PIGGING PRODUCTS & SERVICES ASSOCIATION

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Pigging Industry News

the newsletter of the Pigging Products & Services Association

THE PRESIDENT'S LETTER

By Iain Shepherd, Halliburton, UK

I'd like to take this opportunity to welcome new members who have joined the PPSA since the last newsletter and thank our existing members for their ongoing support. It's good to see opportunities continuing to come through the PPSA on a daily basis and I encourage everyone to use the PPSA to help find products, services and technical assistance. The downturn in the Oil & Gas industry has resulted in some challenging times for many of us recently, but there are some signs of increasing oil prices which should be good news.

The PPSA has recently exhibited at the IPCE exposition in Calgary, Canada. The event was a great opportunity to tell people about the association and the work the PPSA members carry out. It was also fantastic to see so many members there.

This edition of the newsletter includes an interesting "Frequently Asked Questions" section about pigging projects. We also have a wealth of information on the PPSA website http://www.ppsa-online.com/ including the following sections: "About Pigs" "Terminology" and "Frequently asked Questions". To learn even more, there is also the PPSA Publication, "An Introduction to Pipeline Pigging."

The PPSA Buyers Guide & Directory of Members 2016 has been published and mailed out worldwide recently. I encourage you to read it and pass it on to anyone who may use it, particularly buyers and engineers in your organization. If you haven't received your complimentary copy and would like one please contact Diane Cordell at ppsa@ppsa-online.com.

I'm looking forward to The PPSA Annual Seminar which takes place on Wednesday 16th November in my home town of Aberdeen. This year's programme consists of 9 presentations on a variety of subjects related to Commissioning and Operational Pigging. As usual there will be an exhibition and great opportunities to meet existing and new business contacts. New for 2016 is a Tutorials Day on the 15th, which will be followed, as usual by the pre-seminar evening reception and buffet in the exhibition area. The tutorials on offer are, 'An Introduction to Pipeline Pigging', 'Pigging– Good Operational Practice' and 'Pipeline materials properties and integrity'. For more details about the seminar, please visit http://www.ppsa-online.com/seminar.php.

PPSA exhibiting at the IPCE exposition 2016 in Calgary, Canada

NEW Members

Full

Oil Gas & Power Italia S.R.L, Italy

Eureka Efektif Sdn Bhd, Malaysia

Best Energy Equipment (Tianjin) Company Limited, P.R. China

National Oilwell Varco, USA

Industry news

NDT Global's custom solution for an extreme subsea pipeline

NDT Global provided an accurate and detailed baseline survey of **Statoil's** new Polarled gas pipeline. Polarled is the first pipeline on the Norwegian continental shelf that crosses the Arctic Circle which brings both operational and environmental challenges. Statoil utilized NDT Global's ultrasonic technology (UT), a solution that offers highly accurate results for feature depth sizing of their Polarled gas pipeline, a pipeline with varied wall thickness.

Due to the absence of a liquid coupling medium, magnetic flux leakage (MFL) is typically chosen for corrosion identification. On this run, a UT inspection was feasible as prior to operation, the pipeline was filled with treated seawater.

The inspection was completed using high-resolution pinhole and pitting (UMp) metal loss inspection technology. This configuration features an optimized sensor carrier design and a high-resolution grid that is unmatched in the industry. The ultrasound measurement is ideal for thick walled pipes used in deep sea operations with depth sizing accuracy of 0.4 mm (0.02 in).

NDT Global provided tool customization to overcome operational and environmental challenges associated with this line. The project was designed and delivered to meet the specifications of this subsea pipeline.

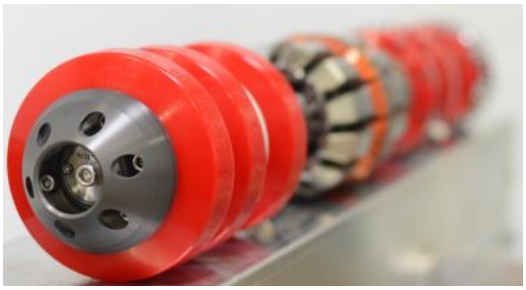
An exacting dataset to accurately monitor future corrosion was delivered. Not only is the pipeline ready for operation but Statoil now has the inputs required to improve integrity management over the lifetime of this strategic asset. The baseline manufacturing defects are now identified and corrosion growth can be confidentially monitored.

