

Pigging Industry News

the newsletter of the Pigging Products & Services Association

THE PRESIDENT'S LETTER

By Mark Slaughter, Applus RTD, USA

First of all welcome to the following new PPSA members: Full member ROUGE Pipeline & Process Services LLC, UAE and two individual members Dr Jim Allen, UK and Lincoln Austin, UK.

Continuing our strategy of representing PPSA in new geographic areas PPSA attended and exhibited at the Australian Pipeline and Gas Association conference in Australia in October. It was great to meet new people and spread the word about the association and our members' work.

PPSA held its annual seminar on Operational Pipeline Pigging in November 2015. Nine papers were presented and two PPSA members (ROSEN Group and Aubin Group) ran separate workshops during the afternoon. As usual there was an exhibition to look round during the breaks and we held a networking reception the evening before. The next seminar will take place in Aberdeen on 16 November 2016.

PPSA is now taking bookings for players and sponsorship for the golf tournament to be held on Monday 8th February at the Black Horse Golf club in Houston, USA. This is a fun annual event available to

everyone. As well as some great golf there will also be food cooked at holes to try on the way round. You can enter a team of 4 or sign up as an individual.

The following day is PPSA's Annual General Meeting that takes place at 3pm in the Westchase Marriott Hotel. Please come along if you can as we value your input about the association about how we should move forward in the future. We will also be announcing the result of the new PPSA directors to the Board. Don't forget to vote if you are a Full member of PPSA.

We are looking forward to the Pipeline Pigging & Integrity (PPIM) conference and exhibition where we will be exhibiting at booth 507. Our directories and newsletter will be on display at the event. It is always great to see familiar faces and meet new people. Please come and visit if you are around.

Our thanks to John Tiratsoo and BJ Lowe for inviting PPSA to attend the forthcoming Pipeline Operation & Maintenance conference in Bahrain in May 2016. They have offered us a free of charge exhibition space and we look forward to

NEW Members

Full

ROUGE Pipeline & Process Services LLC, UAE

Individual

Dr Jim Allen, UK

Lincoln Austin, UK

attending this event. It will be the first time that PPSA has exhibited in this region and intend telling attendees about the association and the members' work.

The PPSA continues to provide a valuable service to the Pipeline Integrity industry. Through the PPSA's leadership and commitment to excellence, the organization has grown its membership and its geographical reach.

The pipeline integrity industry continues to evolve and change. We see a continuous demand for more pipeline operator transparency in their maintenance practices and integrity issues. Additionally we start to see regulatory requirements for on-line public access to inspection data collected. To meet these challenges the PPSA organization offers a valuable platform for networking and comparing best practices that help to maximize pipeline safety for everyone.

As a reminder, do not hesitate to send in any technical enquiries to ppsa@ppsa-online.com.

Golf Tournament—Monday 8 February 2016

Blackhorse Golf Club,
Houston, USA

Everyone welcome!

You can register a team or individual players. Sponsorship is also available.



Please visit <http://ppsa-online.com/golf.php> for details.

A huge thanks to our golf tournament sponsors:



Monsoon can't deter remediation of exposed gas pipeline on Indian beach

A beach in a highly populated tourist area is hardly an ideal work site. But when a 42" gas pipeline laid parallel to the seashore shifted and became exposed on the beach near Ubhrat, India, crews had to overcome several unique challenges posed by the surrounding landscape and notable environmental forces to ensure a safe intervention. Rough seas due to monsoon, cyclonic storm, high tides, and sour gas notwithstanding, the urgency of the repair left little room for error.

The trunk line was completed in 1996, and by 2015 it had shifted about 25m and could be seen moving considerably with the tide. The rising sea level exposed the pipeline in the beach area. The authorities immediately put the beach under constant observation over the threat of rupture and possible explosion until a new pipeline could be commissioned.

To accommodate for the unique nature of the work site conditions, the **T D Williamson** (TDW) team created a customized solution that included hot tapping and then isolating the line using double block and bleed methodology, including the STOPPLE® II plugging system. The solution used a double STOPPLE isolation unit at one end and single unit at the other. As a result, production from the pipeline was shut down for only 21 days.

The remediation also helped prevent a potential environmental incident. As predicted, the weakest portion of the line – the insulation joint that isolates the offshore and onshore sections – inevitably ruptured in the midst of the hot tapping process.

