PIGGING PRODUCTS & SERVICES ASSOCIATION

PO Box 30, Kesgrave, Ipswich
Suffolk, IP5 2WY, UK
Tel: +44 1473 635863
Fax: +44 1473 353597
ppsa@ppsa-online.com
www.ppsa-online.com

July 2022

Pigging Industry News

the newsletter of the Pigging Products & Services Association

THE PRESIDENT'S LETTER

By Jan Frowijn, ROSEN Group, USA

It's been a busy start to the year and fantastic to be back at events talking with our members and meeting new people. We kicked off the year with the annual PPSA golf tournament that took place in Houston in January at the BlackHorse Golf Club. Despite the rain some great golf was played and prizes awarded. The Golfer's breakfast, sponsored by PECI, and a fabulous buffet lunch, sponsored by MOSO Services, were enjoyed by the golfers. Thanks to all the sponsors and golfers for taking part. The event raised money for Young Pipeline Professional projects.

The following day we held our Annual General Meeting to discuss ideas about the PPSA's strategy and how to provide more benefits and opportunities for our members. I was honoured to become the PPSA President and would like to thank the past President Dr. Mike Kirkwood for his support and leadership during the past year. Also congratulations to Danny Molyneux on becoming the Vice-President. The two Directors who stepped down from the board were former President Felix Schmidt of 3P Services who served 4 years on the board and Scott Greig of Halliburton who served 2 years. I am delighted to welcome two new Directors to the board - Odd Reidar Boye of IKM Testing and Andy Caley of Baker Hughes. Following the AGM Meeting, PPSA attended the PPIM Conference and exhibited at the exhibition.

Following this, in March, PPSA was at the PTC Conference and exhibition. Thank you to PTC for giving PPSA a free of charge space at the exhibition. As well as attending some excellent papers it was a fabulous opportunity to meet up with people again and to sing along to some Beatles favourites at the Conference dinner. We were also pleased to invite conference guests to try smoked salmon at the PPSA booth at the get together party night.

We are looking forward to the IPC conference in Calgary in September. Please come by and see us at our exhibit number 825 if you are there. We would love to see you.

Another event that we are very excited about this year is the annual PPSA seminar that will be face to face again on 16th November in Aberdeen, UK. There will also be a reception in the exhibition area on 15th November and discussions are taking place about holding another test loop event in Montrose for YPP members. The programme will be announced soon and registrations will start in August.

PPSA was pleased to sponsor the graduation lunch of the Pipeline Integrity Course that is run by the Oklahoma State University Institute of Technology (OSUIT). Well done to all the graduates and good luck in your future careers.

The PPSA webinar series continues. So far this year we have had a webinar on 'The unreasonable effectiveness of comparing successive in-line inspections to determine corrosion growth' by Jed Ludlow of TD Williamson, and also a webinar on 'Keeping Safety Grounded in the Hydrogen Takeoff: Revisiting Risk in Pig Launching and Receiving Operations' by Neil McKnight of TD Williamson. If you missed attending these events, the recordings are available at: https://ppsa-online.com/webinar along with an archive of past webinars.

As usual we'll be updating the Directory of Members and distributing it this summer. Please let us know if you would like a free of charge copy at https://ppsa-online.com/subscriptions.

As always we are extremely proud and appreciative of the work that our members do every day, keeping pipelines working safely and efficiently throughout the world. Stay safe and hope to see you soon.

Baker Hughes acquires Qi2 Elements to expand inspection solutions for critical energy infrastructure

Baker Hughes has announced the acquisition of **Qi2 Elements,** a designer and manufacturer of advanced robotic sensor systems that inspect, assess, and monitor the integrity of critical energy infrastructure. The acquisition complements Baker Hughes' existing capability in gas pipeline inspection, while also delivering new technology to support storage tank inspection.

Baker Hughes' range of asset inspection solutions includes pipeline inspection services that detect, characterize, locate and size defects which can compromise pipeline integrity. The company's Electro Magnetic Acoustic Transducer (EMAT) technology enables the detection and measurement of cracks and crack related features that may occur in gas pipelines. Qi2 Elements' EMAT capability will extend Baker Hughes' technology to serve customers with small and medium diameter pipelines up to 24 inches, including transmission, distribution, gathering and process pipelines. The combined expanded EMAT capability directly supports energy operators' requirements to ensure asset safety and integrity on a regular basis, and supports future hydrogen infrastructure inspections.

The acquisition also includes Qi2 Elements' robotic inspection technology, delivering the capability to inspect above ground liquid tank storage facilities without the need for personnel to enter confined hazardous spaces. The technology monitors and provides data on the integrity of the tank floor while the tank remains in service. This technology is currently used to support oil and gas customers but has the potential to be deployed in adjacent industries, such as power generation and pharmaceuticals, where liquid storage tanks are utilized.

