



**OLD PIPELINES BRING**

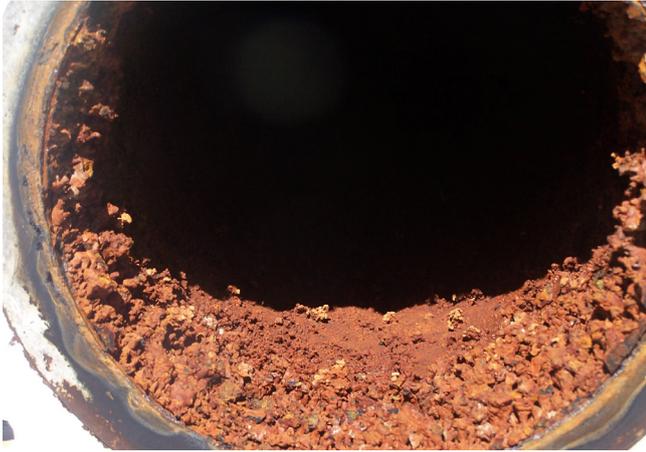
**ON NEW  
TRICKS**



**Internal pipeline cleaning and coating demand is on the rise, explains**  
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**Aegion Coating Services, USA.**

**A** network of thousands of miles of pipelines dramatically speeds up the process of oil transportation, making it cheaper to move products around the world and provides a safe and efficient solution for the transportation of many products. Most owner companies now realise the importance of flow assurance teams responsible for the successful and economical flow of a hydrocarbon stream, from reservoir to the point of sale.

One of the most challenging flow assurance problems facing oil and gas pipeline infrastructure today is the build-up of deposits in pipelines. Any disruption to the internal pipe surface, such as paraffin wax or a build-up of scale, hydrate, asphaltene or corrosion, significantly impacts production by increasing energy requirements to maintain design flowrates. Maintaining a clean pipeline maximises production, increases system longevity,



**Figure 1.** An example of a severely scaled pipeline that has been in service prior to having inline rehabilitation work performed.



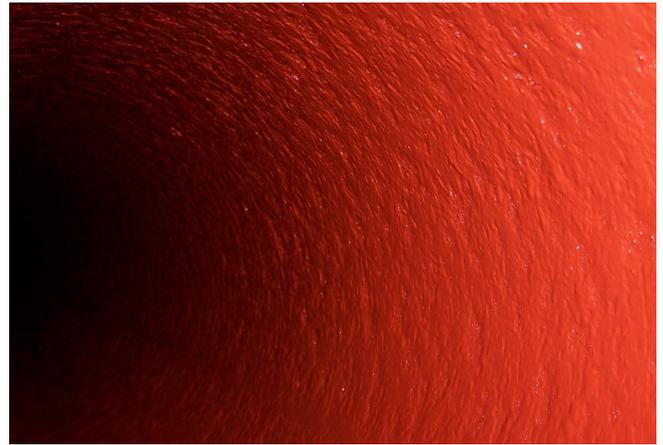
**Figure 2.** The same pipe section displayed in Figure 1, after mechanical and chemical cleaning has been performed.

enhances system reliability, lowers associated safety risks and improves bottom line profitability for operators.

In a recent NACE International IMPACT study the global cost of corrosion was estimated at US\$2.5 trillion, with an estimated saving of 15 - 35% with the use of available corrosion control practices. The oil and gas market is seeing a rising demand for the internal cleaning and coating of ageing pipelines. This rising demand comes at a time when operational cost optimisation and safety are at the forefront. In response, two well-established companies are coming together to provide a better solution than either company could offer on its own. In today's oil and gas business environment, where joint ventures, mergers and acquisitions are too slow, these two companies have opted to harness a relationship where each shares a capability in a way that creates an entirely new service offering.

### Strategies

Effective strategies can be implemented to maximise flow and deter corrosion. The traditional strategy most often implemented is the ongoing chemical treatment



**Figure 3.** The same pipe section displayed in Figure 2, after the coating has been applied.

of the products moving inside a bare steel pipeline using corrosion inhibitors, biocides or anti-scaling chemicals, along with a regular pigging programme. Internal coatings are beginning to receive more recognition, and are proving to be a more effective and cost-efficient strategy compared to chemical treatment and pigging alone. Owners who elect to apply a coating to the inside of their pipelines experience reduced operational costs when compared to the chemical treatment and pigging strategy utilised in conventional lines.

Owners that opt for internally coated pipelines can gain clear proven benefits from internal coatings, including reduced chemical expenditure, increased life expectancy and lower power demands. These same advocates are now looking for an in situ, or in place, cleaning and coating solution for ageing pipelines that were originally built without internal coatings. Aegion Coating Services (Aegion) is actively working with Enerclear Services Inc. (Enerclear) to provide a new turnkey inline rehabilitation solution for ageing pipelines, which will enable owners to experience the same financial and operational benefits they experience with newly constructed pipelines.

