07:30 Coffee and Bacon Rolls

08:00 Introduction

Tony Laing, NSRI

08:05 Pipeline Blockage Removal Methods – Invasive Options

Pipeline blockages caused by scale, wax build-up or hydrates can sometimes be removed by non-invasive techniques, such as chemical treatment or pulsed blockage removal technology. Some pipeline blockages may have been caused by normal operational pigging or more likely due to cleaning operations prior to inline inspection (ILI). Recently we have become aware of several ILI tools causing partial or complete blockage of the pipeline.

When non-invasive techniques have proved unsuccessful or unsuitable then more invasive blockage removal intervention may be required. The less invasive method of blockage removal would be to inject and flush locally, via small bore hot taps through a dual deal, self-energised, lightweight strap clamp.

If the blockage cannot be removed by local flushing/chemical injection, then the blocked pipeline section may need to be completely removed and replaced. If a temporary bypass is installed, production can be resumed while the blockage removal operations are executed. This short presentation will explain how type approved double block and bleed hot tap installed isolation tools enable the safe removal of the blocked section while the pipeline is at operation pressure.

Animations and footage of recent subsea pipeline intervention projects will be used to highlight the applications of these techniques.

Dale has worked in the pipeline and subsea intervention industry since 1992 with involvement in subsea construction, commissioning, repair, isolation, maintenance and decommissioning projects. He joined STATS Group in 2005 and has been involved in the design, development and delivery of engineered pipeline isolation, repair and recovery solutions.

08:20 C-Kore: Fast Automated Subsea Umbilical Testing

C-Kore Systems was founded to bring modern technology to subsea testing. The firm started out with its Cable Monitor for testing insulation resistance (IR) and electrical continuity, followed by a fully automated Subsea TDR, a Pressure Monitor for umbilical installation, and now a new Sensor Monitor for fault-finding and decommissioning applications. The firm is celebrating having just won the prestigious Queen’s Award for Enterprise in the Innovation category and the 2019 Innovation and Technology Award from Subsea UK.

The philosophy behind C-Kore’s product design is to simplify subsea testing. This is achieved by automating the measurement process in compact and self-contained subsea-rated units. This automation, combined with the removal of downlines and platform testing requests, significantly speeds up the testing process. This saves vessel time and ultimately money. As tests
are preprogrammed and automated, the operator can be assured that measurements are repeatable, while the sealed design ensures there are no extraneous environmental influences on measurement accuracy. The tools are designed for use in fault-finding, construction and decommissioning applications.

This presentation provides a quick comparison between C-Kore’s automated subsea testing tools and the traditional approach of using downlines or platform-led testing, followed by a short case study demonstrating how multiple vessel days were saved by a C-Kore customer on a North Sea IR fault-finding campaign.

As the original designer of the C-Kore Cable Monitor tool, Greg leads the C-Kore team developing and delivering C-Kore monitoring and fault-finding systems. He graduated with a first class honours with distinction in electronic engineering from the University of York and has just completed an MBA at Warwick Business School, finishing with distinction.

08:35  

**Subsea LiDAR: Control the Beam, Control the Data, Control the Return**

3D at Depth are the world’s leading expert in Subsea LiDAR laser technology. Our advanced Subsea LiDAR systems and subsea survey support services help customers transform the value of underwater 3D data.

Baseline datasets from ‘Static’ and ‘Dynamic’ Subsea LiDAR surveys can be merged to create precise 3D models of manifolds, wells, spools, flowlines, risers and their surrounding seabed. These models can be used to measure accurate distances, longitudinal profiles, angles and volumes.

4D temporal data collected year over year can be used to precisely determine any differential settlement between drill centre structures, pipeline out of straightness, riser movement, pipeline ovality and the volume of any scour, over time. Annual datasets can be viewed simultaneously using colour as differentiation, making changes easy to locate and then measure.

From data collection and processing, through visualization and analysis, 3D at Depth delivers precise, accurate, repeatable, millimetric 3D point clouds to measure, map and evaluate underwater assets and environments.

Asset managers, LoF managers and subsea engineers are able to visualise accurate digital twins of the assets installed subsea. 2D charts are now a redundant deliverable. 3D digital point clouds of the installed subsea infrastructure reduce interpretation and allows development of cost effective and precise repair solutions.