NDT Global strengthens partnership with PRCI

NDT Global, together with **Eddyfi/NDT** are delighted to announce the strengthening of their partnership with global collaborative research development organization **Pipeline Research Council International (PRCI)** to an Associate Member level.

In 2006, NDT Global joined PRCI as a Technical Program Associate member; this affiliation has proven instrumental to NDT Global's ongoing research and technology development. When acquired by Eddyfi/NDT, NDT Global identified the vast opportunities available to the group of Eddyfi/NDT Companies by leveraging respective expertise, knowledge, missions, and values by becoming an Associate Member with PRCI.

Martin Theriault, CEO Eddyfi/NDT "At Eddyfi/NDT we have a simple mission: push the limits of advanced technology to keep the world's infrastructure safe and productive. We believe strengthening the group partnership with a community offering such a unique forum like PRCI will help us achieve this." Together with sister companies, Dynamic Risk, Eddyfi Technologies, TSC Subsea and Senceive - NDT Global can collectively share and shape future industry visions while continuously working to improve the longevity and safety of global energy pipeline systems. Working with industry committees like PRCI, NDT Global continues to be a technology disruptor whilst delivering new and innovative solutions to our customers through expertise, creativity, and collaboration.

"PRCI welcomes NDT Global as an Associate Member and looks forward to working together with Eddyfi/NDT as a member of the Executive Assembly," said Cliff Johnson, President of PRCI. "It is important that all sectors of the energy pipeline industry work together to enhance pipeline safety and integrity. "

Pipeline pigging and site support services

iNPIPE PRODUCTS™ was approached by a global oil and gas operator to provide pipeline pigging and site support services for a 10" Gas Export Pipeline, located offshore West Africa.

The WHT's provide the facility for accommodating the production and water injection wellheads, performing well test, metering and allocating lift gas and injection water. The produced gas / liquid is then transferred via a pipeline to the FPSO vessel for separation, treatment & storage. The treated gas will be compressed and transferred to the onshore gas pipeline network. The treated oil will be offloaded to the shuttle tanks. Both pipelines run from pig launcher to pig receiver and includes flexible risers that connect the FPSO to the top of the riser towers.

Following a technical review of the project details and discussions with the Client, iNPIPE PRODUCTS™ mobilized the required personnel, who attended both the launch and receive locations to carry out operational onsite support for pigging and ILI runs from the FPSO to the terminal onshore. Following the pig runs, detailed reports were compiled and issued to the client as required.

The project was completed successfully and with great feedback received from another happy client.

Pig runs in 10 inch gas export pipeline

iNPIPE PRODUCTS™ achieves ISO 45001 & ISO 14001 accreditation and wins RoSPA Gold Award for 2022

iNPIPE PRODUCTS™ wins RoSPA Gold Award

iNPIPE PRODUCTS™ is proud to announce that following a rigorous auditing process, the company has successfully achieved the internationally recognised accreditation to ISO 45001 Occupational Health and Safety Management System and ISO 14001: Environmental Management System.

The company is also delighted to announce that for the 5th consecutive year has been awarded the internationally recognised **RoSPA Award** for health and safety achievements, having achieved its first Silver Award in 2018 rising to Gold in 2020, 2021 & 2022. iNPIPE PRODUCTS™ attended the RoSPA award ceremony which took place on Tuesday 17 May at the ExCeL, London.

The latest accolades demonstrate iNPIPE PRODUCTS™ ongoing commitment to health and safety to protect its employees and prevent injury and ill-health combined with its high environmental standards to reduce its environmental impact to build a better tomorrow.

Blind Zone Scanner – the newest feature for ROSEN's TBIT Ultra Service

The Blind Zone Scanner introduces a new feature for the **ROSEN** TBIT Ultra Service for inspection of aboveground storage tanks. This service is capable of accurately detecting and sizing even the smallest metal loss defects, enabling decision-making for the integrity management of storage tanks. Up to this point, floor scanners have been unable to reach ALL areas of the tank floor, leaving behind "blind zones," which typically occur at corners of tank bottom plates and when obstacles such as piping or heating coils are installed. The smaller configuration of the measurement unit itself means the Blind Zone Scanner is able to reach area that would otherwise remain uninspected due to the physical limitations of conventional tank floor scanners. Similar to the TBIT Ultra floor scanner, the Blind Zone Scanner uses high-resolution MFL sensors and an automated detection and sizing algorithm that significantly increases the probability of detection while reducing personnel time in confined spaces. Also, data from both scanners is provided in the same format and delivered in a single report, reducing the manual effort required to combine different data sets as well errors. The Blind Zone Scanner complements the tank floor scan and allows for maximum detection coverage, reducing uninspected areas by 75%.

