PIGGING PRODUCTS & SERVICES ASSOCIATION 25 YEARS

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Pigging Industry News

the newsletter of the Pigging Products & Services Association

THE PRESIDENT'S LETTER

By Steve Mayo, Pipelines 2 Data (P2D) Ltd

A big PPSA welcome to 2015 for all of our members and associates! This 25th commemorative year for the organisation is set to build on our excellent success so far, by furthering our global reach, strengthening our ties with the industry and developing new innovative ways of doing business and learning.

All of this, of course, must be set against the backdrop of the challenging oil price we are facing, at the time of going to print. With many major operators seeking efficiencies and cutting costs, the PPSA can play a bigger role than ever in assisting companies of our kind to stay ahead of the curve.

Thanks to all members who recently attended the annual PPSA seminar in my hometown of Aberdeen, Scotland. It was a massive success, yet again… and if you didn't manage to attend, I would urge you to consider it this year. The technical presentations are now downloadable from the PPSA website.

Going back to our commemorative year, we will shortly have a special book to mark the occasion. This will be filled with interesting photos, articles and anecdotes from the first 25 years of the organisation. Thanks to John Tiratsoo for producing and editing it, as well as all the advertisers and contributors. I look forward to an enjoyable read!

The annual Houston activities are coming up soon, with our golf tournament on Monday 9th February (complete with breakfast, beverage carts, cooking stations and lunch…so try to remember to concentrate on your game!), followed by our AGM on Tuesday 10th February at 3pm.

All of this as well as the PPSA stand (507) at the PPIM conference.

Finally, my year as President is coming to an end. I have been very proud to serve in this role and look forward to continuing on the Board. My thanks to my fellow Directors and Diane Cordell for keeping us all in line! My best wishes go to all members and I look forward to another successful PPSA year.

NEW Members

Full

Sriram Foams (P) Ltd, India

GOTTSBERG Leak Detection GmbH & Co. KG, Germany

Associate

3X Engineering, Monaco

Southwest Electronic Energy Group, USA

PPSA annual golf tournament Houston on February 9, 2015

The golf tournament is being held at the BlackHorse Golf Club, Houston. Everyone is welcome to attend this fun, informal event. It is a fabulous chance to meet others in the industry. As well as some great golf there will be some cooking tents at holes and some beverage carts to visit on your way round. This is followed by a buffet lunch and awards for the winning teams, the 'Closest to the pin' and the 'Longest Drive'. If you would like to take part or be a sponsor the registration form is on our website at www.ppsa-online.com.

A huge thanks to our sponsors:

Pigtek Ltd's largest cleaning pig to date

2014 was another successful year for UK based pigging specialists **Pigtek Ltd**. Among the highlights was overcoming the challenge of delivering a cleaning pig for a 2,500mm internal diameter pipeline - that's 98" diameter in old money!

The line in question – a 2.5km pipeline carrying raw seawater, consisting of GRP and reinforced concrete sections with no internal lining, would be subject to natural fouling from marine growth, such as barnacles and mussels. If left to accumulate, this type of debris would affect product throughput and ultimately compromise the efficiency of the pipeline.

Occasionally divers have been utilised to clean the internal surface of large diameter seawater pipelines, but this is not only laborious, time consuming and expensive, but also an obvious health and safety risk to personnel.

Whilst Pigtek have delivered pigs for successful cleaning of other large diameter pipelines, including 60", 70" and 78", undertaking this project was no mean feat as the step up to 98" pushed boundaries – the logistics for manufacturing, handling, assembly and transportation had to be carefully considered.

The Pigtek team based their design around a steel mandrel pig body fitted with replaceable polyurethane guide discs and seal discs for scraping and sealing within the pipeline. All discs were supplied as one solid piece, rather than utilising overlapping or segmented discs, to maintain the cleaning efficiency of the pig. The design also included a number of unique features to aid cleaning efficiency and assist handling and operation of such a large piece of equipment.

With the pig weighing in at just over 5 tonnes, certified lifting points were fitted and a steel handling/ storage frame supplied.

Having delivered what could be the world's largest diameter pig, Pigtek are well placed to tackle new challenges in the design and supply of cleaning tools for not just large diameter, but very large diameter pipelines!

Pigtek Ltd's 98 inch diameter cleaning pig

Promoting pipeline pigging to future generations - we need your help

As part of PPSA's initiative to promote pipeline pigging to the future generation of pipeline engineers around the world we need your help in identifying engineering or pipeline courses and course tutors. Please send me any tutor's contact details and course titles that you know of so that I can contact their students about opportunities as they arise in the industry.

Also I would like to identify the people in PPSA member organisations who are able to provide information about opportunities such as recruitment days, placements, internships, new entrant jobs etc., so that I can make people who are new to the industry aware of what is on offer. Please send me their contact details.