"We already had our double block and bleed isolation system installed and pressure-tested, on the upstream location," George Easo, TDW project manager recalls. "This helped the operator isolate the leaking section at short notice to facilitate the venting, cold cutting, welding of new section, charging, and commissioning." The section replacement was complete



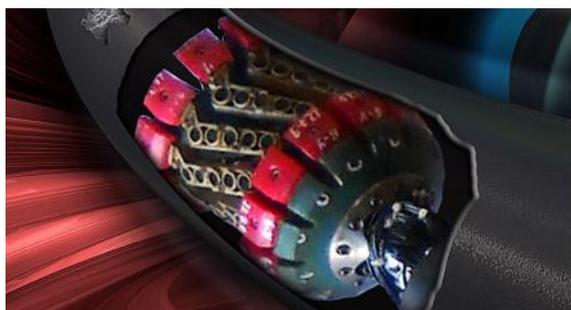
TDW performing remediation on exposed trunk line

July 31, 2015, the line was purged, and gas was charged into the new section. Once the operator verified the safety and integrity of the pipeline, the well was made operational that same day. ●

Baker Hughes inspects pipeline with VECTRA GEMINI™ triaxial MFL tool

The Baker Hughes Process and Pipeline Services (PPS) team successfully inspected a 3 km-long, 36-in. diameter gas pipeline recently for an operator in Saskatchewan, Canada with the VECTRA GEMINI™ triaxial magnetic flux leakage (MFL) inspection tool.

Baker Hughes PPS also provided support services to compliment the MFL inspection service, including piping fabrication, wireline and nitrogen pumping services that were required to safely prepare the pipeline prior to the inspection run. The Baker Hughes PPS solution enabled the operator to inspect their pipeline without adding costly permanent launcher facilities for the in-line inspection tools, saving the operator USD3 million per location. Efficiency savings for the customer were also achieved by reducing the number of contractors and their time on location and by minimizing the client's own personnel for project management and supervision. The desired output was a successful inspection run. The expert Baker Hughes PPS team delivered all the necessary preliminary work, enabling the client to significantly reduce project and enterprise risk. ●



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Flangeless Subsea Launcher

Current temporary subsea launchers are designed for flanged pipe connection to allow maintenance pigs and isolation plugs to be deployed and recovered for pipeline maintenance or repair. However, flanged connections limit the location of attaching the subsea launcher, this led **STATS Group** to develop a flangeless subsea launcher that can be simply and efficiently lowered to the seabed and introduced to an open pipe end. This innovative design provides greater flexibility in positioning the subsea launcher at any given location and can be deployed in depths up to 2200m, while preventing the need for hyperbaric welding.

STATS' ROV operated launcher is lowered to the seabed at location and introduced to the open pipe end. A manipulator clamp mounted at the front of the launcher is positioned and secured onto the pipe, and retracted towards the launcher pulling the launcher centrally on to the open end of pipe until fully installed. The launcher housing incorporates the lock and seal module which when actuated provides a secure connection to, and seal against, the outside diameter of the pipe using STATS' proven lock and seal technology. Once actuated, the locks prevent movement of the pipe during pigging operations and the seal provides a leak tight barrier.

STATS have recently supplied a Flangeless Subsea Launcher with a total of six 32" Remote Tecno Plug™ isolation tools for a project in the Black Sea. This equipment will enable pipeline flood prevention and wet buckle recovery solutions during pipe laying operations. This investment from the client provides contingency equipment to isolate the pipeline in the event of a wet buckle. Once the Remote Tecno Plug™ is deployed into the pipeline the Subsea Launcher can be removed from the pipeline and recovered to the surface. STATS can then provide a Pipeline Retrieval Tool (PRT) which grips and seals on the internal diameter of the pipe and provides a recovery method to pull the pipeline to the surface. Prior to recovery, nitrogen is pumped through the PRT to pig the Remote Tecno Plug™ to the desired set location, which also serves to dewater the pipeline

making it lighter and easier to recover to the surface. Once the Remote Tecno Plug™ is set and the double block and bleed isolation is confirmed the pipeline can be safely recovered to the vessel to allow the continuation of pipe laying operations. The Remote Tecno Plug™ will remain in position until laying activities have been completed and recovered to the closest onshore or subsea temporary head.



STATS Group's flangeless subsea launcher

Innospection Ltd inspects flexible riser and pipe with MEC-FIT™ technique

The MEC-FIT™ technique for flexible riser inspection has become a further more mature technique with new experiences gained from another two successful inspections of flexible riser and flexible pipes in the North Sea performed in Q4 of 2015.