NDT Global's custom solution for an extreme subsea pipeline

Entegra's pull test of ultra high resolution MFL/Caliper platform

Entegra is pleased to announce the successful pull test of its latest ultra-high resolution MFL/Caliper in-line inspection platform. Weighing in at a mere 55 lbs. and measuring only 4'-7" in length, this 6-inch diameter ILI tool packs in nearly twice the number of primary corrosion and caliper sensors.

Mark Olson, President of Entegra, states:
"We couldn't be more pleased with the results. As expected, we're seeing nearly 4 times the data resolution when compared to the state of the art high resolution technology. Combining this technology with our vast experience and our long-time reputation for solutions and service, we've knocked it out of the park, again."



Entegra's ultra-high resolution MFL/Caliper tool

Pulling through in a crunch

Maersk Oil operates a subsea pipeline between two platforms about 20 km apart in the North Sea. In August 2013, **PII** performed a MagneScan™ in-line inspection (ILI) and reported a number of deep features, all but one of which were accessible for the client to conduct diver-operated UT correlations. The critical feature was reported at around 80% wall thickness by ILI and was extremely difficult to analyze and verify. It was located at a transition between two spools of different wall thicknesses (31.75 mm and 15.88 mm), and directly behind the caisson wall, which resulted in lower than expected magnetic field levels for the known wall thickness.

Maersk Oil wanted to proceed quickly and diligently to avoid environmental and safety issues, but also wanted to minimize production losses and not blindly shut down the pipeline any sooner than necessary. Understanding the technical limitations of this unique situation, PII collaborated on a methodology that could provide more insight and the confidence needed for critical next-step decisions.

Maersk Oil asked to conduct a series of pull-through simulation tests to help verify the depth. While these concluded a potential depth of ≥81% wall thickness, PII noted that the traditional pullthrough configuration didn't account for the magnetic field effects presented by the riser's complex operating environment within the caisson.

While designing a more descriptive test setup, PII continued carefully monitoring the live riser with two more MagneScan™ inspections, six months apart. These reported the depth at 80% and 85%, respectively. By then, the unique pull-through test configuration was ready.

To simulate the wall thickness change of the tapered area, Maersk Oil supplied a pipe section with 31.75 mm wall thickness, which was welded together with a section of 16.1 mm wall thickness using the method closest to that used on the infield pipeline.

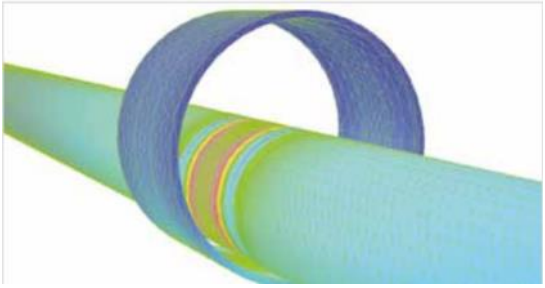
Maersk Oil also supplied two 30-inch, 20.3 mm half shells to simulate the caisson present in the operation. These were positioned to ensure that pull-through field levels were the same as those during the infield MagneScan™ inspections.

Three internal defects were machined into the transitional welds: two with lengths and depths matching the critical defect as reported by the two infield ILI runs (80% and 85% WT) and a calibration feature of 55% WT. These were spaced 120° apart around the pipe circumference, and five pull-throughs were conducted with each defect positioned at 6 o'clock directly inside the simulated caisson. All 15 pull-throughs (3 defects x 5 pullthroughs each) were conducted with the same MagneScan™ tool used for the infield inspections, and at the same speed.

This simulation of operational conditions allowed PII to compare data from the pull-through tests with data from infield ILI runs. Based on the pull-through results, the defect was confirmed to be ≥81% of wall thickness and less than the critical point of 85%.

As a result, Maersk Oil stayed in operation, with substantial cost savings, while the client completed plans for the decommissioning and replacement project.

The replacement line became operational in June 2015, and PII was awarded the contract to perform the baseline inspection.