Please note this initiative is at the very early stages and it will take time to build up a database but that's why we need your help! You can see the web page as it is now at www.ppsa-online.com/students.php. If you would like to know more information about this initiative and how it works please contact Diane Cordell at ppsa@ppsa-online.com.

New inspection service "RoMat" - part of ROSEN's integrated approach

To perform meaningful calculations as part of risk assessment programs or Fitness-for-Service assessments, operators require accurate design information down to the single pipe joint on diameter, wall thickness, grade and seam type to determine the maximum allowable operating pressure (MAOP).
When establishing a pipelines' MAOP, many pipeline operators face uncertainties regarding the yield strength of the respective pipeline material. Especially for pipelines constructed prior to 1970 records are often incomplete and/or uncertain.

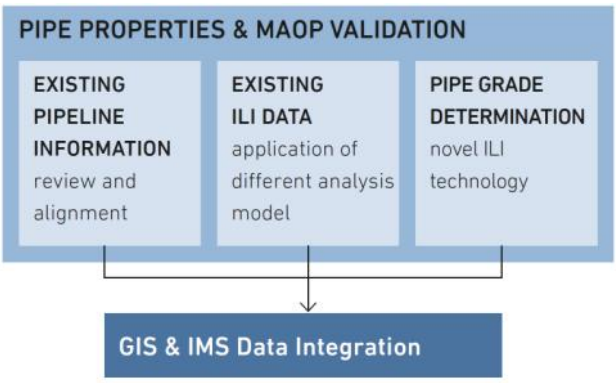
Conventional ILI technology provides valuable pipeline information. It however does not provide pipe grade data. The steel grade of a pipeline and its subsequent yield strength usually has to be determined through costly field verifications.

In order to "close the gap" **ROSEN** has developed a new inspection service called RoMat. This innovative ILI service assists the operator and provides an assessment of the pipe property yield strength of each pipeline joint. It is the world's first inline inspection service capable of continuously identifying and differentiating the pipe steel grade, therefore significantly reducing risks and efforts.

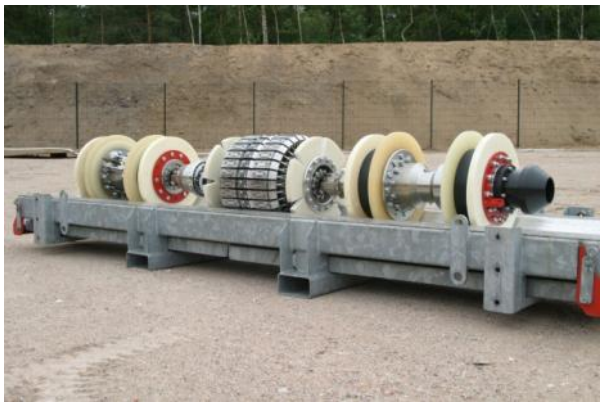
ROSEN's integrated approach addresses all aspects required for the validation of the MAOP and includes three complementary services which can be performed separately or in combination.

1. Integrity: Existing pipeline information (review and alignment)
2. Engineering: Existing ILI Data (Application of different analysis models)
3. Inspection: Pipe grade determination (Novel ILI technology – RoMat)

The complementary services are defined and set up to support the US legislative requirements behind the Pipeline Integrity Verification Process (IVP) as well as the need for accurate location-specific quantitative data in Pipeline Integrity Management. ROSEN helps to ensure that their customer's data records are in accordance to regulatory initiatives in North America which require data to be traceable, verifiable and complete.



The three complimentary services making up the RoMat package



The specialized ILI-tool utilized for the RoMat service

Apache Pipeline Products partners with CDI

Apache Pipeline Products is pleased to announce that they have partnered with **CDI.**

This enables them to bring their customers new opportunities for pipeline pig location, tracking and non-intrusive pig passage detection products.

Application of gel pig technology in pipeline services

De-oiling and leak testing case study

Gel pig technology has proven to be an extremely effective method in the removal of large quantities of debris from pipelines, efficient displacement of crude oil and it is an effective method in assuring the level of cleanliness and dryness required for a successful conversion among other applications. Presented herein is a case study carried out from March–April 2012 for an oil exploration company in Nigeria on an export crude pipeline. It describes one of the successful applications of gel pig technology.

The challenges
The line integrity could not be ascertained as no previous data had been kept. Four different leak points were recorded on the 28 inch pipeline within 1-24km due to an increase in vandalization and theft. The pipeline is the only source of transporting crude within that region. **Topline Nigeria Limited** was contracted to execute the de-oiling of the pipeline before sectional replacement and clamping. They then carried out leak testing to the required pressure after calculating the metal loss due to corrosion.