The first challenge was the inspection of a 13" Oil Export Riser having a tight 55° wire angle structure in both the outer and inner armour layers and the presence of a thick outer sheath of 15.3mm with an anti-wear tape of 2.5mm between the two armour layers. Without the pressure armour layer, this flexible riser is susceptible to Stress Corrosion Cracking (SCC) and Hydrogen Induced Cracking (HIC) in both armour layers. The task was to inspect the flexible riser from top down through the sag bend for cracking in the outer and inner tensile armour layer possibly initiated by SCC and HIC.

Prior to the inspection, the MEC-FIT™ technique was



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successfully verified on a simulated test sample with various flaw types including EDM cracks in 45° and 90° angle. Blind test results showed that all through-cracks in all the layers as well as part-depth cracks in the outer layer were detected. The deployed MEC-Hug Crawler tool was rebuilt to enable circumferential scanning of the 55° wire angle structure with the MEC-FIT™ technique and for deployment by an inspection-class ROV from the installation.



Customised MEC-Hug Crawler inspecting through the sag bend

The second challenge was the wire gap monitoring and measurement of four 10" and three 6" flexible pipe sections stacked in 70 masts of the turret drag chain on a FPSO. Arranged in a "bull-nose" structure, the flexible pipes are subjected to external tensile armour wire disorganisation.

The MEC-FIT™ technique was successfully verified for its capability to detect the signals from the surface and its repeatability in determining the individual wire gaps of the flexible pipes.

Due to the tight space between the flexible pipes on the drag chain configuration where the inspection tool must fit in between the 150mm gaps, the MEC-FIT™ technique was adapted onto the light and handy flat MEC-P7 Scanner customised with a high resolution encoded drive to enable the precise definition of the wire edges and the distance to the neighbouring wire. This inspection was also successfully performed to the client's satisfaction. ●

Pathfinder® surveys subsea pipeline

The **Pipeline Innovation's** Pathfinder® foam caliper tool demonstrates its ability to provide a full internal geometry survey of a 44km subsea pipeline known to have serious buckle damage and in which hard bodied pigs had previously been stuck. Accurately locating and characterising one remaining large dent in the line allows the pipeline operator to cut out and replace the damaged section and complete the commissioning of the line using standard cleaning and gauging pigs.

In Spring 2015, problems were encountered in the commissioning of a 16" x 44km subsea pipeline in the South China Sea. The pipeline was newly constructed and was undergoing pre-commissioning with a train of 5 pigs when the pigs became stuck. Using water pumping, the first 3 pigs were pushed out of the line but all three pigs were damaged.

The final 2 pigs remained stuck in the line and resisted all attempts to push them out. To recover the pigs, it was necessary to locate the section of pipe containing the pigs and cut it out. The location of the stuck pigs was determined by searching for the signals emitted by the transmitters on the pigs. Once located, the pipe was excavated and it was observed that the pipe had a large buckle at this location which had been the cause of the stuck pigs. The dent had probably been caused by impact and dragging from a ship's anchor.

Having replaced the damaged section, the pre-commissioning activities needed to be resumed. Fearful of the pipeline having suffered damage at other locations, the pipeline operator and the constructor were reluctant to introduce hard bodied pigs until the line was shown to be clear. **EUREKA EFEKTIF SDN. BHD**, who were working on the problem with the pipeline constructor, were aware of the Pathfinder® tool from previous communication with PIL and they suggested this as a possible method for checking the line for damage. PIL were contacted and agreed that this was a suitable project for the Pathfinder. An order was placed and production of two pigs commenced.

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Pathfinder® Pig Design

The pig was a standard specification 16” Pathfinder® design with a bare foam body and a PU coated nose and rear. The body OD was 386mm to match the maximum ID in the line and the length of the pig was 730mm.

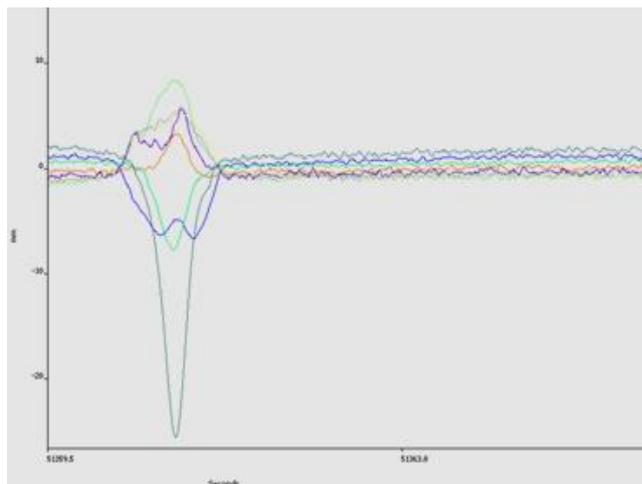
The 16” Pathfinder® pig is configured with caliper sensors for measuring deformation of the pipe wall at 8 locations around the circumference of the pig from which 4 diameter measurements can be calculated. The tool collects caliper data at a rate of 200 samples per second allowing a detailed plot of 4 pipe diameters to be produced with an axial resolution of 5mm at a pig speed of 1m/s. The tool also has accelerometers and gyro sensors which provide information on the location and orientation of features in the pipe. Within 10 days of receiving instructions to proceed, the pigs were assembled, commissioned and calibrated. In order to minimise the shipping and customs clearance times, the pigs and equipment were hand carried to site by the PIL caliper technician.

