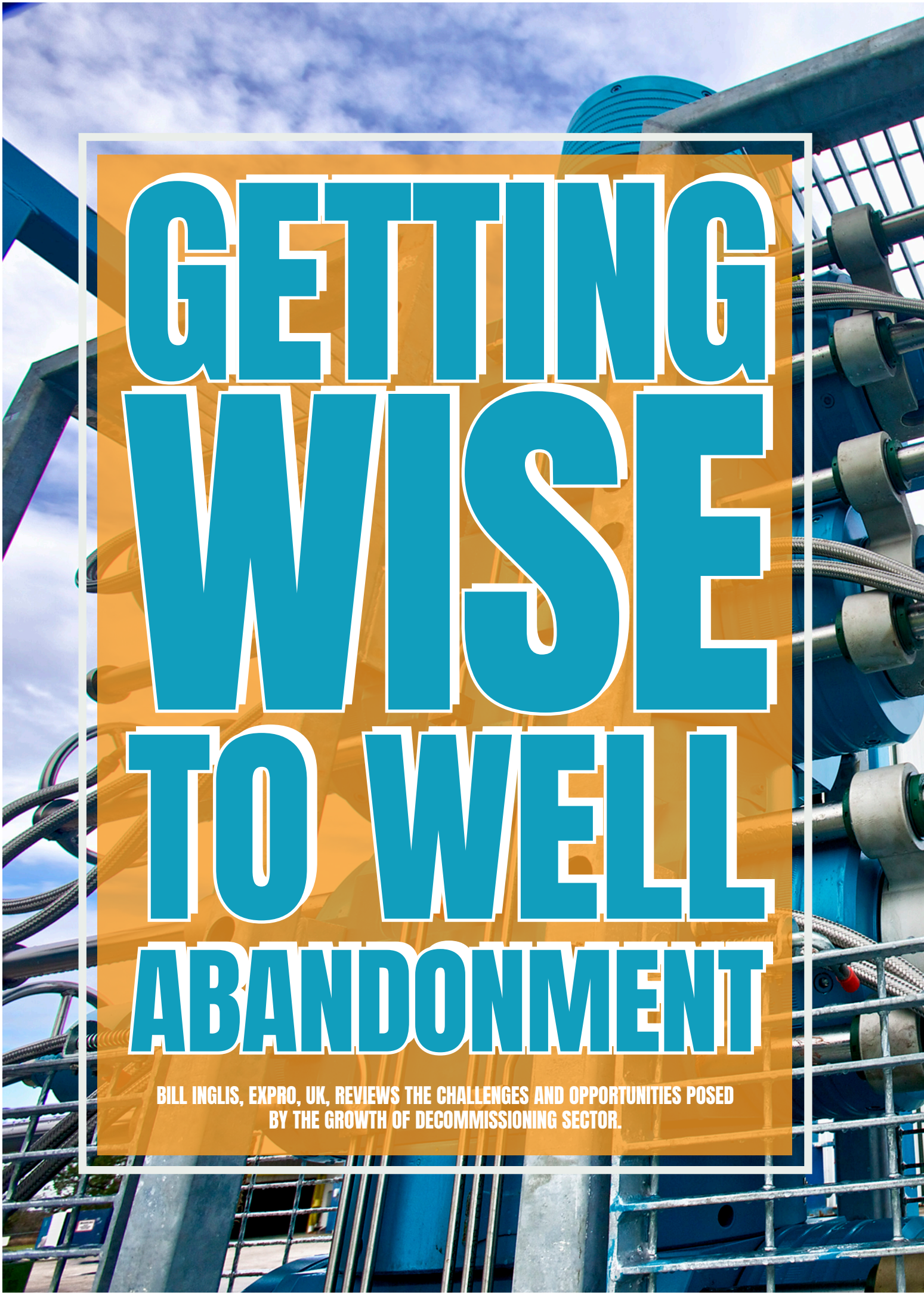

GETTING WISE TO WELL ABANDONMENT

BILL INGLIS, EXPRO, UK, REVIEWS THE CHALLENGES AND OPPORTUNITIES POSED BY THE GROWTH OF DECOMMISSIONING SECTOR.

