DATA SHEET

HALLIBURTON

PERFORATING SOLUTIONS

G-Force® perforating system

Perforate in any direction, regardless of gun/casing position

FEATURES

- Orienting mechanism is contained within the gun carrier, unaffected by potential restrictions in the completion string or well debris
- Can be run through tubing to orient in casing
- Does not require fin tandems, eccentric tandems, or swivel subs
- Gun assemblies can be centralized in the casing
- No external weight bars required, which eliminates gaps between loaded sections and lost shots
- Gun orientation can be verified after gun retrieval
- Adjustable orientation system available; ideal for applications where perforations must avoid fiber-optic installations (wells of 45° deviation and greater)

BENEFITS

- Increased orientation accuracy range of ± 5° in wells of 25° deviation and greater
- Can be loaded as a KleenZone® system for low-debris applications
- Compatible with live well intervention systems, such as the AutoLatch™ connector, ratchet connector, and modular gun system
- Can be deployed on coiled tubing, wireline, slickline, or jointed pipe

Overview

The Halliburton G-Force® perforating system comprises an internal orienting charge tube assembly and gun carrier system that allows perforating in any direction, regardless of the gun position relative to the casing.

With an orientation accuracy range of ± 5°, the G-Force® system overcomes adverse factors that can decrease the capability to orient the guns in a desired direction.

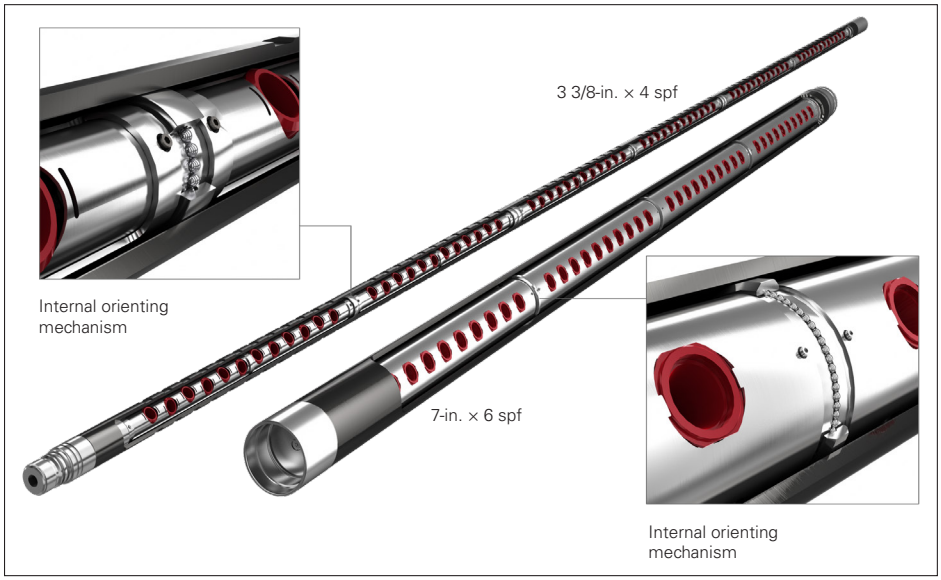
Unlike externally oriented systems, which use devices and weights external to the gun exposed to the casing environment, the G-Force® system orienting mechanism is contained within the gun carrier. This eliminates added friction created by external guns that move axially down the casing wall and minimizes doglegs and other discontinuities during deployment that can cause loss of orientation.

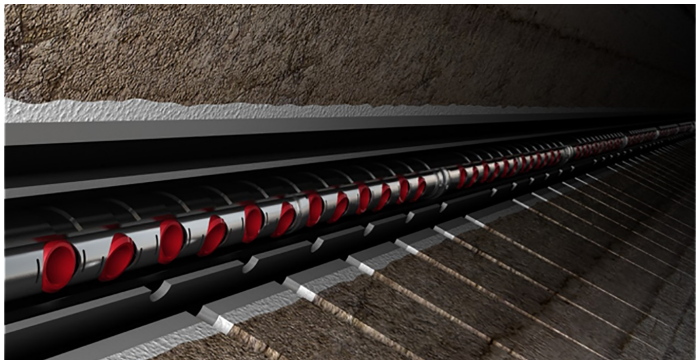
In addition, because the rotating orienting device of the G-Force® system is contained inside the protective environment of the carrier, the fundamental orienting design is unaffected by potential restrictions in the completion string.

