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## **Wel-lok™ Sealing Solutions**

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**BiSN uses patented modified thermite heaters to melt bismuth-based alloys downhole, creating gas tight, metal to metal seals.** Thermite is a compound of iron oxide and aluminum powder. The heat generated is from a chemical reaction and is fully contained within the heater. It is run in the well on electric line and requires only 240V and 60mA for 15 seconds to initiate the reaction. This reaction is non-explosive and does not require any special permits or handling requirements. BiSN controls the amount of heat generated by the thermite by adding damping and binding agents, ensuring the heaters will generate enough heat to melt the bismuth-based alloys but not enough to damage any portion of the downhole metal completions already in the well. Bismuth, as the main material in all of BiSN's alloys, is used due to several unique properties not found in other metals. They are as follow:

- It has a very low melting point relative to other metals. BiSN alloys can be melted as low as 95 °C and as high at 263 °C.
- When in liquid form (melted) it has a viscosity very similar to water. It can flow anywhere in a well that water can flow such as through sand screens, perforated holes or micro annuli in cement.
- It has a specific gravity of 10. Due to its density, it does not require pumping or squeezing. Gravity allows it to flow to the areas it is intended to seal, displacing the wellbore fluid and taking the shape of the sealing area.
- It is non-corrosive and not affected by  $H_2S$  or  $CO_2$ . This makes it a long-lasting seal that will not degrade over the life of the well and beyond.
- Upon solidification, it expands approximately 3%, similar to how water expands when it turns to ice. This expansion generates a radial load against the completion or open hole, anchoring the seal in the well and blocking all fluids and gasses.
- It is non-toxic, used in place of lead in some commercial applications for this quality.
- It is a eutectic metal that goes from a liquid to solid state almost instantaneously when it cools below its melting point. As it does not go through a gel phase, once it solidifies it forms its own base in the well preventing excessive run past and lost material down the well.

The bismuth-based alloy is cast to the outside of the modified thermite heater and run in the well on electric line. Once on depth, the chemical reaction is activated through the electric line as described above. The heater burns from the top down, similar to the wick in a candle. The alloy melts and runs down the outside of the tool until it cools below its melting point and solidifies, creating a base for the remainder of the molten alloy to build upon. As the alloy builds up along the tool the thermite continues to burn down. Once the heater burn is complete, the remainder of the liquid alloy cools, solidifies and expands radially to create a seal in the well.



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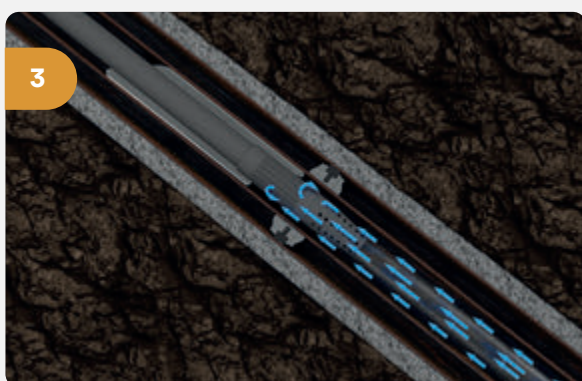
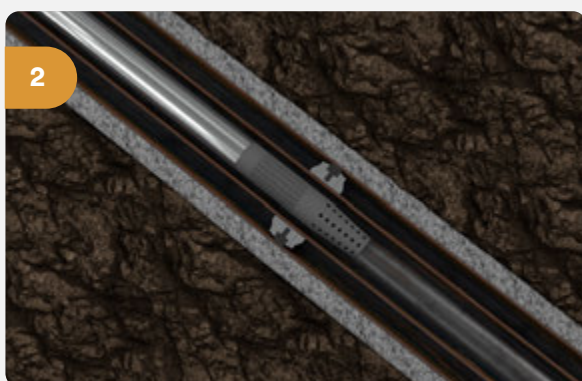
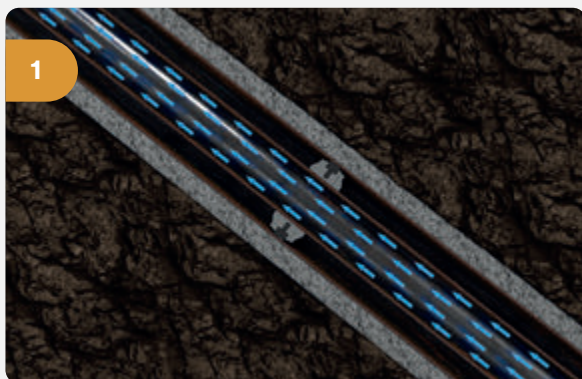
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As world leaders in the use of bismuth based alloys and thermite in the downhole environment BiSN has a portfolio of products aimed at tackling some of the most difficult issues faced by the oil and gas industry. We pride ourselves in building a responsive long term working relationship with our customers and working closely with them to provide innovative solutions. This innovative development in well sealing technology is breaking the mould of traditional sealing solutions and attracting attention from the major players in the oil and gas field. See our website for further information about us and our investors.



