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 H2S or CO2. 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.
<table>
<thead>
<tr>
<th>Product Index</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wel-lok M2M TS™</td>
<td>5</td>
</tr>
<tr>
<td>Wel-lok M2M STC™</td>
<td>7</td>
</tr>
<tr>
<td>Wel-lok M2M WSO™</td>
<td>9</td>
</tr>
<tr>
<td>Wel-lok M2M CRT™</td>
<td>11</td>
</tr>
<tr>
<td>Wel-lok M2M MXD™</td>
<td>13</td>
</tr>
<tr>
<td>Wel-lok M2M PRT™</td>
<td>15</td>
</tr>
<tr>
<td>Wel-lok M2M TDAP™</td>
<td>17</td>
</tr>
<tr>
<td>Wel-lok M2M Perf-loc™</td>
<td>19</td>
</tr>
<tr>
<td>Wel-lok M2M CLS™</td>
<td>21</td>
</tr>
<tr>
<td>Wel-lok M2M SCT™</td>
<td>23</td>
</tr>
</tbody>
</table>
Provide a Permanent Seal in Well Abandonment

Application

The Wel-lok M2M 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 M2M™ - An Overview of the Technology

The Wel-lok M2M™ technology consists of utilizing 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 H₂S or CO₂.
Wel-lok M2M 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 M2M TS™ for Permanent Abandonment

- Can be used even in damaged or corroded casing
- Retrievable without milling
- Non-corrosive and not affected by H₂S or CO₂
- Reduced corporate liability
- Reduced intervention costs
- Reduced environmental impact
- Larger expansion than traditional plugs
- Temperature ranges up to 160 °C

BiSN Wel-Lok M2M TS™ Current Qualified Tools

<table>
<thead>
<tr>
<th>Tubing/Casing Size</th>
<th>Tool OD (in) (A)</th>
<th>Tool OAL (ft) (B)</th>
<th>Tool Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 1/2&quot;</td>
<td>2.5</td>
<td>8</td>
<td>95</td>
</tr>
<tr>
<td>4&quot;</td>
<td>3</td>
<td>8</td>
<td>150</td>
</tr>
<tr>
<td>4 1/2&quot; - 5&quot;</td>
<td>3.5</td>
<td>8</td>
<td>180</td>
</tr>
<tr>
<td>5 1/2&quot;</td>
<td>4.5</td>
<td>8</td>
<td>250</td>
</tr>
<tr>
<td>7&quot; - 7 5/8&quot;</td>
<td>5.75</td>
<td>9.5</td>
<td>610</td>
</tr>
<tr>
<td>9 5/8&quot;</td>
<td>8</td>
<td>9.5</td>
<td>800</td>
</tr>
</tbody>
</table>

* Custom sizes available. Final length depends on well conditions.
additional 2.5 ft on OAL for running tool

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. US Patent 9708882.

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Wel-lok M2M™ - An Overview of the Technology

The Wel-lok M2M™ technology consists of utilizing 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 H₂S or CO₂.

Application

The Wel-lok M2M STC™ (Seal Through Casing) has been developed to achieve a gas tight V0 seal in the well annuli that cannot be achieved by traditional cement balance plugs. Run on electric line, this tool is truly a 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.

For further information:
832-919-7500
info@bisn.com
www.bisn.com
**Wel-lok M2M 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 M2M STC™ for Annular Sealing**

- 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 H₂S or CO₂
- Can seal in cased or open hole
- Can seal in multiple annuli in a single run
- Reduced intervention costs
- Reduced corporate liability

**BiSN Wel-Lok M2M STC™ Current Qualified Tools**

<table>
<thead>
<tr>
<th>Completion Size</th>
<th>Tool OD (in) (A)</th>
<th>Tool OAL (ft) (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 1/2” x 7”</td>
<td>3.50</td>
<td>21</td>
</tr>
<tr>
<td>7 5/8” x 9 5/8”</td>
<td>4.00</td>
<td>21</td>
</tr>
<tr>
<td>5 1/2 x 9 5/8”</td>
<td>4.25</td>
<td>33</td>
</tr>
<tr>
<td>9 5/8” x 14” open hole</td>
<td>8.00</td>
<td>21</td>
</tr>
<tr>
<td>9 5/8” x 13 3/8” x 20”</td>
<td>8.00</td>
<td>21</td>
</tr>
<tr>
<td>13 3/8” x 20”</td>
<td>12.00</td>
<td>21</td>
</tr>
<tr>
<td>“20” x 30”</td>
<td>18.50</td>
<td>21</td>
</tr>
</tbody>
</table>

* in development

**final length depends on well conditions**

**additional 2.5 ft on OAL for running tool**

---

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Reduce Water Production in Existing Wells