Job design and execution
The job scope involved the de-oiling and leak testing from 1- 24km section of the pipeline where the clamping and sectional replacement was to be done. Three gel trains were launched comprising of two solid gel and one water based slug (GW 28) in the middle. The flow station production into the trunk line was shut down to enhance speedy completion. The solid gel pig was designed with a life span of one week, after which it would dissolve and be transported along with hydrocarbon to the storage tank farm. During the pig train launch, the first solid gel pig was inserted and a water based (GW 28) gel slug was injected to about 700m column, then followed by the second solid gel pig. The last solid gel was propelled with fresh filtered water until a volume equal to about 30km was achieved. All the pipeline riser valves were shut and a sample of liquid taken to the lab for further rigorous tests to be conducted to confirm the acceptance criteria of 10ppm.

Result and evaluation
Samples of liquid taken after the gel pig had passed and the valve was isolated showed 11ppm. The maintenance team quickly replaced and clamped the damaged section. No trace of crude was found after cutting the line. The leak test commenced immediately and the line was pressurizesd to 40bar and held for 24hrs. Only 0.2bar pressure drop was recorded which was attributed to temperature change.

Topline Nigeria Ltd gel pig technology

Conclusion
Gel pig technology can be applied in a pipeline ranging from 4-36'' diameter, and from a few kilometers to hundreds of kilometers in length in a wide variety of services including crude oil, natural gas and refined petroleum product. The use of gel pig technology has proven to be very effective in cleaning, drying, purging, inhibiting and commissioning pipeline. As the length of the pipeline increases, the gel pig method has become increasingly attractive rather than alternative conventional methods.

After the successful completion of that pipeline, other pipeline projects that required the application of gel pig technology have been awarded to Topline Limited.

Using mapping to add longer-term value to in-line inspection

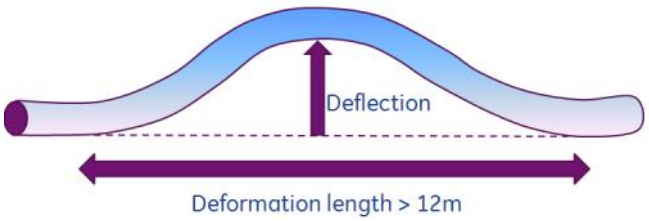
Natural force damage from earth movement and heavy rains or floods accounts for only 8% of all pipeline failure incidents. However these type of incidents account for a much higher percentage of overall property damage than any other cause. Natural force damage tends to result in rupture failure rather than leaks, hence greater spill volumes, longer downtime & increased property and environmental damage.

Ian Murray of **PII Pipeline Solutions** (PII) discusses the low frequency but high consequence nature of natural force damage and explains why it requires careful mitigation. He goes on to outline how reliable and accurate data gathering and the use of inertial measurement unit (IMU) technology during in-line inspections (ILI) can help prevent this kind of failure.

The remote nature of long-distance pipelines can expose them to a range of external loads. Earthquakes, landslides, sea bed movement, ship anchor drags, permafrost, flooding, 3rd party damage, construction and backfill all have the potential to locally deflect a pipeline from its as built position. While steel pipelines exhibit small amounts of inherent ductility, any deflection from the design centreline will impart an increased level of strain into the material. Too much deflection can cause buckling, wrinkles, damage at weld or defect locations and ultimately, failure. While the incidence of natural force damage is comparatively low, the consequences are far greater. Natural force damage only equates to 8% of significant incidents but causes 34% of all property damage. This is because these incidents tend to result in pipeline rupture rather than leakage, hence greater spill volumes, longer downtime and increased property and environmental damage.

It is possible to identify ground conditions and locations where pipelines may be at risk of damage from bending deformation and where mapping should be considered as a matter of course. As well as any pipeline which has known or suspected pipeline movement or failure history, these include pipelines in areas of known or suspected soil settlement, wash out or flooding, known or suspected subsidence or landslide, known or suspected earthquake or seismic activity, known or suspected sand dune migration and areas experiencing large seasonal swings in ground conditions (dry to wet, frozen to thawed). Subsea pipelines in areas of known or suspected seabed movement or areas of spanning, as well as subsea pipelines in areas of known marine activity where there is a chance of anchor drag or trawling should also be assessed routinely. There is also a major long term benefit of mapping newly laid pipelines in order to validate ‘as laid’ straightness and provide a baseline for future integrity surveys.