The Pathfinder® was loaded and launched from an offshore platform at 6pm on 11th July. The pig was pumped through the line using water at a speed of 0.5m/s, arriving at the receiver at 2:30pm on 12th July. The pig was removed from the receiver and within 1 hour the caliper technician had downloaded data from the tool and had started his first pass data analysis. Immediately, the technician identified a large feature in the data approximately 14 hours into the run. The datafile from the run was then uploaded to the PIL base in the UK where the specialist data analyst was able to confirm that the feature was a dent with a depth of approximately 11% of pipe OD. The client was informed and the preliminary report was issued by the field technician the following day.

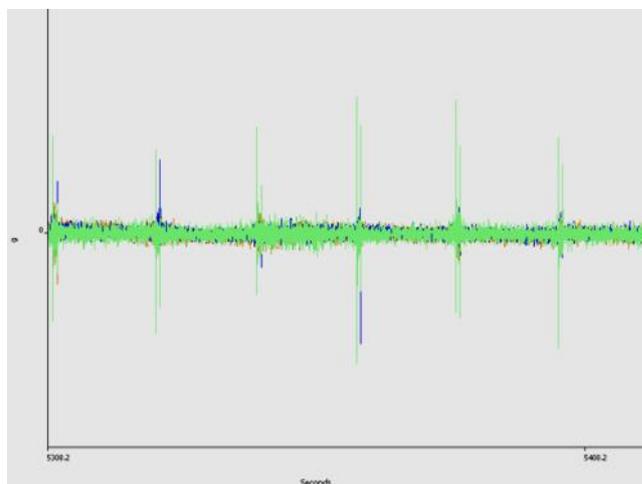
Data analysis revealed a large dent type feature with a dent depth of 27mm and a total bore restriction of 33mm. The orientation of the dent was at the 9 o’clock position. As the Pathfinder® tool does not have odometer distance measurement wheels then assessment of the location of defects must be carried out using a combination of time reference, pumping

speeds and if possible a girth weld count. Girth weld responses were visible in the data for this run. By matching the girth weld count from the caliper data with the pipe tally in the as-laid pipe book, it was possible to identify the location of the dent by pipe spool number and GPS coordinate information which had been recorded during pipe laying.

A dive support vessel was mobilised to the GPS location above the pipeline and divers deployed. A dent was identified with a depth and clock position as predicted. Once the damaged section was replaced, the pipeline operator proceeded with commissioning of the line using hard bodied pigs.



Multi-channel plot of dent in pipe



Girth weld responses

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A pigging solution for illegal hot taps

Theft from pipelines is a growing problem in the energy industry with an estimated \$37B in revenue lost globally each year. As well as the significant financial loss illegal taps are responsible for causing massive environmental damage and numerous deaths in local communities. Although Nigeria and Mexico have the most recorded thefts from pipelines, it is fast becoming a global problem that affects nearly every country managing pipeline infrastructure. Over the past 15 years theft from pipelines has evolved from a few opportunistic thieves, to an international criminal business, with well organised and financed gangs transporting stolen product across international boundaries to established black markets.

It is notoriously difficult to protect pipeline infrastructure against theft due to its often remote location, the challenge of deploying security patrols and CCTV surveillance over many hundreds of kilometres of exposed pipeline which is costly and impractical. It is near impossible to prevent thieves from approaching an operational pipeline with the aim of pilfering the product. A number of monitoring technologies are currently deployed to identify and locate illegal taps to limit the scale of theft, and each of these systems come with their own advantages and disadvantages. However criminal gangs are also becoming more resourceful and in some cases are injecting water back into the pipeline to overcome the pressure / volume sensors, making it more difficult to identify the theft.