FEA model of the spool in the caisson

Pull-through line build with simulated caisson and pipe defects at 6 o'clock position

Lifelike images of a pipe wall: ROSEN reveals new premium service

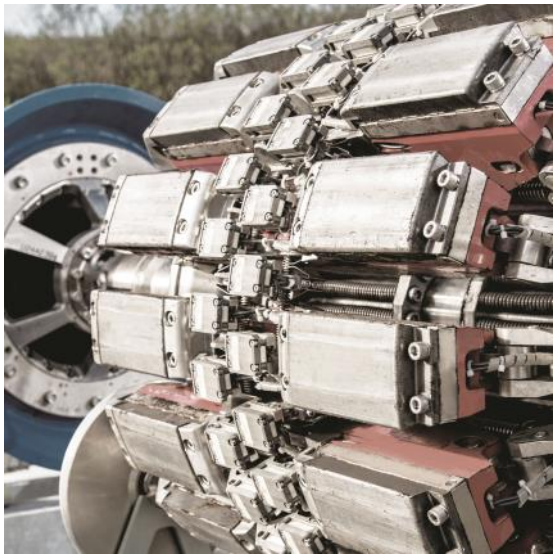
A pipeline's integrity is constantly threatened by corrosive environmental conditions as well as potentially corrosive internal media. Especially those assets that have been in service for a long time often show multiple defects, such as pinholes and preferential girth weld corrosion, or even more complex defect groups like top-of-the-line corrosion or microbially-induced corrosion, featuring pinholes in pits or even pinhole colonies. Although all defects bear certain risks and eventually need to be addressed, some represent more immediate threats than others. However, the smallest defects do not necessarily represent the smallest risks.

In the past, reliable detection and sizing of defect groups and minuscule defects like pinholes with a diameter of one millimeter (0.04 inches) or less has been all but impossible. Current MFL inspection services simply cannot deliver a signal that is dense enough to create realistic images of a pipe wall's surface. At the same time, large amounts of data constitute a challenge, as their complexity is likely to decrease the repeatability of evaluation results. The consequence is conservative integrity assessments, forcing operators to undertake expensive and often even unnecessary field verifications in order to obtain a realistic image of their asset's structure.

ROSEN's RoCorr MFL-A Ultra now addresses both of these challenges: With 1.6 x 1 millimeters, RoCorr MFL-A Ultra features the highest ILI resolution on the market. Full triaxial, ultra-high-definition MFL sensors detect even tiny changes in a pipe wall's structure, displaying what until now has often remained unseen. Unlike other MFL services, it scans the entire internal and external pipe wall. For the adequate assessment of the high-quality data, RoCorr MFL-A Ultra applies AutoData™—machine-learning, adaptive algorithms that are calibrated using high-resolution 3D laser scans of real pipe defects. These algorithms continuously evolve during their application and therefore constantly improve the quality of their results. Within seconds large amounts of data are processed, ensuring that all features are included in the evaluation process and final report.

Just like an MRI scanner provides lifelike images of the interior of the human body, RoCorr MFL-A Ultra produces lifelike images of a pipe wall's structure. The combination of triaxial ultra-high-resolution MFL sensors and an automated data processing application allows for veritable Pipeline Imaging™. RoCorr MFL-A Ultra operates under the same conditions (velocity, bend passage, temperature, pressure) as common MFL services. Moreover, the dual layer sensor design delivers both high- and ultra-high-resolution data in one run, providing a seamless connection to previous inspection data for corrosion growth assessments.

RoCorr MFL-A Ultra not only permits a realistic evaluation of a pipeline's current integrity status, but also ensures the repeatability of inspection results. More accurate river bottom profiles, higher sizing accuracy, and revised feature clustering will significantly improve the reliability of integrity calculations. This in turn will lead to conclusive integrity and MAOP assessments that actually reflect reality, ultimately avoiding unnecessary dig-ups and enabling operators to tap the full potential of their assets.



The highest ILI resolution on the market: the new RoCorr MFLA Ultra tool

Inspecting while you clean

Inspecting a pipeline whilst carrying out routine cleaning or maintenance activities can deliver a number of very distinct advantages and cost savings to a pipeline operator. By combining, what are arguably the two most common and important maintenance activities for pipelines, one can be less disruptive to production, reduce the risk of a stuck ILI pig, increase the quantity of data for analysis, while significantly reducing operational costs.

Cleaning and inspection are currently seen as two separate tasks, often carried out by different vendors, with their own proprietary tools, and separate objectives. In practice however, the success of an inspection run is often heavily dependent on the effectiveness of the cleaning operation. The advantage of cleaning or utility pigs, whether they are foam or mandrel configuration, is their simple, robust and well proven design, which makes them easy to use and suitable for high frequency deployment. ILI tools on the other hand are complex in nature and can be disruptive to operations. They are deployed infrequently but do provide detailed data on the integrity of the pipeline in the right conditions.

