

GN TREE SAVER

Wellhead Christmas Tree Bypass Tool

Overview

Well stimulation treatments are often characterized by high pressures, large volumes of strong acid and large amounts of sand. The GN Tree Saver allows operators to protect their wellheads designed for everyday operating conditions rather than for the infrequent extremes encountered during stimulation treatments.

This helps avoid costly wellhead change-outs, or the resultant need to kill the well, necessary when pressure work is required or when valves experience washouts due to erosion or corrosion.

GN offers complete customer solutions of wellhead bypass equipment and accessories. Our Tree Savers are uniquely designed to fit customer requirements and to operate in a variety of conditions.

GN Tree Savers are manufactured to a quality program standard that meets the latest ISO 9001 requirements as well as following all relevant industry standards.

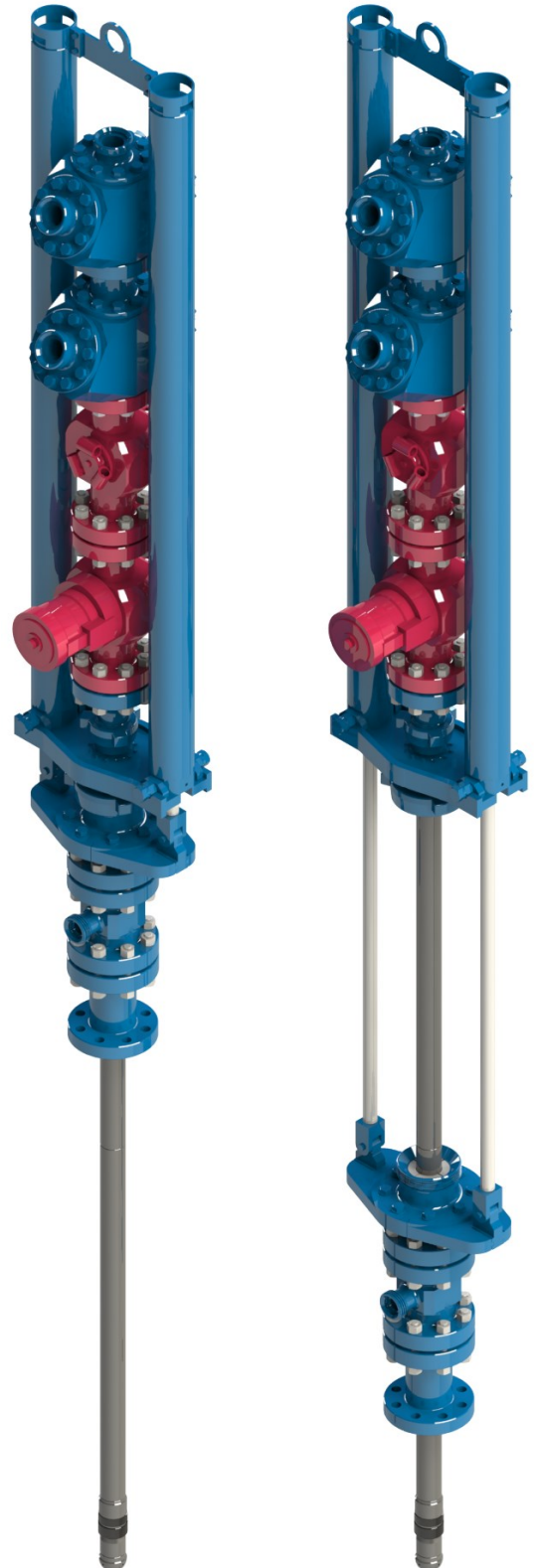


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GN Tree Savers Worldwide

For over 55 years, GN has been committed to providing our customers with innovative, quality products and services that meet or exceed their expectations.