To date, Smart Pigs have not been used to locate theft from illegal taps as the current design of ILI tools were not intended for high frequency deployment. Some of the limitations are summarised as:

1. They are disruptive to normal operations, often special launchers/receivers are needed and pipelines need to be cleaned and speeds need to be controlled for sensors to work correctly
2. Specialist personnel are needed to operate the tools
3. Data analysis often takes weeks or months
4. Cost of ILI tools is prohibitive for constant use.

Due to the growing problem **i2i Pipelines Ltd** (i2i) have developed a Smart pig to tackle illegal taps and theft from pipelines. The Patrol pig™ is an advanced inspection pig with a simple operational design made specifically for constant, high frequency deployment by local technicians. Like i2i's dedicated inspection pigs the Patrol pig has advanced sensors packaged in a robust and simple operational design that can detect illegal taps as well as changes in the composition of the product and the pressure profile across each joint in the pipeline. It can be used in any piggable pipeline with all data analysed with proprietary software within hours of recovery, allowing remedial action and teams to be onsite in the shortest possible time.

The key advantages of the Patrol pig are summarised as:

- The Patrol pig does not disrupt normal production It can be deployed from standard launcher / receiver
- The pipeline does not need to be cleaned prior to use and can be launched with or instead of cleaning pigs.
- Sensors pick up the hole caused by the illegal tap.
- The sensors look for other signs of illegal activity like the injection of water into the product or localised pressure drops across a section of pipe.
- Identifying the location of a tap is extremely accurate
- The Patrol pig has minimum operator interface
- Data analysis is carried out automatically onsite
- The data set from each pipeline run can be compared against previous runs for greater sensitivity
- The Patrol pig uses i2i's proprietary signal recognition and cloud based reporting system so data is available to engineers irrespective of location.
- A number of Patrol pigs can be run together
- The added bonus is that the pipeline can be inspected for other integrity related defects at the same time it is being used to detect illegal activity.



i2i Pipelines Ltd's Patrol Pig

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Discovery Patrol Pig

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Think Simple....

Jee hosts Unpiggable Pipelines webinar

Subsea engineering and training company, Jee Ltd, has drawn on its extensive subsea inspection and pigging expertise to offer a free webinar exploring the topic of 'Industry advances in pigging 'unpiggable' pipelines'.

The webinar was presented by Senior Engineer, Rob Davies, on 20th January 2016 and is available to watch on-demand. The webinar gives participants an understanding of how to overcome typical challenges associated with 'unpiggable' or challenging pipelines.

Rob Davies is a Chartered Senior Engineer with an in-depth knowledge of pigging and pipeline inspection. With significant experience in planning pigging and inspection campaigns, Rob has provided technical support and assurance for more than twenty pipeline cleaning and inspection campaigns across the UK and Norway in the last five years. This has included a number of previously unpiggable and challenging lines for major operators.

Exploring the latest advances to overcome these challenges, this webinar is ideal for anyone involved in subsea pipelines, and particularly their integrity. This webinar is part of an on-going series being presented by Jee, in-line with the company's ongoing commitment to continuous development and knowledge sharing.

To watch this free webinar, please visit www.jee.co.uk/resources

Inline Services continues innovation in cleaning pigs

Inline Services is well known for their customized pigging products, large inventory, quality, and customer service. The company has again expanded its facility another 7,500 square feet in order to increase inventory capacity and take their business to the next level on design production.

Their core focus is the development of the most efficient cleaning pigs to reduce the operator's cost in controlling the integrity of their pipeline systems.

Inline's key focus is still concentration on corrosion control by offering pigs with special brushes and discs.

Inline has expanded their use of pencil brushes and cutter discs for debris control and pit cleaning. The cutter discs offer angled edges to scrape off wax, black powder and other debris.

Inline's primary product continues to be the Foam Disc Pig, one of the most efficient liquid removal and separation pigs available in the market today. It is uniquely designed, making it stand out from the rest. The Foam Disc Pig is molded with circular grooves across the body to provide a series of wiping edges. These grooves are coated with a polyurethane elastomer, which improves the wiping action and increases its wear resistance. This pig is manufactured as a single body construction, and is available in medium or high density foam as well as extended body lengths. Pigging options available are pull ropes, cables, gauging plates and transmitter cavities. The use of tracking equipment is also an important factor to pipeline pigging and has been a recent area of growth for Inline. The continued design and production of customized pigs sets Inline apart from competitors. ●

3P Services move to new facility

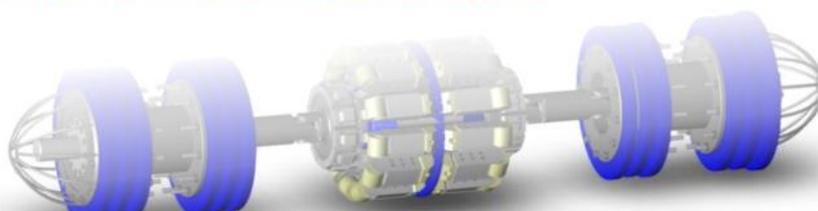
3P Services will finally move to its new facility in February. The new accommodation has been in development construction since the end of 2014.