## Provide a Permanent Seal in Well Abandonment



### APPLICATION

The Wel-lok™ TS (Tubing Seal) was developed to overcome the shortcomings of traditional methods, using bridge plugs and cement during well abandonment. It is typically run on electric line but can be deployed on a slick line or coil tubing as well. It can pass through small restrictions such as damaged or crushed tubing, yet still create the gas tight seal. It has a higher expansion ratio than conventional plugs, higher pressure ratings than inflatable packers and gas blocking abilities that cement cannot match.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole. The melted alloys have a viscosity similar to water, and a specific gravity 10 times that of water, allowing them to flow into the smallest areas of a wellbore without the need of any surface pumping equipment. As the alloys cool and solidify, they expand to provide a seamless gas tight seal that is non-corrosive and not affected by  $H_2S$  or  $CO_2$ .

**The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole.**



## Features

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### WEL-LOK™ TS FEATURES

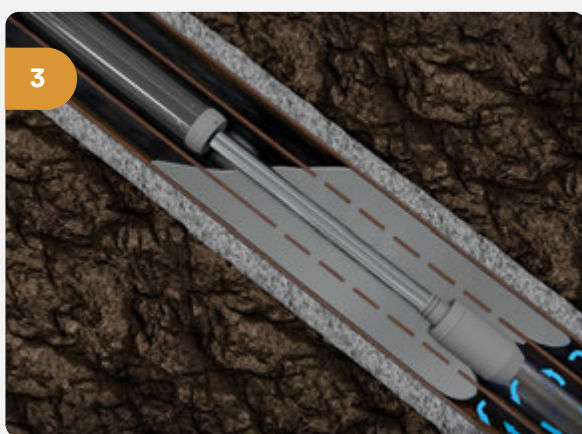
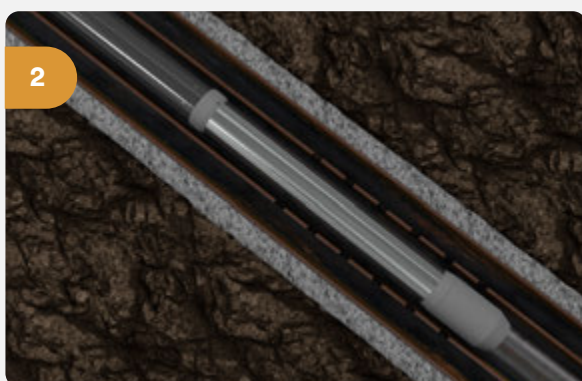
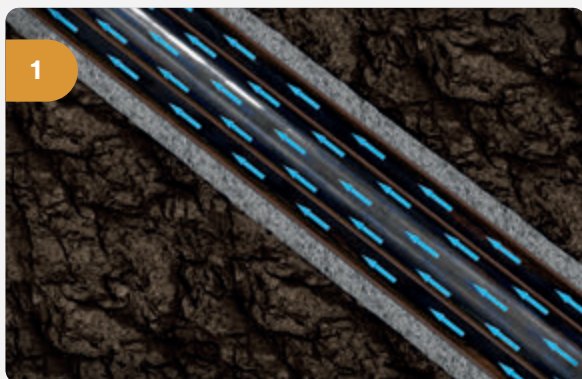
- Creates a metal to metal seal without using elastomers
- Ready for pressure testing in one hour
- VO ISO 14310 tested
- No mechanical parts
- Electronically activated
- One trip operation
- Differential pressures ratings up to 10,000 psi
- Available in a range of sizes to suit API & non API tubings

### KEY BENEFITS OF USING WEL-LOK™ TS FOR PERMANENT ABANDONMENT

- Can be used even in damaged or corroded casing
- Retrievable without milling
- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Reduced corporate liability
- Reduced intervention costs
- Reduced environmental impact
- Larger expansion than traditional plugs
- Temperature ranges up to 160°C

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## Provide a Permanent Seal in Multiple Annuli



### APPLICATION

The Wel-lok™ STC (Seal Through Casing) has been developed to achieve a gas tight VO seal well annuli that cannot be achieved by traditional cement balance plugs. Run on electric line, this tool a truly rigless solution without the need for surface pumping equipment to circulate the alloy in place. Due to its viscosity and density, once melted the liquid alloy will flow through the perforated holes with gravity into the annulus. When it cools below its melting point it solidifies, expands and creates a gas tight seal across the entire wellbore. The entire process, from melting to solidification, takes place in minutes and the seal is ready to test within an hour.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

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**The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole.**



## Features

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### WEL-LOK™ STC FEATURES

- No mechanical parts
- Electronically activated
- One trip operation
- Differential pressure ratings up to 10,000 psi
- Available in a range of sizes to suit API & non API tubing and casings
- Temperature ranges up to 160 °C