As it is not practical to directly measure the strain in the pipeline material along sections that might extend to hundreds of kilometers in length, the strain is calculated by considering the curvature of the pipeline. Curvature is a numerical measure of how ‘bent’ a pipeline is and it is defined as the angle a pipe turns through over distance. To assess the additional strain in a pipeline due to natural force damage or other external loading, the exact position is surveyed using an ILI tool or ‘pig’ equipped with an inertial measurement unit (IMU) module. The IMU measures the pig’s movement in 3D, using three gyroscopes to measure rotation and three accelerometers measure acceleration plus gravity. The resulting data is used to determine pipeline coordinates in 3D so that pipeline curvature and resultant strain can be calculated.



Pipeline curvature example

Pipeline mapping can be carried out as part of a wider integrity monitoring program where defects and metal loss can also be identified in a single run using smart pigs. PII's MagneScan™ high-resolution metal-loss inspection for advanced length and width sizing of pitting and Narrow Axial External Corrosion (NAEC) or CalScan™ EP (Caliper) tools can locate and measure dents and other geometric deviations. Inclusion of the mapping function makes little change to the overall logistics of an inspection run. The main additional activity is the provision of surveyed reference points prior to inspection, approximately every 3 kilometres (2 mi) along the pipeline. These points can be features such as block valves or temporary above-ground markers. Applying multiple inspection techniques in a single run helps to make the best possible use of a time-limited inspection window.

The mapping data provided by the IMU is used to provide a 3D model of the pipeline's actual centerline co-ordinates so that any areas of significant curvature and the associated bending strain magnitude can be identified and investigated. When repairs are required for defects reported by an inspection, highly accurate IMU coordinates enable the pipeline operator to quickly and reliably locate them via a precise GPS location prior to excavation, significantly reducing digging costs and in-field time. With a GPS accuracy of ± 1.5 m the IMU mapping technology helps pipeline operators plan the most effective and efficient repair methodology by taking into account local geography and third-party constraints that may impede site access. If bending strain is found, remedial action can include exposing the pipe and replacing backfill or rock dumping. In extreme cases, extended environmental loading can lead to buckles, which need to be cut out and repaired.

Various existing industry codes consider the effect of excessive bending strain and offer guidance on limits.The presence of an axial bending stress can reduce the failure pressure of a circumferentially orientated defect including cracks and corrosion. Several fracture mechanics based methods can be used to estimate the axial failure stress for a circumferential flaw in a pipeline. The total stress due to internal pressure and axial bending load can then be compared to the estimated axial failure stress.

Reporting bending strain allows consistency of results between different pipe diameters as well as highlighting areas which may be a potential integrity threat. When a single run analysis is carried out without any historical data, the strain on the line is calculated from the measured curvature. Considering a pipeline subjected to a maximum radius bend of 400 x diameter (400D), over a 12m length the strain will be 0.125%.The 400D curvature threshold is roughly equivalent to the strain at yield for Grade B line-pipe. When historical data is available, the comparison with a previous inspection greatly improves confidence in the identification of low-level deformations. Changes in strain as low as 0.02%, (equivalent to a 2500D bend, over a 12m length of pipeline), can be detected when new IMU data is compared with a benchmark dataset. During field testing the performance of PII's IMU mapping system has been confirmed by blind tests in a client's pipeline. In one particular test, the client exposed a 60m length of pipe and displaced the centre by 200mm. By running an IMU tool before and after the deformation, PII successfully located and sized the deformation feature in 29 kilometres of 30" pipeline. Other run-to-run comparisons have confirmed the repeatability of PII's bending strain data, both onshore and offshore.

PII has first-hand experience of inspecting undersea pipelines that have been subjected to considerable external force. PII was engaged by a European customer who has a number of large diameter offshore lines in its infrastructure portfolio. A single IMU inspection run was undertaken as part of a strain screening investigation to produce a baseline assessment. When the data was analysed it identified areas of deflection from the design centreline by up to 90m. Further investigation indicated that previous repairs to the pipeline had been carried out in the area that had suffered the most severe deflection, potentially causing the movement. In other areas it appeared that the damage and pipeline movement was consistent with impact from an anchor and subsequent dragging.

As well as helping to assess bending strain, IMU mapping can help pipeline operators to satisfy regulatory demands. Increasingly, regulations demand that pipeline operators document the precise location of pipeline assets. In some cases, however, records are old and of unknown accuracy, or may not include details of centerline location. Pipeline mapping can benefit operators by determining the precise location of each girthweld and pipe feature.

Another example of where mapping has been fundamental to an operator's integrity monitoring programme came during PII's inspection of a spirally welded crude oil pipeline. The pipeline had been built during the 1970s in a geologically unstable area with additional ground condition variations. A number of the spiral welds had suffered ruptures due to the combined loading from internal pressure, cyclic pressure loading and axial stress from ground movement. PII's initial inspection established that the pipeline was subject to multiple threats including internal and external corrosion, spiral weld anomalies/cracks, girth weld anomalies/ cracks, dents and ovalities. Triax Magnetic Flux Leakage, calliper and IMU ILI tools were deployed into the line to detect and quantify threats. Over 0.5 million defects were detected by the tools together with over 1000 strain events. With such a wide range of combined threats, PII created an assessment matrix to govern assessment rules & criteria.