I2i Pipelines have been pioneering the integration of smart sensor technology into simple utility pigs with the aim of combining the best capabilities from these two very different tools into a single functional design. This new generation of smart utility pig has all the operational benefits and capabilities of utility tools with the increased capability of carrying out detailed internal inspection of the pipeline. Flow assurance data like product composition pressure, temperature and xyz mapping are also collected as standard during a cleaning run.

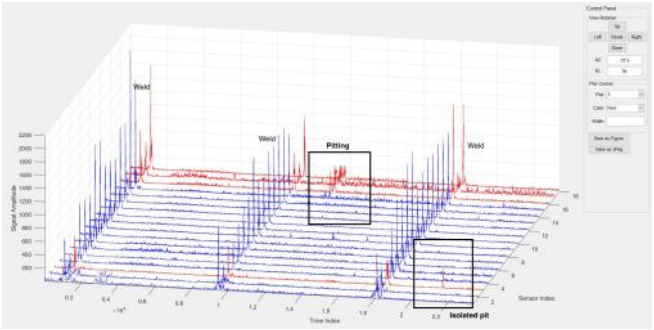
In 2016 the Pioneer smart utility pig was put through a series of pull tests at the PRCI TDC in Houston, as well as operational field trials to prove up the capabilities of these new tools. The Pioneer tools employ a novel electromagnetic inspection technique that is capable of inspecting in dry gas or multiphase conditions and a maximum standoff of 1" from the pipe wall. There is no requirement to clean the pipeline prior to use and the inspection technology is not affected by speed variations. The tools can be adapted to carry additional cleaning capabilities like wire brush disks and magnets.

It has been successfully demonstrated that Pioneer smart pigs can identify isolated pits and internal metal loss whilst effectively cleaning the pipeline.

A 16" Pioneer Smart Utility Pig ready for pull tests at PRCI TDC

Inspection data from the Pioneer tools can be displayed in a number of different formats from colour maps to surface plots. The surface plot example below highlights the detail that can be achieved by viewing the internal surface of the pipe wall and how isolated pits can be identified.

Each line in the graph represents a single sensor trace along the internal pipe wall surface. Pipe features, like welds, are easily identified and used to ref the location of any anomalies.



The ability to inspect with regular frequency allows anomalies to be monitored. This is a significant step forward for pipeline Operators. This capability will provide the data needed to generate predictive analysis to improve the integrity management of a pipeline.

Internal pipeline inspection can now be as simple and as frequent as a regular cleaning run without any disruption to production operations and totally independent on the cleanliness of the pipeline.

IKM Testing completed subsea down-line operations at 1300 meters

July 6th 2016, **IKM Testing** reached an important milestone when completing a successful subsea pig-ging/flushing operation on 1300 metres of water at the Aasta Hansteen project together with **Subsea7** Norway as Client and **Statoil ASA** as Company.

Since the first operation until offshore completion August 14th 19 successful deployments covering flooding/flushing, hydro testing and dewatering operations on the same depths have been completed at the Aasta Hansteen field in the Norwegian Sea.

The down line system consists of a reel and 1600m 2.5" ID Themoplastic Composite Pipe (TCP) downline manufactured by Airborne. The down line and the installation reel was custom designed and fabricated for the project.

Subsea7 used the vessel Seven Viking for the opera-tion.

Deployment, operation/pumping and recovery were performed in an efficient manner in close collabora-tion between all parties onshore/offshore and valuable experience was gained.

IKM Testing would like to thank all involved parties in this technically challenging project and are looking forward to working more with deep waters both on the Norwegian Continental Shelf as well as globally.

Downline Details:

Parameter	Requirement
Inner diameter	63.5 mm
Outer diameter	112 mm (+/- 2.5 mm)
Length	1600 m
Pressure rating	5,000 psi
Factory acceptance test pressure	1.5 times pressure rating (7,500 psi)
Downline weight on reel (water filled)	Approx 21 Te (+/- 3 Te)
Brake capacity	15 Te
Constant tension range required for the pipe	10 – 50 kN
Downline bending stiffness (EI) at minimum operating temperature	41 kN*m²
Minimum barrel diameter	7 m
Minimum bend radius (not on reel)	5.9 m

Reel details: Electro-hydraulic reel with 2-off integrated HPUs, constant tension & remote control
Dimensions (LxBxH) : 9300mm x 5760mm x 9550mm
Weight : 74.8 Tons (w/o down line), MGW = 125 tons
Drum diameter : 7000 mm
Pull capacity: 5 Tons (Constant Tension: 1-5 Tons / Brake: 15 Tons)

CPPI inspects pipeline with triaxial MFL tool in Thailand

China Petroleum Pipeline Inspection Technologies Co., Ltd (CPPI) team successfully inspected a 11.5 km-long, 10 inch diameter gas pipeline in mid August for **PTT** company, Thailand with a triaxial magnetic flux leakage (MFL) inspection tool.