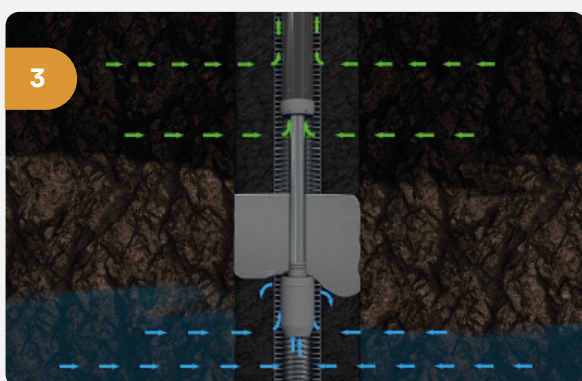
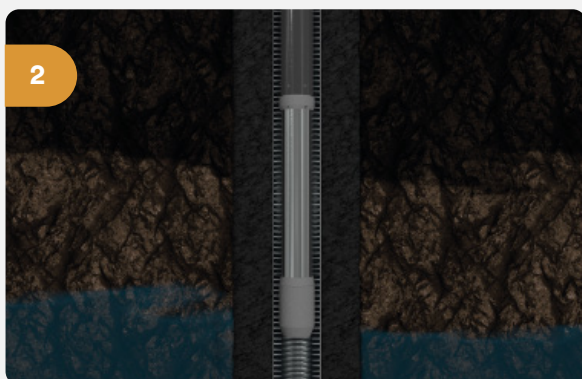
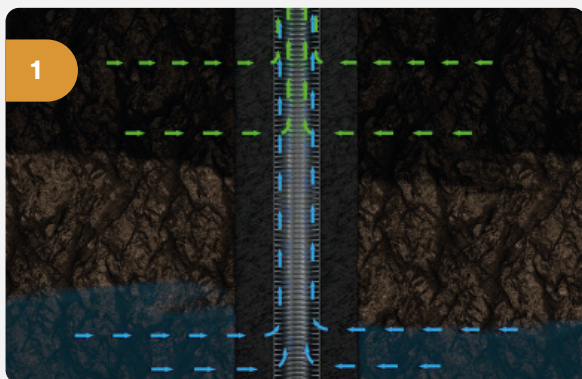
### KEY BENEFITS OF USING WEL-LOK™ STC FOR INTERVENTION

- Can be used even in damaged and corroded tubings and casings
- Creates a gas tight barrier without the need to pump from surface
- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Can seal in cased or open hole
- Can seal in multiple annuli in a single run
- Reduced intervention costs
- Reduced corporate liability

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## Reduce Water Production in Existing Wells



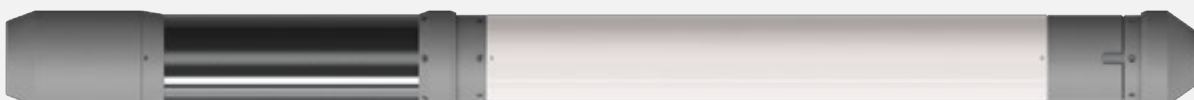
### APPLICATION

The Wel-lok™ WSO (Water Shut Off) has been specifically developed to reduce unwanted water production from wells with sand screen and open hole gravel pack completions (OHGP). Unlike any other solution on the market, the Wel-lok™ WSO tool seals the annulus and the wellbore in one operation without the need to perforate the sandscreen or squeeze the alloy into the open hole annulus. The melted alloy fills inside the completion and in the annulus to form a metal to metal sealing solution that is seamless, significantly reducing unwanted water production.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

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**The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole.**



## Features

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### WEL-LOK™ WSO FEATURES

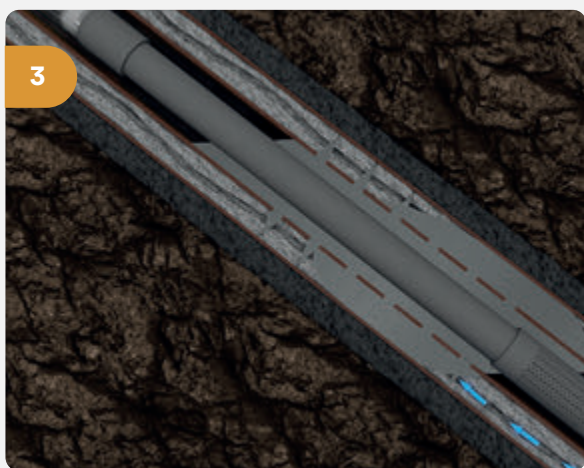
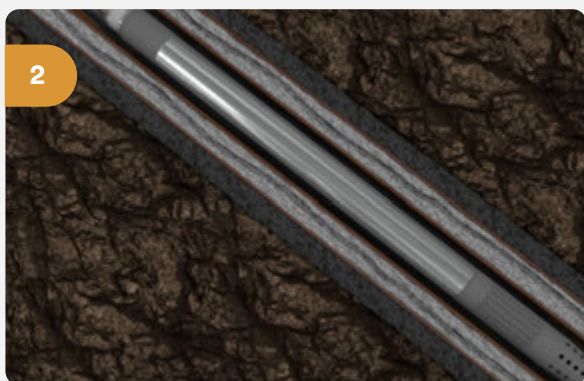
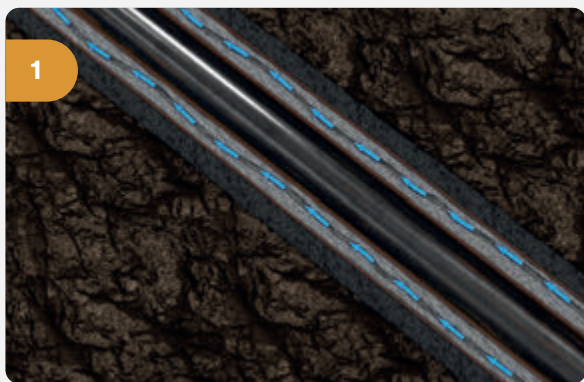
- Seals the annulus as well as the wellbore with advanced bismuth technology
- No need to damage the casing with perforation as melted alloy flows through the sand screen
- Molten alloy is gravity fed, eliminating the need to pump or squeeze
- Utilises modified thermite chemical reaction heater to quickly melt bismuth based alloys
- No moving parts means reliable operation
- No maximum run rate
- Easy and quick to deploy in a single trip intervention

