

# THE COST OF CORROSION

**Ed Hall, Oxifree, UK, discusses how thermoplastic coatings can save operators time and money when protecting pipelines from damage caused by corrosion.**

**A**sset maintenance is a line in every operational budget, the necessary evil as facilities age. The allowance given to that budget will be determined by strategy; planned or reactive, preventative or predictive, performance, expected life vs usage, monitoring, and how the asset will be checked – visual vs technology. Each component is assigned a value.

The maintenance budget will develop year on year, especially in the case of new equipment as data is gathered and refined. Ideally equipment will be ranked so focus is given to the most important parts for the business. Planning and scheduling is most cost-effective since various sources suggest it is generally 3 - 5 times more expensive to carry out unplanned maintenance. If it is an emergency following a failure, this can reach as much as 10 times more expensive.

A properly executed maintenance plan will review work carried out, looking at asset reliability and subsequent problems, loss of production, unplanned work, and variances from the plan. Maintenance managers are frequently under pressure to reduce spend (and in extreme situations this might result in reduced spending on preventative maintenance).

Identifying new technologies that provide a long-term solution, eliminate the need for shutdown and are quick to apply makes for a welcome change.

The cost of corrosion is approximately US\$276 billion annually according to the SSPC. It occurs when metal comes into contact with oxygen and water in the environment; however, this reaction can be accelerated by many other factors. Onshore environments are subject to UV rays, harsh climate conditions, potential chemical splash and fumes





degrading the structures, along with the potential for high humidity and abrasion from sand/dust or soil.

Offshore, corrosion is accelerated by salt water, wind, rain and wave slam combined with a build-up of chlorides which create the perfect electro-chemical environment.

The constant wet and dry can accelerate the effect on metal degradation; combine this with damage caused by impact or abrasion and the result is extensive maintenance costs affecting both operational and capital expenditure.



Figure 1. Complete pipeline protection provided by TM198 and Oxitape.



Figure 2. Previous tape protection had not stood up to the abrasive ground to surface environment.

## A COVID-19 world

No one could have imagined our current 2020. With a pandemic sweeping the globe and talks of recessions, budgets are being hit harder than ever. Oil prices have dropped, projects have been put on hold, there are struggles with supply chains, workforce constraints with social distancing measures, turnaround projects pushed back with a focus on just the critical work required, and regional lockdowns that halt almost everything locally.

The impact on maintenance and asset integrity is profound. Maintenance managers now face a whole new set of challenges to balance, on an already sensitive set of scales.

Companies are scaling back turnarounds to allow for the most critical work to proceed; these will be the higher-ranking parts of equipment where failure has the potential to halt production. The rest will be postponed to a later time. However, weighing later with when is critical so that new failures are not realised.

Deployment of personnel has been, and will likely continue to be, a challenge running into late 2020 and possibly beyond – not only with the risk of an outbreak amongst staff, but with the need to provide a safe environment with social distancing measures and PPE equipment. This has resulted in smaller workforces in operation at any one time and careful deployment to where manpower is needed most, delaying operational and maintenance activities.

Lockdowns across the globe have led to a halt in production for many businesses in the supply chain. They not only face catching up on work lost but the added constraints of the new workplace safety measures. Reductions in workforce allowed in at any one time to comply with these measures will likely slow further production.

Constraints on travel across the globe pose problems for the movement of personnel to get to project destinations, whether it be inspection or maintenance activities. Quarantine times and isolation windows could well extend the time people are travelling, and of course whether countries have agreed air bridges to enable the reciprocal flow of passengers. But whilst industry faces constraints to operational maintenance there is one universal truth – it still needs to be done.

## Asset integrity problems

Challenging times call for solutions which work within the constraints and still provide results. Corrosion under pipe supports (CUPS) is the second biggest issue of corrosion on external piping after corrosion under insulation. The issue is at the 6 o'clock position and is often overlooked without close visual inspection. It is not always suitable to lift the pipe for inspection due to the risk of damage or product release, resulting in safety issues.

A pipe support is usually made out of steel, providing a framework of a certain distance from the ground to support and distribute the weight of suspended pipes. They typically comprise of structural steel such as I-beam, angle and channel section. These pipes are normally secured to the member using U-bolts. Also utilised are either half or full saddle clamps and welded supports, which allow movement of the pipe within the support; however, they also invite corrosion. These pipes can be carrying a variety of substances, such as water, gas, oil, chemicals, petrol – anything that travels through a pipe.