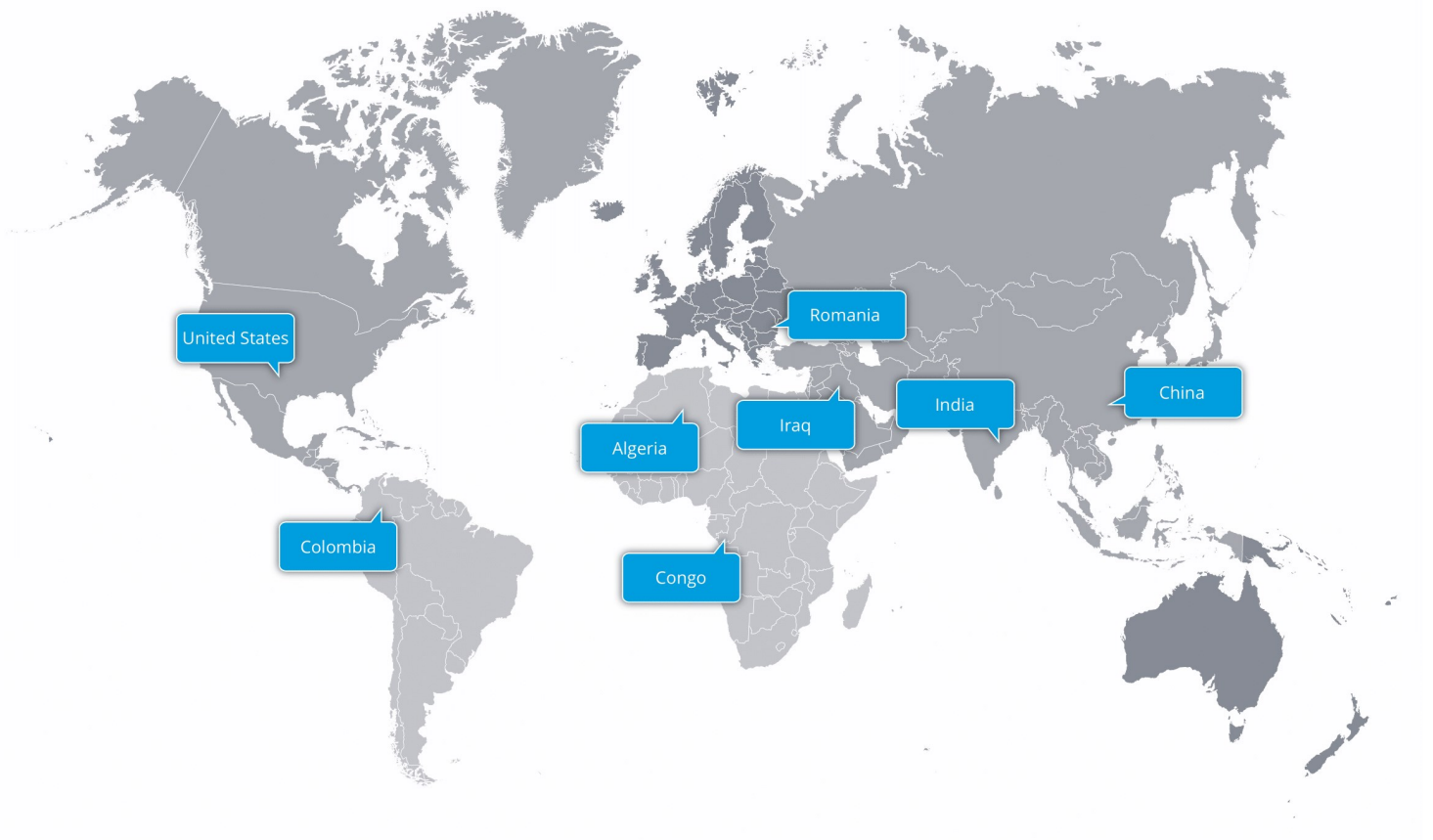
Our vision is to be the manufacturing solution that will ensure competitiveness in the global marketplace for our customers and allow us to strategically grow together.

Our GN team is experienced in engineering specialized tool designs and manufacturing unique solutions. We are dedicated to continuous improvement, providing excellent service, worldwide support and close collaboration in order to realize our customers needs.

With multiple GN Tree Savers working globally every year, our equipment has been proven in a variety of challenging conditions across the world.

Our products have been recognized by customers for their performance, reliability and quality and have found a strong presence in the competitive stimulations market.

We are proud to have GN Tree Savers working in all parts of the world.



Design Considerations

GN Tree Savers can be designed and configured according to customer requirements based on some of the following considerations:

- Wellhead connection: The required flange or screwed connection to which the Tree Saver will be mounted on.
- Wellhead to tubing distance: To determine the required length of high-pressure mandrel that is to be inserted into the wellhead.
- Tubing size and weight: To determine the size of pack-off nipples required to seal in the production tubing.
- Wellhead minimum bore: To assure that the pack-off nipple size selected will pass through the minimum restrictions in the wellhead.
- Valve requirements: Such as sizes, pressure ratings and valve types.
- Fracturing heads: Such as arrangements, sizes, pressure ratings and required flow rates.
- Component configuration: Such as arrangement of valves, frac heads and flange changeovers.
- Hydraulic requirements: Such as a Hydraulic Power Unit for cylinder and valve operation.
- Flow rate requirements
- Working pressure requirements
- Additional accessories

Upon customer request, GN can also provide third party inspection/certification and pressure testing.

Previously Produced GN Tree Saver Sizes

Tubing/Casing Size	Mandrel Size	Tubing/Casing Weight	Mandrel Bore	Flow Rate
in.	in.	lbs/ft	in.	bpm
2 3/8	2 3/8	4.6/4.7	1.25	18
2 7/8	2 7/8	6.4/6.5, 8.6/8.7	1.50	26
3 1/2	3 1/2	7.7, 9.2/9.3, 10.2, 12.7/12.95	1.75	35
4 1/2	4 1/2	11.6, 12.6, 13.5, 15.1, 15.5	2.375	65
5	4 1/2	18.0	2.375	65
5 1/2	4 1/2	20.0, 23.0, 26.0	2.375	65
7	4 1/2	32.0	2.375	65

Design Features

GN Tree Savers incorporate many design features for increased job safety and performance:

- **Low Profile:** Due to the offset cylinder design, when installed, the control valves are in close proximity to the wellhead. This allows easy and immediate access in case of an emergency. In addition, vibration strain from treating lines is minimized by this close connection.
- **Direct flanged connection to the wellhead:** Most common flange sizes are available as a base for the tool. The Tree Saver is also adaptable to most wellheads with threaded connections.
- **Integral tool design:** Dual lockdown union connections work to secure the valve assembly to the Tree Saver and lock the hydraulic cylinders in place.
- **New pack-off nipple design:** GN pack-off nipples incorporate major improvements in design and materials to provide maximum seal reliability and strength.
- **Installation and removal of the Tree Saver can be performed while the well is under pressures up to 5,000 psi.** It is not necessary to kill the well to apply the tool.
- **GN Tree Savers are designed for a working pressure of 15,000 psi, an operating temperature range of -29°C to 100°C and standard service.**