**Ian Ellis**  
**Operations & Client Lead**  
**3D at Depth**

**Ian Ellis is the Operations & Client Lead for 3D at Depth Limited’s Europe, Africa & Middle East region. Located in Kingswells just outside Aberdeen, Scotland, UK.**

*Responsible for managing regional, technical and operational project management, as well as commercial interfaces for Scotland and Northern Europe. From receipt of a scope of work, through to the delivery of results, Ian will ensure our customers achieve their project objectives safely and*
effectively. Ian’s career started as a survey data processor and has spanned 21 years’ in the offshore Oil and Gas industry. Over this period Ian has held onshore and offshore positions with Subsea 7, UTEC Survey, Nautronix and latterly Proserv where he acted as the Survey Operations Manager.

With expertise in the hydrographic survey, acoustic positioning, inertial navigation and data processing Ian will also support the advancement and commercialisation of new technologies to meet the client’s needs within the region.

08:50 Identifying and Characterising Flow Assurance Issues

Case study outlining how Tracerco employed non-intrusive pipeline scanning techniques to locate and characterise a blockage within a subsea pipeline in the Gulf of Mexico. The pipeline became blocked shortly after start up. Tracerco screened the pipeline using their Explorer tool and located 3 regions of restriction/blockage. They then deployed the Discovery scanner to characterise the restriction and identified the blockage material to be asphaltene thus giving the operator the knowledge required for a successful remediation.

Mike has over 30 years’ experience in the offshore industry and is one of Tracerco’s experts in subsea applications. Starting out as an assistant field engineer, Mike has progressed through the ranks, holding senior field engineer roles before moving onto project engineering and management. Mike is now a Business Development Manager for Tracerco’s Subsea business. Mike has a BEng(Hons) degree and is a member of the Institute of Diagnostic Engineers.

09:05 How to reduce hydrogen generation and copper corrosion in umbilicals

There are fundamental processes that occur with seawater in contact with the copper conductors of a cable when an Insulation Monitoring Device (IMD) is used to monitor the degradation of electrical insulation resistance in subsea cables, connectors and umbilicals. Damage can occur as a result of basic integrity monitoring, and if there are two separate electrical faults on an umbilical, catastrophic damage and failure will occur.

This presentation will prove through theory, backed-up with practical test results, that degradation of the cable’s conductor insulation in a seawater environment will lead to serious and potentially catastrophic damage of the copper conductors. It will also be shown that the applied voltage from the surface power supply and/or from a standard IMD will also result in the generation of hydrogen gas within the cable or umbilical.

Most subsea power delivery systems utilise a ‘floating earth’ supply and with such systems, it is mandatory that an Insulation Monitoring Device (IMD) is used to verify the integrity of the insulation resistance. Subsea Controls Engineers have generally reacted to IMD alarms by planning interventions to locate and repair the source of the insulation failure. However, by ignoring the alarms or accepting that a subsea system be operated at a low insulation resistance, most engineers will not realise that this decision could ultimately
result in a total electrical failure and in the generation hydrogen in the umbilical.

The presentation will show how such consequences can be mitigated and eliminated by having an IMD that dynamically modifies its measurement parameters depending on the actual measured electrical insulation condition.

*Neil Douglas has been in the Subsea Controls Industry for over 30 years, the majority of which were spent with what is now BHGE. In 2007, along with co-director Max Nodder, he established Viper Subsea (since renamed Viper Innovations), a company that specialises in technology development and integrity management of subsea controls and electrical distribution equipment.*

*Neil holds a Bachelor of Science degree in electrical and electronic engineering and a Masters in Subsea Engineering. He is also a board member of the West of England Local Enterprise Partnership.*

**09:20 Subsea Electrical Testing System (SETS)**

The requirement to test subsea cables and connections has long been recognised in the Offshore Oil and Gas industry. As early as the 1990s a need was further identified for quicker, safer and more effective means of electrical testing on subsea submarine cables than the usual fault finding from shore, platform or vessel.

These traditional methods involved a substantial undertaking in time and money for support vessels, manpower and production downtime and often the already suspect electrical architecture was put at further risk by the process of cable end recovery and the testing itself.

1997, and Imes began working with BP and Aker Solutions to develop a system for electrical testing at point, subsea. Initial systems were simple subsea pods, ROV carried and deployed, that simply measured and logged data for later recovery and analysis mainly for fault finding.

Since then continual development has seen SETS capability increase to provide a range of tests, lie test setup and data feedback allowing real time detailed information on the integrity of cables and umbilicals during installation and pre-commissioning as well as the traditional fault-finding capability.

IMES SETS allows for each element of the subsea architecture to be isolated and tested individually and the fault(s) located rapidly and effectively reducing time spent on commissioning, post install test and fault-finding exercises resulting in huge cost savings on vessel and manpower time.

