



QROIL PRODUCTS
WELL COMPLETIONS



Oilfield

Sand Control System

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SAZ Screens

SAZ Oilfield offers a wide range of products and services for Sand Control and Flow Control Applications. The screens are designed and qualified in accordance with API 19S.

We address our customers' diverse sand control challenges with focus on complete Sand Management Solution cycle – Design, Execute and Evaluate. Our in-depth domain expertise, complimented with large portfolio of Screens, ICDs and Sand Control Tools enable us to deliver enhanced Sandface Completions.

SAZ provides solutions for Heavy Oil, Conventional Oil and High Rate Gas applications in both onshore and offshore fields. Combining our Sand Screens with Passive and On/Off ICD technology, provide customers flexibility to manage drawdown and injectivity in both carbonate and sandstone reservoirs. Combining best in class hardware with our modelling capabilities delivers long term optimized solutions for various reservoir types.

SAZ Screen products are complemented with a complete portfolio of Centralizers, Running Tools, Liner Hanger & Accessories to ensure successful deployment of our screens in both Cased and Open Hole Completions.

	Screen Media	Screen Type	Passive Flow Control	Dynamic Flow Control
PRODUCT FAMILIES	Premium Weave Or MaxPerm 3D	SazPrime HD	FloPrime HD	FloPort HD
		SazPrime MD	FloPrime MD	FloPort MD
		SazPrime SD	FloPrime SD	FloPort SD
	Direct Wire Wrap	SazPro DW	FloPrime DW	FloPort DW
	Slip on Wire Wrap	SazPro SW	FloPrime SW	FloPort SW
	Pre-Pack	SazPac		

SazPrime Premium Mesh Screens offer a unique design incorporating multiple diffusion bonded layers of woven metal mesh, creating a single monolithic sand control screen which is robust and has enhanced filtration characteristics.

SazPro Wire Wrap Screens are available in both Slip-On and Direct Wrap options. Direct Wrap screens allow tension, compression and torque ratings that are comparable to the basepipe. High Open Flow Area options are also available.

SazPac Pre Pack Screens offer robust and economical solution as an alternate to gravel packing in certain applications. Available in various configurations of Wire Wrapped inner and outer jackets, along with various sand packing options viz. Ceramic Proppant, Resin Coated Gravel and Natural Sieved Gravel.

FloPrime offering combines our nozzle based, viscosity independent ICDs with SazPrime and SazPro screens.

FloPort offering further integrates our passive ICDs with mechanical Sliding Sleeve for an On/Off ICD system which can be optionally coupled with various screen types. An additional Stimulation Port can be provided for a Three Position FloPort.

SAZ Modular Screen plant

SAZ Screen's manufacturing capabilities allows for flexibility on manufacturing location to support customer with their local content initiatives. Our Modular assembly plant can be quickly mobilized to enable local assembly of our proprietary pre-fabricated premium screens (SazPrime) and ICDs (FloPrime) on customer supplied base pipe, thereby reducing lead times and optimizing client inventory.

SAZ's unique, patent pending, manufacturing process enables us to take a fixed set-up factory type manufacturing process for sand control screens and flow control devices and convert it into a portable manufacturing facility that can be commissioned at the required site.

The Modular Screen Plant exceeds the quality requirements of a traditional plant by rigorously following the ISO 9001 and API Q1 quality process. The screens are designed and qualified in accordance with API 19S.

A key enabler to this invention is the modular screen section. The 4ft ready to assemble screen modules, locally available basepipe and SAZ's portable manufacturing set-up allows delivery of final product at end user's doorstep in minimum possible time.

Advantages of portable manufacturing facility are:

- ⊙ Smaller footprint compared to a traditional screen assembly plant;
- ⊙ Shorter turnaround time for setting-up a factory
- ⊙ Lower capital expenditure
- ⊙ Allows local manufacturing in locations where it would otherwise be economically unviable to do so or where existing infrastructure is not suitable for large plants
- ⊙ Reduces lead time by utilizing base pipe from local sources such as client's existing inventory
- ⊙ Improves inventory management for end users.