### KEY BENEFITS OF USING WEL-LOK™ WSO FOR INTERVENTION

- Reduced intervention costs
- Reduced water handling costs
- Extends the production life of the well
- Increased oil production
- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Reduced contingent liabilities
- Reduced environmental impact
- Temperature ranges up to 160°C

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## Eliminate Gas Migration in Cemented Annuli



### APPLICATION

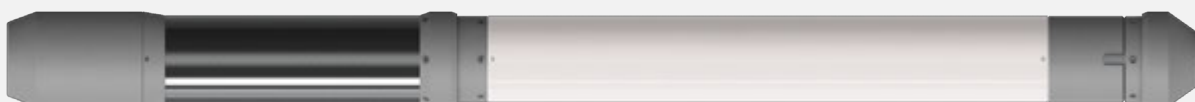
The Wel-lok™ CRT (Cement Repair Tool) was developed to eliminate sustained casing pressure, or casing vent flow, in cemented annuli. Unlike traditional methods of perf and squeeze or perf and wash, this tool does not require any surface pumping pressure to squeeze or circulate the sealing material into place. The tool is also run rigless on electric line, sealing through casing perforations, so section milling is not required. The bismuth-based alloy has no porosity and solidifies to create a seal in minutes as opposed to hours with traditional cement and resins, eliminating the possibility of a micro-annulus being formed to allow future gas migration. If full bore access is required, it can be milled out and still maintain a gas tight seal in the annulus.

### WEL-LOK™ -

#### AN OVERVIEW OF THE TECHNOLOGY

The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole. The melted alloys have a viscosity similar to water, and a specific gravity 10 times that of water, allowing them to flow into the smallest areas of a wellbore without the need of any surface pumping equipment. As the alloys cool and solidify, they expand to provide a seamless gas tight seal that is non-corrosive and not affected by  $H_2S$  or  $CO_2$ .

**The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole.**



## Features

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### WEL-LOK™ CRT FEATURES

- No mechanical parts
- Electronically activated
- One trip operation
- Differential pressure ratings up to 10,000 psi
- Available in a range of sizes to suit API & non API tubings and casings
- Temperature ranges up to 160°C

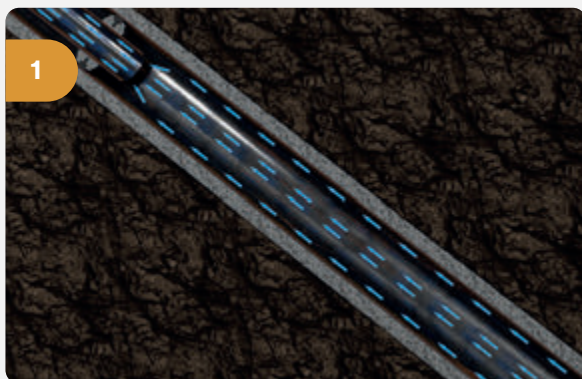
### KEY BENEFITS OF USING WEL-LOK™ WSO FOR INTERVENTION

- Can be used even in damaged and corroded tubings and casings
- Creates a gas tight barrier without the need to pump from surface
- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Can seal in cased or open hole
- Millable to achieve a full bore
- Non-porous and solidifies in minutes as opposed to cement and resins
- Eliminates the need for expensive interventions and unreliable cement squeezes
- Reduced corporate liability

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## Provide a Seal in Through Tubing Applications, Wells with Restrictions & Large Diameter Casings



### APPLICATION

The Wel-lok™ MXD (Maximum Drift) has been specifically developed for rigless through tubing applications. This tool has a smaller OD and higher expansion ratio than some of the other Wel-lok M2M™ tools but uses the same technology to create metal to metal (M2M™) seals. Unlike conventional through tubing tools utilising a petal basket and cement or inflatable packers, the MXD™ offers a gas tight seal up with up to a 10,000 psi differential pressure rating and can be deployed in a single trip. Utilising bismuth alloy pellets, deployed inside a bailer, eliminates restrictions of the volume of alloy that can be used to create a seal.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole. The melted alloys have a viscosity similar to water, and a specific gravity 10 times that of water, allowing them to flow into the smallest areas of a wellbore without the need of any surface pumping equipment. As the alloys cool and solidify, they expand to provide a seamless gas tight seal that is non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>.

