Panel Discussion - The Effect of AI on the Offshore Industry
11:50 - 12:30
Digitalisation in the Offshore Pipeline Industry
- Exploring the impact of AI on the sector - examples
- Applications and benefits
- The future for AI

Participants
Pieter Swart - Export Pipeline Delivery Manager - Browse, Shell Australia Pty. Ltd
Janne Oddaker - Director Digital Subsea Services, TechnipFMC

Lunch
12:30 - 13:30

Pipeline Corrosion Management Using Machine Learning Assisted Image Processing
13:30 - 14:10
Digitalisation in the Offshore Pipeline Industry
Corrosion is a serious safety concern for offshore pipeline technology. The total annual direct cost of corrosion in the oil and gas production industry is estimated at $1.4 billion as per NACE report. Severe corrosion can cause corrosion fatigue and leak, which can be catastrophic if it is not detected at an early stage. Therefore, the corrosion detection, as well as classification, are crucial and done manually by experts through visual inspection of the images taken by ROV or divers. This manual procedure is still a time-consuming process due to the longer pipeline at a deep-water location, where the accuracy is usually poor due to limited visibility.

In this paper, two different image processing approaches are used to detect the corrosion and classify them based on their condition (high/medium/low): a simple computer vision algorithm and Machine Learning algorithm. The first method uses OpenCV for the simple computer vision algorithm during image processing. Tensorflow with Keras in backend is used for generating deep learning model for the second method. The algorithm will first detect the corrosion and the type of corrosion which is a typical classification problem. Machine Learning-based image processing approach has much higher accuracy than the simple computer vision-based image processing for the case study using an offshore inspection data from ROV.

This method will significantly improve the processing time and the accuracy of corrosion detection and classification. The automated visual inspection process for corrosion identification and classification also reduce the overall maintenance cost.

Authors: Subrata Bhowmik and Harit Naik, McDermott International, Paddington, London

Participants
Subrata Bhowmik - Senior Engineer/Data Scientist for Subsea Digitalisation, McDermott International
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<thead>
<tr>
<th>TIME</th>
<th>DIGITALISATION IN THE OFFSHORE PIPELINE INDUSTRY</th>
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<tr>
<td>08:00</td>
<td>08:30    - Registration and Welcome Coffee</td>
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<td>09:00    - Chairman's Welcome and Round-the-Room Introductions</td>
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<td>09:20    - Digitalisation – The Next Technology Frontier for the Offshore Pipeline Sector</td>
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<tr>
<td>10:00</td>
<td>10:00    - Digital Twins for Offshore Pipelines – Through the Lifecycle</td>
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<td>10:40    - Networking Refreshment Break</td>
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<tr>
<td>11:00</td>
<td>11:00    - Digital Solutions for Cost Effective Pipeline Operations</td>
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<tr>
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<td>11:50    - Panel Discussion - The Effect of AI on the Offshore Industry</td>
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<tr>
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<td>14:50    - Q&amp;A and General Discussion Session</td>
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<td>15:00</td>
<td>15:15    - Chairman's Summary, Close of Seminar and Coffee</td>
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### Registration and Networking Welcome Coffee

08:30 - 09:00

#### Chairperson's Welcome and Round-the-Room Introductions

09:00 - 09:20
Offshore Pipeline & Riser Integrity Management Seminar

**Participants**

Chas Spradbery - Operations Director, Peritus International

### Digital Twinning for Emergency Pipeline Repair System (EPRS) for Asset Optimisation and Cost Efficiency

09:20 - 10:00
Offshore Pipeline & Riser Integrity Management Seminar

The aim is to help operators develop a digital twin to optimise the operating cost while guaranteeing suitable and dynamic intervention methods for EPRS along the complete pipeline profile. It is intended to use predictive analytics and probability modelling to align both ends of the bowtie. This allows the operator to predictively and proactively maintain the asset integrity along the lifecycle while devising an EPRS best suited. The digital twin acts intelligently to manage and maintain the asset, also identifying the best suitable repair, decommissioning and recommissioning methods based on the location of defect, type of defect and remnant life of the pipeline.

Pipelines are dynamic as is the context in which they operate. The opportunities for intervention and repair evolve over time and an EPRS should be dynamic to develop synergy for cost-effective solutions while safeguarding the reputation.

**Authors:** Rutger Schouten and Rahul Raghukumar, IRM Systems

**Participants**

Rahul Raghukumar - Project Lead, IRM Systems

### Autonomous Inspection of Deepwater Pipelines

11:10 - 11:50
Offshore Pipeline & Riser Integrity Management Seminar

- Developments in AUT and AUVs
- New ways to inspect, support and maintain the integrity of subsea pipelines
- Benefits, challenges and lessons learned

**Participants**

Gilles Gardner - Global Asset Integrity Technical Advisor, i-Tech 7

### Reliability Modelling of the Heating System in an Electrically Heat Traced Pipe

11:50 - 12:30
Offshore Pipeline & Riser Integrity Management Seminar

**Participants**

Christian Geertsen - R&D Director, ITP InTerPipe

### Internal Inspection Solutions for ‘unpiggable’ Offshore Pipeline

13:30 - 14:10
Offshore Pipeline & Riser Integrity Management Seminar

- Importance of pipeline pigging
- Identifying the challenge for internal inspection
- Solutions to inspect ‘unpiggable’ pipelines (with case studies)