Ultimately, the Blind Zone Scanner delivers:

- An efficient and cost-effective solution, reducing out-of-service hours and HSE risk by outperforming manual UT inspection
- The ability to scan blind areas of conventional tank floor scanners
- The ability to scan below obstacles such as internal piping and heating coils
- Automated defect detection and sizing
- Full capture and storage of high-resolution mapping data, providing:
  - Indications and location (coordinates) of metal loss
  - Discrimination between internal and external features
  - Measurement of liftoff between sensors and steel plate
- Data stitching, i.e. the alignment of data sets from tank floor scanner (TBIT Ultra) and Blind Zone Scanner and plus integration into data management and visualization software (ROSOFT)

Together with the TBIT Ultra Service for tank bottom inspection, the Blind Zone Scanner delivers full-coverage inspection, ensuring operators trust and reliability in their decision-making process for the integrity management of storage terminals. For more information on the entire package, visit https://www.rosen-group.com/global/solutions/services/service/tbit-ultra.html.

ROSEN in winning teams for two annual gas industry awards

On May 11, the **ROSEN Group** attended the 2022 Gas Industry Awards and were part of the winning teams for two of the awards: Product of the Year and the Innovation Award.

Since 1998, the Gas Industry Awards have been recognizing and rewarding the outstanding accomplishments of individuals and organizations working across the gas industry. **The Institution of Gas Engineers & Managers (IGEM)** and the **Energy & Utilities Alliance (EUA)** organize the award annually.

Bringing together almost 700 professionals from the gas sector, the Gas Industry Awards 2022 the event celebrates nine unique awards each year.

This year, ROSEN was part of the winning teams for the following awards:

- Product of the Year: FTPS Pipeline Spacers for Dead Insertion of PE Pipe over Weko Seals by FT Pipeline Systems Limited, Cadent Gas Ltd, ROSEN (UK) Ltd
- Innovation Award: Leakvision by Synthotech, Synovate, Energy Industries Council, Northern Gas Networks, ROSEN (UK) Ltd

The ROSEN Group would like to congratulate all winners and nominees for their accomplishments and big congratulations to the ROSEN (UK) Ltd colleagues for their achievements.

CERTIVATION receives ANAB accreditation as personnel certification body

As of 22 December 2021, ***CERTivation GmbH****, a wholly owned subsidiary of the* ***ROSEN Group****, is officially accredited by the* ***ANSI (American National Standards Institute)*** *National Accreditation Board (ANAB) for fulfilling the requirements of ISO/IEC 17024:2012 General Requirements for Bodies Operating Certification of Persons. The accreditation was granted within the scopes of "Certified in Pipeline Integrity Management: CS_014F" and "Certified in Pipeline Defect Assessment: CS_020F."*

The new accreditation represents a strategic expansion of the company's service portfolio. CERTivation is an accredited provider of the certification of management systems according to international norms such as ISO 9001, ISO 27001 and ISO 45001. In addition, CERTivation offers services based on American Petroleum Institute (API) standards. These include API-U-certified trainings according to the API-Q1 and API-Q2 standards as well as audits for manufacturing organizations and service suppliers in the petroleum and natural gas industry. Therefore, it was a natural step to also seek accreditation as a personnel certification body in the field of pipeline integrity.

As part of the ROSEN Group, CERTivation has a strong connection to the oil and gas industry and thus a good sense of the industry's needs. One of these needs is the availability of qualified programs for the continuous learning and development of its employees. Pipeline standards and regulations specifically require staff to be both competent and qualified in the tasks they perform. The American Petroleum Institute's recommended practice API 1173 states, "The pipeline operator shall ensure that personnel … have an appropriate level of competence in terms of education, training, knowledge and experience." This is why CERTivation commissioned the Qualification Panel for the Pipeline Industry (QPPI), an independent panel of qualified subject matter experts, to identify the competencies that are essential in the field of pipeline integrity, and to develop respective certification schemes. Eight qualifications were selected for certification by CERTivation.

CERTivation has now been accredited for certifying personnel in Pipeline Integrity Management and Pipeline Defect Assessment. Individuals certified in Pipeline Integrity Management can define and distinguish between differing integrity management methods/techniques, particularly pipeline integrity management and systems, and can list the threats to pipeline safety and the consequences of pipeline failure. Individuals certified in Pipeline Defect Assessment can describe pipeline integrity and pipeline defect assessments (for all types of defects found in pipelines), and can summarize and give examples of fatigue assessment. CERTivation is currently in the process of accreditation according to ISO 17024 by ANSI for the certifications of the six other qualifications identified by the QPPI.

