

PetroGuard® Openhole Shunt System

ENHANCE LONG-INTERVAL GRAVEL PACKS WITH AN IMPROVED SHUNT SYSTEM

OVERVIEW

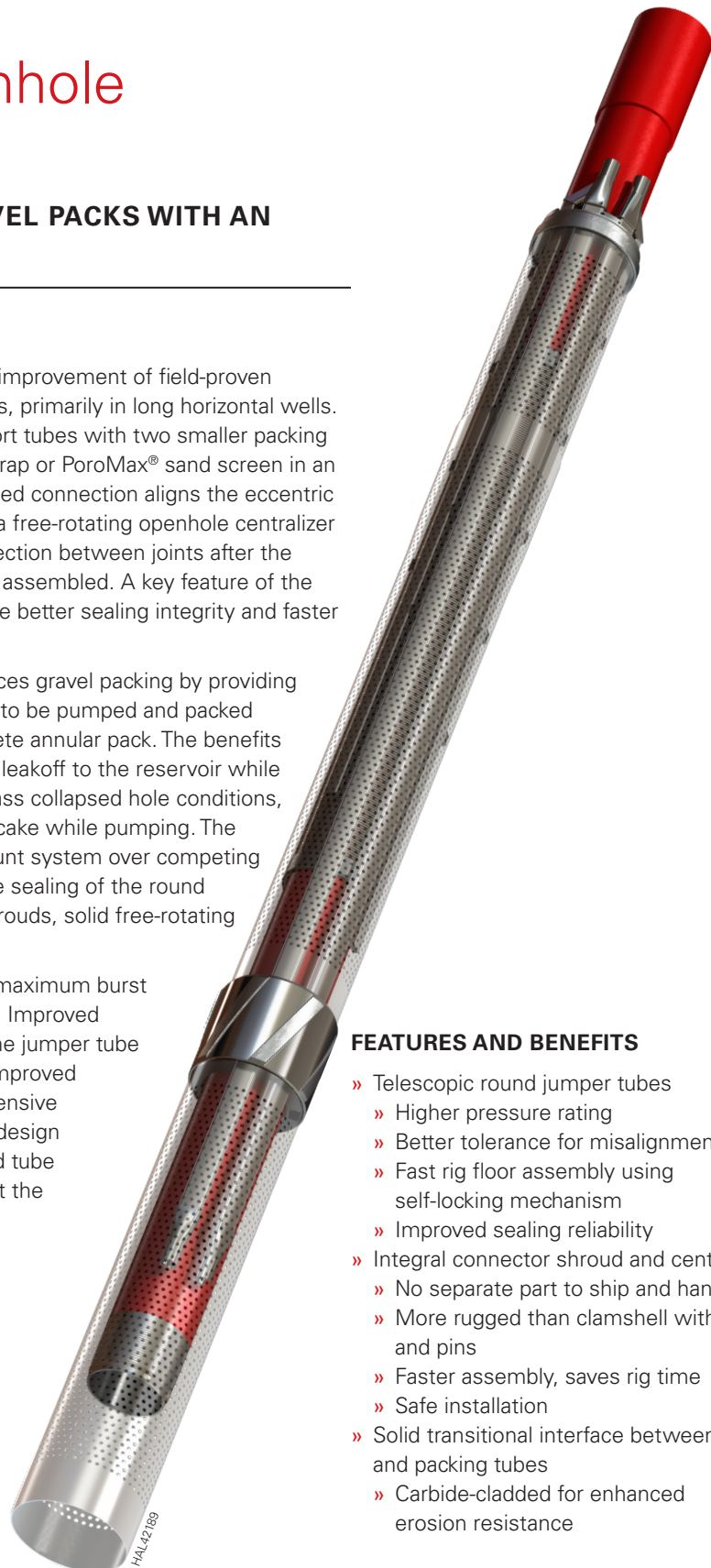
The PetroGuard® Openhole Shunt system is an improvement of field-proven technology to enhance gravel-packing operations, primarily in long horizontal wells. This 2 x 2 system consists of two larger transport tubes with two smaller packing tubes, mounted onto a standard PetroGuard® Wrap or PoroMax® sand screen in an eccentric design. A timed metal-to-metal threaded connection aligns the eccentric tubes between joints. Integral to the system is a free-rotating openhole centralizer and a shroud that slide down to cover the connection between joints after the transport tube inter-connect jumpers have been assembled. A key feature of the system is the round jumper tubes, which provide better sealing integrity and faster assembly time than similar competing systems.

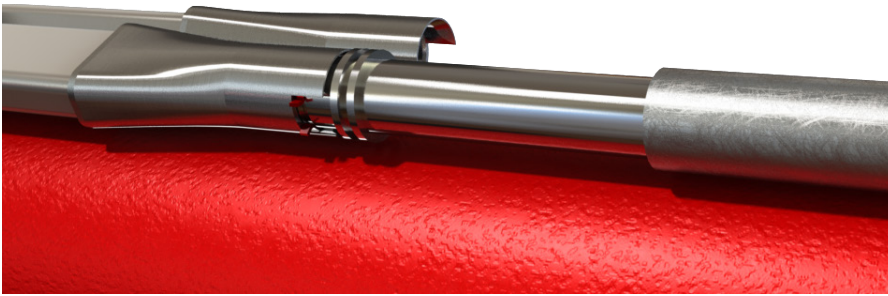
The PetroGuard Openhole Shunt system enhances gravel packing by providing a bi-path for the borehole-screen annulus slurry to be pumped and packed along the producing interval to achieve a complete annular pack. The benefits of this system include addressing massive fluid leakoff to the reservoir while packing the interval, providing the ability to bypass collapsed hole conditions, and reducing erosion to the borehole wall/filter cake while pumping. The enhancements of the PetroGuard Openhole Shunt system over competing systems are yielded through enhanced pressure sealing of the round jumper tubes, ruggedness of the connection shrouds, solid free-rotating centralization, and improved assembly times.