Application

The Wel-lok M2M 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 M2M 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 M2M™ - An Overview of the Technology

The Wel-lok M2M™ 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 H₂S or CO₂.
The image contains a page from a document about Wel-lok M2M WSO™, highlighting its key features and benefits. Here is the text in a readable format:

**Wel-lok M2M 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 M2M 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 H₂S or CO₂
- Reduced contingent liabilities
- Reduced environmental impact
- Temperature ranges up to 160 °C

### BiSN Wel-Lok M2M WSO™ Current Qualified Tools

<table>
<thead>
<tr>
<th>Completion Size</th>
<th>Tool OD (in) (A)</th>
<th>Tool OAL (ft) (B)</th>
<th>Tool Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” screen x 7” liner</td>
<td>2.75</td>
<td>21</td>
<td>400</td>
</tr>
<tr>
<td>4” slotted liner x 6” open hole</td>
<td>3.25</td>
<td>21</td>
<td>550</td>
</tr>
<tr>
<td>5” screen x 8.5 open hole</td>
<td>3.8</td>
<td>21</td>
<td>800</td>
</tr>
<tr>
<td>5 1/2” screen 9.5 open hole</td>
<td>4.18</td>
<td>21</td>
<td>900</td>
</tr>
</tbody>
</table>

*Custom sizes available.

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. US Patent 9708882.

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Eliminate Gas Migration in Cemented Annuli

Application

The Wel-lok M2M 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 M2M™ - An Overview of the Technology

The Wel-lok M2M™ 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 H₂S or CO₂.
Wel-lok M2M 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 tubing and casings
- Temperature ranges up to 160 °C

Key Benefits of Using Wel-lok M2M CRT™ for Eliminating Casing Vent Flow

- 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 H₂S or CO₂
- 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

BiSN Wel-Lok M2M CRT™ Current Qualified Tools

<table>
<thead>
<tr>
<th>Casing Size</th>
<th>Tool OD (in) (A)</th>
<th>Tool OAL (ft) (B)</th>
<th>Tool Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 1/2&quot;</td>
<td>3.5</td>
<td>8</td>
<td>400</td>
</tr>
<tr>
<td>5 1/2&quot;</td>
<td>4.5</td>
<td>8</td>
<td>550</td>
</tr>
<tr>
<td>7&quot;</td>
<td>5.75</td>
<td>10</td>
<td>900</td>
</tr>
<tr>
<td>9 5/8&quot;</td>
<td>8.25</td>
<td>12</td>
<td>1,800</td>
</tr>
</tbody>
</table>

* custom sizes available

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

Application

The Wel-lok M2M 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 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 any restrictions on the volume of alloy that can be used to create a seal.

Wel-lok M2M™
An Overview of the Technology

The Wel-lok M2M™ 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 \( \text{H}_2\text{S} \) or \( \text{CO}_2 \).
Key Benefits of using Wel-lok M2M MXD™ for Rigless Intervention and Abandonment

- Reduced intervention costs
- Long lasting reliable sealing solution despite restricted access
- Extends the production life of the well
- Non-corrosive and not affected by H₂S or CO₂
- Reduced environmental impact
- Temperature ranges up to 160 °C
- Available in a range of sizes to suit API & non API tubing casings

BiSN Wel-Lok M2M MXD™ Dimensions

<table>
<thead>
<tr>
<th>Casing Ranges</th>
<th>Tool OD (in) (A)</th>
<th>Left in Hole Length (ft) (B)</th>
<th>Tool OAL (ft) (C)</th>
<th>Tool Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*3 1/2&quot; - 7&quot;</td>
<td>2.125</td>
<td>12.5</td>
<td>28</td>
<td>600</td>
</tr>
<tr>
<td>4 1/2&quot; - 7 5/8&quot;</td>
<td>2.875</td>
<td>12.5</td>
<td>28</td>
<td>750</td>
</tr>
<tr>
<td>5&quot; - 9 5/8&quot;</td>
<td>3.5</td>
<td>12.5</td>
<td>28</td>
<td>950</td>
</tr>
</tbody>
</table>

* in development

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Repair a Leaking Production Packer

Application
The Wel-lok M2M PRT™ (Packer Repair Tool) is designed to repair a leaking production packer by creating a new seal in the production tubing by sealing the 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 M2M™ - An Overview of the Technology
The Wel-lok M2M™ 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 H₂S or CO₂.
Wel-lok M2M PRT™ 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

Key Benefits of Using Wel-lok M2M 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 H₂S or CO₂
• Reduced environmental impact
• Temperature ranges up to 160 °C

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Wel-lok M2M™ - An Overview of the Technology

The Wel-lok M2M™ 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 H₂S or CO₂.