**Participants**

Sean Tucker - Senior Pipeline Engineer and Deputy Head of Pigging, Jee

### Cost Effective Polymer Based Solutions to Address Splash Zone Integrity

14:10 - 14:50
Offshore Pipeline & Riser Integrity Management Seminar

- Innovations in polymeric products to mitigate splash zone corrosion
- Utilising tuned, engineered products to pinpoint specific areas of concern
- Suite of bespoke products for all riser and Guide-Tube splash zone applications

**Participants**

Stewart Duthie - Manager, Subsea Technology, Flexlife Ltd

### Panel Session: Achieving Reliable Integrity Management

14:50 - 15:30
Offshore Pipeline & Riser Integrity Management Seminar

Today’s speakers will reconvene to discuss and debate integrity management and life extension strategies, what the challenges are and where are the technology gaps. Your opportunity to also share your experiences and observations.

**Participants**

- Rutger Schouten
- Rahul Raghukumar

### Networking Lunch

12:30 - 13:30

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**SESSIONS**

**OFFSHORE PIPELINE & RISER INTEGRITY MANAGEMENT SEMINAR | 25 FEBRUARY -**

**Chairman's Closing Remarks, Close of Seminar and Coffee**

15:30 - 15:50
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|       | 09:20 - Digital Twinning for Emergency Pipeline Repair System (EPRS) for Asset Optimisation and Cost Efficiency |
| 10:00 | 10:00 - Pipeline Freespan Mitigation in Challenging Seabed  
|       | 10:40 - Networking Refreshment Break |
| 11:00 | 11:10 - Autonomous Inspection of Deepwater Pipelines  
|       | 11:50 - Reliability Modelling of the Heating System in an Electrically Heat Traced Pipe |
| 12:00 | 12:30 - Networking Lunch |
| 13:00 | 13:30 - Internal Inspection Solutions for 'unpiggable' Offshore Pipeline |
| 14:00 | 14:10 - Cost Effective Polymer Based Solutions to Address Splash Zone Integrity  
<p>|       | 14:50 - Panel Session: Achieving Reliable Integrity Management |
| 15:00 | 15:30 - Chairman's Closing Remarks, Close of Seminar and Coffee |</p>
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<td>09:15 - 09:40</td>
<td>Pieter Swart - Export Pipeline Delivery Manager - Browse, Shell Australia Pty. Ltd</td>
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<td>09:40 - 10:05</td>
<td>Keynote Address – Pipeline &amp; Subsea Operations for the Future: An Operator’s Perspective</td>
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<td>10:05 - 10:30</td>
<td>InnerVue™ Non-Intrusive Pipeline Diagnostics</td>
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<td>10:30 - 10:50</td>
<td>Upset Ends of Clad Pipes</td>
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<td>10:50 - 11:30</td>
<td>Networking Refreshment Break</td>
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<tr>
<td>11:30 - 11:55</td>
<td>Digital Transformation: Is Aiming for Digitalisation Enough Or Does Future Pipeline Integrity Management Require an Industry 4.0 Approach?</td>
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**Global Energy Markets and Impact on the Offshore Pipeline Sector**

- Review of offshore markets
- Macro-economic overview
- Pipeline and trunkline trends
- Future forecasts
- Conclusions

**Participants**

Henning Bjørvik - Senior Analyst, Rystad Energy

**Keynote Address – Pipeline & Subsea Operations for the Future: An Operator’s Perspective**

- Current state of the market
- What are the challenges and opportunities from the operator’s perspective?
- What do they need from their partners? What will future requirements look like?
- Where to next?

**Participants**

Andy Studman - Pipeline Technical Authority & Subsea Team Lead, Shell UK

**InnerVue™ Non-Intrusive Pipeline Diagnostics**

- InnerVue™ diagnostic service is a fast, accurate, non-intrusive, low-risk technique to detect flow inefficiency, blockages, leaks and anomalies. It uses pressure waves that travel through the pipeline or well at the speed of sound and reflect internal diameter deviations, which can then be extrapolated to locate and identify features. InnerVue has been successfully deployed around the world to profile pipelines during pigging operations, locate lost inline inspection tools, verify wellbores, and many other tasks in a safe and cost-effective manner. It was recently deployed for its 1st pig tracking operation.

**Participants**

Iain Shepherd - Global Engineering Manager, Halliburton Pipeline & Process Services

**Upset Ends of Clad Pipes**

- In case of offshore pipelines transporting media from deep sea waters, partly very long riser pipelines are necessary to connect the pipe systems at the bottom of the sea to the floating platforms. The pipes used in areas where stresses are extremely high require specific design. As the circumferential weld joining individual pipe segments is generally the weakest area in a pipeline, special care has to be taken to alleviate the stress potential. Here the most common option are pipes having ends with a higher wall thickness over a specified length thus increasing the cross section of the weld. The bigger the cross section of a circumferential weld, the lower the strain. A possibility is to thicken the riser pipes at the ends by overlay welding and multi-lay technique welding process will be used. The first development work is completed and will be presented.