CERTivation is an accredited certification body located in Lingen, Germany. Its services are divided into two main areas. Firstly, the certification of management systems according to ISO 9001, ISO 27001 and ISO 45001. CERTivation is accredited by the German Accreditation Body (DAkkS) according to the internationally recognized standards ISO 17021 -1 and ISO 27006. Secondly, the certification of persons in the field of pipeline integrity engineering. For this, the ANSI National Accreditation Board (ANAB) has accredited CERTivation according to ISO 17024 for the programs:

- Certified in Pipeline Integrity Management: CS_014F
- Certified in Pipeline Defect Assessment: CS_020F

In addition, CERTIVATION offers other non-accredited services. It is, for example, recognized by the American Petroleum Institute as an API-U trainer for the API Spec Q1 and API Spec Q2 standards.

For more information about CERTivation, please go to www.certivation.com.

4Pipe Hidropig industry and special services

Throughout its 35 years of existence in Brazil, **4Pipe-Hidropig** has developed the manufacturing process of different types of Pigs, for several applications, working in oil and gas companies - onshore and offshore, distribution terminals, industries in general, water companies, sewage and effluents, as well as training a team of engineers and technicians for technical services using Pigs in the field. Among the standard "Pigging" services, which include the phases of construction, commissioning, operational maintenance, inspection and even the desactivation of the pipeline, we are also proud of our experience in special operations, where we carry out the process "Pigging" in pipelines that are NOT piggable, but that operate with chemical products and hydrocarbons.

These pipeline, here called NON Piggable, are located in industrial facilities, terminals, among others, which were built without a standard for the Pig passage, that is, they are pipes that do not have points for the introduction and removal of Pigs such as launchers and receivers, thereefore this lines used for displacement of fluids that generate debris, which have in their geometric profile, short radius curves, diameter variations, valves with some internal projections, transition of construction materials and intrusive equipment.

The Pigging process in NON-Piggable lines begins with the customer's demand to carry out possible maintenance, because it is not able to safely drain the fluid inside the pipe, being necessary first to transform that risk atmosphere into an inert atmosphere.

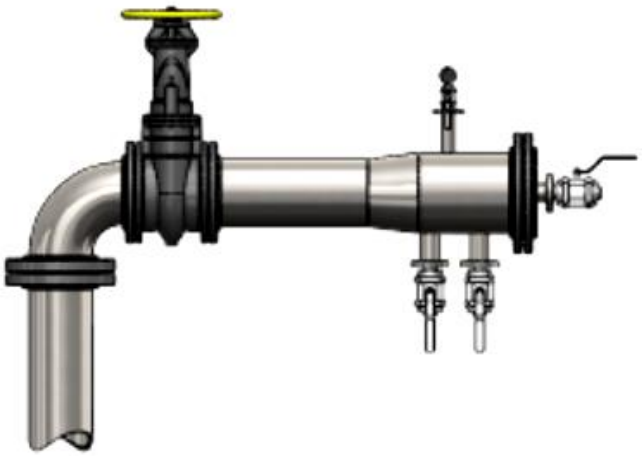
In these cases, the team of engineers travels to the customer's facilities to check the entire pipeline track, evaluate possible point for the introduction and removal of Pigs, in some cases providing portable station for launching and receiving, it is also needed to evalaute the condition of storage to receive the product displaced by the Pigs, in such a way as to guarantee the integrity of the operation, operators and the environment.

Operational variables of the drained product, such as temperature, pressure, flow and duration of pumping, must to be check in order to confirm the feasibility of Pigging.

Recently, our service team accepted the challenge of carrying out Pigging in a non-pigable pipeline, which transports a chemical product, which cannot be released directly into the atmosphere. It was necessary to evaluate how the line would open at a point to introduce portable stations both for launching and receiving Pigs, it was also necessary to design and manufacture a Pig called Multisize, which would meet the operation demands. It was a pipeline built in carbon steel with an approximate 7.0 km length, part of it Ø 6 inches, later at 1.0 km, there is an expansion to Ø 8 inches and than reduces to Ø 6 inches, being necessary for the Pig displace itself in these diameter variations being able to carry the drained fluid Ammonia in the gas phase.

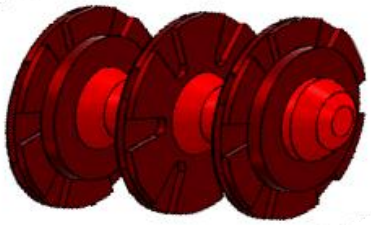
The Pig designed for the operation, called Pig Multisize, has the ability to enlarge and reduce its size, as it moves along the pipeline. It was launched through a portable station, using Nitrogen in the gas phase as the displacement fluid. The Multsize Pig carried all the ammonia in gas phase to the portable receiving station, where there were hoses that directed the product to an equipment called a washer of gases.