It was noted that crack defects that are identified as acceptable under pressure load may be unacceptable when bending strain taken into account.

Jee Ltd to host subsea pipeline integrity management webinar on 24 February

Leading independent subsea engineering and training company, Jee Ltd, will draw on its extensive integrity management experience to host a free-to-attend webinar on 24 February 2015.

Available to a global audience, the webinar - 'Lessons learned in subsea pipeline integrity management' - will be presented by the head of Jee's integrity management discipline and Principal Engineer, Grant Adam, and will give participants an overview of subsea pipeline integrity management best practice. A chartered engineer with more than 20 years oil and gas industry experience, Mr Adam has an in-depth knowledge and technical understanding of integrity management and its associated areas, including internal and external inspection. His experience includes creating riser inspection strategies, inspection tool and stuck pig contingency plans, and corrosion management strategies.

Increasingly, strain-based designs are being considered for new pipelines. These designs can use modern pipe material such as x80, x100 or x120. With strain-based designs it is even more important to confirm that the strain capacity of the pipeline has not been fully utilized during pipe laying. An IMU Strain inspection can provide operators with this confirmation.

Strain measurement is an excellent indicator of where unknown or unexpected pipeline movement may have occurred. By identifying change of shape of a pipeline and any potential movement since the last inspection run it offers enhanced integrity monitoring and early warning of ground instability. Strain measurement also helps prevention of failures through identification of strain events and coincident features throughout the pipeline. Combined with PII's IMU technology, it provides an invaluable integrity monitoring tool for pipeline operators.

Example of triax MFL inline inspection technology

Ensuring gas throughput in Poland

Keeping hundreds of miles of Poland's pipelines flowing at optimum capacity isn't easy. It requires great care and attention to plan and execute the rigorous maintenance programs necessary to ensure that every line is clean and free of defects, especially those that could eventually cripple production. A recent pipeline refurbishment program carried out by a major gas transmission operator in the mountains of eastern Poland, along the Ukraine border, illustrates the complex nature of maintaining pipelines.

In keeping with its commitment to maintaining the integrity of Poland's gas transmission system, the operator commissioned a cleaning and inspection of a 28-inch diameter, 11 km section of a 40 km pipeline, which was commissioned in the early 1970s. The pipeline is particularly important because it can support an interconnector to and from the Ukraine.

T.D. Williamson (TDW) was commissioned to execute the program, which was completed in August 2014. As a result of the complex pipeline cleaning, gauging and inline inspection (ILI) activities, the operator reaped a number of benefits, including increased product flow and enhanced pipeline integrity.

The advantages to the operator are far-reaching. Because the line is clean and free of debris that impeded flow, there is a much higher flow rate. Also the associated production costs are lower and transmission is more efficient. Looking ahead, the operator's repair costs will also be reduced because the ILI data produced by the inspection flags defects, making it possible for the operator to address them. Potential damage otherwise incurred by these defects is mitigated, reducing future maintenance costs and downtime.

When TDW was contracted to clean the line it was operating at a pressure of 38 barg, at an average flow of 75,000 m² per hour. It was deemed unpiggable because it was so choked by debris that a cleaning pig would be unable to pass. Further complicating the situation, a visibility study carried out by TDW revealed a section of the line with eight acute miter bends, making it impossible for the pigs to navigate.

FREE technical information service

Contact PPSA members to answer your questions about pigging and pipeline integrity at ppsa@ppsa-online.com

Working in cooperation with the operator, TDW developed a solution. They custom-designed temporary pig launchers and receivers and welded them at strategic points along the line. To prevent a pig from being lodged in the miter bends, these sections were removed and replaced with pipe that would accommodate the pigs. All pigs scheduled for use during the program were fitted with transmitter units to track their progress. Finally, to verify the piggability of the line TDW performed a gauge pig run. Once this was successfully completed, preparations were made to proceed with the first of the cleaning runs.

To clean the lines, a five-step cleaning program was carried out with 24 specially selected cleaning pigs. After completing 23 runs, the line was clean and free of debris. TDW cleared about 3.5 tons of silt, timber, metal fragments, welding rods and pipelaying equipment, allowing gas to flow more freely.

Satisfied that the line had been thoroughly cleaned, TDW proceeded with the inspection phase, executing inspection runs during a three-week period. TDW used a number of its high-resolution inspection tools to inspect the pipeline, including deformation technology for geometric anomaly inspection, Gas Magnetic Flux Leakage inspection technology for corrosion inspection, and the XYZ Inertial Measurement Unit for GPS pipeline mapping.