While operators and, arguably, governments remain focused on maximising hydrocarbon recovery prior to abandonment, decommissioning represents a multibillion dollar opportunity for the service sector – US$13 billion per year by 2040 according to IHS Markit.[1]

Increases in global decommissioning activity will see approximately 600 projects targeted for disposal in the next five years. The US Gulf of Mexico has the largest number of platforms to be decommissioned, with more than 5000 oil and gas structures in place. Initial levels across the UK and Norwegian Continental Shelf remain relatively low, with only 12 projects ongoing in 2015, however 186 projects are expected in the period up to 2025. Despite the low volume, the North Sea carries the greatest spend, with the largest cost related to the size of the structures being removed.

These key maturing basins have focused the need for a robust decommissioning strategy – one that requires an appropriate approach and governance. With time, resources, technology and regulations all impacting on the decision-making process, operators are increasingly looking for solutions to carefully manage their decommissioning liability.

Regulations

Regulations, guidelines and policies vary between countries and companies, from agreeing the placement and acceptable length for a cement barrier, through to disposal of platforms after they are removed from the seabed. When it comes to well abandonment, the onus is on the operator to meet and exceed the governing criteria, ensuring that there is no risk to the environment. The challenge for the industry is to do this safely, cost-effectively and sustainably.

In response to several high profile incidents, the industry has been forced to improve its well integrity standards. Regulators are moving towards a more proactive involvement and enforcement policy. In the US, the introduction of the Bureau of Safety and Environmental Enforcement's (BSEE) Idle Iron Policy[2] focuses on late life disposal, requiring operators to decommission their facilities after they are classified as 'no longer useful for operations'. This occurs after five years of no production and where there are no plans for future development. Other recent examples of the increased focus on integrity can be seen with the API recommended practice 1171[3] for the integrity for gas storage wells and the BSEE new well control changes to Code of Federal Regulations part 250.

This governmental approach has been partially responsible for sustaining a stable decommissioning industry in the Gulf of Mexico. In the past decade, approximately 130 platforms[4] have been decommissioned per year, according to the BSEE statistics.

By contrast, regulations on the UK[5] and Norwegian Continental Shelves are focused on goal setting, with

