Overcoming Microbial Induced Corrosion

In 2006 the Trans Alaska pipeline suffered catastrophic failure, resulting in losses in excess of USD $28 million per day. This failure played havoc with the world oil price and more significantly caused untold damage to the environment. The primary cause of this failure was investigated exhaustively and, after much debate, the final verdict was Microbial Induced Corrosion.

In recent years there has been a trend to specifying expensive corrosion resistant alloys in both the oil and gas and mining industries in an attempt to eliminate corrosion and the ultimate failure of critical plant and equipment. Throwing money at the problem will not necessarily protect you from hefty fines and jail sentences. Exotic corrosion resistant alloys are expensive but not necessarily corrosion resistant under certain conditions. Exotic alloys can be subject to pitting corrosion, stress cracking, wormholes, galvanic corrosion and hydrogen embitterment. With the exception of titanium alloys, MIC has been reported on most industrial metals and alloys. Flanged joints and welds are particularly susceptible, especially where flange misalignment provides a small stagnant pocket or where there is porosity in flange welds. Where stagnant areas or porosity exist, bacteria can colonise and multiply, resulting in rapid localised corrosion. When exotic alloys do start to fail the repairs are expensive and time consuming. In many instances the repaired pipes are coated to eliminate the problem reoccurring.

Riser pipes after 21 years in seawater

The solution to MIC might be a lot cheaper than you think; by turning the clock back and looking at industry practices before exotic alloys were common place. The application of high performance anti-corrosion coatings

to carbon steel pipe work did the job and there are case studies that show good life cycle benefits. However, serious investigation into the type of coating you are proposing is critical as some coating materials provide nutrients to bacteria and can actually accelerate MIC.

Corrocoat have been involved in the research, development, manufacture and application of high performance industrial coatings in the Oil and Gas industry for over 35 years and would like to share with you, a real life example, of how coated carbon steel can perform as well or better over the long term.

In 1983 Corrocoat were asked to specify a coating system for carbon steel seawater riser pipes destined for an oil rig in the North Sea. The application was for external exposure to seawater (immersed, splash zone and atmospheric) and internally warm seawater with low hydro chlorite dosing. Corrocoat specified our standard Polyglass coating to both internals and externals of the riser pipes. In 2004, twenty one years later, the riser pipes were removed for review and inspection. The coating revealed only minor mechanical damage that occurred during removal of the pipes. Overall the pipes spools were found in excellent condition with only minor surface staining.

Cleaned up and ready for another 20 years

The existing coating on each pipe spool was flash blasted and flange areas, damaged during the removal of spools, were grit blasted to Sa 2 ½ with a minimum surface profile of 50µm. The flanges were then coated with a new technology product, Corroglass 600 series, to a minimum dry film thickness (dft) of 1.5mm, and finally spark tested to 19Kv Hv-AC. The spools were put back into service with a life expectance of a further 20 years.

Corrocoat's glass flake technology and coatings have improved significantly since 1983 and Corrocoat is now the largest Extra Corrosion Resistant (ECR) glass flake manufacturer in the world. The quality of the glass flakes is paramount in slowing moisture diffusion and corrosion potential. Corrocoat produces unique, uniform and high aspect ratio ECR glass flakes, slowing moisture diffusion to an almost non existent level.

The development of our modified epoxy, vinyl ester, filled with flake glass coating (VEF) provides superior protection in the most corrosive environments, and our Corrothane XT was developed to provide similar corrosion resistance at even higher temperatures. Both these products are totally unaffected by MIC and are resistant to aggressive chemical attack at elevated temperatures. Other recent developments in the Corrocoat range include abrasion resistant veil coats, and a non toxic, environmentally friendly, bio foul system for seawater intakes.