This operation, allowed the pipeline maintenance and operation team to open the points along the line, for the appropriate evaluations and repairs.



Portable pig receiving

Station pig launching station



Pigging multisize

IP Pipeline Technology's oil-stolen orifice detection technology

By: Yang Lijian, Doctoral Supervisor, Shenyang University of Technology, Fred Lee, IP Pipeline Technology, Chen Jiao, IP Pipeline Technology

1.The principle of oil-stolen orifice detection technology via permanent magnet disturbance

As a newly-developing mode of non-destructive testing, permanent magnet disturbance detection is based on the magnetic disturbance phenomenon. Once a testing component is magnetized, its space magnetic field maintains a steady state, however, a defect would give rise to magnetic interaction causing a disturbance environment. Therefore, the defect can be inspected by detecting the instantaneous reconstruction of the internal magnetic field of the permanent magnet.

The magnetic disturbance has little influence on the size and volume of the permanent magnet, but the internal magnetic field of the permanent magnet go through drastic changes. Therefore, the magnetic disturbance can only be measured indirectly by using coils around the surface of the permanent magnet. The sensor structure is shown in Figure 1.

When the permanent magnetic disturbance sensor scans the pipeline surface at a constant speed, magnetic interaction occurs forming a magnetic disturbance environment. The pipeline then is magnetized by the permanent magnet, which gathers magnetic line of force inside the pipeline. If the pipeline has no defects, the magnetic line of force passing through the coils of the sensor should be equally distributed, without induced voltage. If the pipeline has oil-stolen orifice defects, the magnetic line of force will be refracted into the air with lower permeability, at the moment the magnet field near the defects will grind against the original magnetic field of the permanent magnet, changing the original steady-state magnetic field and causing a disturbance, which makes the magnetic line of force through the sensor uneven, generating induced voltage. Therefore, this structure can be used to detect permanent magnetic disturbance caused by the discontinuity of pipeline defects, so as to achieve oil-stolen orifice detection.

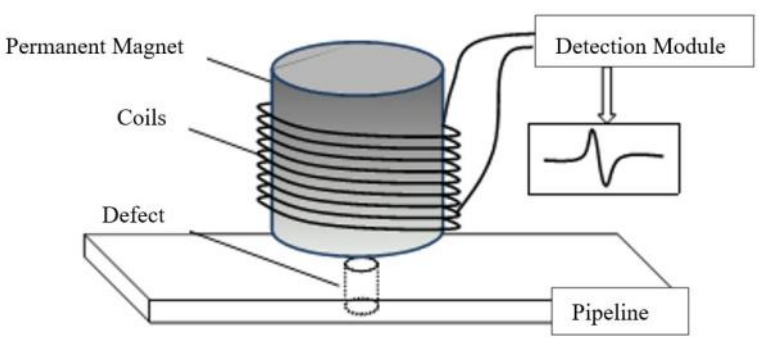


Figure 1. Sensor Structure

2. The signal features of oil-stolen orifice detection technology

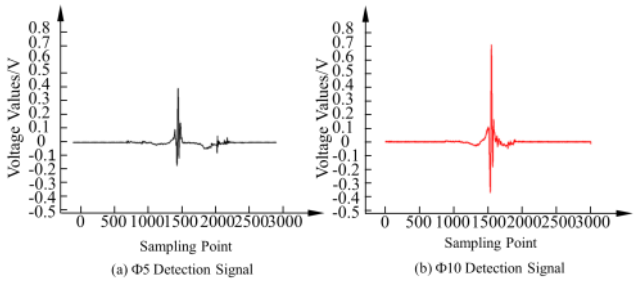


Figure 2. Detection signal of orifice defects

When using the oil-stolen orifice detection technology via permanent magnet disturbance, the detection signal peak will increase gradually as the aperture increases, and the signal experiences abrupt changes integrally compared with defect-free position.

3.The system structure of oil-stolen orifice detection technology

The detection system is composed of power cups, primary probes, the main processing module, and odometer wheels. As shown in figure 3, the detection section made up of probes and the main processing module includes a signal processing circuit, gathering module and storage system.