**Participants**

Sabrina Schramm - Product Engineer, BUTTING

**Networking Refreshment Break**

- 10:50 - 11:30

**Digital Transformation: Is Aiming for Digitalisation Enough Or Does Future Pipeline Integrity Management Require an Industry 4.0 Approach?**

- It is well recognised within the pipeline engineering community that digital transformation of the industry will happen, and that this must happen with an increasing pace of uptake. Computing capabilities and data sources are changing at an incredible rate and we have the opportunity to improve on current integrity management processes. The sheer volume of data now available has the potential to enable better assessment of the problems commonly faced by pipeline operators, but does pose additional problems for traditional methods of managing data, and methods of performing further work with the data available, all of which must be solved efficiently.

- Ultimately digital transformation will force a radical change in many companies’ business strategy. The authors share recent experience of some of the common pitfalls and roadblocks which can be encountered when transferring away from traditional management and use of data as part of digital transformation; and go on to detail some of the lessons learned by Penspen as part of Penspen’s digital transformation process.

**Authors:** Aidan Charlton and Nigel Curson, Penspen

**Participants**

Aidan Charlton - Senior Engineer (Digital Modelling Integrity), Penspen Ltd

**Networking Refreshment Break**

- 10:50 - 11:30
Digital Project Delivery – A Data-Centric Pipeline Design Automation Case Study  
11:55 - 12:20  
OPT Day 1  

Digitisation and industrial automation are key methods for improving quality and reducing cost used in many sectors. Subsea pipeline projects have traditionally relied on controlled documents to capture and share information. It can be difficult to continuously update them as information changes and consequently projects resort to using a multitude of uncontrolled spreadsheets to store and control key information. This results in several challenges – difficulties locating the latest information, lack of revision control, a risk that incorrect information could be used, and often a loss of information during handover to operations.

Wood, working closely with global clients, is now applying a data-centric approach to digitally deliver through-life subsea pipeline engineering. This presentation will give an overview of this process, whereby pipeline design data is QA’d and verified prior to incorporation within a central platform which acts as a single source of truth for the Design phase. Engineering and simulation tools capturing 40 years of proven experience reference this data, increasing the efficiency of engineering, providing high quality data to engineers, allowing an optimised, transparent decision-making process. Once a Project moves to the Build phase, the database moves with the project, and acts as the foundation for the Build and Operate phases. Digital twins and web portals further increase data accessibility and interpretation, reducing execution risk, improving management of change and streamlining data handover to operations. This approach lets the engineers focus on design optimisation, operational safety and value improvement.

The case study will demonstrate the value of the application of digitalisation and design automation to an operational gas trunkline in West Australia and one in the Caspian.

Authors: Rob Kennedy, Digital Programme Manager – Wood (UK); Colin McKinnon, Technical Director – Wood (UK); Andrew Rathbone, Principal Pipeline Engineer – Wood (APAC); Simon McGee, GIS Lead – Wood (APAC)

Participants  
Colin McKinnon - Technical Director - Subsea & Export Systems, Wood

Special Address from the President of MOGSC  
12:45 - 13:00  
OPT Day 1  

- Malaysia’s significance as the oil & gas industry regional hub and gateway to Asia Pacific markets  
- MOGSC’s support and influence for companies venturing into Malaysia  
- Launch of OPT Asia in conjunction with the 5th MOGSEC 2020

Ts. Sharifah Zaida Nurlisha, President, Malaysia Oil & Gas Services Council (MOGSC) and CEO, MMC Oil & Gas Engineering

Afternoon Session Chairman  
14:15 - 14:20  

Participants  
Hervé Guéveneux - Head of Pipeline and Riser – Technology Department, Total E&P

Flexible and Composite Risers: Development of Subsea Regulations to Reduce Risk Level in the Norwegian Petroleum Industry  
14:20 - 14:45  
OPT Day 1  

The Petroleum Safety Authority Norway (PSA) is an independent government regulator responsible for safety, emergency preparedness and the working environment in the Norwegian petroleum industry. Norway’s regulations for petroleum operations offshore and on land are risk-based, and give great emphasis to principles for reducing health, safety and environmental (HSE) risk. They have been developed over more than 40 years, changing from detailed prescriptive regulations in the early days to the present requirements, which are largely formulated in performance-based (functional) terms. They specify requirements for the various aspects, characteristics or qualities which a product, process or service must possess. Regulations and guidelines must be viewed collectively in order to acquire the best possible understanding of the standard which the regulations seek to achieve. An important aspect of the regulatory regime is learning from incidents and the sharing of the knowledge in the industry. This presentation will summarize the development of the regulations and give examples from the pipeline and subsea regulations and the way the PSA follows up the industry today. We will give examples on how standards are referenced in our guidelines to indicate recommended solutions. We will also give examples on how we are involved in development of standards and important recent updates to subsea standards in Norway. Finally, we will elaborate on reporting of incidents and present some statistical data for pipelines, risers and subsea systems to evaluate the risk level in the industry.

Authors: Trond Sundby, Petroleum Safety Authority and Morten A. Langle, Petroleum Safety Authority Norway

Participants  
Morten Langley - Principal Engineer, Petroleum Safety Authority Norway

Nice idea! Is it proven? - Has the Way to Proven Innovations Become Leaner  
12:20 - 12:45  
OPT Day 1  

Details to follow

Participants  
Lars Even Torbergsen - Senior Principal Specialist, DNV GL
The Latest Applications for GRP Structures Subsea – Case Studies

14:45 - 15:10
OPT Day 1

GRP Subsea Structures have been accepted for Subsea use for close to 20 years, mainly in the North Sea, but in the past years also for Africa, Mediterranean and Caspian Sea. GRP Protection Covers have been the most common use of GRP, but lately a range of new applications has been developed.