**The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole.**



## Features

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### WEL-LOK™ WSO FEATURES

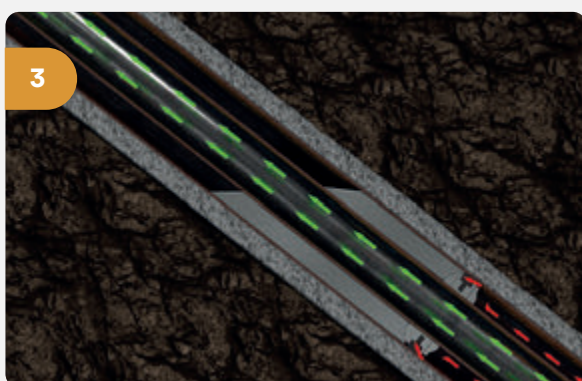
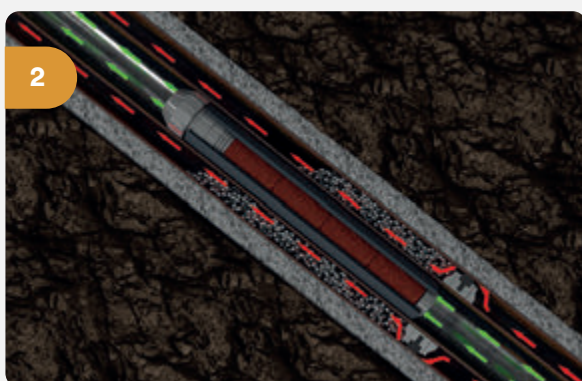
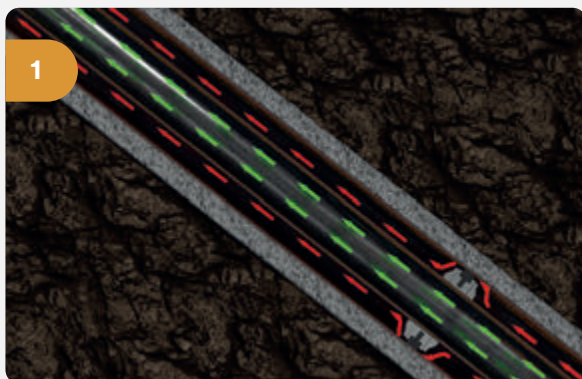
- Slim tool profile design to negotiate restrictions
- High expansion ratio capability for sealing in large diameters
- Utilises modified thermite chemical reaction heater to quickly melt bismuth based alloys
- Gas tight seal in large diameter casings without the use of elastomers
- Easy and quick to deploy in a single trip intervention
- Wireline set

### KEY BENEFITS OF USING WEL-LOK™ MXD FOR INTERVENTION

- Reduced intervention costs
- Long lasting reliable sealing solution despite restricted access
- Extends the production life of the well
- Non-corrosive and not affected by  $H_2S$  or  $CO_2$
- Reduced environmental impact
- Temperature ranges up to  $160^{\circ}C$
- Available in a range of sizes to suit API & non API tubing casings

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## Repair a Leaking Production Packer



### APPLICATION

The Wel-lok™ PRT (Packer Repair Tool) is designed to repair a leaking production packer by creating a new seal in the production tubing by casing annulus. Sealing a production annulus with a PRT™ eliminates the need to remove a production string from a well to replace the packer, reducing operator costs and downtime while introducing a superior seal in the well.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole. The melted alloys have a viscosity similar to water, and a specific gravity 10 times that of water, allowing them to flow into the smallest areas of a wellbore without the need of any surface pumping equipment. As the alloys cool and solidify, they expand to provide a seamless gas tight seal that is non-corrosive and not affected by  $H_2S$  or  $CO_2$ .

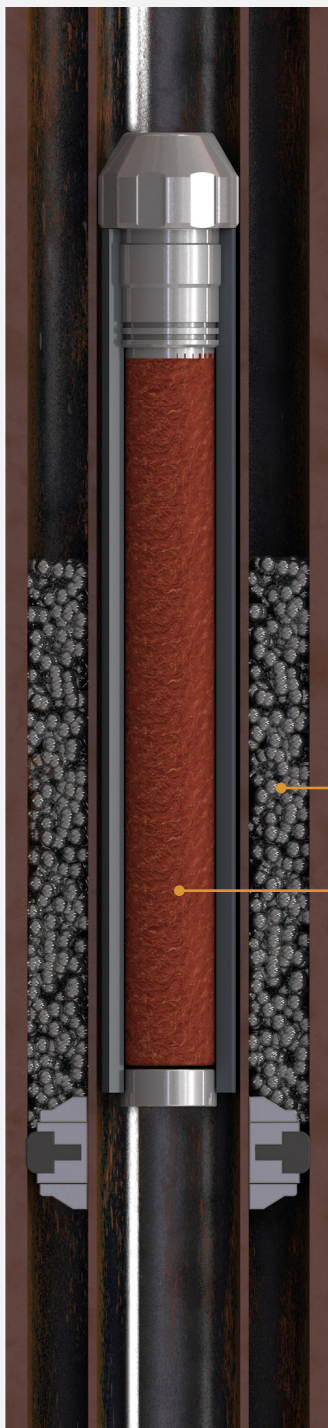
**The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole.**





## Features

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### WEL-LOK™ PRT FEATURES

- No mechanical parts
- Electronically activated
- One trip operation
- Differential pressure ratings up to 4,000 psi
- Available in a range of sizes to suit API & non API tubing and casings
- Rated as a VØ gas tight seal