It offers new, purpose built office and workshop space with about 5000 m² (approximately 54,000 sq ft) working area available. More than 100 employees, the entire existing work force, will make the move. The new accommodation will permit many efficiency enhancements to all aspects of the company's activities and will have space for up to 200 workers. The site is roughly 2.5 ha (approximately 6 acres) with the option for an additional area, which would come to a total of 4 ha (10 acres). The new base is situated in Lohne, just outside Lingen, Germany and not far from the existing facility. ●



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Detecting composite repairs using MFL

Well in excess of 100 **Clock Spring** composite sleeves are applied to pipelines in over 80 countries a day. The Clock Spring composite sleeve is proven and validated to have a 50-year minimum lifetime and have acceptance by the US Department of Transportation. The American Society of Mechanical Engineers B31.8 and B31.4 codes give approval for the repair of up to 80% wall loss on both liquid and gas pipelines suffering from corrosion, and to permit the repair of multiple other defects on transmission pipelines. There have been over 10 million hours of in-service life of Clock Spring composite sleeves completed, demonstrating it is the safe, effective and viable alternative to cut and replace and welded steel sleeves.

Composites by their very nature however are non-ferrous and therefore not detectable by MFL inspection tools. If a pipeline operator did not keep accurate records of the exact location of their completed composite repairs there is the chance they could waste resources daylighting previously completed composite repairs. This is a problem which multiple composite repair manufacturers have tried to overcome.

A simple sounding method to overcome the issue of non-detectable composite repairs is to include a ferrous material within the composite. The most commonly used practice is to place a woven steel mesh within the composite, while this may sound like a simple and practical solution it is not without its difficulties. The primary issue is the woven mesh is applied in the center of the composite repair, which given the installation procedure of a composite repair means there is a ferrous object over the defect, this provides noise over the defect and means the MFL tool cannot effectively check the defect to assess if the corrosion area has grown. This might lead to a catastrophic failure of a defect. The secondary issue is from the modulus of the steel mesh applied. The moduli of the steel mesh is different from the moduli of the strength member (fiber) utilized within the composite, as the pipeline goes through pressure cycles the two different moduli will cause the composite matrix (resin) to crack. The cracks will allow moisture to enter the composite and corrode the

ferrous mesh and over time the moisture absorbed will attack the fibers which are the strength member of the composite causing the composite to break down. If it breaks down it will not be able to stop the deformation of the defect and the pipeline could fail. Applying a ferrous object within a composite is not an effective method to allow MFL tools to detect a repair and could have catastrophic consequences.

Clock Spring Company, L.P. have a simple solution of applying metal marker bands to the outer surface of their composite sleeves to provide a ferrous near metal object which will be detectable to MFL tools. The metal bands are placed on the outer surface of the composite so that they are galvanically isolated from the pipeline preventing future problems. The image below shows the ferrous marker bands applied to a Clock Spring composite sleeve used to reinforce a girth weld.



Clock Spring apply metal marker bands to composite sleeve

A pipeline operator within the United Kingdom decided to complete a blind test on the marker bands to demonstrate the bands were effective. The marker bands were applied at a pumping station mid-way along the pipeline. A total of two marker bands were placed at a location where they would be deliberately challenging to detect, near to valves, spooled sections, flanges and nozzles. The ILI vendor was not made aware that the marker bands had been fitted before inspection. During inspection they found the marker bands were clear and easy to detect. ●

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Pigtek Ltd – World’s Biggest Pig?

Just when **Pigtek Ltd** thought they had pushed the diameter of pigging to its limits, an enquiry for an even bigger pipeline system was received.....

Having previously delivered what could have been the world’s largest diameter pig, UK based pigging specialists **Pigtek Ltd** have taken things one step further by recently supplying an even larger diameter pig! With the previous cleaning pig sized to suit a 98” diameter pipeline, Pigtek have now completed the task of designing and supplying a mammoth 102” pig.

Due to the pipeline characteristics, it was not possible to use the same pig body as previous, or simply up-scale the existing design. So a demanding re-design was necessary and although the principles were the same, the whole design, manufacturing and assembly process needed rethinking.