To keep pace with subsea cable and umbilical technology IMES are in the final stages of producing an OTDR (we believe to be a subsea first) capable of locating and pinpointing faults within subsea optical cables and umbilicals.
IMES Suite of testing tools have been hired and purchased by companies such as BP, Shell, Noble, Petrobras, SS7, DOF Subsea and the Wood Group.

Paul Basford joined IMES Ltd in 2013 as a project manager after having spent 8 years in the Middle East engaged in a number of projects for the UAE Government. Prior to this I served with the Royal Marines carrying out amphibious operations and peace keeping duties globally.

Currently the Business Development Manager with IMES engineering department based in Sheffield helping to promote key products for the O&G, defence, nuclear and renewables industries.

09:35 Predictive Integrity Assessment for Life Extension

With improvements in reservoir management and enhanced recovery of hydrocarbons, many older assets, are looking to operate into extended life. A key challenge for these assets is the need to predict the safe operating life of equipment, even with limited condition data, and to manage degradation such that the asset can continue to operate safely and economically while maintaining sufficient residual integrity to support decommissioning.

Astrimar’s predictive integrity management approach using their state-of-the-art software, pRIOriti-AIM™, has been used in combination with life extension best practice (SINTEF, 2010) to demonstrate capability to provide operators with significantly greater confidence in making these operational and IM decisions.

The approach of pRIOriti-AIM goes beyond current Machine Learning approaches that learn from the past to interpret the present. Instead it uses recognised reliability techniques to learn from the past to predict the future. This truly predictive approach helps companies be better at anticipating and forecasting equipment degradation and when failure is likely. It also helps to monitor for trends to identify changes of condition and rate, to inform risk-based decision making on when to inspect/monitor, as well as the optimum time to repair/replace in the context of both normal and extended life operations. Additionally, the approach helps operators to learn how asset performance depends on operating conditions and environment, and better manage influencing factors. Statistical updating algorithms mean that future predictions are improved every time there is new data.

This presentation will illustrate the approach that has been used for subsea assets operated by 2 different operators for evaluating equipment for continued normal operation and for extended life operation. Examples with equipment that can be inspected quantitatively, as well as equipment for which the condition data is far less quantified, will be provide. Resulting risk-based decisions and the benefits of this approach will be presented.

Caroline is a Director and Chief Consultant of Astrimar and a Fellow of the IMechE, with more than 25 years’ project engineering, analysis and consultancy experience focussed in the offshore oil and gas and subsea engineering business sectors. Caroline’s technical expertise centres around reliability engineering, technical risk and integrity management. Caroline has supported oil and gas operators in developing and implementing best
practice for reliability engineering and integrity management primarily applied to subsea production systems. Experience has ranged from early project stages including concept selection and front-end engineering through to operations, late life integrity management, life extension and decommissioning. A significant amount of experience has also been built up in reliability-based practices for technology qualification. Caroline is passionate about turning science-based reliability methods into pragmatic solutions, to make best use of available data. By incorporating reliability into everyday business, her goal is to help clients understand and prevent failures at every stage of the life cycle. Astrimar has been at the forefront of subsea reliability and technology qualification best practice since its inception in 2010.

09:50  Deep Artificial Neural Networks for the Automatic Annotation of Subsea Inspection Data

Oil and Gas operators are mandated to carry out inspections of their subsea pipelines for insurance and legal purposes, normally executed on an annual or bi-annual basis to corroborate the integrity of the asset, to ensure there are no leaks or damage through corrosion, nor potential detrimental impact from e.g. fishing nets and natural causes. Whilst there have been many advances in the ROV technologies, Inspection, Maintenance and Repair (IMR) still utilises significant human intervention to annotate events on the survey data.

Recently a number of automatic video annotation approaches have been announced, however, these have been demonstrated on clear waters, using bespoke and vendor specific camera systems that mitigate motion blur and poor image quality, through strobed lighting and high shutter speeds. Although these technological advancements in the equipment are beneficial, the vast majority of working-class ROVs are still equipped with standard cameras and do not offer the high picture clarity and visibility to operate effectively, hence limiting their usage. N-Sea and the University of Strathclyde utilise the latest research in Artificial Intelligence and developed Deep Learning Neural Networks to automatically annotate survey data by fusing multiple sensing modalities such as cameras, multibeam echo and pipe tracker sensors. The algorithm has been trained and validated purposely using video footage and data acquired by standard working-class ROV equipment making it applicable to the wider subsea survey utilities. The developed algorithm has been extensively evaluated and demonstrates accuracies above 90% in identifying Burials and Exposures, Anodes, Field Joints and Free Spans from a single snapshot of data (single set of still images) and this performance increases to 99% when multiple data frames are combined to exploit the temporal nature of the data. The technology developed has the potential to significantly reduce survey costs, increase survey speed and consistency.