### KEY BENEFITS OF USING WEL-LOK™ PRT FOR REPAIRING PRODUCTION PACKERS

- Reduced intervention costs
- Long lasting reliable sealing solution despite restricted access
- Extends the production life of the well
- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Reduced environmental impact
- Temperature ranges up to 150°C

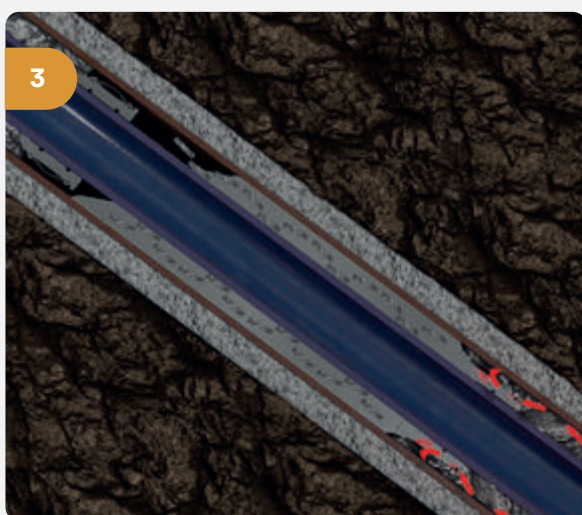
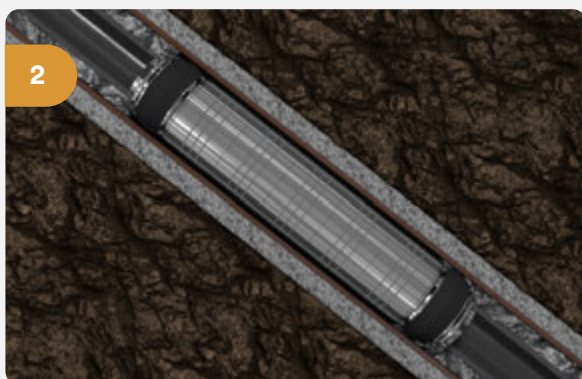
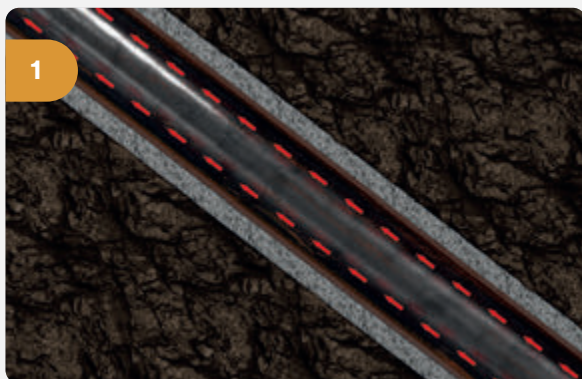
BEADS

HEATER

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## Reduce Gas Migration in the Annulus of New Wells

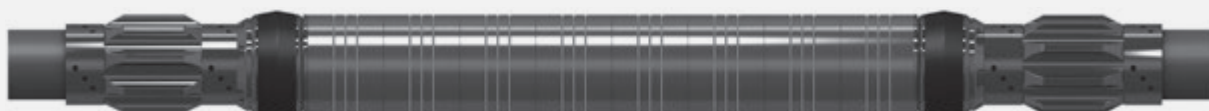


### APPLICATION

The Wel-lok™ TDAP (Thermally Deformable Annular Packer) was developed as a preventative tool to be run as part of the original casing string. It is run on an inner casing string and cemented into place. After cementing, the TDAP™ is set by running a chemical reaction modified thermite heater inside the casing to melt the alloy and create a gas tight seal in the annulus, eliminating the possibility of future casing vent flow when the cement in the annulus ultimately degrades and develops micro-annuli. If utilised in the design of the well, this tool can eliminate future expensive interventions and unreliable cement squeezes required to address surface gas pressure through cemented annuli.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

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## Features

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### WEL-LOK™ TDAP FEATURES

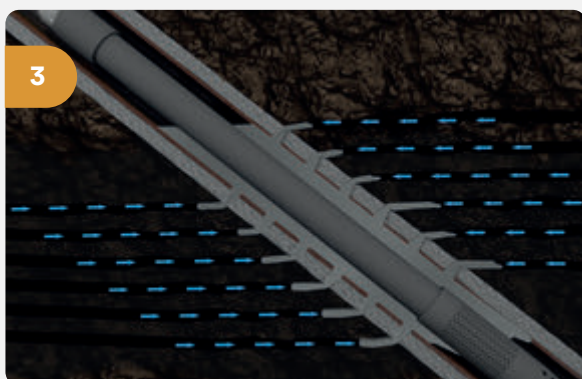
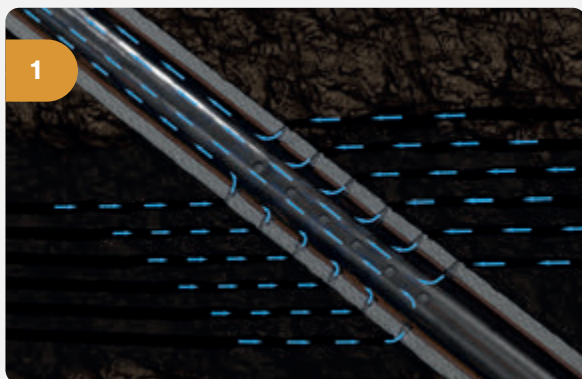
- Seals the annulus with advanced metal to metal technology
- Gas tight seal without the use of elastomers
- Utilises modified thermite chemical reaction heater to quickly melt bismuth based alloys
- The melted alloy has the viscosity of water allowing it to flow into the area requiring sealing including micro-annuli in cement
- Produces a seamless, gas tight metal to metal seal as the alloy expands when it solidifies
- No mechanical moving parts once set
- Available in a range of sizes to suit API & non API casings
- Electronically activated