We will present some latest developments for GRP Foundations, GRP Buckling Initiators, GRP Freespan Correction, GRP Crossings, GRP Wellhead Protection Structures and large GRP Protection Structures replacing heavy steel structures. Main advantages with GRP Subsea Solutions are low weight, low impact to soil, stackability, no corrosion, 50 years design life and less than 50% of Carbon Footprint of steel.

Participants
Jon Inge Brattekås - SVP Market & Technology, CSUB AS

From the Topside to the Well Head: ETH-HCRAW – a Cost-Effective Flexible Pipe Solution for Active Heating

16:00 - 16:25
OPT Day 1

ETH-HCRAW represents an optimum combination of the flexible pipe technology with Electrically Trace Heating capabilities, thanks to Heating Cables Replacing Armour Wire. The intended heating performances are achieved thanks to the adjustment in number and size of the heat tracing cables fitted within the tensile armour layers, together with temperature monitoring system, without added layers or manufacturing steps in the flexible pipe.

Since the pioneer application in 80’s, the technology has evolved and matured through a thorough component and system qualification. Based on the efficiency and versatility of its concept, the ETH-HCRAW Flexible has proven to be an advantageous solution to tackle multiple project requirements. It is also targeted to furthermore increase its footprint thanks to the latest development of the system enabling long length pipe sections together with temperature monitoring system. The purpose of this presentation is to present these latest developments.

Authors: Jérémie Barbier and Antoine Gallais, TechnipFMC

Participants
Jérémie Barbier - Flexible Pipe Design Engineer, TechnipFMC

Networking Refreshment Break
15:30 - 16:00

Construction, Reeling and Active Heating Trial of a Full-Scale Electrically Heat-Traced Flowline (EHTF) System

16:25 - 16:50
OPT Day 1

The EHTF technology is a thermally insulated PiP equipped with an electrical heating and temperature monitoring system with the objective to maintain the flowline above wax or hydrate appearance temperature. This paper presents the manufacturing, reeling, and active thermal test trial of a full-scale EHTF PiP. Two PiP stalks were manufactured using Subsea7’s helix machine at the Vigra Spoolbase, to lay heating wires and temperature monitoring fibre optic cables. A tie-in was completed with electrical and optical fibre splicing. The stalk was spooled onto the Seven Oceans vessel. Mechanical strains in the cables were monitored, and electrical and optical integrity checks were successfully conducted from the vessel. Active thermal tests, performed before and after reeling, consisted in three phases representative of in-service capabilities: heat-up, maintenance and cooldown. The obtained U-value, temperature profiles, and electrical requirements were compared to analyses and confirmed the system’s accuracy and functionality after the reeling process.

Authors: Saad Cherkaoui, Guy Mencarelli, Laurent Broutechoux, Mostafa Hendawy, Donald Silcock – Subsea 7, Geraldine Salque – ITP Interpipe

Participants
Saad Cherkaoui - Principal Engineer, Subsea 7
The concept of Digital Twin is widely discussed in the oil and gas industry as it can provide a single source of truth with all the relevant projects' information through a collaborative cloud.

Subsea design involves various disciplines whose inputs and outputs feed into each other's processes, creating a complicated ow of data with iterative loops. The purpose of the study is to illustrate the benefits of digitizing processes in order to consolidate this ow of data through the analysis of a subsea tie-back system.

The study demonstrates an alternative methodology, making use of digital technologies in order to handle changes in a more dynamic way. Digitalization is valuable for tracking the parameters as well as providing automated alterations. This feature will allow users to have a quicker turn-around on projects, allowing them to run various scenarios and better understand the consequences of design decisions.

Authors: Ta-Ju Sun¹, Adithyaa Karthikeyan¹, Gautier Noiray¹, Subrata Bhowmik²

¹McDermott International, Houston ²McDermott International,

Participants
Ta-Ju Sun - Associate Subsea Engineer, McDermott International

Champagne Roundtable Session
17:15 - 18:30
Choose your table. Each table will have a host who will lead the discussion

Electrically Heat-traced Pipe in Pipe
Moderator: Christian Geertsen, R&D Director, ITP InTerPipe

Construction Methods
Moderator: Tim Crome, Chief Engineer – Norway & Russia, TechnipFMC

Carbon Fibre Pipes
Moderator: Colin McKinnon, Technical Director - Subsea and Export Systems, Wood

Decommissioning
Moderator:

Flexible Risers & Pipes
Moderator: Yannick Benedek, Flexible Pipe Business Development and Marketing Manager, Flexi France