The PetroGuard Openhole Shunt system has a maximum burst pressure rating of 5,000 psi for the shunt tubes. Improved sealing is achieved through the seal design of the jumper tube system inter-connecting the screen joints. For improved erosion resistance and lower pressure loss, extensive computer flow modeling was conducted in the design process to reduce friction at flow transitions and tube connections. The design allows gravel packing at the highest possible rates.

FEATURES AND BENEFITS

- » Telescopic round jumper tubes
 - » Higher pressure rating
 - » Better tolerance for misalignment
 - » Fast rig floor assembly using self-locking mechanism
 - » Improved sealing reliability
- » Integral connector shroud and centralizer
 - » No separate part to ship and handle
 - » More rugged than clamshell with hinge and pins
 - » Faster assembly, saves rig time
 - » Safe installation
- » Solid transitional interface between transport and packing tubes
 - » Carbide-cladded for enhanced erosion resistance





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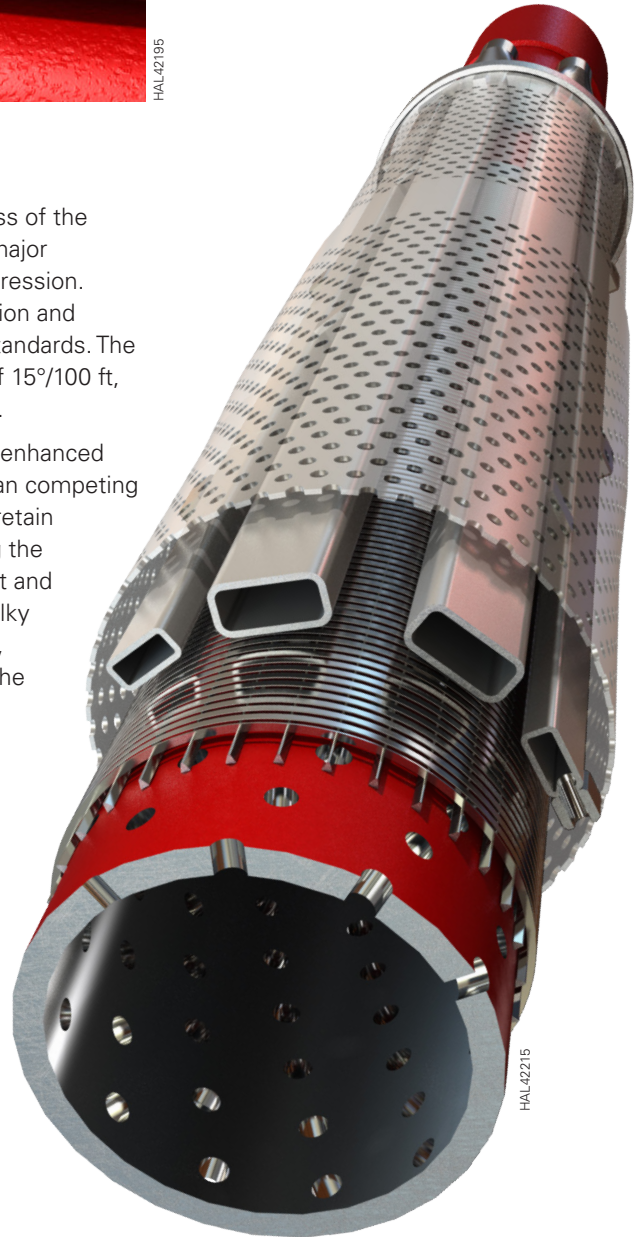
DESIGN

An extensive testing program was conducted to ensure the ruggedness of the PetroGuard Openhole Shunt system. Apart from the sand screen, all major components of the system were tested for torque, tension, and compression. The 5.5-in. basepipe system is rated at 5,000 ft-lb of torque, with tension and compression forces at 60,000 lb, all matching or exceeding industry standards. The system has been rated to a bending capability/dogleg severity (DLS) of 15°/100 ft, with testing done at varying orientations where it incurred no damage.

An additional advantage of the PetroGuard Openhole Shunt system is enhanced assembly efficiency. The jumper tube system is easier to assemble than competing designs, and there are no loose fasteners or components required to retain the tubes as the retention system is fully integral. The shroud covering the connection between joints is an integral component of the screen joint and slides down across the connection to provide greater integrity than bulky clamshell systems requiring separate assembly. A sturdy custom-built, free-rotating centralizer covers and anchors the connection shroud in the run-in-hole position.

FIELD PROVEN

The PetroGuard Openhole Shunt system has been deployed in extremely harsh deepwater conditions, in applications exceeding 2,500 ft of openhole section. The connection has been shown to be made up in 60% of the time compared with competing designs—yielding significant savings in rig time.



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