A stainless steel mandrel pig body was utilised, fitted with polyurethane guide and seal discs. An innovative approach to the design was required to keep the weight to a manageable level. All polyurethane discs were supplied as one solid piece, rather than using segmented or overlapping discs. These were manufactured to very tight tolerances, which again pushed production and manufacturing beyond previous limits. ●

Vitrocell USA, Inc announces Lithium Sulfuryl Chloride line of cells

Vitrocell USA, Inc., a subsidiary of **Vitrocell Co. LTD, Korea**, is pleased to announce the availability of its full line of high-temperature 3.9V Lithium Sulfuryl Chloride line of cells for pigging applications. These cells are of a stainless steel construction, and are prepared and rigidly tested to allow for maximum performance and durability under extreme conditions of heat, shock and vibration. Cells are available in DD, D, C and AA sizes, to complement Vitrocell’s Tekcell line of 3.6V Lithium Thionyl Chloride cells for use in pigging applications. Many of these cells have received ATEX Certification and all have best in class performance at a reasonable cost.

Vitrocell USA distributes the Exium and Tekcell line of battery products from Vitrocell Co. LTD, Korea. They partner with pack manufacturing companies in the US and Canada to provide battery packs for all of your power needs for MFL, ultrasonic, caliper, tracking and other applications.

To find out more about their cell offerings, along with expert evaluation and optimal configuration of batteries for your application, check out the Vitrocell USA website: www.vitrocellusa.com. ●

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3X Engineering's composite repair

Overview

The objective of the repair performed in August 2015 by **3X Engineering** and its local exclusive distributor **TAVANA Pipeline Engineering** was to reinforce and stop corrosion on localized area of the 20" gas pipeline that had several external corrosion spots and one 1mm diameter hole. The pipeline is in Iran and has a maximum operating temperature of 60 °C and a design pressure of 172 barg.

Scope of work

- After calculations and Finite Elements Analysis (FEA), 68 layers have been determined to perform the repair.
- Because of the leaking defect the repair was performed offline. An initial sandblasting was made prior to 3X intervention to get a rough surface (75-micron surface profile).
- Before wrapping, climatic conditions had been checked and the surface had been cleaned and degreased.
- The wrapping repair was performed as follows:

- 1/ Special filler (F3XS1) application to rebuild the surface.
 - 2/ Metallic steel plate (with filler), fixed with straps during curing time, installed over the defected area.
 - 3/ Second filler application performed to ensure the proper impregnation of the first layer.
 - 4/ Wrapping using Kevlar and R3X1080 resin. 68 layers of composite (over 88cm) were applied to reinforce the pipe i.e. 34 passes (50% overlap).
- Identification plate for traceability was positioned on the pipe. Curing time of the composite system required 50°C during 3 days. This curing process was initiated with heating blanket during 72 hours.

Results

Thanks to the efficient collaboration between 3X and its local distributor, the pitted areas have been repaired using the REINFORCEKit 4D-ECHT and the pipeline is now protected from external corrosion. The pipe integrity has been restored and the pipeline has been pressurized successfully back up to 153 barg.



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Online Electronics' MEG ARTS® successfully completes first project

Online Electronics Ltd's award winning MEG ARTS® subsea analysis and sampling system has successfully completed its first operation during the summer of 2015 in a pipeline project in the UK Continental Shelf. The project recommissioned a gas export line following maintenance. A conditioning pig train was run from the production facility to a sea bed manifold that connected to an operating gas line.

Deployed from a construction support vessel, MEG ARTS® was placed next to the manifold and connected by hose to a vent valve. The system operated unattended, monitoring and recording the density, temperature and pressure of the received fluids. The line fill of water from the pressure test was followed by MEG (mono-ethylene glycol) in the pig train. Samples of MEG were captured according to limits defined for the project. During transit of a pig train there was some mixing of water with MEG. It was important to know that the quality of MEG confirms that the line is sufficiently dry and ready for production.

The system was retrieved to the support vessel and the samples were recovered. The data clearly showed the change from sea water and different qualities of MEG as each pig was received.



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Both the construction company executing the project and the operating company were pleased with the performance of the system and quality of pipeline data that it has not been practical to obtain before the availability of MEG ARTS®.

The system is the winner of the Pipeline Industry Guild Technical Awards; Subsea Pipeline Technology Award 2015.