Figure 3. Minimal equipment solutions will be welcomed in a post covid world.

Many solutions that are in the market place require a shutdown in order to install the solution, and even then only when they are replacing pipework such as the use of half round plastic rods which minimise the contact point of metal to metal. In a best case scenario these solutions are fitted at the outset of pipe installation.

Even during a shutdown, if the operator is not intending to replace the pipework, they are reluctant to remove U-bolts/hangers/clamps, and lift the pipe to install these, as they do not want to risk the possibility of damage to the pipework.

In what is becoming known as the 'new normal', these issues for providing a solution do not fit well with the budget and business constraints we are seeing in the COVID-19 world.

### Providing a solution

A service provider in Singapore was experiencing the issue of CUPS despite regular maintenance, blasting and painting. Corrosion persisted especially in the complex geometric areas of pipe supports, pipe brackets and flanges. With a short time frame, as the asset was being shut down for a range of refurbishment and life extension works, an efficient solution was required.

Thermoplastic coatings provide a pliable barrier to assets which mould to the contours of any shape. They are simple and fast to apply and require minimal surface preparation; simply brush away loose rust and debris, a light clean with an environmentally friendly degreaser if required, and then apply. No need to lift the pipe off the support, and no need to shut down the pipeline process.

This was the solution used. A small team of three men was deployed with a machine to carry out the works, which covered 190 assets in total comprising of pipe supports, U-Bolt pipes and flanges. There was no lifting of the pipes, no blasting and the application process has such a small footprint that other works could be carried out in surrounding areas where required.

Utilising a small team, which can often comprise a team of two, and equipment with a small footprint requiring minimal preparation is a major advantage to operating in these challenging times. Thermoplastic coatings also provide protection immediately, halting existing corrosion and protecting from further corrosion.

The inhibitor oil within the thermoplastic coating penetrates between the pipe and the pipe support where protection and lubrication is most critical. The drying time is approximately five minutes, slightly depending on the environment, and equipment can usually remain in operation. Solutions which can utilise small teams, are time efficient, and can minimise disruption should be well received in this new era.

### Total pipeline protection


In Nigeria total pipeline protection was required in a surface to ground interface for a major oil operator. The area requiring protection is subject to harsh abrasion by backfill and high water tables: notorious for accelerated corrosion issues. Previous application of a protective tape had not stood up to the elements which are obviously varied and extreme. In this instance the use of a thermoplastic coating followed by a protective tape over the top was used. The protective tape provided a hard shell against impact and abrasion, allowing the thermoplastic to provide corrosion protection underneath, exuding an inhibitor oil which would penetrate existing corrosion and stop new corrosion.

The thermoplastic solutions mentioned were provided by Oxifree TM198. TM198 is a patent protected, organic, self-lubricating coating for the protection of metal components. This solution halts, mitigates and eliminates (further) corrosion, contains organic corrosion inhibitors, is reusable during application and provides immediate protection.

Application of TM198 is not affected by high humidity or damp surfaces. With this case in Nigeria, the client was impressed by the application process being so quick and that progress was made in between periods of torrential rain. Both Oxifree TM198 & Oxitape can be exposed to moisture after application, providing immediate protection. In addition, they can both be applied to live equipment so there was no operational shutdown required.

The TM198 coating is melted down from a solid resin and applied using a heated hose and gun to fit the contours of any complex component. A key feature of the TM198 encapsulation system is the unique non-adherence to the substrate, along with self-lubricating properties, which allows any metal work that needs to move to also move within the TM198. The natural inhibiting oil which is secreted from the coating acts as a secondary barrier against contaminants, as well as providing valuable lubrication to the target area.

This unique solution is only applied once and will provide many years of protection in the harshest of environments. Should inspection be required this can be done through the coating with the use of NDT/ANDT inspection techniques (such as UT) or a small area cut away from the coating for visual inspection, which can simply be refilled/resealed.

Industries were already facing the challenge to reduce unnecessary expenditure and make critical savings to maintenance, while increasing safety and reducing ecological impact. As we take on the new challenges that a pandemic can bring, extending asset lifespan without operational shutdown is the fundamental way forward. Providing a solution with minimal footprint and limited personnel will be a major advantage to operations. Couple that with a protection solution that halts, mitigates and eliminates (further) corrosion to complex structure interfaces, whilst benefiting the bottom line, thermoplastic coatings are the ideal answer. 



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