EPRS
Moderator: Dale Millward, Technical Advisor, STATS Group

Networking Drinks Reception
18:30 - 19:30
Evening Networking Events

Arrive for Dinner
19:30 - 20:00
Evening Networking Events

Take Your Seats and Enjoy the Evening
20:00 - 22:30
Evening Networking Events
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| 09:00 | 09:00 - Opening of OPT 2020  
09:05 - Chairman's Welcome to Day 1  
09:15 - Global Energy Markets and Impact on the Offshore Pipeline Sector  
09:40 - Keynote Address – Pipeline & Subsea Operations for the Future: An Operator's Perspective |
| 10:00 | 10:05 - InnerVue™ Non-Intrusive Pipeline Diagnostics  
10:30 - Upset Ends of Clad Pipes  
10:50 - Networking Refreshment Break |
| 11:00 | 11:30 - Digital Transformation: Is Aiming for Digitalisation Enough Or Does Future Pipeline Integrity Management Require an Industry 4.0 Approach?  
11:55 - Digital Project Delivery – A Data-Centric Pipeline Design Automation Case Study |
| 12:00 | 12:20 - Nice idea! Is it proven? - Has the Way to Proven Innovations Become Leaner  
12:45 - Special Address from the President of MOGSC |
| 13:00 | 13:00 - Networking Lunch  
13:00 - Networking Lunch |
| 14:00 | 14:15 - Afternoon Session Chairman  
14:20 - Flexible and Composite Risers: Development of Subsea Regulations to Reduce Risk Level in the Norwegian Petroleum Industry  
14:45 - The Latest Applications for GRP Structures Subsea – Case Studies |
| 15:00 | 15:10 - Developments in Mechanical Connectors for Hydrocarbon Flowlines and Risers – Is It Different This Time?  
15:30 - Networking Refreshment Break |
| 16:00 | 16:00 - From the Topside to the Well Head: ETH-HCRAW – a Cost-Effective Flexible Pipe Solution for Active Heating  
16:25 - Construction, Reeling and Active Heating Trial of a Full-Scale Electrically Heat-Traced Flowline (EHTF) System  
16:50 - Young Engineers Presentation - Cloud-Based Digital Twin for Enhanced Subsea Design |
| 17:00 | 17:15 - Champagne Roundtable Session  
17:15 - Champagne Roundtable Session |
| 18:00 | 18:30 - Networking Drinks Reception |
| 19:00 | 19:30 - Arrive for Dinner |
| 20:00 | 20:00 - Take Your Seats and Enjoy the Evening |
## Chairperson’s Welcome to Day 2
**09:00 - 09:10**

**Participants**
- Torhild Heiberg-Andersen - Chief Engineer Pipeline & Transport Technology, Equinor

## Keynote Address – A Review of the Offshore Pipeline & Subsea Landscape
**09:10 - 09:40**

**Participants**
- John Evans - Chief Executive Officer, Subsea 7

## Innovative Solutions to Address Stabilisation Challenges of a Forty-Eight Years Old Subsea Pipeline
**09:40 - 10:05**

**Participants**
- John Charalambides - Director of International Business Development, Oceaneering

## Networking Refreshment Break
**10:30 - 11:00**

### Flowline Connection Systems & M5 Connectors
**10:05 - 10:30**

**Participants**
- Farhad Davaripour - PhD Candidate, Memorial University of Newfoundland

### A Numerical Investigation on a Pipe Subject to a Non-Perpendicular Trawl Impact Using a Hybrid Shell-Beam Model
**11:00 - 11:25**

**Participants**
- Farhad Davaripour - PhD Candidate, Memorial University of Newfoundland

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Subsea pipelines are externally concrete coated to provide vertical and lateral stability. The loss of concrete coating can lead to floatation or lateral movement on the seabed. If seabed is hard/rocky, then lateral rubbing may lead to wall thinning at 6 o’clock and can result in a leak or flattening at the bottom affecting ovality. This paper presents the challenges faced during stabilization of an aging pipeline suffering from excessive concrete loss and subsequent lateral movement of 4.5m. This led to erosion scattered along the pipeline length at several locations and a leak. Although, concrete mattresses were initially used, but due to wall thinning of pipeline sections and significant weight to be compensated, concrete clamp weights were subsequently used as an innovative solution. These stabilization measures compensated lost/damaged concrete weight coating by providing sufficient weight to avoid lateral movement as well as eliminated the risk of pipeline damage in future.

Authors: Qasim Saleem, Riyadh Al-Shiban and Abdulrahman Al-Shammari, Saudi Aramco, Saudi Arabia

Participants
- Qasim Saleem - Engineering Specialist, Saudi Aramco

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Fishing activity in offshore areas associated with oil and gas development is unavoidable. This presents a risk to the structural integrity of flowlines from trawl gear impact. Accordingly, DNV-RP-F111 recommends a beam and spring-mass (BSM) model to assess the overtrawlability of pipelines. Using the BSM model to examine a non-perpendicular trawl impact considers only the normal component of the impact; the tangential component of the non-perpendicular trawl impact is disregarded in the BSM model; this could lead to an underestimation of the pipe structural response. Accordingly, a hybrid shell-beam model is introduced to examine two cases including: 1) a pipe subjected to a non-perpendicular trawl impact, and 2) the case where only the normal component of the non-perpendicular trawl impact is considered. The results of this work for two pipe sizes, 5 and 14-inch, show that the dent depth in the pipe in case-1 exceeds the one in case-2 by 20 percent. It is concluded that the dent size in a pipe subject to a diagonal impact is dependent on both normal and tangential components of the impact. Accordingly, the hybrid shell-beam model enhances the capabilities of the BSM model, as the full non-perpendicular impact could be incorporated in the hybrid model.