Application

The Wel-lok M2M 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 M2M 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 M2M TDAP™ for Completion

- Non-corrosive and not affected by H₂S or CO₂
- 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

BiSN Wel-Lok M2M TDAP™ Current Qualified Tools

<table>
<thead>
<tr>
<th>TDAP Size</th>
<th>Tool OD (in) (A)</th>
<th>Length of Alloy (ft) (B)</th>
<th>Heater OAL (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 1/2” x 8 5/8”</td>
<td>7.88</td>
<td>4</td>
<td>10.8</td>
</tr>
<tr>
<td>5 1/2” x 10 3/4”</td>
<td>9.8</td>
<td>4</td>
<td>10.8</td>
</tr>
<tr>
<td>9 5/8” x 13 5/8”</td>
<td>12.09</td>
<td>4</td>
<td>10.8</td>
</tr>
</tbody>
</table>

*custom sizes available

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Sealing Perforations in Cased Hole Completions

Wel-lok M2M™ - An Overview of the Technology

The Wel-lok M2M™ 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 H₂S or CO₂.

Application

The Wel-lok M2M™ 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 is 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. The Perf-lok™ can also be milled out inside the casing, maintaining a seal inside the perforations through its unique expansion properties.

Patent No. US 9,708,882

For further information:
832-919-7500 | info@bisn.com | www.bisn.com
**Wel-lok M2M 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 M2M 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 H₂S or CO₂
- 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

---

**BiSN Wel-Lok M2M Perf-lok™ Current Qualified Tools**

<table>
<thead>
<tr>
<th>Casing Size</th>
<th>Tool OD (in) (A)</th>
<th>Tool OAL (ft) (B)</th>
<th>Tool Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 1/2&quot;</td>
<td>3.5</td>
<td>8</td>
<td>400</td>
</tr>
<tr>
<td>5 1/2&quot;</td>
<td>4.5</td>
<td>8</td>
<td>550</td>
</tr>
<tr>
<td>7&quot;</td>
<td>5.75</td>
<td>10</td>
<td>900</td>
</tr>
<tr>
<td>9 5/8&quot;</td>
<td>8.25</td>
<td>12</td>
<td>1,800</td>
</tr>
</tbody>
</table>

* custom sizes available  

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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. US Patent 9708882.

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 M2M CLS™ (Casing Leak Seal) was developed to address the shortcomings of traditional methods in sealing leaks in tubings and casings. This tool provides a V0 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 M2M™ - An Overview of the Technology

The Wel-lok M2M™ 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 H₂S or CO₂.
Summary of Wel-lok M2M 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 M2M CLS™ for Tubing and Casing Leaks

- 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 H₂S or CO₂
- 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

BiSN Wel-Lok M2M CLS™ Standard Dimensions

<table>
<thead>
<tr>
<th>Casing/Tubing Size</th>
<th>Tool OD (in) (A)</th>
<th>Tool OAL (ft) (B)</th>
<th>Drift ID if not milled (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 1/2&quot;</td>
<td>25</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>4&quot;</td>
<td>3</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>4 1/2&quot; - 5&quot;</td>
<td>35</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>5 1/2&quot;</td>
<td>45</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>7&quot; - 7 5/8&quot;</td>
<td>5.75</td>
<td>9.5</td>
<td>4.5</td>
</tr>
<tr>
<td>9 5/8&quot;</td>
<td>8</td>
<td>9.5</td>
<td>6.5</td>
</tr>
</tbody>
</table>

* custom sizes available

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Reduce Unwanted Sand Production

**Application**

The Wel-lok M2M 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 M2M™ - An Overview of the Technology**

The Wel-lok M2M™ 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 H₂S or CO₂.
Wel-lok M2M 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 M2M SCT™ for Sand Control

- Reduced intervention costs
- Reduced sand production
- Extends production life of the well
- Increased oil production
- Non-corrosive and not affected by H₂S or CO₂
- 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

BiSN Wel-Lok M2M SCT™ Current Qualified Tools

<table>
<thead>
<tr>
<th>Completion Size</th>
<th>Tool OD (in) (A)</th>
<th>Tool OAL (ft) (B)</th>
<th>Tool Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” screen x 7” liner</td>
<td>2.75</td>
<td>21</td>
<td>400</td>
</tr>
<tr>
<td>4” slotted liner x 6” open hole</td>
<td>3.25</td>
<td>21</td>
<td>550</td>
</tr>
<tr>
<td>5” screen x 8 ½” open hole</td>
<td>3.8</td>
<td>21</td>
<td>800</td>
</tr>
<tr>
<td>5 1/2” screen x 9 ½” open hole</td>
<td>4.18</td>
<td>21</td>
<td>900</td>
</tr>
</tbody>
</table>

* custom sizes available
**final length depends on well conditions additional 2.5 ft on OAL for running tool

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