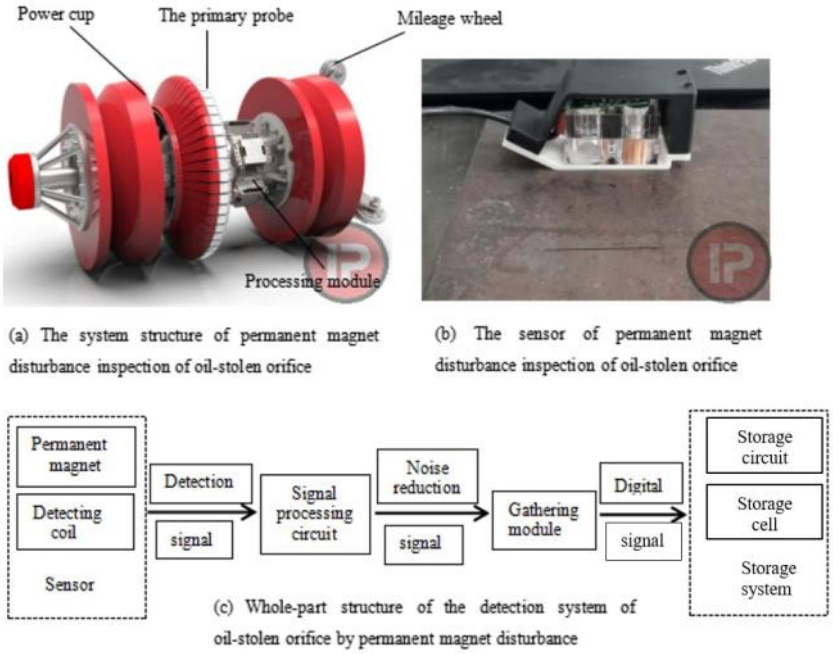


Figure 3. Oil-Stolen Orifice Detection System

Tool sizes available	10″-56″
Pipeline product	Crude oil, refined oil
Product temperature range	0℃-70℃
Maximum operating pres-sure	12MPa
Operating speed range	≤4m/s
Minimum pipeline bend radius	1.5D
Wall thickness range	4-32mm
Maximum operating time	≥200h
Maximum inspection length	≥350km

Figure 4. Technical Parameters of Oil-Stolen Orifice Detector

Positioning accuracy	2‰×calibration interval
Corrosion circumferential	±5mm
Pirate oil hole detection	≥Φ5 through hole (Confidence
Circumferential deviation	±10°

Figure 5. Performance Specifications

(a) Oil-Stolen Orifice Detector

Pipeline	Donglin
Detection	2021-4
Diameter	24inch
Length	57km
Product	Oil

b) Case Information

Figure 6. A Real Case

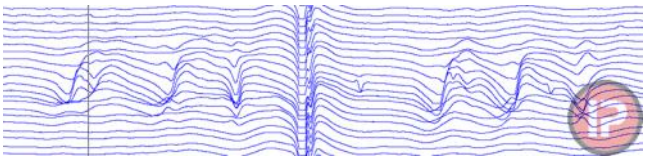


Figure 7. Data of Oil-Stolen Orifice Detector

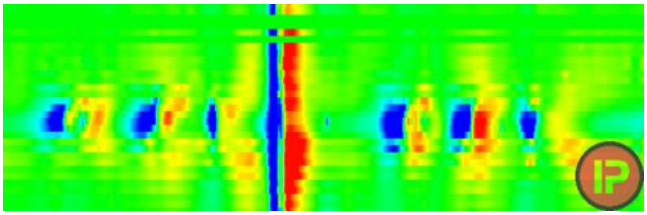


Figure 8. Data of Oil-Stolen Orifice Detector

International pipeline community met in Berlin for ptc 2022

Designed as a hybrid event, the **17th Pipeline Technology** Conference and its exhibition attracted 659 participants from 49 different countries, including delegates from 70 pipeline operators and 53 exhibiting companies. After two years of ptc Remote, hundreds of industry professionals – representatives of operators, technology and service providers, researchers, public services – were finally able to meet again directly in Berlin. They demonstrated from 7-10 March 2022 latest achievements, developments, and offerings in the industry, thereby consolidating the status of the ptc as one of the most prestigious international meeting places for exchange in the pipeline industry.

The two managing directors of the **EITEP Institute,** Marian Ritter and Dennis Fandrich opened the event by thanking the chairman of the ptc advisory committee Dirk Strack together with all committee members, the speakers, sponsors, exhibitors and participants who took the opportunity to finally meet again in Berlin. Reacting to Russia's attacks on Ukraine, the keynote speech given by Bengt Bergt, member of the Committee for Climate Protection and Energy of the German Bundestag, was dedicated to the topic "Security of Energy Supply in Times of Crisis: Short-Term Measures and Long-Term Implications" and gave insights into the current plans in German energy policy.

The program of the 17th Pipeline Technology Conference was enriched with its panel discussions which covered current challenges of the industry: cyber security, decarbonization, the issues of public perception and the shortage of skilled workers. Another important panel discussion covered the consumer point of view, where specialists from thyssenkrupp, Evonik, Nikola and en2x discussed future perspectives for pipeline-based infrastructures. However, the core of the conference was again the technical sessions with more than 100 different presentations. The participants were very happy that they finally had the opportunity to meet in person again. Richard Price, Integrity Manager at British Pipeline Agency: "A great event and a great venue. This was an interesting and thought-provoking conference and presented a wide range of valuable topics."