Dual Cylinder GN Tree Saver

Description

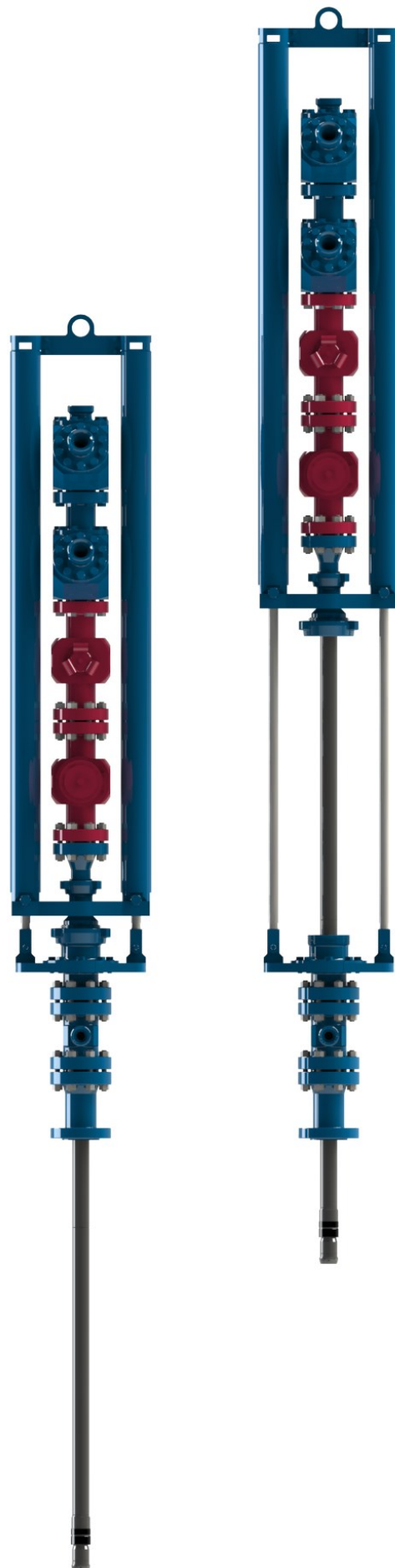
The Dual Cylinder GN Tree Saver is a GN design where two offset hydraulic cylinders are centered over the wellhead. When the Tree Saver is assembled and rigged up, the two cylinders act as stabilizer rods and work in parallel to facilitate the insertion and removal of a high-pressure tubing (mandrel) from the wellhead.

A lockdown union allows the cylinder to be locked into place when the Tree Saver is in its fully inserted position. When the mandrel is set in the well, the high pressure plug valve is immediately above the well tree, providing relatively easy access for rigging the injection piping and in the case of an emergency.

Advantages

The dual hydraulic cylinders allow for a shorter more compact Tree Saver design and simplifies the transportation and installation requirements.

The plug valve and frac head assembly can be installed using a single lockdown union decreasing the time required for rigging.



Dual Cylinder GN Tree Saver 4 1/2" High Flow Rate

Technical Specifications

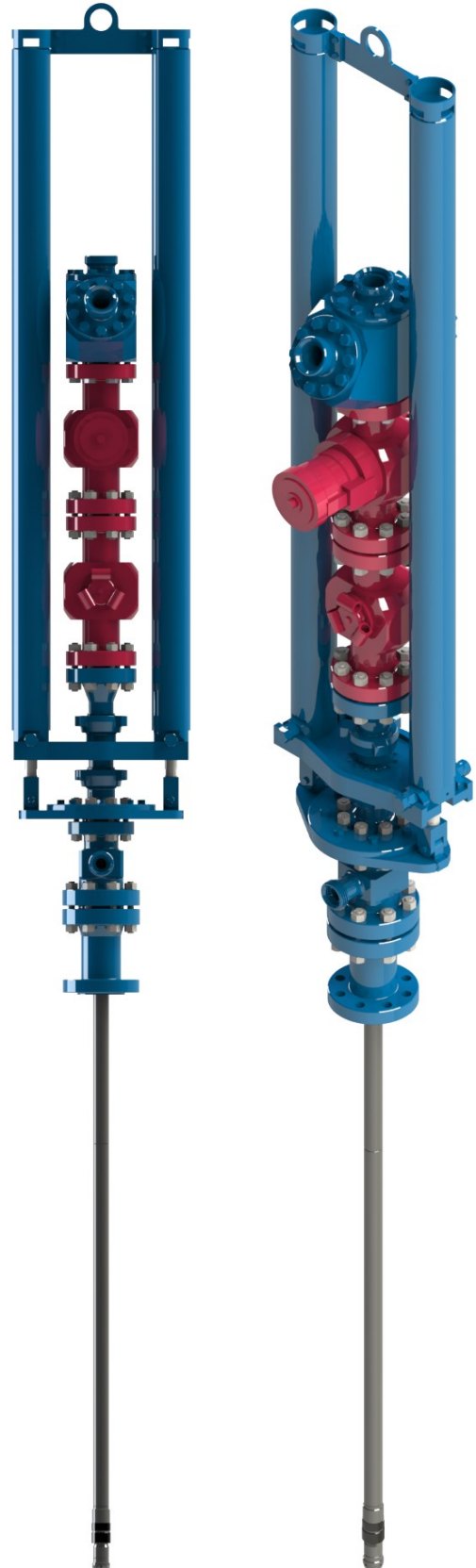
- Tubing/Casing Size 4 1/2"
- Hydraulic Cylinders Stroke of 93.25"
- Insertion Pressure up to 5,000 psi
- Flow Rate 65 bpm
- 6" 1502 Lockdown Hammer Union
- Plug Valve Manual 3 1/16" 15K
- Plug Valve Hydraulic 3 1/16" 15K
- Dual Frac Head 3 1/16" 15K x 3" 1502F (5x)
(4 lateral and 1 top connection)
- Flange Changeovers
3 1/16" 15K x 3" 1502M
4 1/16" 10K x 4 1/16" 5K
- Flange Changeover Tee
4 1/16" 10K (2x) x 2" 1502F
- Mandrels
Size: 4 1/2" Bore: 2.375" Length: 2, 5 ft
- Pack-off Nipples w/ Bull Nose
Size: 4 1/2" Tubing/Casing Weight: 11.6 and 15.1 lb/ft
- Hydraulic Power Unit, Diesel Engine, Hose Reels 75 ft
per line, Quick Connect Ends, Max WP of 2,250 psi