Authors: Farhad Davaripour, Bruce W.T. Quinton, Kenton Pike, Memorial University of Newfoundland

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OPT Day 2
08:00 - 09:00
OPT Day 2

Coffee and Early-Bird Networking

OPT Day 2
09:00 - 09:10

Chairperson’s Welcome to Day 2

OPT Day 2
09:10 - 09:40

Keynote Address – A Review of the Offshore Pipeline & Subsea Landscape

OPT Day 2
09:40 - 10:05

Innovative Solutions to Address Stabilisation Challenges of a Forty-Eight Years Old Subsea Pipeline

OPT Day 2
10:05 - 10:30

Flowline Connection Systems & M5 Connectors

OPT Day 2
11:00 - 11:25

A Numerical Investigation on a Pipe Subject to a Non-Perpendicular Trawl Impact Using a Hybrid Shell-Beam Model

OPT Day 2
11:30 - 12:00

Networking Refreshment Break

OPT Day 2
12:00 - 13:00

Lunch and Exhibition Hall
Innovations in Pipeline Pre-Commissioning
11:25 - 11:50
OPT Day 2

The newly installed TurkStream offshore pipelines are routed through the Black Sea, from Russia to Turkey. The twin 32” export gas pipelines are 940 km long and laid along the seabed to a maximum depth of 2,200m. In a world-first for this type of pipeline, TurkStream and DNV GL deemed the engineering and construction standards to be sufficiently high to waive the traditional pre-commissioning hydrotest. Subsequently, with Baker Hughes, a new type of “dry pre-commissioning” was developed. Pipeline cleaning, gauging and caliper inspection remained project requirements. The fast-tracked Baker Hughes operations centered on using a membrane nitrogen generation spread to propel a multi-function 6 pig train and mono-ethylene glycol (MEG) slugs, safely and efficiently from Russia to Turkey. This paper details several of the technical challenges which were overcome in the development of a successful and innovative “dry pre-commissioning” methodology that demonstrates the viability of the no-hydrotest approach for major export pipelines.

Author: Peter Dixon, Baker Hughes Process & Pipeline Services (PPS)
Co-authors: Steve Thornton and Danny Fehnert, Baker Hughes PPS and Jay Chaudhuri, SouthStream Co-authors: Steve Thornton and Danny Fehnert, Baker Services (PPS)

Participants
Steve Thornton - Global Sales Leader – Major Projects, Baker Hughes

Re-Purposing Pipelines for Hydrogen Storage and Transportation
11:50 - 12:15
OPT Day 2

The UK has made an ambitious commitment to achieve net-zero CO2 emissions by 2050. The UK North Sea offers both substantial renewable energy potential, and assets and infrastructure that could be converted from oil and gas production to other duties in service of this goal, as an alternative to decommissioning.

Xodus Group have recently conducted a research project into the potential for reuse of existing North Sea pipelines for hydrogen storage and transportation. This paper will discuss the areas covered within the study, with focus on materials considerations for hydrogen containment. Damage mechanisms and metallurgical considerations are reviewed, leading to definition of minimum requirements of pipe and workable operating conditions. The potential for converting existing assets was assessed through a multi-discipline review of existing UK North Sea infrastructure, including material compatibility checks of the existing pipeline network and safety and environmental assessments.

The paper will also explore synergies with carbon dioxide transportation and storage, touching on some strategic areas of interest in the UKCS. New technologies are identified that will be needed to enable this change of service to support the energy transition.

Soffiane Ounnas and Mike Allan. Xodus Group

Participants
Soffiane Ounnas - Lead Materials & Corrosion Engineer, Xodus Group

Networking Lunch
12:15 - 13:15

World’s First Remote Operated Hyperbaric Tie-in at Johan Sverdrup
13:15 - 13:40
OPT Day 2

Development of a remote hyperbaric welding system for pipeline tie-ins and repairs have been a major activity at the Pipeline Repair and Subsea Intervention (PRSI) Pool Base in Haugesund, Norway for more than 15 years. Equinor operates the pool arrangement of behalf of 20 operator companies and provides repair contingency for close to 20,000 km of offshore pipelines. The Remote Welding System was developed, tested and qualified for repairs and planned operations down to 1300 meters sea water. The system contains a complete set of tools required for a hyperbaric tie-in or repair, and includes a habitat that provides a dry and inert atmosphere around the tie-in point, a Gas Metal Arc Welding tool that includes a pre/post weld heat treatment system, welding consumables and a welding tip changer for long duration welding. The Remote Welding System has since end of 2014 been implemented in repair contingency, and in April 2019 Johan Sverdrup Oil export pipeline was tied-in to the offshore riser platform using the Remote Welding System. This was the world’s first ever hyperbaric welded tie-in fully remote operated.

The project included several remote operations previously only performed by use of diver intervention, including remote machining of pipe ends, installation and alignment of a 90m long spool and the performance of two hyperbaric welds.

This presentation covers the experiences from the first offshore use by the Johan Sverdrup project, the general methodology of the Remote Welding System and the highlights of the qualification work behind it.