3X ENGINEERING reinforces 36" conductors supported platform

The objective of the repairs, carried out in November 2021 by **3X ENGINEERING (3X)** local partner **PETROENERTECH**, was to reinforce 18 units of 36" conductors supported platform suffering from external corrosion. To restore the structural integrity of the platform and prevent further deterioration, it was decided to install REINFORCEKiT® 1D (R1D) product.

According to the client's requirements and superficial metal loss, it was decided to apply R1D composite solution ==> 3X water activated composite system dedicated to protect and reinforce installations. Two composite layers were determined to reinforce each conductor over 10 meters height.

Surface preparation was performed with grit blasting to get a good surface cleanliness roughness (superior to 60µm Rz) and ensure a good bonding between the steel pipes and the composite repairs. Hygrometric conditions were checked and the surfaces were cleaned with acetone. The composite wrapping repairs were then completed following below stages (installation procedure is the same for the 18 units to be reinforced).

1/ In presence of external loss, F3X8 filler was used to reshape the conductors. P3X1 primer was then applied on the whole prepared area.
2/ Once the "Dry Touch" was reached, composite wrapping was completed applying 2 layers of R1D over 10 meters height. To do so, this water activated composite system was wrapped around the conductors spraying water continuously.
3/ Compression film was then rolled all over the wrappings and slightly pierced using perforating tool (spiked roller). Any trapped CO2 gas bubbles could thus evacuate to get optimal repair laminate quality.
4/ Anti-UV coating application as finishing stage.

This project was challenging due to the bad weather and many COVID restrictions, but our local partner PETROENERTECH delivered an outstanding performance applying our REINFORCEKiT® 1D on very high surfaces.
==> 18 conductors wrapped over 10 meters height.

STATS Group primed to support industry with Net-Zero goals

STATS Group, are in a strong position to capitalise on new opportunities arising in the transition to more sustainable energy supplies and a carbon net-zero future.

With decades of experience working on oil and gas pipeline projects, STATS has at its disposal the skills and proven technologies to deploy in Carbon Capture and Storage (CCS), related CO_2 pipelines, and natural gas pipelines blended with hydrogen.

STATS Group chief executive officer, Leigh Howarth, said: "STATS technologies have been helping our customers reduce emissions for 20 years. Our focus on innovation means we're ideally placed to continue this support, not only in the traditional hydrocarbon sector, but also as the industry transitions to more sustainable energy supplies."

With investment in both CCS and hydrogen projects accelerating, there is a growing focus on how existing pipeline infrastructure can be repurposed for both CO_2 and blended or pure hydrogen transportation.

Over the past two decades, STATS Group has played a central role in numerous pipeline interventions, repairs and maintenance projects, giving the company a deep knowledge base of the very infrastructure that, in the future, may be repurposed.

In that same period, and directly relevant to CCS, STATS has established itself as the "go-to" provider of intervention and isolation services on high-pressure liquid CO_2 pipelines.

Leigh Howarth, said: "After safely completing multiple workscopes for Kinder Morgan on their high -pressure (up to 138 bar) CO_2 pipelines in New Mexico in the United States, we're in an excellent position to support CCS infrastructure owners and operators with future pipeline maintenance and upgrade projects.

"Also with an eye to the future, STATS is partnering in a joint industry project with DNV and a number of pipeline owners and operators, looking at the implications on natural gas pipelines to transport natural gas blended with hydrogen."

Notwithstanding the opportunities in relation to CCS and hydrogen, STATS continues to support its customers to reduce emissions, recognising the pivotal role that natural gas is playing as the world seeks to first reduce carbon emissions ahead of a longer term transition to more sustainable sources of energy.

Using the company's proprietary double-block-and-bleed pipeline isolation technologies, localised repair and maintenance worksites can be safely isolated without the need to depressurise large sections of the pipeline, thereby avoiding the need to discharge significant quantities of emissions into the atmosphere.

Mr Howarth concluded: "We're excited about the future energy transition and the role STATS is playing in supporting our customers to achieve their net-zero goals.

STATS Group 30 inch BISEP isolation CO_2 pipeline

STATS Group 30 inch BISEP isolation CO_2 pipeline

Development of flexible pipe inspection technology

Thomas Jung, Dr. Manuel Quack

Flexible pipes have served the offshore industry for decades. However, operators are facing extreme operating conditions and have been working on developing solutions to ensure asset integrity. The integrity management of flexible pipes is a challenge due to their multi-layer construction consisting of different materials.

As a leading provider of in-line inspection (ILI) services, **ROSEN** started the development of ILI technologies for flexible piping. In the two-part approach, the focus is first on the inspection of the innermost layer, the carcass. In the next stage, the pressure armor layer must also be considered. Joining the two parts – a complete understanding of the inner carcass and of the pressure armor layer – provides the operator with substantial proof of the integrity of flexibles.