The downstream of this pipeline are Thailand National Plant users, A key challenge was the operation speed of 5m/s. As a result, the proposed window time for pigging was only 1 day. To achieve this unique task, CPPI efficiently arranged the tool calibration, mobilization and customs clearance. The successful and safe execution of this project is an important milestone for CPPI to enter Southeast Asia.

CPPI's triaxial magnetic flux leakage (MFL) inspection tool.

3X Engineering repairs subsea dent damage in Vietnam

Overview
The objective of the repair performed in June/July 2016 by **3X ENGINEERING (3X)** and its local distributor **PETROENERTECH** was to reinforce a damaged subsea pipe section over 1.5 meter length, due to dent defect situated at 48-meter depth (3.8 % dented depth). The pipeline had a18 inch OD, a temperature of 60 degree and operating at a pressure of 138 barg.

Scope of work
Finite Elements Analysis (FEA) simulation was performed by 3X to determine the number of layers necessary to perform the reinforcement showing that 60 composite layers of REINFORCEKiT 4D SUBSEA (R4D-S**)** product had to be implemented.

Underwater, several preliminary operations were performed (identification of the defected area, removal of concrete and existing concrete). Then surface preparation by sandblasting was undertaken by divers to get a good surface roughness (60-micron surface profile).

3X wrapping reinforcement was performed following several stages :

1/ Primer (P3X32) application on the whole defect to provide a good adhesion of the filler.

2/ A rigid composite plate coated with F3XSS filler to rebuild the pipe shape was positioned over the dent and strongly fixed with ratchet belts during few hours.

3/ Second P3X32 application performed on the whole pipe surface to be repaired before wrapping.

4/ Kevlar® tape pre-impregnated with R3X1050-S resin (using special 3X device called BOBIPREG) wrapped around the pipe. Sixty layers of composite materials were applied over the dent (i.e. 30 passes of 50% overlap).

Finally, various measurements (total length of the repair, repair circumference and hardness measurements) were made to make sure the repair was performed as required.

Results
The 18" gas sea line repair was successfully completed within 4 days. The total length of the repair was 1.53m. This project was a big challenge because of the 48-meter depth and the huge number of layers of composite to be applied. Thanks to 3X's experience in subsea repairs, added to the efficient collaboration between **PETROENERTHECH**, **PV GAS** representatives and **PVMTC** divers, this subsea repair was a big success.

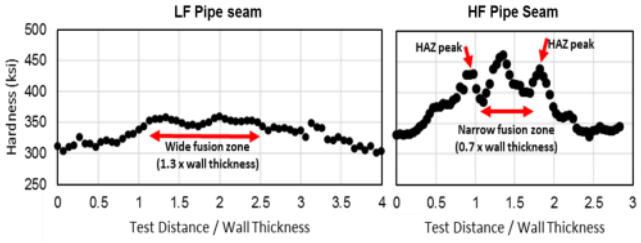
New NDT device for mechanical properties during integrity digs is ready for field trials

Nondestructive testing (NDT) on the exterior surface of active pipelines is an opportunity for operators to augment their material databases, complementing data gathered via in-line inspection. Thousands of integrity digs are performed each year, but there is no consensus on how to fulfill the pipeline mechanical data requirements proposed by regulators.

To solve this problem MMT has developed the **Hardness Strength and Ductility (HSD) Tester**, a novel, portable and nondestructive testing apparatus for directly measuring the mechanical properties of pipelines during integrity digs. The HSD Tester attaches to a pipeline to perform a frictional sliding test, where a hard stylus is pressed into the sample material and slides along the surface to form a superficial groove.

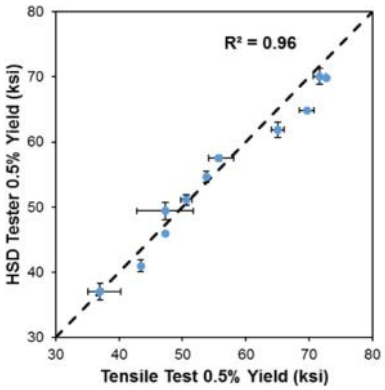
Surface grooves from two HSD Tests on pipe exterior surface

For Electric Resistance Welded (ERW) pipe seams, the HSD Tester provides the ability to differentiate in the field between Low Frequency (LF) and High Frequency (HF) processes, as well as determining if the seams were normalized after welding.