Dual Cylinder GN Tree Saver 2 7/8", 3 1/2", 4 1/2" and 5 1/2"

Technical Specifications

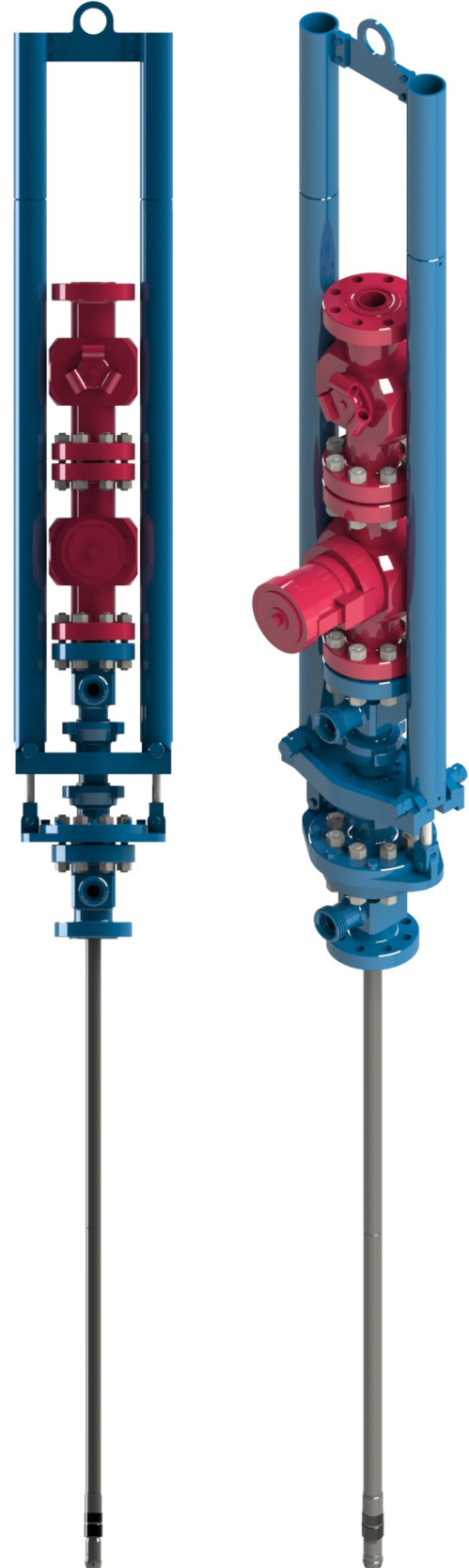
- Tubing/Casing Size 2 7/8", 3 1/2", 4 1/2" and 5 1/2"
- Hydraulic Cylinders Stroke of 93.25"
- Insertion Pressure up to 5,000 psi
- Flow Rate 26—35 bpm
- 3" 1502 Lockdown Hammer Union
- Plug Valve Manual 3 1/16" 15K
- Plug Valve Hydraulic 3 1/16" 15K
- Frac Head 3 1/16" 15K x 3" 1502F (3x)
(2 lateral and 1 top connection)
- Flange Changeovers
 - 3 1/16" 15K x 3" 1502M
 - 4 1/16" 10K x 4 1/16" 5K
- Flange Changeover Tee
 - 3 1/16" 10K x 4 1/16" 10K x 2" 1502F
- Mandrels
 - Size: 2 7/8" Bore: 1.50" Length: 4, 5 ft
 - Size: 3 1/2" Bore: 1.75" Length: 4, 5 ft
- Pack-off Nipples w/ Bull Nose
 - Size: 2 7/8" Tubing/Casing Weight: 6.5 lb/ft
 - Size: 3 1/2" Tubing/Casing Weight: 9.2 lb/ft
 - Size: 4 1/2" Tubing/Casing Weight: 12.6 and 13.5 lb/ft
 - Size: 5 1/2" Tubing/Casing Weight: 20.0 lb/ft
- Hydraulic Power Unit, Diesel Engine, Hose Reels 75 ft per line, Quick Connect Ends, Max WP of 2,250 psi