Following data validation and analysis, TDW delivered a report to the operator. After assessing the pipeline, as reflected in the ILI data, the operator will work with TDW to formulate plans to schedule any necessary repairs or further procedures. The operator and TDW are currently discussing how this method of cleaning and inspection might be carried out on the remaining 29 km section.

In-line inspection of challenging pipelines validated with flow loop simulations by Quest Integrity Group

Quest Integrity Group, a global leader in the development and delivery of advanced inspection and engineering assessment services, announces flow loop simulation capabilities, including client-specific pipeline configurations, to validate its InVista™ ultrasonic in-line inspection (ILI) technology in demanding environments.

The company conducts flow test loop demonstrations in various locations worldwide and can custom build flow loops for clients to include their real-world ILI challenges such as heavy wall piping, dual-diameters, reduced port valves, 1D bends, risers, unbarred tees and wyes. By simulating multiple ILI obstacles in a test environment, the company effectively demonstrates the navigational proficiency of the InVista tool, and pipeline operators gain first-hand knowledge of the tool's capabilities for their pipelines.

Quest Integrity recently constructed a 6-inch custom flow loop for a large, international oil and gas client in Houston, Texas. The client needs integrity data for a high-profile, heavy wall sour gas pipeline asset in the United States, but wanted to avoid failed run or stuck tool situations. Quest Integrity's flow loop simulations included running the tool at varying speeds and bi-directionally to validate data collection and operational capabilities. InVista successfully overcame the operational trials presented and collected accurate data for both known and unknown defects in the line.

The flow loop simulation facility in Stafford, Texas, USA.

Prioritizing pipeline anomaly investigations case study by Quest Integrity Group

Project Overview

An offshore offloading facility contracted **Quest Integrity Group** to perform an ultrasonic in-line inspection (ILI) of a 4-inch pipeline using its InVista™ technology. The inspection provided both metal loss and geometry data where various dents and ovalities were identified and quantified. Sixteen anomalies did not meet common depth-based acceptance criteria and would therefore require investigation and remediation. Since depth alone is not an effective criterion for prioritizing anomalies, Quest Integrity performed an advanced assessment to investigate the lifecycle of the anomalies to establish a risk-based program for the client.

Solution

Remaining life assessments were completed on the dents and ovalities using the detailed geometry profiles that the ILI data provided. Since geometry anomalies are prone to developing cracks, the probability of failure of a dent is related to the amount of time to crack formation. This time can vary widely between anomalies; it is based on the sharpness of the profile and the amount of pressure cycling that occurs. Quest Integrity has developed a methodology for determining the stress concentration factor using geometry ILI data and then applying the pressure cycling information at the anomaly location to predict remaining life. This provides a more accurate anomaly prioritization than one based on depth.

Results

- InVista ILI Inspection identified 52 geometry anomalies including dents, double dents and ovalities.
- Sixteen of the anomalies had depths greater than the conventional depth criteria of 6% and would have required field investigation and remediation.
- Finite Element Analysis (FEA) models were created for the anomalies. Using a proprietary methodology which combines all of the component

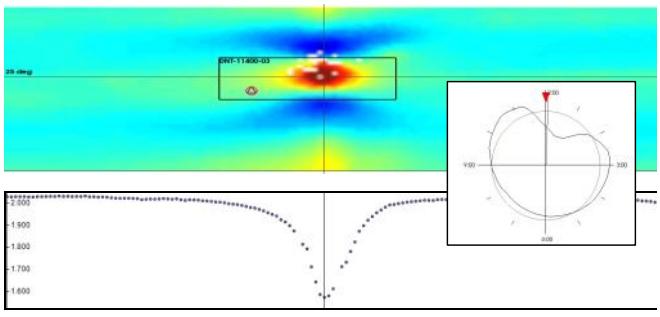
stresses, the Stress Concentration Factors (SCFs) were calculated for each location. The SCF measures the amount of stress is magnification due to the presence of the anomaly. The magnitudes of the SCFs are driven by the sharpness of a dent or the abruptness of an ovality.

- Using the operational pressure data that was provided by the client, pressure cycling histograms were created at each anomaly location using the hydraulic modelling capabilities of Pacifica™. This method accounts for the decrease in magnitude of the pressure cycles the further downstream the anomaly is from the pump station.
- The remaining life of each anomaly was then estimated by multiplying the pressure histogram by the SCF and using an S-N fatigue life curve to determine the number of allowed cycles. A safety factor of 2 was applied when converting allowed cycles into remaining life. An allowance for the damage that occurs during dent formation and subsequent re-rounding was included in the life prediction.
- Only three anomalies had a calculated remaining life of less than 100 years. The client scheduled digs for these three locations and has the advanced engineering assessment documentation to support the remainder of the geometry anomalies.