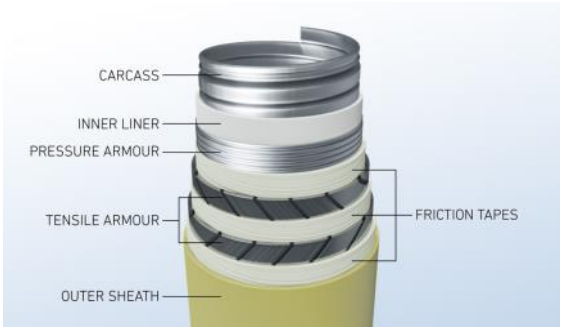


Figure 1: Typical multi-layer structure of a flexible pipe

Continuous data flow

A valuable piece of information for the integrity of the carcass is the distance between the individual elements and the inside structures. To achieve optimal accuracy, ROSEN decided to develop a high-resolution eddy current measurement system. Figure 2 shows a carcass laboratory sample and a high-resolution eddy current measurement of this carcass's interior. The continuous character of the eddy current data is evident. Carcass spacing can now be defined as the distance between single minima or single maxima in the data – or both.

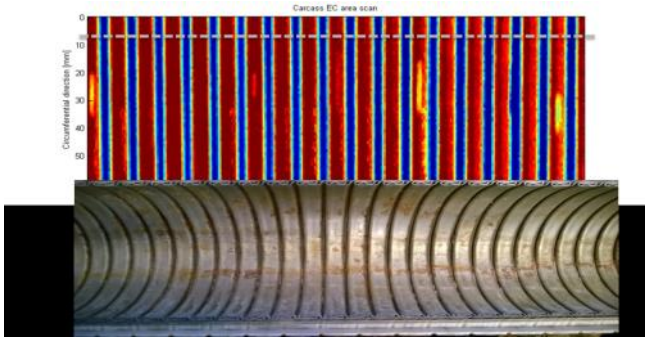


Figure 2: laboratory measurement for carcass spacing calculation

Development of new sensor carrier for ILI tools

Based on the laboratory tests, a new sensor carrier was developed for in-line inspection (ILI) tools. A prototype ILI-tool was equipped with the new sensor carriers and qualification pull tests were conducted.

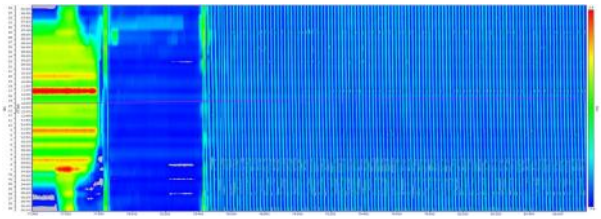


Figure 3: Full-scale pull test data of a flexible, starting with the end fitting

Excellent data could be gathered from both end fittings and from the carcass, making it possible to evaluate carcass spacing. Figure 4 shows the calculated carcass spacing for one eddy current channel over a length of more than 10 m. An average of 20.33 mm with a standard deviation of 0.26 mm (1.28%) could be achieved; this means the distance can be measured with submillimeter accuracy. With the new sensor, it will be possible to assess with reasonable accuracy the overall regularity of the inner carcass of flexibles via the data, as shown in the C-scan, and via the calculated spacing values.

In parallel to the flexible pull test, the magnetic flux leakage part of the new sensor was qualified in compliance with the ROSEN standard magnetic flux leakage tool fleet. As a result, carbon steel pipelines, which are often connected to flexible piping, can also be inspected with this new sensor system in a single inspection run.

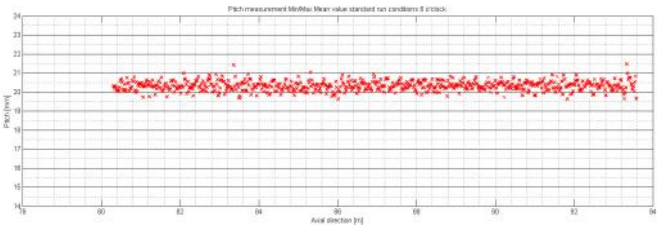


Figure 4: Calculated carcass spacing along a measurement track in the flexible pull test, where submillimeter accuracy could be achieved

Taking the development further

As an outlook towards the next stage in technology development, first magnetic measurements of the pressure armor layer showed promising results. Further options are to apply the capabilities of the high-resolution eddy current system regarding the detection of internal cracks in other non-standard pipes, including those made from duplex and those cladded with stainless steel where conventional tools are not suitable. The ROSEN laboratory setup is currently adapted for these kinds of test measurements.