Seam characterization using the HSD Tester

The HSD Tester is proven for both ERW and seamless pipes through their material database and multiple blind testing projects. They are available to perform additional testing for validation, if required.



Excellent correlation between the HSD Tester and laboratory tensile tests for pipeline grade steel identification

They have recently constructed a protective enclosure for the HSD Tester which enables testing in-ditch on active pipelines. Their technology is now ready for field trials to verify pipe seam fabrication methods and determine material grade properties.

HSD Tester attached to a pipeline in the field

At MMT, they strive to improve their technology through ongoing research and development, and are actively seeking collaborative partnerships for evaluating new pipeline solutions. Ongoing projects include in-line testing applications and material evaluation for fracture toughness.

World 1st for STATS Group on Cortez pipeline project

Pipeline engineering specialist **STATS Group** has completed the world's first leak-tight double block and bleed isolation of a high pressure CO_2 pipeline system.

The project, on behalf of **Kinder Morgan**, was part of a pipeline intervention and isolation operation on a high pressure 30" carbon dioxide pipeline extending over 500 miles from south-western Colorado to Denver City in the US and operating at 2,140 psi.

The purpose of this project, which took place as part of a larger initiative to convert a non-piggable pipeline into a piggable pipeline, was to install full bore inline valves and retrofit pigging launchers and receivers into the pipeline system. The installation of a 24" bypass pipeline around the isolated section allowed continuous production and avoided system downtime during maintenance activities.

STATS Group is a pioneer of fail-safe double block and bleed isolation of pipelines using its patented BISEP™ technology. The BISEP™ provides leak-tight isolation, dramatically increases safety over traditional line-stop technology and doesn't require any additional hot tap vents or bleed ports. The BISEP™ contains dual energized seals and the annulus zero-energy zone proves and monitors the seal integrity before and during intervention work.

While the pipeline operated under normal conditions, the site contractor excavated the pipeline and welded on split tee fittings. Two 30" fittings provided access for the BISEPs™, enabling mid-line isolation, and two additional 24" fittings allowed production to continue around the isolated section through a bypass line.

High pressure slab valves were installed on each fitting and STATS technicians leak-tested and hot tapped the pipeline at each location, successfully breaking containment and retrieving the pipeline coupons. The 24" bypass line was then installed, purged and leak-tested allowing the slab valves to be opened and flow to pass into the bypass line. The BISEPs™ were then installed onto the 30" fittings and the upstream BISEP™ was deployed into the flowing pipeline.

The downstream BISEP™ was then deployed and set in the pipeline creating a mid-line isolation and diverting the flow through the 24" bypass line. The section of pipeline between the BISEPs™ was then vented in a controlled manner to a safe location allowing the BISEP™ seals to be tested and verified.

Both primary and secondary seals were pressure tested with full pipeline pressure in the correct direction and the annulus between the seals was vented to ambient. After the tests the isolation certificate was issued. The BISEP™ annulus provides a zero-energy zone between the seals which is monitored during the isolation.

Steve Rawlinson, STATS Group vice president Americas, said: "Hot tapping and isolating liquid and gas pipelines has a long and successful track record globally, however this is the first time the isolation of high pressure CO_2 pipelines has been attempted due to a number of challenges which we successfully overcome.

"To date, STATS have carried out isolations at four sites along the CO_2 pipeline operating at around 2,000 psi and have completed in excess of 160 days of individual BISEP isolation, whilst avoiding system downtime during critical maintenance activities. Throughout the isolations there has been no degradation of the seals or leaks past the primary barrier, allowing the launcher and receiver upgrades to occur safely.

STATS Group Cortez 24 inch bypass line installation

T.D. Williamson SpirALL® EMAT technology helps operator prioritize repair of pipeline cracks

Due to growing regulation and industry requirements, pipeline operators are redoubling their efforts to mitigate cracks. As a result, demand for inline inspection (ILI) crack tool technology that can detect and size defects, such as environmentally -assisted cracking and seam weld anomalies, is also on the rise.