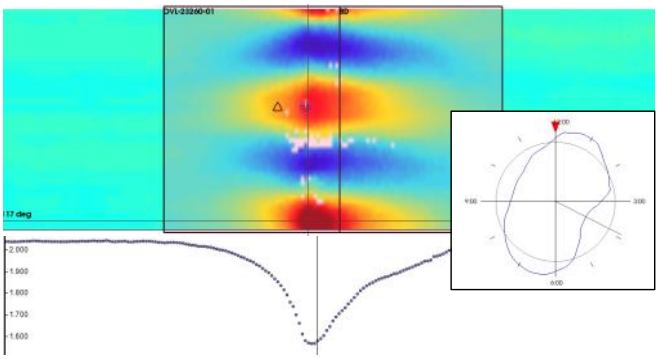
Benefits

Better understanding of risk: Leveraging ILI data benefited the client with fitness-for-service knowledge. The advanced engineering assessment used the geometry profile and operating pressure data to predict the life cycle of the anomalies and determine their remaining life.

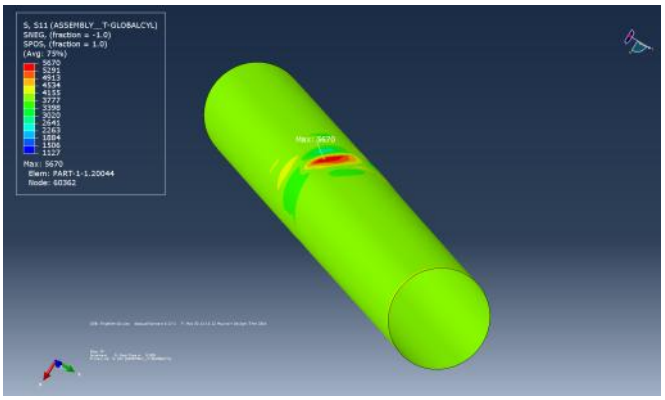
Prioritization of Anomaly Investigations: The remaining life assessment of the anomalies provided a defensible rationale for investigating the ones with shorter remaining life predictions. This decreased the number of digs from 16 to three, providing a cost and time savings to the client.



ILI inspection data showing 2D, axial and cross-section views of 9.8% deep dent



ILI inspection data showing 2D, axial and cross-section views of 26.6% deep ovality



FEA model of a dent showing axial stress due to pressure thrust load

Pipeline intervention paves way for safe, rapid repair works in Greece

Executing repair works in refineries where hydrogen sulfide (H_2S) is present creates significant safety risks. As even short-term exposure to high-level concentrations of H_2S can be fatal, every type of repair carried out in this type of potentially lethal and highly corrosive environment is approached with the highest level of security procedures.

Time was of the essence when the pipeline maintenance team at Hellenic Petroleum retained **T.D. Williamson** (TDW). The Greek operator needed TDW to create a safe working environment for its pipeline maintenance team to carry out repair works on a tower attached to a key gas line at its Aspropyrgos Refinery near Athens, Greece. TDW would provide this by completing a hot tap and STOPPLE® plug intervention to isolate the tower for repair works. This was challenging because the product flowing through the line was fuel gas at 5 barg, containing 5 percent H_2S. The line would have to be cut, plugged, and safely isolated without shutting down production. In addition, due to the highly corrosive environment, the entire operation was to be completed in 48 hours. The only alternative would have been to shut down the line and production unit, resulting in a complete halt in production. Hellenic wanted to avoid this costly scenario.

In preparation for the hot tap and plugging on the 14 -inch tower feeding line attached to unit U-3500, and as an added safety precaution, TDW application engineers developed a special procedure to clean the isolated section so as to prevent H_2S from accumulating around the STOPPLE® plugging head and at the bottom of the line. In addition to purging the isolated section from content, nitrogen was flushed continually through the isolated section throughout the entire operation to make certain that it was clean and free of H_2S at all times. This enhanced safety process was completely effective, with no release of H_2S gas detected.

Following TDW's standard procedures for operating in sour service conditions, the hot tap and plugging equipment underwent special preparation prior to mobilization.

This included treatment with a corrosion inhibitor and special lubricant to fully protect the equipment, ensuring flawless operation.

With the customized equipment prepared, a standard STOPPLE plug and LOCK-O-RING® Plus completion plug, TDW technicians set to work on the intervention. Working in close quarters at the refinery, the team was acutely aware that the job had to proceed with extreme precision to safely isolate the line within the 48-hour window. The hot tap proceeded on schedule, and the line was securely plugged in just 40 hours. With the gas line safely isolated, the valve replacement team installed the new valve. Throughout the isolation, pressure in the line was maintained at 5 bar and production continued. The entire operation – including setup, hot tapping, plugging, valve replacement, and setting the completion plug – was completed in just nine days.