Dual Cylinder GN Tree Saver 2 7/8" and 3 1/2" with PES

Technical Specifications

- Tubing/Casing Size 2 7/8" and 3 1/2"
- Hydraulic Cylinders Stroke of 57.37"
- Insertion Pressure up to 5,000 psi
- Flow Rate 26—35 bpm
- 3" 1502 Lockdown Hammer Union
- Plug Valve Manual 3 1/16" 15K
- Plug Valve Hydraulic 3 1/16" 15K
- Plug Valve Manual 2" 1502 (2x)
- Flange Changeover Tees
 - 3 1/16" 15K x 2 9/16" 5K x 2" 1502F
 - 3 1/16" 15K x 3 1/8" 5K x 2" 1502F
 - 3 1/16" 15K x 2 9/16" 10K x 2" 1502F
 - 3 1/16" 15K x 3 1/16" 10K x 2" 1502F
 - 3 1/16" 15K x 3" 1502M x 2" 1502F
- Mandrels
 - Size: 2 7/8" Bore: 1.50" Length: 0.5, 1.5, 3, 5 ft
 - Size: 3 1/2" Bore: 1.75" Length: 0.5, 1.5, 3, 5 ft
- Pack-off Nipples w/ Bull Nose
 - Size: 2 7/8" Tubing/Casing Weight: 6.5 and 8.7 lb/ft
 - Size: 3 1/2" Tubing/Casing Weight: 9.3 and 12.95 lb/ft
- Hydraulic Power Unit, Electric Engine, Hose Reels 82 ft per Line, Quick Connect Ends, Max WP of 2,250 psi
- GN Pressure Equalizing System (PES) with 12 ft hose



Dual Cylinder GN Tree Saver 2 7/8" and 3 1/2"

Technical Specifications

- Tubing/Casing Size 2 7/8" and 3 1/2"
- Hydraulic Cylinders Stroke of 93.25"
- Insertion Pressure up to 5,000 psi
- Flow Rate 26—35 bpm
- 3" 1502 Lockdown Hammer Union
- 3" 1502F Connection for Valve Assembly
- Flange Changeover Tees
 - 3 1/16" 15K x 2 9/16" 10K x 2" 1502F
 - 3 1/16" 15K x 3 1/16" 10K x 2" 1502F
- Mandrels
 - Size: 2 7/8" Bore: 1.50" Length: 1, 2, 3, 5 ft
 - Size: 3 1/2" Bore: 1.75" Length: 1, 2, 3, 5 ft
- Pack-off Nipples w/ Bull Nose
 - Size: 2 7/8" Tubing/Casing Weight: 6.4/6.5 lb/ft
 - Size: 3 1/2" Tubing/Casing Weight: 9.2/9.3 and 10.2 lb/ft



Dual Cylinder GN Tree Saver 3 1/2" and 4 1/2" High Flow Rate

Technical Specifications

- Tubing/Casing Size 3 1/2" and 4 1/2"
- Hydraulic Cylinders Stroke of 93.25"
- Insertion Pressure up to 5,000 psi
- Flow Rate 35—65 bpm
- 6" 1502 Lockdown Hammer Union
- 3" 1502F Connection for Valve Assembly
- Flange Changeovers
 - 4 1/16" 10K x 3 1/8" 5K
 - 4 1/16" 10K x 4 1/16" 5K
- Mandrels
 - Size: 3 1/2" Bore: 1.75" Length: 2, 5 ft
 - Size: 4 1/2" Bore: 2.375" Length: 2, 5 ft
- Pack-off Nipples w/ Bull Nose
 - Size: 3 1/2" Tubing/Casing Weight: 9.3 lb/ft
 - Size: 4 1/2" Tubing/Casing Weight: 12.6 lb/ft
- Hydraulic Power Unit, Diesel Engine, Hose Reels 75 ft per line, Quick Connect Ends, Max WP of 2,250 psi



Single Cylinder GN Tree Saver

Description

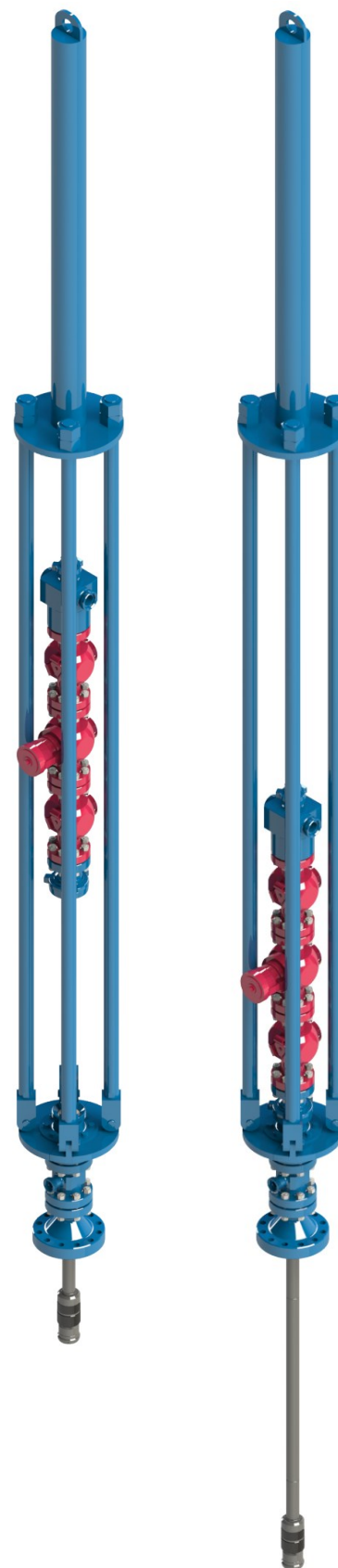
The Single Cylinder GN Tree Saver is a GN design where the hydraulic cylinder is centered directly over the wellhead. When the Tree Saver is assembled and rigged up, the cylinder's piston rod is movable between four stabilizer rods. This facilitates the insertion and removal of a vertically aligned high-pressure tubing (mandrel) from the wellhead.