This inline rehabilitation solution for existing pipelines combines two well-established services to offer a new thorough cleaning and coating process to the market. In situ coating provides a uniform homogeneous coating throughout the pipeline, including on all field joints and bends. In situ coating applications are extremely effective and can be used on all types of oil and gas lines, potable water lines, freshwater injection lines, commingled water injection lines and aviation fuel lines. In situ coatings prevent corrosion from taking place within a pipeline at a fraction of the cost of pipeline replacement. The benefits to in situ internal pipeline coating include:

- Corrosion protection.
- Power savings.
- Reduced chemical treatment.
- Increased safety.

- Extended life.
- Paraffin retardation.

The in situ coating process reduces the number of excavation sites required, lessens environmental impact, appeases landowners and reduces risks associated with river and road crossings. Pigging programmes and costly inhibitor programmes can be drastically reduced, or even eliminated, once the pipeline is internally coated.

### Combined offering

EnerClear, a wholly owned subsidiary of Corrosion and Abrasion Solutions Ltd., is a global leader in delivering field-based pipeline corrosion prevention and remediation solutions. EnerClear's team are specialists in the in situ internal pipeline cleaning and coating process, and have offered a progressive pigging, multiple pass in situ flood coat system that cleans and coats existing pipelines since 2005 (using a coating process first developed in the 1970s).

The new combined offering will first use EnerClear's in situ cleaning system to clean an existing steel line to a NACE2 SSPC SP10 near white metal finish. Next, Aegion will utilise its untethered robotic coating system to apply up to 60 mils of a 100% solids liquid epoxy, resulting in a like-new internally coated pipeline. The company has provided internal field joint coating and inspection services with untethered robotic systems for more than 30 years.

### Process

A new three stage process involves mechanically and chemically cleaning the pipeline, before drying it via a 'progressive pigging system'. Mechanical cleaning, the first phase of the three stage process, begins by determining how extensive the cleaning and pigging programme needs to be. This process incorporates specialised pigs along with several soap, water and solvent pigging runs to flush out loose debris, hydrocarbons and wax, and remove the bulk of scale and build-up inside the line.



**Figure 4.** Aegion's untethered robotic coating unit can apply up to 60 mils of 100% solids epoxy coating for mainline pipe rehabilitation.

The second stage is the acid cleaning and etching process. This process entails batching-inhibited acid in a pressurised slug between two pigs. Multiple inhibited acid runs are made at a controlled rate of travel to loosen and remove all contamination, mill scale, corrosion by-products and welding slag from the pipe walls. The acid strength is measured via titration, and fluid samples are monitored throughout the process. Once the desired cleanliness is achieved, Aegion's internal robotic unit performs an abrasive cleaning process with steel grit. This process introduces an adequate anchor profile to the newly cleaned metal to ensure the greatest possible coating adhesion. The coating process is the third and final stage. This is where Aegion introduces the robotic coating system to spray a two part liquid epoxy on the prepared surface, in thicknesses of up to 60 mils. A robotic inspection unit provides the ability to perform dry film thickness and holiday testing, along with visual inspection via onboard high definition cameras.

It is expected this service offering will be of interest to pipeline owners who desire to extend the life of an asset that is experiencing corrosion challenges with conventional corrosion prevention methods. More specifically, there are many pipelines that do not have steady state operation or continuous flow. Pipelines with intermittent flow are not as efficient at distributing chemical treatment evenly and frequently and, thus, often suffer advanced corrosion. This situation may exist with pipeline shut-ins, loading/unloading terminals, in-plant and tanker vessel piping.

Oil refineries, gas plants and chemical plants can have lengthy intra-plant and inter-plant transfer lines that may have internal corrosion concerns that could warrant abrasive cleanup, coating and/or inspections. The scheduling of downtime 12 - 24 months in advance enables adequate time to discuss inline rehabilitation service needs with plant owners and operators. For pipelines suspected of being in poor condition, the baseline inspection can occur at the start of a turnaround, with enough time for corrective coatings if needed.

### Conclusion

Each of these companies have a well-established service offering, which has performed well in the market place for decades. However, until recently, these services were offered independently, each with their own shortcomings. EnerClear offered a great in situ cleaning service with some limitations and challenges surrounding their flood coating process, and Aegion offered robotic field joint cleaning and coating for new construction, with no ability to clean a line that had been in service. This industry collaboration between EnerClear and Aegion will provide a robust in situ internal coating rehabilitation solution poised to address the rising demand for internal pipeline rehabilitation. Preliminary trials have proven successful and will continue through 2017, with projects already being scheduled for execution in 2018 and 2019. 