"We thank TDW for collaborating with us throughout every stage of the STOPPLE intervention project at the Aspropyrgos Refinery," said Anestis Spiliotis, Mechanical Engineer – Machinery Maintenance Department and Project Supervisor for Hellenic Petroleum. " I would like to give special thanks to Mr. Akis Tsiomos for his valuable contribution, Mr. Willem Erven for his flawless performance, and the TDW team who worked on this project," he added.

As a result of careful preparation, innovative engineering, and attention to detail, TDW provided a safe, H_2S-free environment in which essential maintenance was completed. "Given the risks posed by working in close proximity to H_2S and the narrow window of time, we are proud to have safely achieved the isolation for our customer," said Gaelle Bruggeman, Project Coordinator for TDW.

Video of intelligent valve interlocks

Netherlocks recently posted a demonstration video on its YouTube channel, revealing the advantages of adding electronics to mechanical valve interlock systems. It explains how a pigging sequence can be secured by combining the reliable characteristics of a mechanical safety solution with electronic features. Distinctive characteristics of the system show how:

- it increases safety significantly by integrating operator procedures with DCS and SIS
- it provides live step by step information, guidance and a process overview for the whole procedure
- it makes operational sequences dynamic by integrating feedback from the DCS (pressure, temperature) to authorize the next step.

The video can be viewed on YouTube at http://youtu.be/sFoQ2oQ-qwY, which is on the Netherlocks YouTube channel (http://ww.youtube.com/user/netherlocksproducts).

ROSEN`s new 28/30” ultrasonic crack detection tool

ROSEN delivers crack detection tools with the best in class circumferential resolution of 7mm and including full metal loss mapping for diameters greater than 20”. The combination of both technologies allows a better investigation of the pipeline and avoids a separate inspection. ROSEN can provide datasets for every distance point of the pipeline. Due to this full scan approach, they provide special post-run services.

The ROSEN Group recently introduced an ultrasonic crack detection tool for axial cracks in 28/30” diameter pipelines. Developed and validated at the **ROSEN Research and Technology Center** in Germany, one of the largest ILI tool factories in the world. With competencies from development to production and testing on on-site, ROSEN is able to provide outstanding products for demanding customers in time.

ROSEN’s 28/30” ultrasonic crack detection tool

In early 2014, ROSEN started the development of a 28/30” inspection tool for axial cracks. The use of new technologies like rapid prototyping and additive manufacturing techniques minimized the risk and ensured the successful realization. After 9 months’ development, the tool was available for the test program, where pipe sections with crack like features were inspected. After successful testing, the first inspection was conducted for a USA client.

The tool has 1.5D bend capability, an overall length of only 3.4m, gyro option, over 1000 ultrasonic sensors and the combination capability with other inspection technologies.

Pure Technologies acquires Hunter McDonnell Pipeline Services

Pure Technologies Ltd. has acquired the oil and gas pipeline inspection services business and related assets of **Hunter McDonnell Pipeline Services, Inc.** and its affiliated companies ("HM").

"This is a highly accretive acquisition for the company and will serve as a catalyst for expansion into the oil and gas pipeline sector," said Jack Elliott, President and CEO of Pure. "While we have been growing our presence in this sector over the past few years through the deployment of our SmartBall® leak detection technology, the acquisition of the HM business will accelerate this growth. HM has been at the leading edge of developing and enhancing a suite of premium technologies and asset management services, from pipeline surveys and remote tracking of ILI tools to risk assessment and engineering. When combined with Pure's existing services, the company will be now able to provide hydrocarbon pipeline operators with unparalleled information for use within their integrity programs."

Since 2011, HM has provided tracking services on Pure's SmartBall technology inspections to its North American clients. In August 2013, Pure and HM entered into a partnership agreement whereby Pure trained HM staff to deploy the SmartBall technology.

"HM has built an excellent reputation for itself within the industry over the years," said Mark Holley, Pure's Executive Vice President and COO. "Considerable R&D spending has led to the development of HM's enhanced, proprietary products and services, patents and trade secrets.”

HM's business will be transacted through PureHM Inc. in Canada and PureHM U.S. Inc. in the U.S. ("PureHM"), newly-incorporated subsidiaries of the Company. Pure will transfer all of its activities related to the oil and gas pipeline industry to PureHM. Shamus McDonnell, co-founder and CEO of HM, will assume the position of President, PureHM, and Jim Hunter, co-founder and Vice President of Operations for HM, will assume the same position with PureHM.