Authors: Jan Olav Berge, Senior Advisor Pipeline technology, Equinor and Jørund Fonneland, Hyperbaric Welding Manager, TechnipFMC DeepOcean PRS Joint Venture

Participants
Jan Olav Berge - Senior Advisor Pipeline Technology, Equinor
Jørund Fonneland - Hyperbaric Welding Manager, TechnipFMC DeepOcean PRS Joint Venture
Workmanship Equivalent ECA (WECCA) Method for Safer Pipeline Welds

13:40 - 14:05
OPT Day 2

The workmanship criteria have traditionally been used for pipeline girth welds and is based on inspection carried out using the radiography (RT) method, which only gives the flaw length. The Workmanship Equivalent ECA (WECCA) method is similar to the traditional ECA, which takes advantage of the AUT inspection method and considers various flaw heights with assorted flaw lengths. But WECCA differs from traditional ECA by targeting the safety level aligned with workmanship (or agreed safety level) instead of carrying out a fit-for-purpose ECA. Since WECCA has a safety level similar to workmanship, there will be an option of having no additional testing from the welding procedure qualification (WPQ) test which is the same as workmanship.

This method will give a better repair rate without compromising the safety levels of the weld, providing a win-win solution for both pipeline operator and installation contractor, and gives more confidence to workmanship advocates.

Author: Tommy Ngai Co-author: Kenneth Brian Gomez, McDermott, Kuala Lumpur, Malaysia

Participants
Tommy Ngai - Senior Principal Subsea Engineer, McDermott Asia Pacific

FSWBOT: Weld Repair of Internal Corrosion Defects in Live Pipelines

14:05 - 14:30
OPT Day 2

Internal defects in pipelines are difficult and costly to repair, especially for subsea lines. Yet even these costs are small in comparison with the loss of revenue that ensues if it is necessary to close a pipeline while a repair procedure is performed. Modern pipeline inspection gauges (PIGs) are now able to detect the early onset of corrosion and thus an ability to repair the pipeline before the corrosion spreads is desirable. Conventional repair techniques either cannot be used in pipes (arc welding), or require the pipeline to be shut down. TWI has thus developed a variant of its proven solid state friction stir welding technique that can produce sound welds under oil in order to effect a repair on cracked or corroded pipes. This welding system will be deployed on a specialised PIG being developed by a consortium led by Forth Engineering and will be able to make internal repairs on operational pipelines. Project progress to date has been good, with the following key milestones achieved:

- The feasibility of friction stir welding under oil has been demonstrated.
- Initial assessments have shown that the welds are sound and do not change the composition of the welded metal.
- The basic design of the system and its power requirements have been established, enabling detail design and specification of the onboard systems to begin.

The project is now moving forward to build a demonstration prototype which will be tested in a simulated flowline in autumn 2020.

Authors: Stephen Cater and Joe Sykes, TWI Technology Centre

Participants
Stephen Carter - Principal Project Leader, TWI

Networking Refreshment Break

14:30 - 14:50

Subsea Tie-in and Pipeline Reconfiguration in the North Sea Without Depressurising the Entire System

14:50 - 15:15
OPT Day 2

Two offshore platforms in the North Sea are being negatively affected by seabed subsidence. To enable economic production of the fields’ tail end production profile, infrastructure redevelopment is required. While the platforms are being redeveloped the production pipelines will be disconnected from the platforms. The redevelopment work scopes are expected to take up to two years. To assist efficient reconnection of the 26” and 22” production pipelines to the platforms Subsea Isolation Valve Skids were installed. The strategic use of a piggable pipeline isolation tool and hot tapping equipment facilitated the subsea pipeline reconfiguration. The reconfiguration was done without depressurising the entire 100km long 26” gas export pipeline, that normally operates at 85bar. The use of a remote-controlled isolation tool that provided a fully proved double block and monitored isolation; enhanced safety, reduced the project execution time and led to significant cost savings.

Author: Dale Millward, Technical Advisor, STATS Group

Participants
Dale Millward - Technical Adviser, STATS GROUP
Considerations and Development for Future EPRS
15:15 - 15:40
OPT Day 2

The MORGRIP business has created, supplied and championed Emergency Pipeline Repair System (EPRS) methodology for over 30 years. Our expertise has developed from onshore & topside applications (1988) to diver-installed subsea EPRS “clubs” (started in 1993) and remote repair systems (since 1995). In October 2019 MORGRIP was acquired by global pipeline repair specialist Connector Subsea Solutions, to support the industry in delivering ground breaking original solutions to deal with the new challenges faced by an aging industry, where asset integrity and safety remain paramount.

EPRS for carbon steel rigid pipelines is well documented. This paper will provide a detailed technical overview on how new challenges are being addressed, including the innovative repair of (i) clad and lined pipes; (ii) Pipe-in-Pipe systems; and (iii) Deepwater (remote operated) vertical and horizontal riser and flowlines. We will appraise the output from recent JIP Design Studies and projects that have been driven by Major Operators, who consider the new technology critical to future field life integrity.