After installation on the wellhead, the piston rod connection to the frac head and four stabilizer rods can be disengaged in order to allow the top portion of the Tree Saver to be removed. This also allows for a high flow rate frac head with multiple lateral connections to be installed on the Tree Saver and used during treatment operations.

Advantages

The single hydraulic cylinder eliminates the problem of opposing hydraulic cylinders working against each other if they are not moving at the same speed.

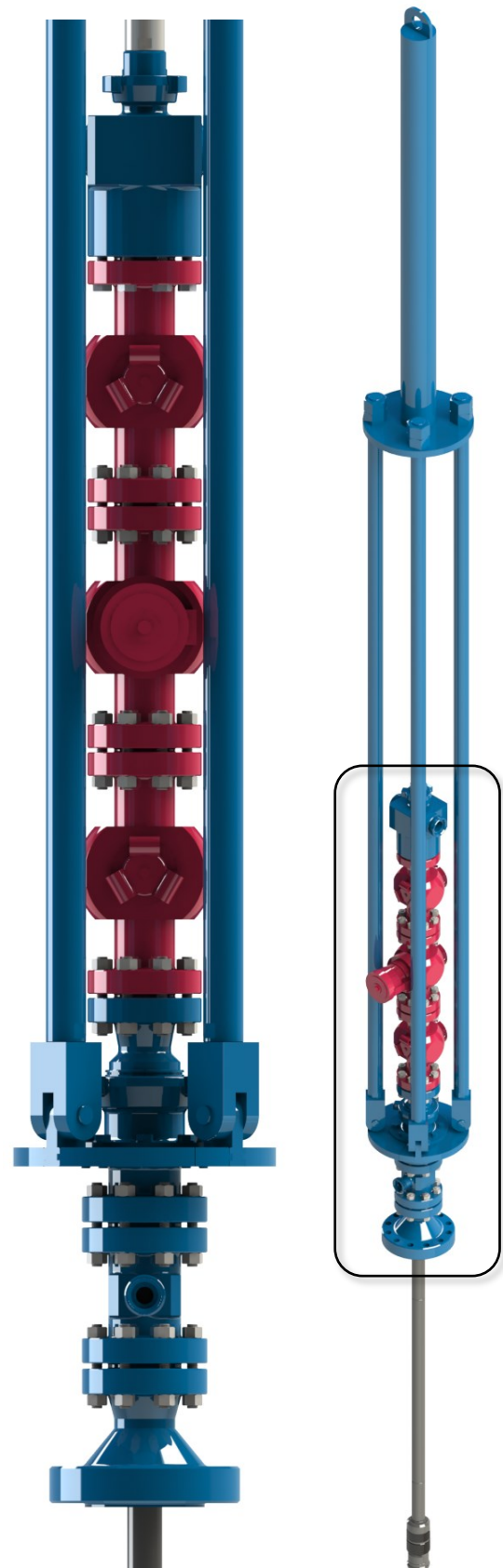
This design provides operators more flexibility to install their own high flow rate frac head and rig injection piping to it from multiple sides.



Single Cylinder GN Tree Saver 4 1/2", 5", 5 1/2" and 7"

Technical Specifications

- Tubing/Casing Size 4 1/2", 5", 5 1/2" and 7"
- Hydraulic Cylinders Stroke of 110"
- Insertion Pressure up to 5,000 psi
- Flow Rate 65 bpm
- 6" 1502 Lockdown Hammer Union
- Plug Valve Manual 3 1/16" 15K (2x)
- Plug Valve Hydraulic 3 1/16" 15K
- Frac Head 3 1/16" 15K x 3" 1502F (3x)
(2 lateral and 1 top connection)
- Flange Changeovers
 - 4 1/16" 10K x 5 1/8" 5K
 - 4 1/16" 10K x 5 1/8" 10K
 - 4 1/16" 10K x 7 1/16" 5K
 - 4 1/16" 10K x 7 1/16" 10K
- Flange Changeover Tee
 - 4 1/16" 10K (2x) x 2" 1502F
- Mandrels
 - Size: 4 1/2" Bore: 2.375" Length: 1, 4, 4.5, 5 ft
- Pack-off Nipples w/ Bull Nose
 - Size: 4 1/2" Tubing/Casing Weight: 12.6 and 15.5 lb/ft
 - Size: 5" Tubing/Casing Weight: 18.0 lb/ft
 - Size: 5 1/2" Tubing/Casing Weight: 20.0 and 26.0 lb/ft
 - Size: 7" Tubing/Casing Weight: 32.0 lb/ft
- Hydraulic Power Unit, Diesel Engine, Hose Reels 82 ft per line, Quick Connect Ends, Max WP of 3,000 psi