Hans van Peet joined N-Sea in August 2018 as Survey Authority. Having previously worked for Heerema Marine Contractors, Hans brings more than 30 years of specialist experience in survey, positioning and ROV intervention to the role. He previously led subsea services for a variety of leading offshore
companies, including the technical management of major frame agreements for ROV and survey and positioning services.

10:05  Large-Scale Subsea Power

Teledyne has developed a fuel cell-based subsea power node that can enable the large-scale delivery of subsea electrical power. It is envisioned that this subsea power node could be used to power recharging and communication docks to enhance the endurance of unmanned underwater vehicles (ROVs). This system could also provide back-up power to subsea oil fields and data centers. The subsea power node has been deployed dockside to perform ship husbandry exercises. In these exercises, a resident ROV traversed a dock to inspect simulated ship hulls. The subsea power node is capable of delivering either 8 or 25kW per module. This system can be hybridized with a battery to provide 100’s of kW while maintaining the described subsea recharging capability. Smaller units in the range of 50 to 100 W are also being developed to support the ocean sensor community. This presentation will introduce the subsea power node and discuss the capabilities it can enable.

Dr. Thomas I. Valdez is the Chemical Engineering Group Manager at Teledyne Energy Systems Incorporated, Hunt Valley Maryland. He manages the development of advanced chemical and electrochemical engineering systems. These projects include advanced electrolysis for the generation of hydrogen and oxygen, fuel cell technologies with a focus on powering air-independent applications, and battery systems for energy storage. His battery system focus is on advanced passive thermal management to enhance durability and address failure propagation mitigation in lithium-based batteries.

Thomas has over 28 years of experience in the area of advanced power systems for military, space, underwater, and commercial applications. His career began at NASA's Jet Propulsion Laboratory (JPL) where he was a major contributor to the JPL Fuel Cell Group and Power Systems Section. Thomas has received various NASA New Technology Awards, has published several technical papers in scientific journals, and has co-authored three book chapters on fuel cell technology. He has several patents with regard to his work on fuel cells, electrochemical sensors, and energy harvesting systems.

His educational background starts with being a student of Mr. Jaime Escalante, whose teachings were the basis of the Hollywood movie Stand and Deliver. Thomas holds a Bachelor of Science degree in Mechanical Engineering and a Masters of Science degree in Materials Engineering from the University of California, Irvine. He completed his doctorate in Materials Science under Professor Florian Mansfeld, winner of the Electrochemical Society Vittorio de Nora Award, at the University of Southern California.
Umbilical Integrity – when it goes wrong

In the mature North Sea basin, many subsea assets are at and beyond design life. Operators are faced with a range of challenges in the support of these ageing assets. In our experience umbilical and cable electrical integrity is the main failure mode in operational subsea equipment. Obsolescence and spares management are issues which exacerbate the problem of failing connectors and umbilicals.

We set up our Legacy Locker service to address these issues. Through it, we can quickly source and manufacture equipment you need to effect repairs and re-establish production.

We recently worked on a project where the client had experienced a sudden and total failure in their subsea production controls. We received a call from the client on Tuesday 2nd April. They needed two electrical jumpers urgently. We had two connectors in our own legacy locker stock. Another client released two from their stock. Another client had the required cable in their stock which we manage for them here at SEA. They gave permission to use their cable.

We were able to build and test two jumpers, each 120m long and deliver them back to the client on Friday 5th April. This included hyperbaric testing. The two jumpers were delivered straight to the DSV and we subsequently installed. Production was restarted.

Manufacturer lead time for typical subsea connectors is currently around 24 weeks. We understand that this field produces 6000 bpd, giving savings of around $70m based on current oil price.

There are added advantages to this approach. We and all our client get turnover of stock. A client may not want a like for like replacement. In this case the client who released the cable had plenty in stock and decided to replace it with connectors.

SEA is a Subsea Engineering company based in Dyce Aberdeen focused on Subsea Controls Systems. SEA has built a reputation for providing new design and manufacture equipment as well as responsive solutions with high quality to our customers. SEA utilise Legacy Locker with the promotion of supply, reuse, refurbishment and re-certification of existing equipment to the industry.

Simon initially studied Electronic and Electrical Engineering at Edinburgh University and later Engineering Design at The Robert Gordon University and recently became a Certified Project Management Associate through APM.

Simon has worked in the oil and gas sector for over 20 years. He started his career as a planning co-ordinator for offshore development systems and has since been involved in both surface and subsea operation management both locally and overseas with Cameron, Plexus Ocean Systems and Wood Group before joining SEA in 2012.

Close