Modular Plant Features:

Container based plant set-up

- ⊙ Basepipe drilling unit
- ⊙ Deburring/cleaning unit
- ⊙ Crimp and welding unit
- ⊙ Pipe decks (disassembled)
- ⊙ Drill and Tap unit

Local set-up requirements

- ⊙ Workshop (covered) with level concrete floor
- ⊙ Mechanical lifting facility (forklifts)
- ⊙ Factory licenses (fire/municipal/labor/electricity)
- ⊙ Electricity and water supply.
- ⊙ Waste management - solids and liquids.



SAZ Premium Screens

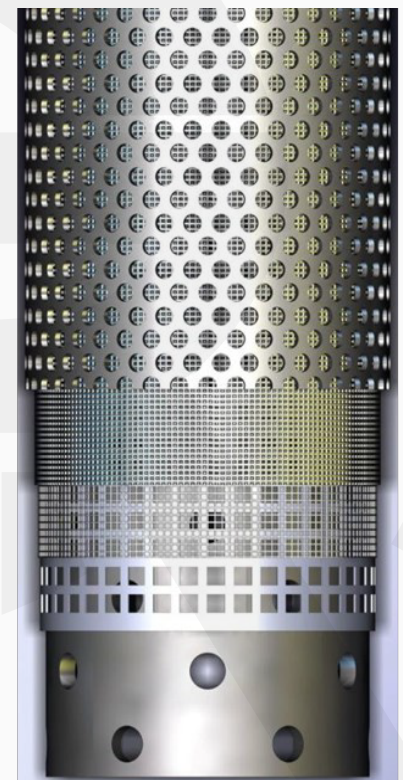
SazPrime Premium metal mesh sand control screens offer a unique screen design incorporating multiple diffusion bonded layers of woven metal mesh, creating a single monolithic sand control screen which is robust and has enhanced filtration specific characteristics.

Features

- ⊙ Available in multiple configurations – combinations of number of filter layers, support layer and inner and outer shroud options.
- ⊙ Available in various weave type – square, dutch, reverse dutch and SAZ exclusive Broadcast 3D weave.
- ⊙ Broadcast is a multiple pore sintered media that uses a combination of broad pore size range and high porosity to increase sand retention at all particle sizes with minimum plugging.
- ⊙ Maximum initial and retained permeability compared to other screen options.
- ⊙ Unique design eliminates all welds within the filter media resulting in a stronger overall structure and the elimination of any potential faulty welds.
- ⊙ Precise woven metal mesh laminates achieve optimal filtration, uniform flow and mechanical strength.
- ⊙ Diffusion bonded (sintered) designs result in a robust monolithic structure that provides fixed pore geometry.
- ⊙ Fully annealed alloy provides superior corrosion protection.
- ⊙ Available in standard SS alloys and Alloy 20.

Applications

- ⊙ Openhole and Cased-hole completions.
- ⊙ Vertical, deviated and horizontal completions for oil and gas wells.
- ⊙ Inflow and Injection control wells.
- ⊙ Thermal applications.
- ⊙ Stand alone and gravel pack completions.
- ⊙ Pump protection.



SAZ Premium Screens

SazPrime HD is as high strength premium screen design for applications that need high burst and collapse pressure screens. The screen design incorporates a multi-layer construction wherein the filter layer is supported by a drainage layer below and a support layer outside. The number of sintered layers in the screen can vary between two to four layers depending on the application type. Multiple sintered layer provides the screen with high burst and collapse ratings.

Perforated shroud on the outside protects the screen media and provides a large surface flow area. The diffusion bonded layers with high performance mesh is designed for harsh environments.

Screen's pore structure does not change under high deployment and operating stress loads. The screen pore structure stops heterogeneous sands, resists plugging, promotes high retained permeability, and resists erosion which are key factors for unconsolidated and heterogeneous long horizontal wells.