But identifying the most effective ILI tools and techniques can be challenging in itself. Most options have limitations that keep them from providing a complete picture of anomalies and their potential risks. For example, hydrostatic testing will miss defects below a critical length, depth, and width. Additionally, because it is a one-time, pass/fail test, it doesn't provide information about the type of defects that remain in the pipe and how they may have grown as a result of such testing. Ultrasonic crack detection (UTCD) is another alternative. However, because it requires a liquid couplant, UTCD can't be used in natural gas or light-grade liquid pipelines without making significant, costly operational compromises such as batching, reduced product throughput, and post-inspection line drying of natural gas lines.

Pipeline operators are increasingly turning to electromagnet acoustic transducer (EMAT) technology to overcome those limitations. Because EMAT technology produces a larger, guided acoustic signal into the pipe wall (compared to other acoustic techniques), it provides a different approach for detecting and sizing cracks. Merging EMAT data with additional integrity data, produced by a multiple dataset tool that combines multiple ILI technologies on a single inspection device, provides improved characterization of detected anomalies.

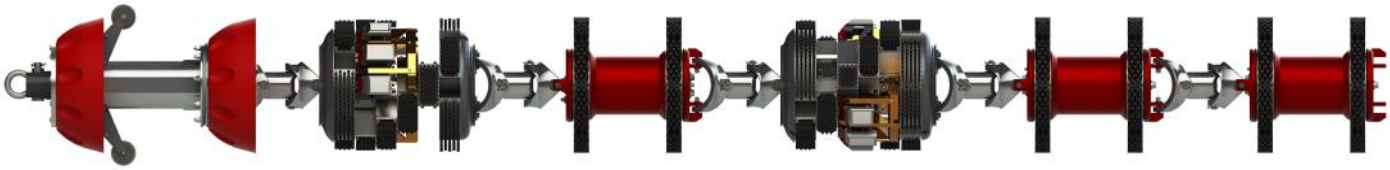
By running the SpirALL® EMAT tool and the Multiple Dataset (MDS) platform from global services provider **T.D. Williamson (TDW)**, a pipeline operator in the United States was able to address the most critical threats to the pipeline's integrity and prioritize repairs.

Following a long seam failure and release of approximately 5,000-gallons of liquid propane, the operator required a comprehensive seam assessment to identify and prioritize the repair of cracks on its 16-inch, low-frequency electric resistance welded (LF-ERW) pipeline. Not only was the inspection necessary to satisfy the company's own integrity management program, the operator needed to prove to the Pipeline and Hazardous Materials Safety Administration that the pipeline could operate safely at pre-failure, maximum operating pressure.

Both the internal and regulatory goals were met by deploying the 16-inch SpirALL EMAT tool and MDS platform.

The SpirALL EMAT technology generated the primary data used to detect and size cracks in the LF-ERW long seam. Results revealed numerous seam anomalies that were confirmed in the field as hook cracks and lack of fusion.

According to Sean Moran, TDW EMAT product manager, SpirALL EMAT and MDS technology "advances analysis capabilities by utilizing various data collected by multiple technologies to improve the characterization of cracks. In addition, by leveraging EMAT and MDS, we discover interactive threats that individual technologies are unable to identify".



TDW's 16 inch SpirALL® EMAT tool

NDT Global raises the bar for pipeline corrosion inspection

NDT Global is now offering its high resolution pinhole and pitting (UMp) metal loss inspection service as standard in all markets globally. Its complete ultrasonic corrosion inspection tool fleet has been upgraded to UMp. The UMp service reliably detects defects and sizes as small as 5 mm (0.2 inch) which represents a two-fold improvement in the minimum sizing threshold, from the previous entry level ultrasonic service of 10 mm (0.4 inch). This higher accuracy is provided at a 90% certainty to ensure accurate input to integrity models and reduce the costs to operators.

Many inline inspection providers offer corrosion inspections without the resolution required to detect and size pinhole defects. However, operators have identified pinhole and especially embedded pinhole defects as a significant risk factor in their integrity management programs.

NDT Global's long term goal is to help the industry eliminate pipeline failure due to material defects. "We hope that this move will encourage other providers to remove low resolution measurement services, raising the bar for the industry with real benefits for pipeline safety" commented Andy Bain, COO, NDT Global.

Example of pinhole corrosion

CPPI pull through test competition

An international public bidding for an MFL Intelligent pigging project was announced by **PetroChina Southwest Pipeline Company** in July 2016. The pipeline to be inspected was 1116km in length and 20 inch and 40 inch diameter. An open and justice Pull Through Test Competition was held with five international pipeline inspection companies taking part. Companies were from the UK, Malaysia, Netherlands, China and Germany The competition was held in **CPPI's** pull through test center. Each inspection company's equipment, its running mechanical dynamic performance and inspection staff's capability were witnessed by all.