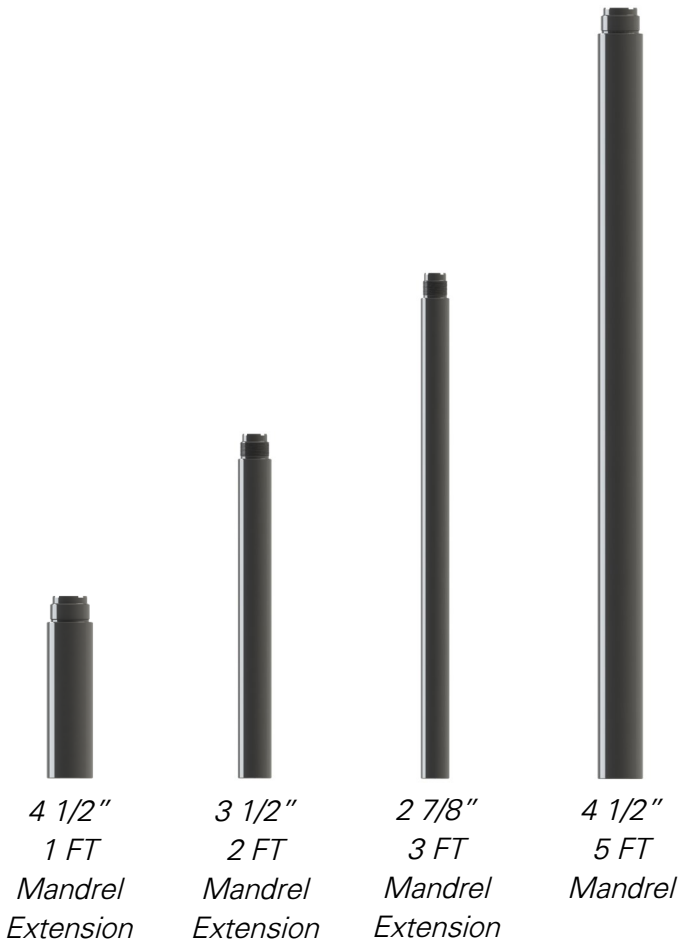
GN Tree Saver Accessories

High Pressure Mandrels

GN Tree Savers utilize a combination of mandrels to make up the high-pressure tube that allows treating fluids to be injected into the well tubing without contacting the wellhead valves and fittings. The mandrels are heavy walled pipes, with a working pressure of 15,000 PSI.

GN can produce mandrels of varying nominal sizes of API tubing with different diameters per each size.

Our mandrels come in a variety of lengths based on customer requirements. The standard length being 5 FT with extensions ranging from 1/2 FT to 4 1/2 FT.



Pack-off Nipples

The GN Tree Saver uses one or two pack-off nipples in combination with a guiding bullnose to seal the high pressure mandrel to the production tubing.

GN is able to produce pack-off nipple's required for a variety of production tubing/casing sizes and weights.



GN Pressure Equalizing System (PES)

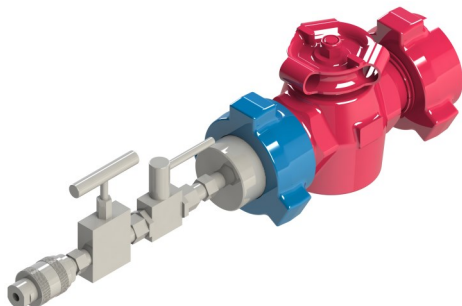
The GN Pressure Equalizing System allows operators to have precise control over the flow and pressure in the Tree Saver during insertion and retraction of the high pressure mandrel into the production tubing.

During insertion, pressure can be equalized below and above the wellhead master valve without opening the master valve. This gives operators additional flexibility during installation of the Tree Saver on the wellhead.

When retracting the mandrel, a pressure differential is created between the interior of the mandrel that is open to the production tubing and its exterior facing the wellhead walls. Using the system operators can equalize this differential pressure in order to safely unseal the pack-off nipples from the production tubing thereby protecting the wellhead and tree saver from dangerous hydraulic shock loading.

Technical Specifications

- 1/2" 15K Quick Connect Line with a 12 ft hose
- 2" 1502 manual plug valves for flow control
- Hammer union connections for quick removal
- Precise pressure control using a combination of ball and needle valves on each end of the line
- Tees can be plugged when not using the system
- Fully configurable to fit customer requirements



GN Hydraulic Power Unit (HPU)

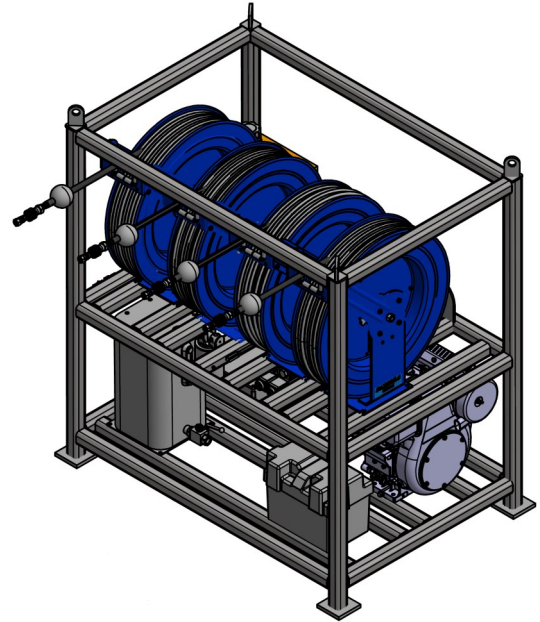
The GN Tree Saver can be equipped with a dual function diesel or electric driven Hydraulic Power Unit. It provides a reliable solution to Tree Saver operations even in the most remote well sites.

The HPU works to supply fluid for operating the Tree Saver's hydraulic cylinders and optional hydraulic plug valve. Designed with two separate hydraulic circuits for independent operation of the cylinders and plug valve, it allows for greater flexibility while performing job operations.