SazPrime HD High Pressure Premium Screen					
Basepipe Nominal OD (in)	Nominal ID inches (ppf)	Screen OD (in)	Perf size (in)	Perf Density (HPF)	Pipe Open Flow Area (%)
3.5	2.992 (9.2)	4.078	0.375	96	8.0%
4	3.476 (11)	4.578	0.5	72	9.4%
4.5	4.000 (11.6)	5.048	0.5	72	8.3%
5	4.408 (15)	5.578	0.5	84	8.8%
5.5	4.892 (17)	6.078	0.5	96	9.1%
6.625	5.921 (24)	7.228	0.5	108	8.5%

Note: Screens available with API/Premium/Flush thread connections

SAZ Premium Screens

SazPrime MD is a modular screen design that offers a monolithic screen cartridge that can be assembled locally as part of our Modular Screen plant set-up. This screen is ideal for projects that require high local content by enabling local assembly of screens on customer supplied base pipe. This proprietary screen design includes a spiral shroud on the outside of filter layer and a perforated support plate beneath the control layer. The unique perforated drainage layer adds to the strength of the screen assembly. Perforated shroud on the outside protects the screen and provide for a large surface flow area. It is a high-performance screen design that offers high burst and collapse ratings.

The diffusion bonded layers with high performance mesh is designed for harsh environments. Screen's pore structure does not change under high deployment and operating stress loads. The screen pore structure stops heterogeneous sands, resists plugging, promotes high retained permeability, and resists erosion which are key factors for unconsolidated and heterogeneous long horizontal wells.

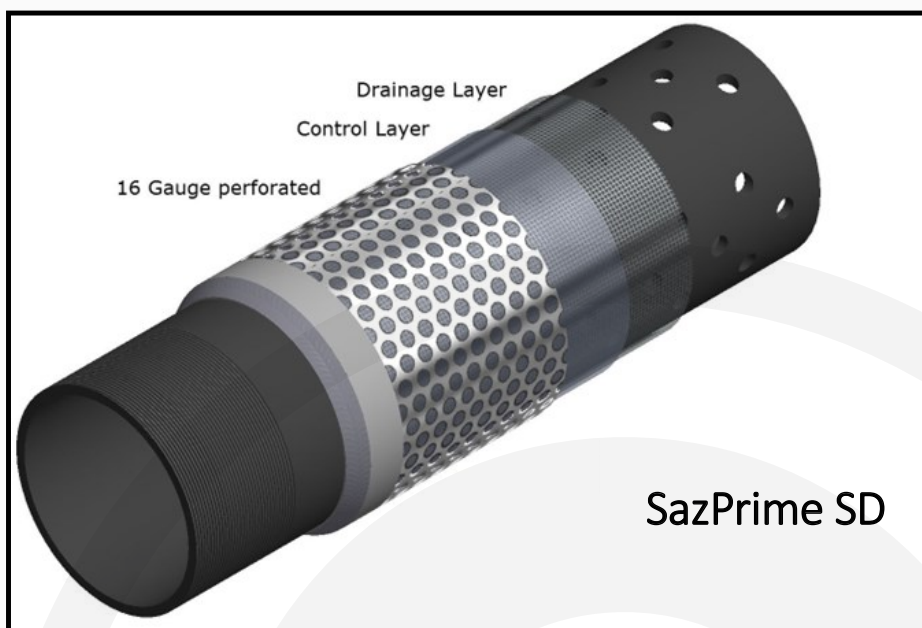


SazPrime MD Modular Premium Screen					
Basepipe Nominal OD (in)	Nominal ID inches (ppf)	Screen OD (in)	Perf size (in)	Perf Density (HPF)	Pipe Open Flow Area (%)
4	3.476 (11)	4.58	0.5	72	9.4%
4.5	4.000 (11.6)	5.08	0.5	72	8.3%
5	4.408 (15)	5.58	0.5	84	8.8%
5.5	4.892 (17)	6.08	0.5	96	9.1%
6.625	5.921 (24)	7.23	0.5	108	8.5%

Note: Screens available with API/Premium/Flush thread connections

SAZ Premium Screens

SazPrime SD is a standard premium screen design for applications where high collapse and burst pressure screens are not required. It's unique construction method - filter / control layer supported by a drainage layer and a perforated shroud on the outside – are all sintered together as a sheet and then rolled into jackets. This fully integrated shroud with high performance mesh can be adoptive for various applications. Screen's pore structure does not change under high deployment and operating stress loads typical of thermal heavy oil horizontal wells. The screen pore structure stops heterogeneous sands, resists plugging, promotes high retained permeability, and resists erosion which are key factors for unconsolidated and heterogeneous long horizontal wells.



