

TRIS Injection Sleeve with Wireline Retrievable VOi™



Applications

- Mild to severely corrosive environments
- Injection Wells
- Formations requiring injection rates to 70,000 bpd [11,129 m³/d] based on tubing size
- Wells requiring injection pressure to 10,000 psi [69 MPa]

Benefits

- Improved back pressure management
- less Hp required for high flow rates
- Prevents uncontrolled well flow
- Eliminates choke size chatter by continually adjusting in response to a flow
- Prevents injection back-flow
- Maximizes injection rates
- Provides dual barrier system
- Reduces erosion from high rate injection flow
- Eliminates need for external control line

Features

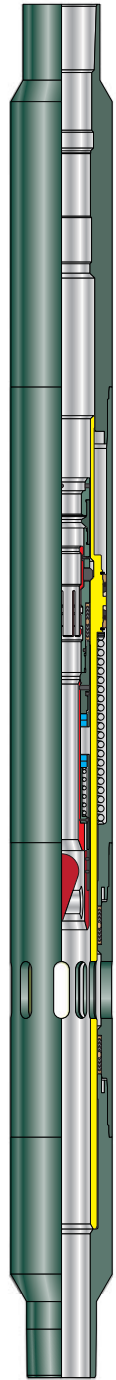
- Wireline retrievable orifice
- Subsurface controlled
- Minimum pressure drop over entire injection rate range
- Erosion resistant materials in flow path
- Proven hard/soft seat
- Orifice automatically adjusts in response to flow rate
- Designed in accordance with API 14A
- Metal to metal body joint

The patent-pending Tejas TRIS™ is a dual barrier tubing retrievable injection sleeve system featuring the VOi™ variable orifice choke and is designed for multi-zone injection. The TRIS™ is similar to conventional sliding sleeves that have an inner sleeve shifted open to establish communication/injection from the tubing to the annulus/formation. Unlike conventional sliding sleeves which are shifted mechanically (via wireline or coiled tubing shifting tools) the TRIS™ is shifted open with differential pressure from flow alone. When injection is suspended, the TRIS™ and VOi™ return to the closed position, providing dual barrier protection, one from below the VOi™ and the second from the annular space behind the TRIS™.

The VOi™ is a wireline deployed variable orifice injection choke. The VOi™ is designed to maintain a constant low pressure drop over a wide range of injection flow rates. This directly translates into improved pressure management and lower horsepower requirements. The VOi™ also incorporates a patent-pending design that ensures the sliding sleeve in the TRIS™ is completely opened before any fluids are injected into the reservoir. This eliminates any potential “throttling/chatter” of the flow tube during operation improving the overall longevity of the tool.

The TRIS™ and the VOi™ system allows for the adjustment and selection of the back-pressure / cracking forces required to control flow during operation. This flexibility allows the TRIS™ and the VOi™ to be tailored for staged injection rates at each respective zone.

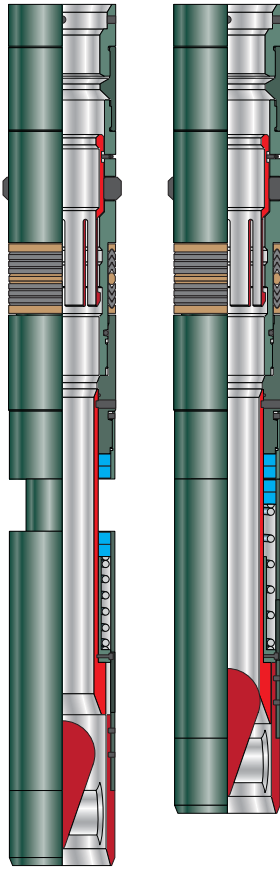
The design of the TRIS™ provides a reliable, extremely versatile sleeve that is virtually maintenance free. Together with the VOi™, the TRIS™ provides full well integrity without the necessity of running a control line to depth. The TRIS™ features metal-to-metal body joints and incorporates field-proven seal technology to reduce operational friction. Both the TRIS™ and the VOi™ are designed to provide a 20-year service life and are available in a wide variety of material selections that are suitable for both severely corrosive and highly erosive



TRIS Valve

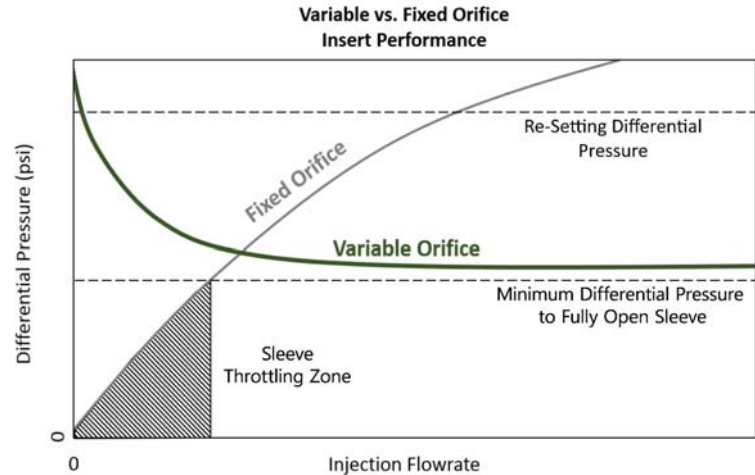


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VOi
Open
Position

VOi
Closed
Position



environments associated with water-injection applications.

The TRIS™ features several internal profiles for contingency operations, if needed. The sleeve offers a wide variety of upper lock profiles for isolation and a sliding sleeve exercise profile. The TRIS™ and VOi™ are also manufactured in accordance with the American Petroleum Institute (API) Specification 14A.

The TRIS™ and VOi™ system is designed to cover the entire range of injection rates up to 70,000 bpd [11,129 m³/d] and 10,000 psi [69 MPa] working pressure and is also capable of downhole temperatures ranging from 32 to 325°F [0 to 161°C].

Engineering Data for TRIS Injection Sleeve with Wireline Retrievable VOi

Tubing Size in [mm]	Max. OD in [mm]	Min. ID in [mm]	Working Pressure psi [mm]	Tensile Strength lbf [kN]	Upper Landing Nipple		VOi Landing Nipple	
					Bore in [mm]	Type	Bore in [mm]	Type
4.500 [114.3]	6.765 [171.8]	3.688 [93.7]	10,000 [68,947]	475,000 [2,113]	3.812 [96.8]	DB	3.688 [93.7]	RJT
5.500 [139.7]	8.010 [203.5]	4.500 [114.3]	10,000 [68,947]	729,000 [3,243]	4.562 [117.5]	DB	4.500 [114.3]	RJT

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