

# **SEALING A PIELINE REPAIRS AND REHABILITATION.**

ipelines form a basic backbone for the transportation of any type of fluid, starting from normal drinking water up to a complex system involving corrosive, toxic and hazardous chemicals and gases etc. As long as the transport chain is fine, the entire process can be very smooth, nevertheless, even a pinhole leak or minor corrosion on pipes might put the owner at stake. The system becomes even more critical if the pipelines carry complex chemicals that are flammable, corrosive or toxic. Extreme conditions or high risk working scenarios can cause pipelines to experience damage and deterioration, which includes corrosion, external damage

in the form of dents, leaks and the like. The costs for repairing/maintenance of pipelines would shoot up heavily if the pipeline needed to be shut down for such repair operations. It is the greatest technical challenge for any industry to hunt for a cost-effective solution without any compromise in technology. Alstern Technologies Singapore Private Limited offers a range of proven maintenance and repair products that are unique in pipeline services, which can minimise or totally eliminate pipeline downtime.

Besides being the manufacturer of SealXpert products, the Alstern Technologies Group specialises in other business units namely a pipeline services division, projects division, commissioning services division and field equipment rental. It is a specialist engineering company providing pipeline engineering services, which not only focuses on pipeline integrity, maintenance and online modifications but also provides a comprehensive range of products and pipeline engineering services that enable piping inspection, intervention, isolation, repair, connection and testing work scopes.

The Group has offices in Singapore, Hong Kong, Malaysia and a liaison office in Nigeria. Headquartered in Singapore, the sales and marketing network covers mainly South East Asia (including Singapore), East Asia, Europe, Middle East, Africa and North America.

The company is dedicated to provide clients with solutions that ensure optimum throughput, extend the service life of a client's assets and minimise downtime. The company is certified with ISO 9001: 2008 and OSHAS 18001: 2007 to meet customer expectations and to ensure the pipeline engineering services meet the highest standards.



Figure 2. LPG gas pipeline with severe corrosion and leaks on pipe surface.

# A high stakes challenge

A liquefied petroleum gas (LPG) pipeline at a glass-manufacturing factory had been plagued with severe corrosion and several locations along the pipe section were observed with major leaks. LPG is a flammable mixture of hydrocarbon gases used as a fuel in heating appliances and vehicles. Unlike any other non-hazardous chemical, LPG can form a flammable mixture with air even in concentrations between 2 - 10%. Also the vapour/air mixtures arising from leakages may be ignited some distance from the point of escape, and the flame can travel back to the source of the leak.

It is indeed a major issue to be addressed off the cuff, as LPG gas leakages when untreated can pose a serious threat to the environment and to humans as well. Engineers from Alstern Technologies were mobilised immediately to the site to understand the crisis and to provide an efficient solution for the leak and corrosion repair. The 10 in. SCH40 carbon steel pipe with an operating pressure and temperature of 150 psig and 30 °C respectively, was found to have many pinholes around the straight, tee and elbow locations. Furthermore, the pipe wall thickness had drastically been reduced due to severe corrosion and pitting.

#### A seamless repair alternative

The flammable nature of LPG gas means that only cold repair was possible on the pipeline, as any hot works would be dangerous under such conditions. The challenge in this project was to seal all the pinholes in order to stop existing leaks and to reinforce the pipe wall to strengthen the pipe to operate at its maximum allowable operating pressure (MAOP). It was therefore decided by the engineers to carry out the repair using SealXpert products.

The repair was successfully completed with the application of Seal Stic<sup>™</sup> steel epoxy onto the pipe to seal off major leak locations. Seal Stic quick cure epoxy sticks are high performance hand-mouldable, metal-filled epoxies with industrial strength. The product mainly finds its



Figure 3. Team Alstern provided a complete cost-effective and efficient solution for pipeline repair.



Figure 4. Corroded crude oil transportation pipeline.



Figure 5. Pipeline after reinforcement.



Figure 6. Pipe condition after repair and reinforcement.

application in repairing and filling holes, cracks and defects. The epoxy sticks are quick-curing and cost-effective in returning worn-off parts or equipment back to service. After the application of the epoxy sticks onto the pipe, Wrap Seal PLUS<sup>™</sup> standard resin and activator was applied onto the pipe surface to stop the corrosion and seal off the pinhole leaks. This is uniquely designed as a corrosion repair system for pipelines, vessels and storage tanks. It acts as a corrosion barrier, remediates and reinforces pipes and tanks. It is to be noted that Wrap Seal PLUS can be used on all metal pipes and pipe fittings. After having halted the leak and taken a preventive action for anti-corrosion, the pipeline reinforcement for the repair location was finally carried out with the wrapping of a fibreglass wrap – the Wrap Seal.

The repair products were allowed to cure based on the respective working conditions and the leak was completely stopped by the time the pipeline was returned to its MAOP. The repair products are a cost-effective solution for leak repair, and proved to be a seamless repair and timesaving as well. The repair system also resulted in additional operational benefits, including minimum labour; easy to apply; and aesthetically perfect results. Since the quick repair system is easy to use in emergency situations, SealXpert products are widely acclaimed in the market, and this is underscored by the company's growth in recent years.

#### The epoxy technology

It is worth mentioning about epoxies here, as they are the workhorses of the pipeline repair products. Their chemical and corrosion resistance, high mechanical strength, good adhesion to a variety of substrates and a combination of other properties have always made them a material of choice for providing cost-effective, long-term protection on industrial, marine and offshore structures. The curing process of epoxies is a chemical reaction in which the epoxide groups in epoxy resin reacts with a curing agent to form a highly cross-linked, 3D network. It is the choice of hardener/curing agent that determines the strength of the epoxy products catering to suit for different applications and so is the case for the SealXpert range of products.

## **Other project milestones**

#### Corrosion repair of crude oil pipeline

Some 6000 m of an 8 in. crude oil transportation pipeline were severely corroded. The pipeline has been in operation for 30 years and needs to be repaired and rehabilitated regularly to ensure its integrity and prolong its service life under an operating pressure of 350 psig. The Wrap Seal PLUS corrosion repair system was used for the pipeline rehabilitation in this project after which fibreglass repair tapes were applied to reinforce the pipe wall thickness. This pipeline rehabilitation project was completed successfully in three months.

# Corrosion repair on splash zone riser pipeline

A 10 in. splash zone of a riser pipeline in an offshore platform in the Persian Gulf is subjected to constant erosion. Several locations in the splash zone were thinning significantly. Alstern Technologies was engaged to carry out the repair and rehabilitation of the splash zone pipeline and the project was completed successfully in due course.

## Conclusion

The SealXpert products are a competitive solution in the pipeline repair/reinforcement industry, offering top-grade solutions that optimise customer throughput without compromising on cost and technology.

#### References

- An Updated Perspective on using Composite Materials to Reinforce Offshore Pipelines and Risers, Proceedings of the 6<sup>th</sup> International Offshore Pipeline Forum, IOPF 2011.
- 'Properties & Hazards of LPG Gas: LPG Properties, LPG Hazards', FloGas.co.uk, http://www.flogas.co.uk/132/lpg-properties-hazards (Accessed on 22<sup>nd</sup> of October, 2012).