SazPrime SD Standard Premium Screen					
Basepipe Nominal OD (in)	Nominal ID inches (ppf)	Screen OD (in)	Perf size (in)	Perf Density (HPF)	Pipe Open Flow Area (%)
3.5	2.992 (9.2)	3.86	0.375	96	8.0%
4	3.476 (11)	4.36	0.5	72	9.4%
4.5	4.000 (11.6)	4.86	0.5	72	8.3%
5	4.408 (15)	5.37	0.5	84	8.8%
5.5	4.892 (17)	5.87	0.5	96	9.1%
6.625	5.921 (24)	7.01	0.5	108	8.5%

Note: Screens available with API/Premium/Flush thread connections

SAZ Wire Wrap Screens

SazPro Wire Wrap screens provide field-proven and reliable sand control solution. SazPro SW (Slip-on Wire Wrap) consists of wire wrapped jacket manufactured separately from the base pipe. SazPro SW pre-fabricated jacket is slipped on to perforated base pipe and welded with end rings to the base pipe providing option for modular make-up on customer supplied base pipe. This screen is ideally suited for Cased Hole Application.

SazPro DW (Direct Wire Wrap) consists of wire directly wrapped around the base pipe thereby providing high strength screen with mechanical properties equivalent or greater than the unperforated liner. This screen is ideally suited for Open Hole Application with long lateral and for wells with high dogleg severity.

Features

- ⦿ Consistent, accurate slot openings for reliable sand control
- ⦿ Customized slot openings depending on Particle Size Distribution
- ⦿ Available in various base pipe sizes and net screen lengths
- ⦿ Available in various metallurgy of wire including standard 316L and Alloy 20.
- ⦿ Various design of wire available depending on application such as Keystone and House shaped wires
- ⦿ Can be handled with standard casing handling equipment thereby reducing rig time

Applications

- ⦿ Openhole and cased-hole completions.
- ⦿ Vertical, deviated and horizontal completions for oil and gas wells.
- ⦿ Thermal applications such as SAGD wells.
- ⦿ Stand alone, gravel pack and frac pack completions.
- ⦿ Pump protection.



SAZ Wire Wrap Screens

SazPro SW Wire Wrap Screens					
Basepipe Nominal OD (in)	Nominal ID inches (ppf)	Screen OD (in)	Perf size (in)	Perf Density (HPF)	Pipe Open Flow Area (%)
2.375	1.995 (4.6)	2.86	0.375	48	5.9%
2.875	2.441 (6.4)	3.38	0.375	60	6.1%
3.5	2.992 (9.2)	4.06	0.375	72	6.0%
4	3.476 (11)	4.55	0.5	48	6.2%
4.5	4.000 (11.6)	5.08	0.5	60	6.9%
5	4.408 (15)	5.62	0.5	60	6.2%
5.5	4.892 (17)	6.08	0.5	72	6.8%
6.625	5.921 (24)	7.12	0.5	84	6.6%
7	6.276 (26)	7.58	0.5	84	6.2%

SazPro DW Direct Wrap Screens					
Basepipe Nominal OD (in)	Nominal ID inches (ppf)	Screen OD (in)	Perf size (in)	Perf Density (HPF)	Pipe Open Flow Area (%)
2.375	1.995 (4.6)	2.76	0.375	48	5.9%
2.875	2.441 (6.4)	3.28	0.375	60	6.1%
3.5	2.992 (9.2)	3.96	0.375	72	6.0%
4	3.476 (11)	4.45	0.5	48	6.2%
4.5	4.000 (11.6)	4.98	0.5	60	6.9%
5	4.408 (15)	5.52	0.5	60	6.2%
5.5	4.892 (17)	5.98	0.5	72	6.8%
6.625	5.921 (24)	7.02	0.5	84	6.6%
7	6.276 (26)	7.48	0.5	84	6.2%