### KEY BENEFITS OF USING WEL-LOK™ TDAP FOR COMPLETION

- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Reduced downtime and costs for interventions
- Reduced impact on the environment
- Enhanced corporate responsibility
- Reliable sealing solution
- Extends the life of the well providing a long term seal
- Reduced contingent liabilities
- Easy to deploy in a single trip intervention
- Temperature ranges up to 160°C

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## Sealing Perforations in Cased Hole Completions



### APPLICATION

The Wel-lok™ Perf-lok was developed to isolate perforations in a cased hole completion for zonal isolation or well P&A. Unlike typical cement squeezes traditionally used for this purpose, the Perf-lok™ does not require squeezing as it flows into the perforation tunnels by gravity due to its viscosity and density. Applying pressure to squeeze the cement can often cause the perforations to collapse and eliminate the ability to fill the entire void. It can also be milled out inside the casing, maintaining a seal inside the perforations through its unique expansion properties.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

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**The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole.**



## Features

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### WEL-LOK™ Perf-lok FEATURES

- No mechanical parts
- Electronically activated
- One trip operation
- Differential pressure ratings up to 10,000 psi
- Available in a range of sizes to suit API & non API tubing and casings
- Temperature ranges up to 160°C

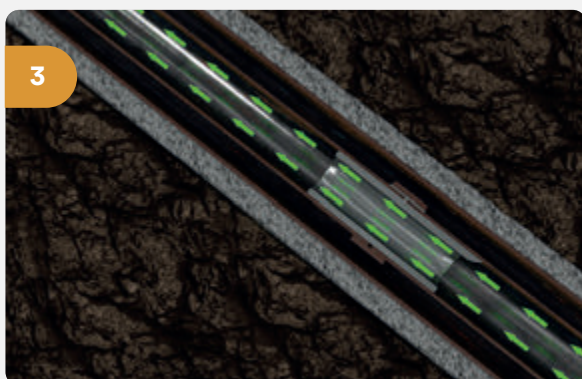
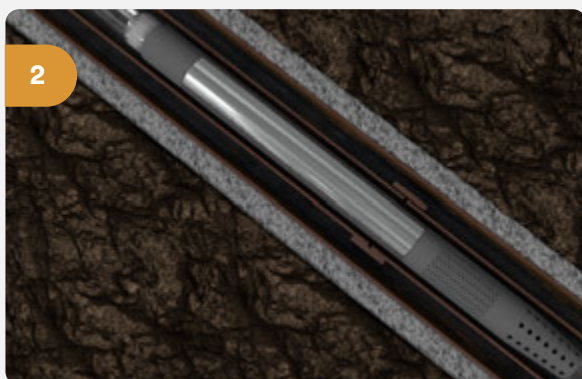
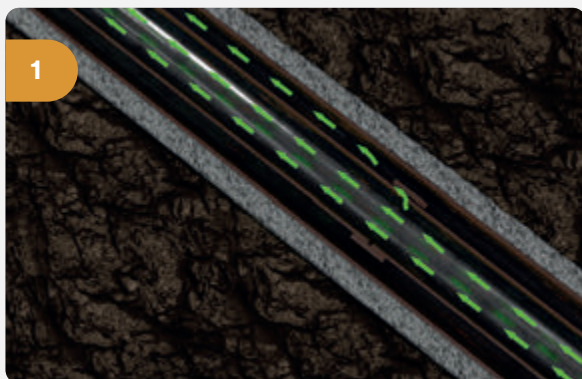
### KEY BENEFITS OF USING WEL-LOK™ Perf-lok FOR SQUEEZING PERFORATIONS

- Can be used even in damaged and corroded tubings and casings
- Creates a gas tight barrier without the need to pump from surface
- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Can seal in cased or open hole
- Millable to achieve a full bore
- Non-porous and solidifies in minutes as opposed to cement and resins

As world leaders in the use of bismuth based alloys and thermite in the downhole environment BiSN has a portfolio of products aimed at tackling some of the most difficult issues faced by the oil and gas industry. We pride ourselves in building a responsive long term working relationship with our customers and working closely with them to provide innovative solutions. This innovative development in well sealing technology is breaking the mould of traditional sealing solutions and attracting attention from the major players in the oil and gas field. See our website for further information about us and our investors.