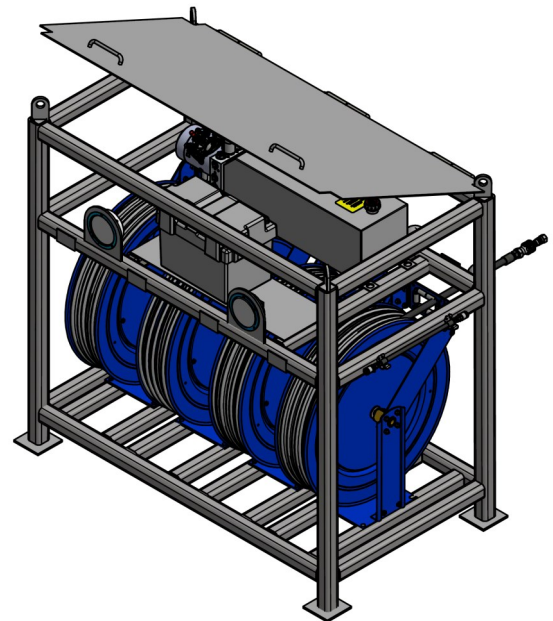
Technical Specifications

GN Hydraulic Power Units can be designed and modified to match customer requirements.

- Diesel engine or electric motor option
- 4 reels of 75 FT 3/8" hydraulic hose
- Hydraulic Tank with 5 gallon capacity
- 12V DC battery power
- Aluminum frame design
- Hydraulic oil pressure gauges
- Hose reels equipped with air purge lines
- Suitable for crane and forklift transportation
- Multifunction remote control with 18 FT cable



*Diesel Engine
Hydraulic Power Unit*



*Electric Motor
Hydraulic Power Unit*

GN Fracturing Heads

GN manufactures a variety of frac heads of different arrangements, sizes, connections and flow rates to fit the Tree Saver.

All of our frac heads can be designed to match specific customer requirements.



*3 1/16" 15K x 3" 1502 F (3x)
65 BPM Frac Heads*



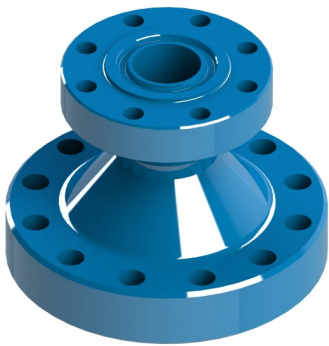
*4 1/16" 15K x 3" 1502F (6x)
120 BPM Frac Head*

GN Flange Changeovers and Tees

GN produces changeovers and tees to fit a variety of wellheads. They can be configured in flange and hammer union ends.

We are able to design to customer specifications with varying pressure ratings and sizes.

Typical configurations shown below.



*4 1/16" 10K x 7 1/16" 10K
Flange Changeover*



*3 1/16" 15K x 6" 1502M
Flange Changeover*



*3 1/16" 10K x 4 1/16" 10K
x 2" 1502F
Flange Tee*

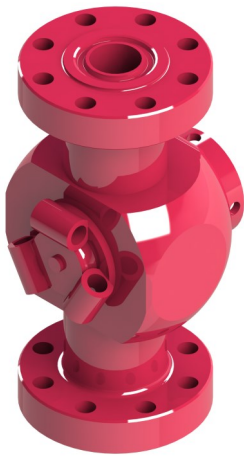


*3 1/16" 15K x 3" 1502M
x 2" 1502F
Flange Tee*

Tree Saver Compatible Valves

GN Tree Savers can be equipped with a variety of valves based on customer requirements. Different sizes and valve types such as plug and gate in both flanged and hammer union configuration are available.

Valves used in our equipment are sourced from companies such as FMC, WEIR-SPM, MSI and others. Typical sizes and configurations shown below.



*3 1/16" 15K psi BX154
Manual Plug Valve*



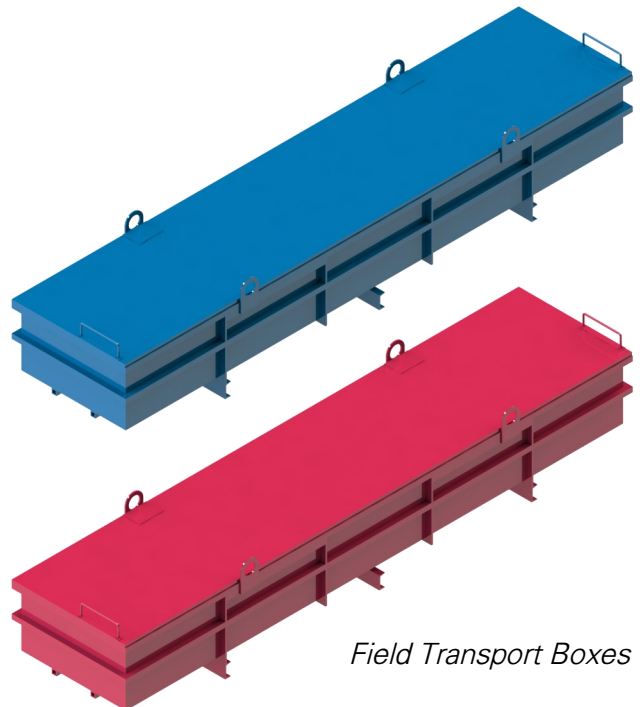
*3 1/16" 15K psi BX154
Hydraulic Plug Valve*



*2" and 3" 1502 15K psi
Manual Plug Valve*

Additional Accessories and Appearance

- Steel Transport Box for secure field transportation and storage of the Tree Saver and accessories.
- GN Tree Savers and accessories can be painted in any color combination as requested by customers.



Field Transport Boxes

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