Note: Screens available with API/Premium/Flush thread connections

SAZ Pre-Pack Screens

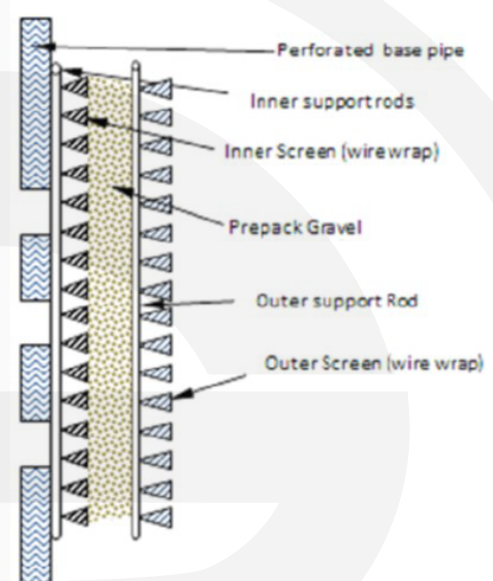
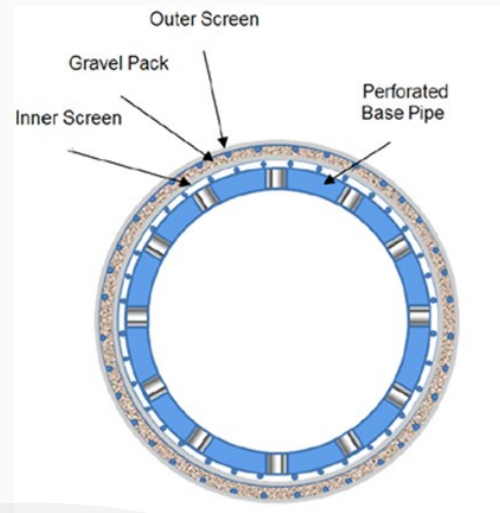
SazPac PrePack screens offer a robust and economical solution as an alternate to gravel pack in certain applications or used as a screen in gravel pack applications where achieving 100% packing is difficult – risk of premature screen outs. The PrePack screen will act as back-up against voids.

Features

- ⊙ Available in various configuration of Wire Wrapped inner screen jacket and outer screen jacket
- ⊙ Consists of Keystone shaped jacket wire and round wire as support rod providing a high flow and strong screen construction
- ⊙ Available in various sand packing – ceramic proppant, resin coated gravel, natural gravel.
- ⊙ Available in various base pipe sizes and net screen lengths.
- ⊙ High open flow area and sand retention characteristics
- ⊙ Rigorous Q&A process ensures no voids in the proppant pack
- ⊙ Long Life performance in harsh environment
- ⊙ Rig time saving

Applications

- ⊙ Economic solution as compared with gravel pack
- ⊙ Shallow wells and workover programs where sand control is required, but budget limitations on doing side tracks
- ⊙ Open Hole and Cased hole completions
- ⊙ Vertical, deviated and horizontal completions for oil and gas wells



SAZ Pre-Pack Screens

SazPac Pre-Pack Screens						
Basepipe Nominal OD (in)	Nominal ID inches (ppf)	Gravel thickness (inches)	Screen OD (in)	Perf size (in)	Perf Density (HPF)	Pipe Open Flow Area (%)
2.375	1.995 (4.6)	0.250	3.577	0.375	48	5.9%
2.875	2.441 (6.4)	0.250	4.077	0.375	60	6.1%
3.5	2.992 (9.2)	0.250	4.702	0.375	72	6.0%
4	3.476 (11)	0.250	5.202	0.5	48	6.2%
4.5	4.000 (11.6)	0.250	5.702	0.5	60	6.9%
5	4.408 (15)	0.250	6.202	0.5	60	6.2%
5.5	4.892 (17)	0.250	6.702	0.5	72	6.8%
6.625	5.921 (24)	0.250	7.835	0.5	84	6.6%
7	6.276 (26)	0.250	8.202	0.5	84	6.2%

Note: Screens available with API/Premium/Flush thread connections

SAZ Flow Control

SAZ Oilfield offers a wide range of products and services for Sand Control and Flow Control applications via our SAZ Screen product line. SAZ Screens provide solutions for Heavy Oil, Conventional Oil and High Rate Gas applications. Combining our Sand Screens with Passive and On/Off ICD technology, provide customers flexibility to manage drawdown and injectivity in both carbonate and sandstone reservoirs. Combining best in class hardware with our modelling capabilities delivers long term optimized solutions for various reservoir types.

