PIPELINES / CONSTRUCTION / REFINISH
COATING & CHEMICAL SOLUTIONS

CREST CORMIX

AUSTRALIAN DEEPWATER STOCKIST & DISTRIBUTOR FOR N-BOLT / I-ROD

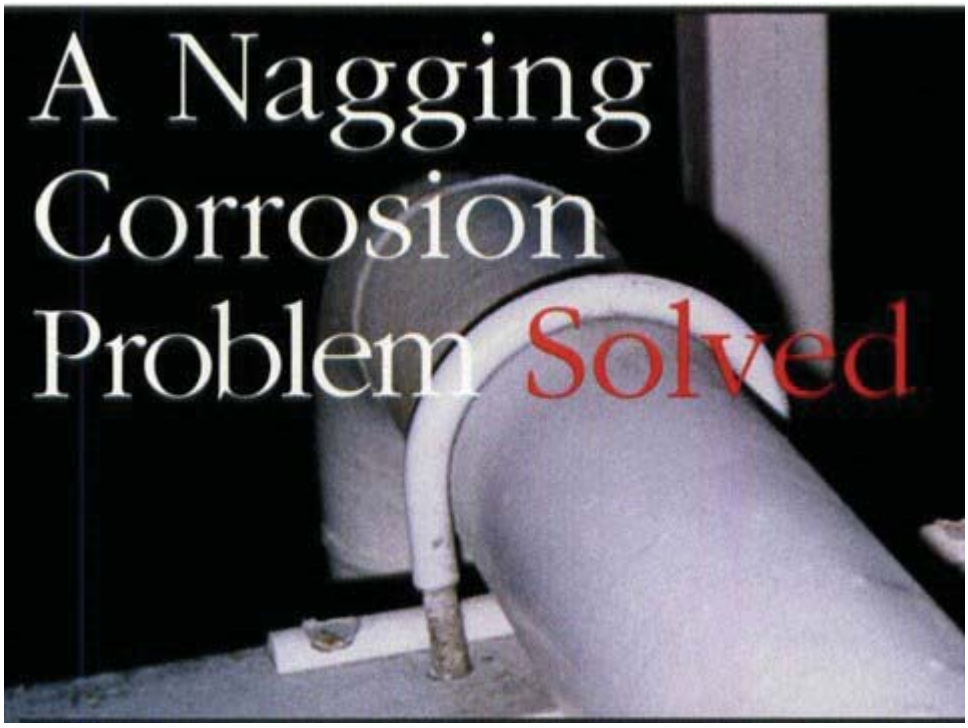
I-ROD - ANTI CORROSION PIPE SUPPORTS

Corrosion at pipe supports is one of the leading causes of process piping failures, which can have potentially catastrophic results. All styles of pipe supports – including beam supports and pipe saddles – create crevices where water is trapped and held in constant contact with the pipe surface. Once corrosion starts in these pockets, it can quickly undercut the paint film and rapidly cause wall loss as it expands from the crevice. If these conditions are not addressed, entire sections of pipe can fail and require replacement. Deepwater developed the I-Rod pipe-support system specifically to ensure longer, safer lives for pipes by eliminating crevices between pipes and supports.

PIPE SUPPORTS: A NAGGING CORROSION PROBLEM SOLVED

by Jim Britton (1998) from *Pipeline and Gas Journal*

FIGURE 1.



During routine inspections of offshore oil and gas production facilities in the Gulf of Mexico, a recurring problem has been noted: The corrosion on piping systems which often leads to piping failure. Why pipe support points are prone to such localized corrosion and what can be done to prevent it?

In all cases, localized corrosion begins with coating failure; the presence of water and oxygen then promote corrosion of the exposed steel. The problem is often aggravated by the presence of bimetallic (galvanic) couples and by oxygen concentration differences caused by crevices. The result is a localized corrosion attack which causes significant wall loss.

Consider some of the more common types of pipe supports used and we can see why the problems arise:

FIGURE 2.
Saddle Clamps

Saddle clamps are widely used (especially on larger diameter pipe), as they offer excellent mechanical support. They are used on both horizontal and vertical pipe runs. They are, however, a potential corrosion hot spot. The saddle clamp often has a rubber liner designed to protect the coating on the pipe during installation. Sometimes this liner is required to provide electrical isolation between the pipe and clamp. In either case, the result is a tight crevice at the pipe surface. The crevice is so aggressive that any water falling onto the pipe in the area of the clamp may be sucked into this crevice by capillary action.

Once in there, it is difficult for the water to escape, so the pipe surface stays wet. Pipe coatings (paint) used on topside piping are designed to protect the pipe from atmospheric corrosion; they were never intended for immersion service. However, that is the service they find under these clamps. The result is softening and failure of the paint and corrosion is able to proceed uninhibited. Saddle clamps offer other disadvantages: They provide for no inspect ability under the clamp, they are expensive and they are rarely removed during maintenance painting so that the coating can be repaired.