Authors: James Rowley CEng, Business Development and Marketing Director - Connector Subsea Solutions / Paul Hughes CEng, Chief Commercial Officer & Marketing Director UK, Connector Subsea Solutions / Pal Magne Hisdal, Chairman, Connector Subsea Solutions

Participants
James Rowley - Business Development and Marketing Manager, Connector Subsea Solutions

Accidental Water Flooding and System Pressure Test of Offshore Pipelines: Cross-Links
15:40 - 16:05
OPT Day 2

Waiving system pressure test (SPT) has been often proposed over the last two decades. Commonly, it regarded offshore pipelines routed over long distances, in both shallow and deep waters, with large diameter and thick walls to meet high transport capacity requirements. A number of motivations for waiving SPT are listed: pre-comm schedule, large volumes of water, sensitive environment, huge compression plants etc.; eventually, questionable technical benefits for significant costs. Any waiving SPT decision had to be strictly linked to the dewatering requirements coming from risk of accidental water flooding (AWF) during installation. When is AWF an actual risk? Actually, for continental links and large export lines, routed from open sea to receiving terminals on land, the pipe lay vessel capacity for managing AWF during installation may be demanding: the holding capacity of the tensioning devices, the strength capacity of the stinger and bearings, moving arms and links to vessel etc. This fact significantly does limit the project availability of capable pipe lay vessels to very few. Advances of dedicated technology can help. On one hand, why to ask for SPT when: 1) fabrication technology and quality control can guaranty an integer line pipe; 2) welding and field joint preparation on the firing line are strictly controlled by means of accurate, qualified and modern tools, so girth welds are definitely tight and strong enough to withstand extreme installation loads; 3) dedicated instrumentation now monitors and controls the well-being and proper operation of the pipe lay equipment, as input to the structural performance of the pipeline, the stinger and from the stinger tip to the touch down point. On the other hand, should the above be confirmed, AWF during installation should be or better, is a marginal risk. There are still grey areas: should technology and new equipment provide the measures to render marginal the probability of accidental events - AWF during installation, is there technical room for minimizing consequence and relevant rational remedy, both technical and HSE-wise, in case of unpredictable AWF? The players on the stage are insurance and operating companies on one hand, pipe lay contractors on the other. In the middle, an established and stringent safety target that modern technology must contribute to meet; the final aim is always reducing the installation costs and improving safety. The scope of the paper is to show a way to deal with the subject, and how to solve the criticality of SPT to AWF cross-links. In particular: the reasons for waiving SPT are described; the eventuality of AWF discussed and cross-links with SPT are defined; the technology that helps to waive SPT and reduce AWF to marginal risk, for an offshore pipeline ready for safe operation along the life span, are commented.

Authors: Roberto Bruschi, Federico Gaggiotti, Adelina Mancini and Luigino Vitali, Saipem Spa, Fano (PU), Italy

Participants
Roberto Bruschi - Digital Transformation, Innovation Technology & Engineering Authority, Saipem Spa

Addressing Extreme HPHT Challenges through Pipeline Bundles Including Qualification of Pre-tensioned Pipeline Method and a Dynamic Arrival Temperature Management
16:05 - 16:30
OPT Day 2

This paper describes advances in two pipeline temperature management techniques for the growing High Pressure High Temperature (HPHT) field development market. A pre-tensioned pipeline prototype is presented which demonstrates how pre-tensioning can be utilised in pipeline bundles to enable subsea tiebacks from extreme HPHT reservoirs to existing infrastructure, by reducing the axial force in the production pipe. This paper also presents a thermal management system in which the overall heat transfer coefficient (U-value) of a pipe-in-pipe system can be adjusted during field life. This can be performed offshore by the operator to meet changing HPHT field conditions, and so dynamically manage the downstream pipe and topside arrival temperatures. Trials were performed on separately modified pipe in pipe sections allowing the pre-tensioning concept and the variable U-value system to be qualified according to DNV-RP-A203. A summary of the qualification processes is presented along with a TRL summary.

Authors: Alex Stanning, Samuel Scott and Harvey Jamieson, Subsea 7

Participants
Samuel Scott - Senior Engineer, Subsea 7
Alex Stanning - Senior Engineer, Subsea 7

Chairman’s Closing Remarks
16:30 - 16:40

Close of OPT 2020
16:40 - 16:45
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| 09:00| 09:00 - Chairperson's Welcome to Day 2  
09:10 - Keynote Address – A Review of the Offshore Pipeline & Subsea Landscape  
09:40 - Innovative Solutions to Address Stabilisation Challenges of a Forty-Eight Years Old Subsea Pipeline |
| 10:00| 10:05 - Flowline Connection Systems & MS Connectors  
10:30 - Networking Refreshment Break |
| 11:00| 11:00 - A Numerical Investigation on a Pipe Subject to a Non-Perpendicular Trawl Impact Using a Hybrid Shell-Beam Model  
11:25 - Innovations in Pipeline Pre-Commissioning  
11:50 - Re-Purposing Pipelines for Hydrogen Storage and Transportation |
| 12:00| 12:15 - Networking Lunch |
| 13:00| 13:15 - World's First Remote Operated Hyperbaric Tie-in at Johan Sverdrup  
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| 14:00| 14:05 - FSWBOT: Weld Repair of Internal Corrosion Defects in Live Pipelines  
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| 15:00| 15:15 - Considerations and Development for Future EPRS  
15:40 - Accidental Water Flooding and System Pressure Test of Offshore Pipelines: Cross-Links |
| 16:00| 16:05 - Addressing Extreme HPHT Challenges through Pipeline Bundles Including Qualification of Pre-tensioned Pipeline Method and a Dynamic Arrival Temperature Management  
16:30 - Chairman's Closing Remarks  
16:40 - Close of OPT 2020 |