FloPrime & FloPort

FloPrime offering combines our nozzle based, viscosity independent passive ICDs with SazPrime (premium mesh) and SazPro (wire wrapped) screens.

FloPort offering further integrates our passive ICDs with mechanical Sliding Sleeve for an On/Off ICD system which can be optionally coupled with various screen types. An additional Stimulation Port can be provided for a Three Position FloPort.

FloPrime ICD Nozzles

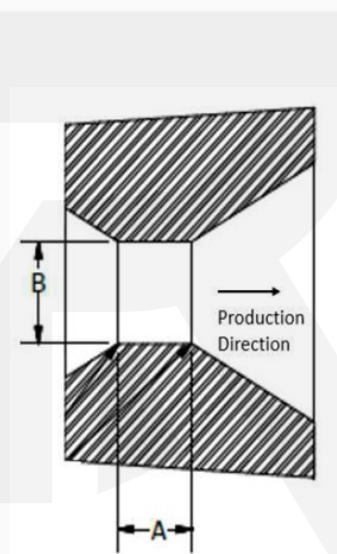
Prime Flow Nozzle are designed to deliver an almost constant discharge coefficient at various Reynold no. (Re) and are viscosity independent. Prime Flow Nozzle have good pressure recovery and at the same time are erosion/corrosion resistant.

Features

- ⊙ ICD nozzles with throat sizes 1.2mm, 1.6mm, 2.5mm, 3.2mm & 4mm.
- ⊙ Nozzle aspect ratio (nozzle throat length (A) / nozzle throat diameter (B)) less than or equal to 0.8.
- ⊙ Nozzle material - Incoloy or any superior metallurgy to resist erosion and corrosion over the well life of 20years.
- ⊙ Complete viscosity independence for ICD module for viscosity ranges from 2-50CP.
- ⊙ Discharge co-efficient of nozzle is almost constant value (+/-10%) up to 300 Reynold number (300-10000Re).
- ⊙ Nozzle have diffuser for excellent pressure recovery.

Applications

- ⊙ Production and injection wells requiring flow control
- ⊙ Vertical, deviated and horizontal completions
- ⊙ Sandstone and carbonate reservoirs (both homogeneous and heterogeneous)
- ⊙ Cased hole and openhole completions



SAZ Gravel Pack System

SAZ Gravel Pack System uses field-proven products and services to enhance well life by mitigating sanding challenges in unconsolidated reservoirs. The single-zone, cased hole gravel-packing system uses a simple and robust tool design.

Gravel Pack (GP), High-Rate Water Packs (HRWP) and Frac-Packs (FP) are various methods to provide long term sand control in Cased Hole Completions. In gravel pack operations, a screen is placed in the wellbore and the surrounding annulus and perforation tunnels are packed with high permeability gravel/proppant properly sized to prevent the passage of formation sand into wellbore. It is critical to completely pack the space between the screen and formation to prevent the movement of formation sand into wellbore.

SAZ's in-depth domain expertise, combined with our large portfolio of sand screens and sand control tools enable us to deliver enhanced Sandface completions.