## Repairing Damaged Tubing or Casing



### APPLICATION

The Wel-lok™ CLS (Casing Leak Seal) was developed to address the shortcomings of traditional methods in sealing leaks in tubings and casings. This tool provides a VO rated seal with higher pressure ratings than conventional casing patches with a larger through bore than traditional packoffs. If full bore access is required, it can be milled out leaving a seal only across the leaking area of the well.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole. The melted alloys have a viscosity similar to water, and a specific gravity 10 times that of water, allowing them to flow into the smallest areas of a wellbore without the need of any surface pumping equipment. As the alloys cool and solidify, they expand to provide a seamless gas tight seal that is non-corrosive and not affected by  $H_2S$  or  $CO_2$ .

**The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole.**



## Features

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### WEL-LOK™ CLS FEATURES

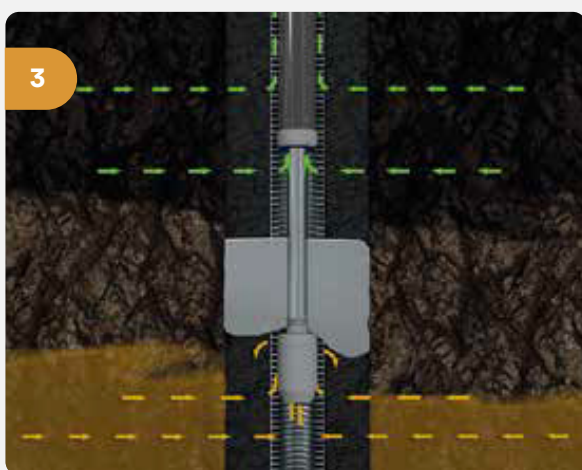
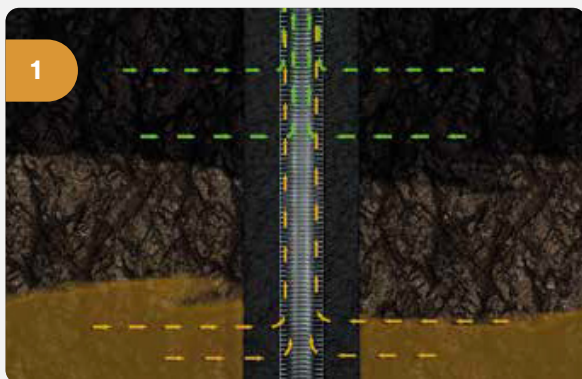
- Creates a metal to metal seal without using elastomers
- Ready for pressure testing in one hour
- V0 ISO 14310 tested
- No mechanical parts
- Electronically activated
- One trip operation
- Differential pressure ratings up to 10,000 psi

### KEY BENEFITS OF USING WEL-LOK™ CLS FOR INTERVENTION

- Can be used even in damaged and corroded tubings and casings
- Larger through bore than standard packoffs
- Higher pressure ratings than standard expandable patches
- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Millable to achieve a full bore
- Available in a range of sizes to suit API & non API tubing and casings
- Temperature ranges up to 160°C

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## Reduce Unwanted Sand Production

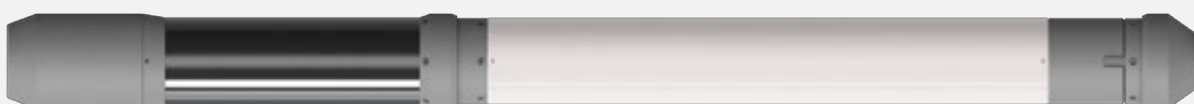


### APPLICATION

The Wel-lok™ SCT (Sand Control Tool) has been developed to eliminate unwanted sand production by isolating both inside the completion string and in annulus of an open hole gravel pack completion (OHGP). This can be done without damaging the completion string with perforations or squeezing as is required for traditional methods. Due to its viscosity and density, the liquid alloy will flow through the sandscreen and into the open hole with gravity, completely isolating the sand producing zone.

### WEL-LOK™ - AN OVERVIEW OF THE TECHNOLOGY

The Wel-lok™ technology consists of utilising a modified thermite chemical reaction heater to melt bismuth-based alloys downhole. The melted alloys have a viscosity similar to water, and a specific gravity 10 times that of water, allowing them to flow into the smallest areas of a wellbore without the need of any surface pumping equipment. As the alloys cool and solidify, they expand to provide a seamless gas tight seal that is non-corrosive and not affected by  $H_2S$  or  $CO_2$ .



## Features

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### WEL-LOK™ SCT FEATURES

- Seals the annulus as well as the wellbore with advanced bismuth technology
- No need to damage the casing with perforations as melted alloy flows through the sand screen
- Molten alloy is gravity fed, eliminating the need to pump or squeeze
- Utilises modified thermite chemical reaction heater to quickly melt bismuth based alloys
- No moving parts means reliable operation
- No maximum run rate
- Easy and quick to deploy in a single trip intervention

### KEY BENEFITS OF USING WEL-LOK™SCT FOR ANNULAR SEALING

- Reduced intervention costs
- Reduced sand production
- Extends production life of the well
- Increased oil production
- Non-corrosive and not affected by H<sub>2</sub>S or CO<sub>2</sub>
- Reduced contingent liabilities
- Reduced environmental impact
- Temperature ranges up to 160°C
- Available in a range of sizes to suit API & non API tubing and casings

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# Wel-lok™ Sealing Solutions

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