Challenge

North Sea

This operation required accurate orientation of the perforation planes in the direction of the maximum principal stress to ensure stable perforation tunnels and overcome a sand production problem that previously limited production from the completion. The result was a safe and flawless onsite operation that guaranteed flow assurance with an initial sand-free oil production rate of 6,000 standard cubic meters per day (37,600 BOPD), which equated to a 20% increase in the overall production potential.



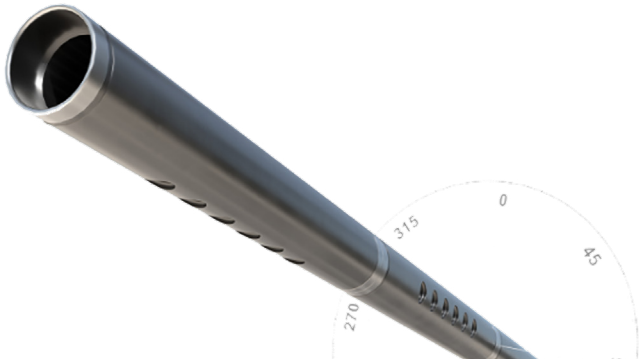


West Africa

For this operation, the operator's objective was to manage sand flow into the wellbore. Challenges included loss of perforations in the productive zone attributed to the use of eccentric weighted hollow steel carriers and loss of orientation accuracy caused by excessive torque and drag associated with conventional orienting techniques, such as external fins and a swivel. Halliburton recommended an oriented gun system with a 7-in. outside diameter (OD) to perforate a 9 5⁄8-in. casing in the direction of maximum principal stress. In addition to performance improvement, the new 7-in. OD G-Force® system reduced operational time during makeup, deployment, and positioning of the gun assemblies; this saved the operator more than 50 hours of rig time.

Onshore US

A geothermal well with a fiber-optic installation on the outside of the casing required an orientated perforating solution to avoid damage to the cable over long perforating intervals. The challenging downhole environment was characterized by a bottomhole temperature of higher than 400°F and the orientation location of the cable changed along the length of the well. To maximize connectivity to the reservoir, 390 RockJet™ HNS rock-tuned shaped charges were deployed using 4 5/8-in. adjustable G-Force® system gun assemblies. The adjustable G-Force system allowed the field team to orient each individual gun separately, which corresponded to the cable orientation at that depth. This unique solution allowed the operator to complete four stages in 7-in. casing without any damage to the fiber to capture valuable downhole data.



4 5/8-in. G-Force® Perforating System Adjustable Gun

G-Force® perforating system specifications

GUN OD (IN.)	SHOT DENSISTY (SPF)	PHASING (°)	CHARGE TYPE	TENSILE RATING (LB)	COLLAPSE PRESSURE (PSI)
2 7/8	4	0, 0 or 180, 0 to 180, 10 to 350, 90 to 270	DP 11.1gm HMX, DP 10.5gm HNS	141,000	22,000
3 1/8	4	10 to 350	175 MaxForce HMX, 175 MaxForce HMX RD, 175 RockJet HMX, 175 Millennium-II HNS	148,000	19,000
3 3/8	4	0, 0 or 180, 0 to 180, 10 to 350, 180	Millennium 21gm RDX, Millennium 21gm HMX, Millennium 21gm HNS, MaxForce-Frac	228,000 232,000	25,000
4 5/8	4	0, 0 to 180 10 to 350, 90 to 270	Millennium 39gm RDX, Millennium 39gm HMX, Millennium-II 39gm HMX, 390 MaxForce HMX, 450 RockJet HMX, 390 RockJet HNS	323,000 to 399,000	15,000 to 20,000
4 5/8 adjustable	4	10 to 350 (Adjustable in 36° increments)	Millennium-II 39gm HMX, 390 MaxForce HMX,450 RockJet HMX, 390 RockJet HNS	323,700	20,000
4 5/8 KleenZone	4	0 0 to 180, 10 to 350	Kleenzone HMX, 39gm HNS	358,200 to 399,000	20,000
7	6	0 to 180	Millennium 39gm HMX, Millennium-II 39gm HMX, 390 MaxForce HMX, 450 RockJet HMX, 390 RockJet HNS	643,900	15,000

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