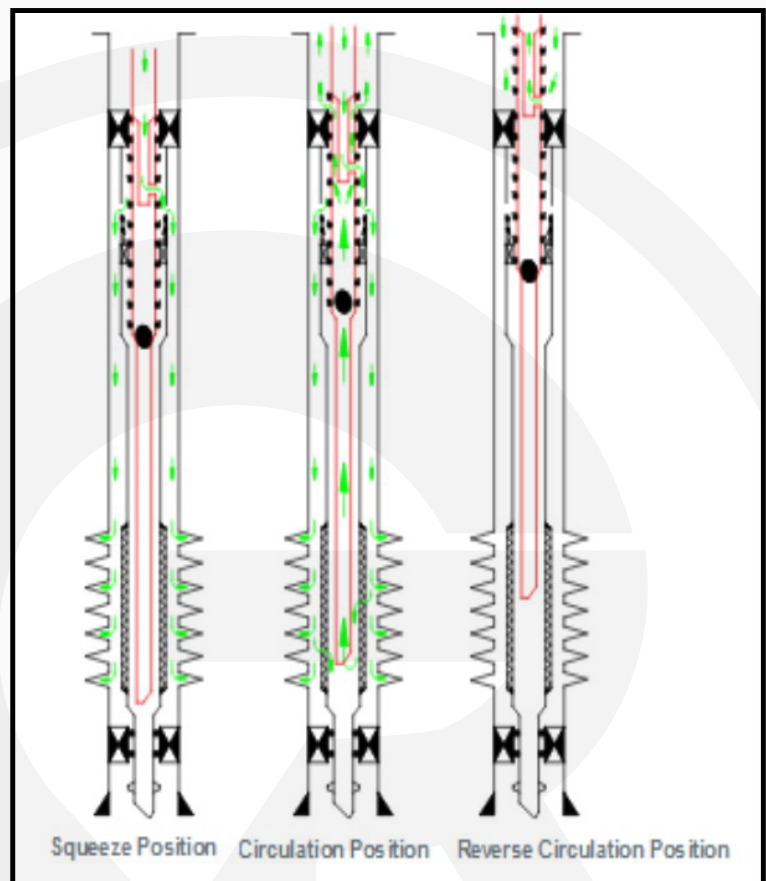
Our Gravel Pack System combines GPrime SR Retrieval Seal Bore Packer and GPrime Gravel Pack Crossover Service Tool to perform reliable GP, HRWP and FP in Cased Hole. The same tool is used to deploy Stand Alone Screens in Open Hole with ability to washdown and displace the filter cake.

Features

- ⊙ Packer setting and service tool release achieved through pressure and vertical movement
- ⊙ Contingency rotational feature to release tool from the Gravel Pack Packer
- ⊙ High Tail Load capacity to deploy liners and screens in long horizontal wells
- ⊙ Positive position indicating mechanism
- ⊙ Setting tool is rotationally locked to the packer to allow torque transmission for deployment of assemblies in tortuous well paths

Applications

- ⊙ Cased hole Gravel Pack and High-Rate Water Packs
- ⊙ Open hole standalone screens applications with filtercake treatment
- ⊙ Deep, deviated and horizontal wells



SAZ Gravel Pack System

GPrime SR Retrievable Seal Bore Packer

GPrime SR Retrievable Seal Bore Packers are fully retrievable, high performance gravel pack and production packers. The packer is fully compatible with sealing system that consists of Seal Units, Self-Aligning Guide Shoe, Snap Latch or Anchor Latch Locator. The packer is tested and qualified in accordance with ISO V-3 and rated to 7,500-psi Differential Pressure at 250 degF. High pressure and temperature system available on request.

GPrime SR packer is set with GPrime Gravel Pack Service Tool and retrieved with GPrime Retrieving Tool using simple straight pull.