FIGURE 3.
Beam Supports

This is a very common method of supporting multiple parallel pipe runs. The pipes are usually stabilized with a U-bolt and it is not uncommon to see a neoprene pad installed under the pipe. The neoprene pad is designed to stop paint damage during installation and to reduce metal-to-metal contact. In truth, it aggravates the problem. Being soft, the material deforms under the weight of the pipe and forms a very aggressive crevice at the pipe surface. Paint failure then ensues by the same mechanisms as previously described.

Again, inspect ability is poor and access for maintenance with painting is poor. This is, however, a very attractive support method because it is inexpensive and flexible for piping designers. Also, the U-bolts offer much greater inspect ability and maintainability than saddles.

FIGURE 4.
Half-saddles and cradles

In many cases, these types of support could be substituted for multiple U-bolt type clamps and a lot of the problems would disappear. However, the point of contact at the beam or in the bottom of the cradle will always be a concern. The same problems of moisture retention, poor inspect ability and maintainability apply to these support types.

OTHER SOLUTIONS

The industry has recognized the problems for a long time and has put some effort into solving the problems. Some of the solutions are more effective than others.

SEALANTS

In an attempt to seal the crevices and prevent moisture ingress, various types of silicone and epoxy sealants and caulks have been used. These typically don't work because there is no chemical bond established between the sealant and the painted or corroded steel surface. In fact, these attempts often make the problem worse by forming additional crevices when they bond.

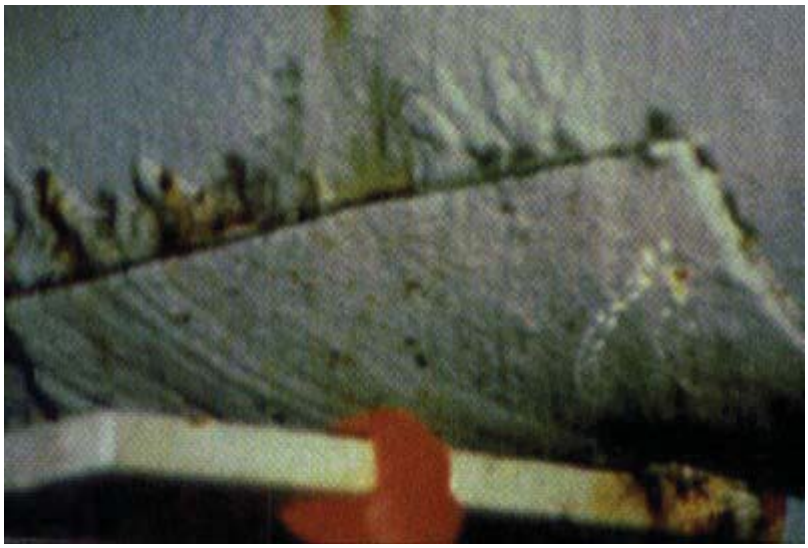
FIGURE 5.

Pads

Curved fiberglass pads are sometimes used, and can work if installed on well-prepared pipe and are properly sealed. However, there is a risk if the pad becomes disbonded. Heavy neoprene rubber pads are not a good idea for reasons previously discussed.

FIGURE 6.

Welds



Supports which stand the pipe off the support and eliminate the crevice by direct welding to the pipe are generally successful. They are also expensive and require additional NDT during construction. If it is permissible to weld to the outside of the pipe, this can be the best overall long-term solution.

THE IDEAL SOLUTION

If we are to design the ideal solution, it should achieve the following goals:
- Eliminate the crevice and thus the ability to hold water in contact with the pipe
- Be simple to install either on new or existing piping systems not requiring hot work
- Be inexpensive
- Provide inspect ability and maintainability
- Eliminate metal-to-metal contact.

FIGURE 7.

I-Rod™ or I-Rods

I-Rods are half-round rods made from a high-strength thermoplastic material. When placed between the pipe and the support, it achieves all the ideal solutions. The curved surface against the curved surface of the pipe minimizes contact area and water is shed from the pipe surface. The separation created also provides good access for inspection and maintenance while eliminating metal-to-metal contact.

Easily installed either in continuous lengths across the top of pipe support beams or as an integral part of a U-bolt assembly to replace saddle clamps, the rods provide a cost-effective solution to the problem. I-Rods have been in service on hundreds of offshore platforms in the Gulf of Mexico since 1989. Performance has matched or exceeded all expectations of the operators specifying them.

I-Rod® high-impact thermoplastic for anti-corrosion pipe supports. I-Rod prevents corrosion at pipe supports by preventing moisture from being trapped.

Half-round I-Rod is available in 10-foot lengths or pre-cut-and-drilled for any standard pipe U-bolt. Corrosion at pipe supports is one of the leading causes of process-piping failures. Not surprisingly, beam supports and saddle clamps have historically caused the majority of problems. They have these undesirable features in common:

- Crevices: The formation of a crevice at the pipe surface.

• Water entrapment: Water is trapped and held in constant contact with the pipe surface

• Poor inspect ability: These supports are virtually impossible to paint or maintain, and visual inspections and NDT are often difficult.
• Galvanic couples: Even when both the pipe and the support are the same steel, the metallurgical differences can still provide enough potential to drive a galvanic corrosion cell.

