-------------------------|-----------------------------|----------------------|
| 3½ | 6 (20) | 60 | 102771488 | 210 FracJET™, PETN, IS | 0.47 (11.9) | 4.00% | 4½-in. 13.5-lb P-110 | 21 |
| 3½ | 6 (20) | 60 | 102771488 | 210 FracJET™, PETN, IS | 0.39 (9.9) | 10.80% | 5½-in. 23-lb P-110 | 21 |
| 3¾ | 6 (20) | 60 | 102771488 | 210 FracJET™, PETN, IS | 0.42 (10.7) | 11.24% | 5½-in. 23-lb P-110 | 21 |



Operational limits for hollow carrier gun systems

Notes

1. This chart is valid for the explosive train inside hollow carrier guns only, (non-electric boosters, detonating cord, and shaped charges)
2. It is not valid for TCP firing systems, electric detonators, or capsule guns
3. Contact Halliburton Technology for information regarding these other components
4. — Projected temperature rating only (not tested)
5. Contact Halliburton Technology for recommendations and possible need for systems testing

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

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