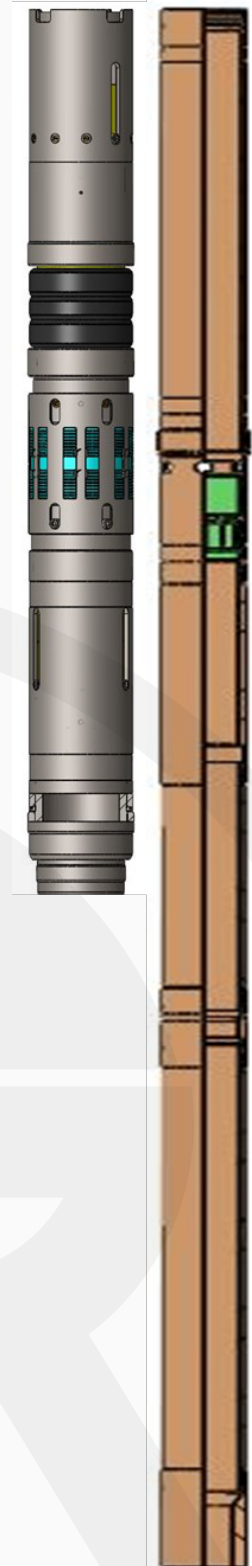
Features

- ⊙ Short overall length facilitates easy running and retrieving through doglegs, tight spots, and short radius curves
- ⊙ Single, self-energizing packing element for repeated low and high differential pressure reversals
- ⊙ Packing element is totally enclosed by chemically resistant, zero extrusion backup system to ensure extended downhole life
- ⊙ High Flow Annular Bypass for displacement of fluid behind packer
- ⊙ Cast iron construction of the exterior components allow emergency milling of the packer should it be impossible to retrieve by the conventional method (i.e. a straight pull)
- ⊙ A hydraulically operated interlocking device, incorporated into the setting sleeve prevents the pre-setting of the packer during running in.

GPrime Gravel Pack Extension

GPrime Gravel Pack Extension incorporates gravel-packing-ports sub with a closing sliding sleeve above a seal bore sub. The lower extension allows spacing the position indicating-cum-shifting tool to ensure proper shifting to various positions during gravel pack operations.

When the GPrime Gravel Pack Service Tool is pulled after completion of the gravel pack, the Shifting collet closes the Sliding Sleeve as it is pulled through. Capable to pump slurry of 10 ppg up to 20 bbls/min. and capable of handling 50,000 lbs of high strength proppant.



GPrime SR Retrievable Seal Bore Packer			
Casing Size (in)	Weight (ppf)	Seal Bore (in)	Packer OD (in)
9-5/8"	47-53.5	6	8.33
7"	26-29	4	5.99
	32-35		5.82
5-1/2"	13-20	3	4.63

SAZ Gravel Pack System

GPrime Gravel Pack Service Tool

GPrime Gravel Pack Service Tool consists of three modules-

- ⇒ Top module – setting-retrieving mechanism
- ⇒ Multiport module – crossover-circulating mechanism
- ⇒ Lower module – check valve-indicating mechanism

Top module – setting-retrieving mechanism

- ⊙ Tubing pressure actuated setting tool used in gravel pack operations.
- ⊙ Short and compact -Increases the efficiency of handling, shipping, and storing as well as operations on the rig.
- ⊙ Simple construction using minimum number of working parts, making it economical to maintain and easier to redress.
- ⊙ The one-piece torque transmitting lugs give additional strength and reliability.
- ⊙ Straight-pull release can be accomplished after applying annulus pressure.
- ⊙ The rotational lock disengages automatically with applied tubing pressure, allowing emergency right-hand release from the packer

Multiport module – crossover-circulating mechanism

- ⊙ Provides a rugged crossover system to achieve high rate and/or high-volume proppant injection.
- ⊙ Provides a hydrostatic reference to make service tool operations independent of reservoir pressure

Lower module – check valve-indicating mechanism

- ⊙ Features a positive tool position indicating system which allows confident movement of service tool at the surface
- ⊙ Optional floating system available for offshore applications.
- ⊙ Indicating/Shifting collet is installed below the Crossover Ports module to shift GPrime Gravel Pack Extension's Sliding Sleeve.
- ⊙ Automatic engage and release of Sliding Sleeve.
- ⊙ Angled engagement surface for optimized shifting force.



SAZ Gravel Pack System

GPrime Retrieving Tool

GPrime Retrieving Tool is used to release and retrieve (in a single trip) all GPrime SR style packers, including large bore, alternate bore, rotationally locked and hydraulic set versions. The tool consists of an anchor latch at the upper end and a spring-loaded catch sleeve at the bottom.

The GPrime Retrieving Tool is run on a workstring or tubing. At packer setting depth tool is engaged with the packer by setting 3000-5000lbs weight. Packer is released by picking up with a pull of 11000-22000lbs force.

Features

- ⊙ Release and retrieval of GPrime SR style packer in a single trip.
- ⊙ Suitable for use with drill collars and jars to aid in packer release and retrieval
- ⊙ Simple construction with minimum parts
- ⊙ Provided with a secondary release mechanism





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