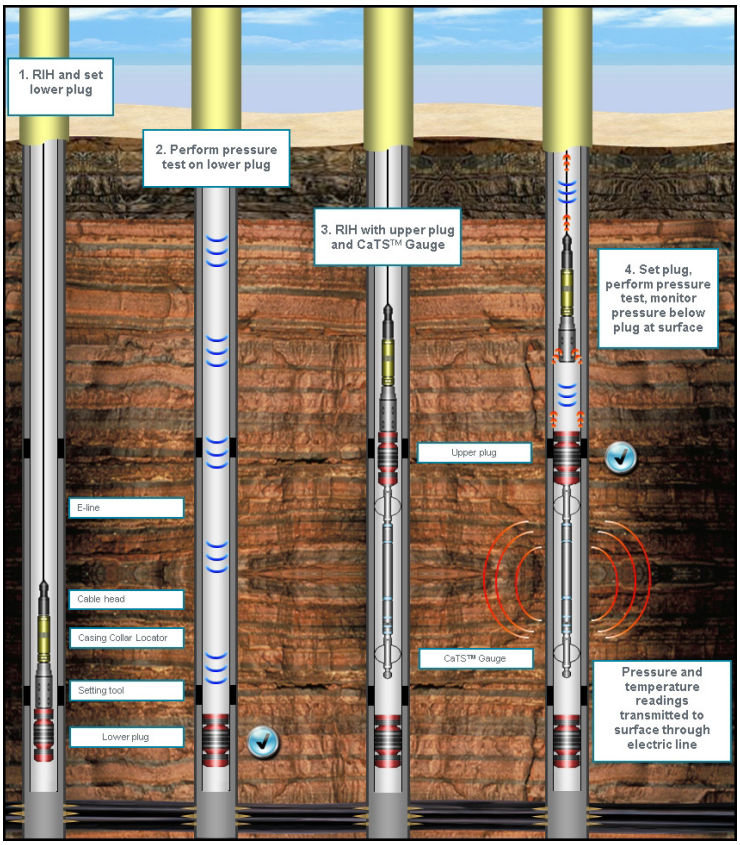

Figure 1. *Solving the problem of barrier verification in close proximity.*

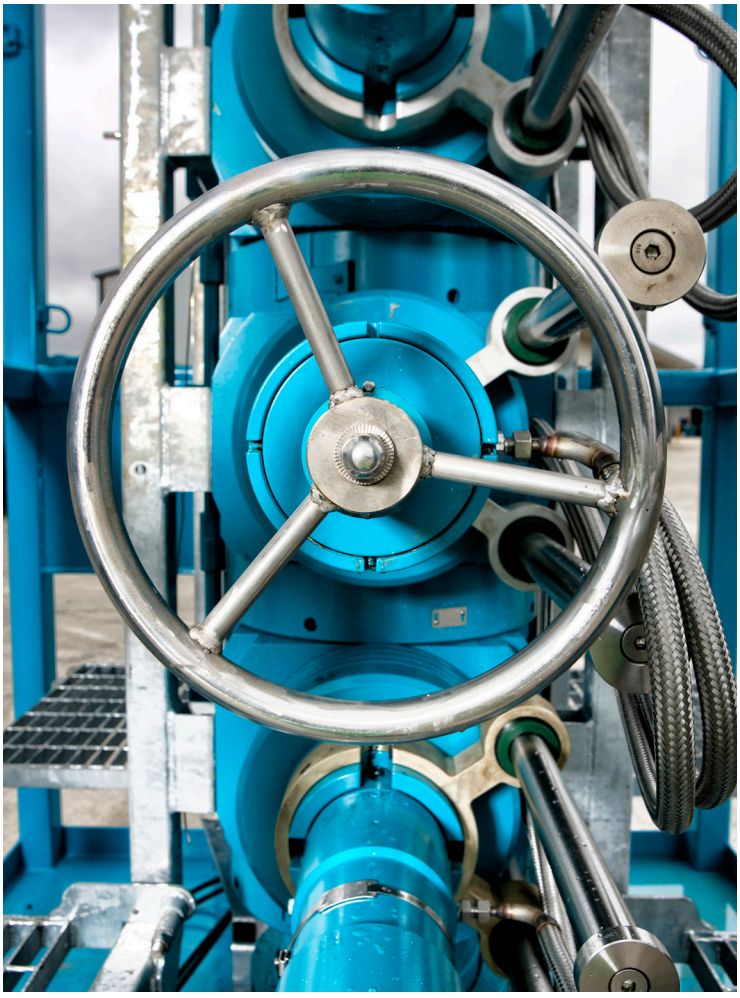

Figure 2. *Pressure control equipment – required until barriers are established.*

guidelines developed by the industry to support these regulations. The focus is on 'how' to decommission as opposed to 'when', particularly given the UK Government's recent emphasis on extending field life and maximising reserves.

Government legislation, guidance and support

Recent legislative changes in the US took several years to come to fruition, with the impetus originating from recommendations made following the Deepwater Horizon tragedy. A key objective was in turning industry best practice into legislation, with BSEE working alongside government branches and organised industry workshops prior to finalising the revisions. A similar process is followed in Norway and the UK, where the industry contributes and suggests changes to guidance documentation.

The UK Government is focused on mitigating early decommissioning. The 'Maximising Economic Recovery in the UK' (MER UK) initiative aims to avoid infrastructure being removed prematurely and leaving untapped oil in the ground. However, according to Oil and Gas UK[6], the North Sea decommissioning bill is forecast to steadily rise in the upcoming years, with a US$21.6 billion (£17.6 billion) estimated spend between 2016 and 2025.

Recent research by Professor Alex Kemp and Linda Stephen stated that at the current oil price, 11 billion bbls of North Sea oil can still be developed at today's 'lower for longer' prices, with 7 billion bbls of unexploited potential. This is contingent on investments and efficiencies, which are often the focus of the newer (usually) smaller, niche companies entering the North Sea which are specialising in maximising incremental reserves from mature assets to defer cessation of production.

To date, major operators have managed asset sales by retaining full or part liability for the decommissioning costs. These asset transfers have taken place despite the process being hindered by a historic inability to transfer any tax benefits accrued by the original operator. However, the UK Government recently announced fiscal measures in its 2017 budget statement that include a strategic review of taxation changes for late-life assets, with the aim of facilitating their sale and transfer.