I-Rod is the solution

I-Rod, a durable, extruded thermoplastic cut into a half-round rod, is the key component in all of Deepwater's I-Rod brand pipe supports. It is available in 10-foot lengths or cut and- drilled for use with standard-size pipe U-bolts. There are three different diameter sizes for I-Rod: 0.75 inch, 1 inch, and 1.5 inch, as well as a high-temperature version for process piping operating above 200 °F.
The Nu-Bolt Assembly is our most popular I-Rod product, which provides corrosion protection at I-beam supports. For Grinnell clamps and pipe saddles, the newest addition is the I-Rod Clip, designed to clip onto new and existing saddle-clamp-style supports or inside clamps.

KEY DESIGN POINTS:

Half-round shape

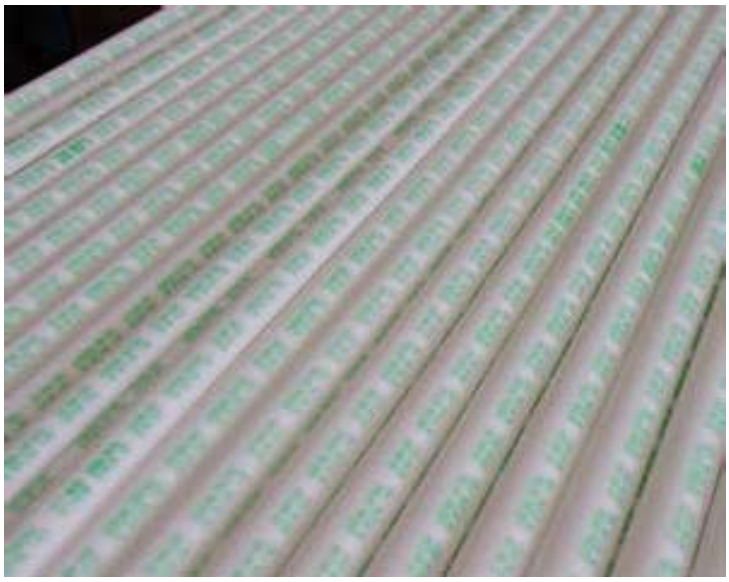
The half-round shape minimizes contact between the pipe and the support, which eliminates the crevice. Keeping water out keeps corrosion from forming.

Maintenance

I-Rod also provides an electrically-isolated stand-off between the pipe and the supporting beam or saddle clamp. This allows for easy maintenance and inspection while preventing galvanic corrosion between dissimilar metals of the pipe and support.

Durability

I-Rod has excellent compressive strength and a very low friction coefficient, making it ideal as a beam dressing. Pipe damage during new construction is reduced when I-Rod is used to assist in pipe fitting.



NU-BOLT™ or NU-BOLTS

Designed by corrosion engineers, the Nu-Bolt assembly combines half-round I-Rod supports with modified pipe U-Bolts. A variety of corrosion-resistant treatments provide reliable, long-term service in the severe operating environments associated with offshore oil and gas production and coastal process facilities.

Corrosion at pipe supports

Corrosion at pipe supports is one of the leading causes of process piping failures, which can have potentially catastrophic results. All styles of pipe supports, including beam supports and pipe saddles, create crevices where water is trapped and held in constant contact with the pipe surface. Once corrosion is initiated in these pockets, it can quickly undercut the paint film and cause rapid wall loss as it spreads from the crevice. If these conditions are not addressed, entire sections of pipe can fail and require replacement.

Deepwater developed the I-Rod pipe-support system specifically to combat crevice corrosion and ensure longer, safer lives for pipelines by eliminating crevices between pipes and supports.

Polyshrink

Polyshrink is applied over the shank of the U-Bolt to protect the pipe's paint system during installation, and is not designed to protect the U-Bolt. The material is a cross-linked, high-compressive-strength, UV-stable polyolefin. It can remain in service in temperatures up to 230 °F (110 °C).

Coatings

The bolt is available in carbon steel with one of two coatings: Hot-dip galvanized or SermaGard®, which is a corrosion-resistant coating reliable in even the harshest offshore conditions. Bolts are also available in 316 stainless steel.

Half-round I-Rod support

Standard I-Rod material works extremely well for most process piping conditions. In situations with extreme operating temperatures, Deepwater can substitute the more resistant I-Rod HT material. Deepwater also offers PEEK material for environments that prove too severe for either, though these instances are rare. For details about all three materials visit stoprust.com.

Maintenance and durability

The Nu-bolt assembly provides an electrically-isolated stand-off between the pipe and the supporting beam or saddle clamp, which allows for easy maintenance and inspection. I-Rod also has excellent compressive strength and a very low friction coefficient. Nu-bolts have been in continuous operation since 1989, when the first new structure specified I-Rod and Nu-Bolt.

For All ENQUIRIES Contact:

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www.crestcormix.com.au