An intelligent pig pull through test is mandatory prior to its mobilization to the worksite. CPPI's Intelligent Pig Testing Center possesses the world leading multi-functional smart pig pull through test system. This system can test the pigs' mechanical dynamic performance, inspection performance and its safety and reliability during it passing through the pipeline, meanwhile, a database is established, which will provide scientific basis for the inspection analysis and inspection report also provide real safety guarantee for the pigs' application on industrial field.

Three sections of 40inch, 923km China-Myanmar Natural Gas Pipeline and one section of 20 inch 193km Lan-Cheng-Yu Product Oil Pipeline were involved in this bidding. The scope of work included cleaning, deformation inspection, high-resolution MFL intelligent pigging, excavation verification, FFP integrity assessment and related reports with training.

It is the first time the competition has taken place in China. A 100m pull through test pipeline with artificial defects, in compliance with POF-2009 was covered by black plastic cloth so that all the defects to be inspected were blind to all bidders. In order to simulate the worksite situation, a 20inch test pipeline run was used with speeds of 1m/s and 2m/s, and a 40inch test pipeline was used with speeds of 2m/s and 3m/s. Their pull through test report was submitted to the client within 3 days for data comparison. Compared with the real defect drawing sizes, the inspection accuracy and sizing capability for each bidder was scored.

Frequently asked pigging questions

Q. What is an 'unpiggable' pipeline?

Traditionally an 'unpiggable' pipeline is one that may not have been designed with pigging in mind and may lack dedicated launch/receive facilities, or have complex geometry, such as significant variations in bore, tight radius bends (particularly for smaller lines) or have bends in close proximity (separation less than the pig length). However, due to recent advancements in technology and a greater understanding of pig behaviour, the industry is adapting in such a way that there are fewer 'unpiggable' pipelines, just challenging ones which require the correct level of engineering and planning in order to be pigged. A thorough feasibility study and tool selection process will ensure that all options have been considered when assessing the piggability of a pipeline. **[submitted by Jee Ltd, UK]**

Q. Why has there been an increase in market interest in cleaning complex and challenging pipelines?

The market interest in cleaning 'unpiggable' pipelines has been growing in recent years for a number of reasons. Firstly, operators increasingly need to inspect unpiggable and challenging pipeline systems and this often comes with the requirement to clean and prepare the pipe wall for the inspection technology. This has led pigging vendors to develop new innovative designs and techniques to clean or sweep debris away from the inspection region to accompany bi-directional or tethered inspections. The alternative to these techniques is subsea launch which in the majority of cases has significantly greater associated costs and modifications required.

Additionally the number of decommissioning projects, particularly in the North Sea, has increased and some of these involve complex pipeline systems that are challenging to clean and flush via conventional pigging techniques. This again has driven vendors to explore new technologies utilising gel and even ice pigs. **[submitted by Jee Ltd, UK]**

Q. What course of action should you take if you suspect that you have a stuck pig?

Pigging is a high risk operation and a stuck or stalled pig can have significant operational, safety, environmental and commercial consequences. If a pig were to get lost in the pipeline, then, without detailed preparation, the options for retrieval may be limited and complex. Prior to any pigging campaign, it is good practise to review the geometry and the operating conditions of the pipeline for any areas that have potential to impair the movement of the pig, such as damaged barred tees, tight bends, or intermittent/unreliable flow rates and to assess any mitigations or preventative measures that can be implemented prior to the run. Typically the first steps after indication of a stuck or stalled pig would be to identify the likely location and thus probable cause. This can be achieved by collating and analysing pig run operating data (pressure, flowrates etc.) to identify any unusual signals or trends as well as the use of trackers to locate the pig. Before resorting to physical retrieval options such as chaser pigs, it is prudent to investigate retrieval of the pig by altering process parameters only as in certain circumstances sending a chaser pig could exacerbate the situation. **[submitted by Jee Limited, UK]**

More FAQs are available on the PPSA website at

http://ppsa-online.com/frequently-asked-questions.php

Also on the website you can see:-

- the PPSA member profiles
- the Buyers' Guide
- how to make a technical enquiry
- the PPSA book, 'An Introduction to Pipeline Pigging'
- past seminar papers
- the newsletter archive