Online Electronics Ltd's MEG ARTS®

OEL agrees distributor agreement with AboveGroundMarkers

Houston based **Online Pipeline Solutions Inc (OPS)**, a subsidiary of the specialist pipeline technology solutions provider **Online Electronics Ltd (OEL)** has recently agreed a distribution agreement with industry leading pipeline pig locating designer and manufacturer **AboveGroundMarkers.com LLC (AGM)**.

The OEL Group of companies which includes OPS is in the business of designing and manufacturing pipeline pig location equipment using a range of sensor technologies including electromagnetic, acoustic, magnetic and ultrasonic.

AGM designs and manufactures pig locating equipment for land applications using leading proprietary technology, principally for the tracking of ILI tools during inspection runs. The equipment is of robust design, easy to use, has user defined feature and is cost competitive. The current range includes DM3, the base AGM device, L22M which includes AGM and Search and Track Capability and WAPT which is a wireless acoustic pig tracker.

As AGM and OPS/OEL have similar and complimentary technologies and products, the distributor arrangement has been agreed as it is of benefit to both parties. As part of the agreement, OEL will promote AGM products on a global basis and AGM will provide training and technical support as required.

Both AGM and OPS/OEL will continue to independently design and develop new products to address customer needs in their respective primary market sectors.

ROSEN's tailor-made solutions for inspecting deep water offshore flowlines

Complex piping arrangements and unknown conditions may make inspecting a pipeline unfeasible when only taking into account traditional technologies and/or methods. Using the unique tool box approach, which incorporates complementing units, components, methods and market knowledge, **ROSEN's Challenging Pipeline Diagnostics Division** can devise inspection solutions for pipelines deemed "unpiggable", and backed by more than three decades of experience, a comprehensive technology portfolio, and extensive market knowledge.

A recent success story began when **Shell Nigeria Exploration and Production Company (SNEPCo)** approached **ROSEN** to inspect two of its oil field flowlines. The pipelines are part of the Bonga field which is located 120 km off the coast of Nigeria in water depths of 1100 m. The field is operated by SNEPCo. The other partners are **Exxon Mobil, Total and Agip**. SNEPCo requested an inspection for two 8 km flowlines, which have 10/12" dual diameters and wall thicknesses from 12.7 mm to 31.6 mm.

Under ideal circumstances SNEPCo could have inspected the complete 16 km pipeline system in one run. The tool would be launched into the first flowline, sent through a pigging loop at the Pipeline End Manifold (PLEM) into the second flowline, and received back on the deck of the Floating Production Storage and Offloading vessel (FPSO). However, it was possible that a defective valve on the PLEM may not open completely, meaning that an inspection tool might not be able to pass through the PLEM. In such a case a common approach is to determine the valve's position by using a gauge tool. Depending on the results the next tool to be launched would be selected. For example, a conventional ILI tool could be considered if the valve was sufficiently open. However, since these tool runs would require a shutdown of production in the flowlines, an approach based on a separate gauge run would require multiple production shutdowns before a full inspection could be performed.

The uncertainty about the valve, along with the deep-water offshore environment, the heavy pipe wall thicknesses, and the continuous operation demands, presented a challenging situation. The valve's position was a critical issue for SNEPCo and it was absolutely essential to complete the full inspection in one shutdown. Therefore, ROSEN proposed a solution that consisted of bidirectional (BiDi) cleaning and gauging tools, as well as a BiDi Ultrasonic (UT) tool.

If the results of the cleaning and gauging process showed no damage, then the UT inspection would be performed in a unidirection. However, if the gauge plate returned heavily damaged, indicating a partially

closed valve, the pipeline would be inspected bidirectionally. The UT tool would be pumped through the first flowline to the PLEM, and then the medium flow would be reversed so that the tool is pumped backwards and received at the FPSO. This process would be repeated for the second flowline, but only one shutdown would be required.

ROSEN developed a tailor-made 12" BiDi UT tool that met the passage and corrosion inspection requirements. Constant stand-off and optimum sensor guidance was established by housing the UT sensors in flexible BiDi polyurethane carriers. The unique design of the BiDi tool ensures that the data quality is equal to that of ROSEN's standard UT tools, thus providing the high resolution data quality required.

When the cleaning and gauging tools were sent through the pipeline, the returned gauge plates confirmed that the valve was fully open at the time of inspection. Therefore, the BiDi UT tool was launched into the pipeline and completed the full inspection through the pigging loop in one unidirectional run.

A detailed analysis of the recorded data was performed by ROSEN and the final results were delivered to SNEPCo to the satisfaction of all parties. This solution provided the following benefits: Maximum uptime during inspection, understanding of the asset to ensure compliance, and minimized risk exposure, effectively guaranteeing operational safety. ●



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