Decisions like these are critical if the broader industry is to be supported in focusing its skills in the most efficient and effective ways. The smaller operators, in particular, often concentrate on late field life development through investment and trialling of technology. This applies to a range of production optimisation technologies, through reservoir monitoring, data acquisition, well intervention, flow measurement, subsurface and process engineering. However, among late life activities, abandonment planning plays a critical role in identifying and producing every final barrel of production while minimising any financial and environmental liability prior to or during the abandonment process.

Technology

Estimating the cost of abandonment remains challenging, and involves consideration of asset size, complexity, history and information available. One issue can be a lack of well intervention history, including poor record keeping, varying data formats and changes in reporting systems. This can lead to lost or poor quality data, which equates to potential cost over-runs during final abandonment.

This can be compounded by the scale of well integrity issues, particularly those caused by extending field life. Understanding the condition of a well is critical to minimising any potential risk

of uncontrolled releases, while managing the cost. Abandoning wells with poor integrity is difficult and expensive, and technology can play a major role in removing some of these burdens.

Monitoring and reporting the condition of a well – from production through to abandonment – will address several of these aspects. For example, Expro's SafeWells well integrity software was specifically developed in partnership with operators, to deliver an effective well management solution to improve communication, auditability and data quality.

If the well condition is unknown before the start of a campaign, a dedicated well investigation and preparation phase can be conducted prior to abandonment. This removes uncertainty, as well as performing the initial steps of an abandonment programme without the need for rigs to conduct costly well intervention (or in the case of subsea wells, the use of a light well intervention vessel). Once the well condition is known then the optimum methodology can be developed to minimise logistical costs and reduce the utilisation of expensive equipment.

Expro has been involved in projects of this nature for several years, including a recent eight-well slickline campaign on Shell's Armada field.[7] This approach successfully delivered the programme six days ahead of target thanks to a combination of an innovative operational approach, a multi-disciplinary crew and lessons learned from previous operations. Well abandonment provides an excellent example of the industry looking to adapt proven technology for refining abandonment applications.

Traditional means of barrier verification still rely on a pressure test, to ensure the barrier is leak tight. When removing blow out preventers or other pressure control equipment, two barriers are required. Normally this is in the form of a deep set barrier and a shallow set barrier, allowing well control equipment to be removed safely. When re-entering the well, the well control equipment has to be re-established before the plugs are removed. In an abandonment scenario it is possible to avoid this step if the two independently verified barriers remain deep in the well, and where well control equipment is no longer subsequently required, days of rig-time can be avoided.

Expro's Cableless Telemetry System (CaTS™) uses electromagnetic wireless reservoir monitoring technology as a well established means of monitoring reservoir pressure and temperature, transmitting data using the steel construction of the well as a signal conduit. It was designed to monitor abandoned appraisal wells or suspended development wells, for interference testing and reducing uncertainties in connectivity. However, this proven technology can be applied to barrier testing in a number of different ways, reducing the abandonment cost, improving safety and reducing uncertainty in verification.

In Norway, CaTS was deployed to allow two deep barriers to be set and independently verified through the deployment of wireless real time surface read out pressure gauges, below the upper plug, allowing independent barrier verification to be proven (in compliance with the NORSOK D-010 standard).[8] In similar applications, this technology has been used in Brazil to prove swell packer isolation during well construction in deepwater environments.

This technology can be applied to suspended subsea wells, when a Light Well Intervention Vessel (LWIV) is deployed to complete the temporary abandonment prior to rig abandonment. Deployment of the CaTS pressure gauge below the shallow pump open plug allows the operator to independently monitor the status of the primary well barrier(s) for the duration of temporary abandonment, providing well integrity status pressure data for rig well abandonment operations. This allows the tubing to be pulled by the rig with a tubing hanger running tool, avoiding the cost of running riser and wireline equipment. One operator estimated this approach saves them three days of rig time per well in a multi well campaign, shortening the rig schedule by roughly a month.

CaTS can also be used to monitor the status of suspended wells, which is increasingly important as regulators enforce new abandonment legislation and timings. For subsea wells, pressure readings can be retrieved by a standard vessel using a dunking transceiver, reducing inspection costs and improving monitoring capability (compared to remotely operated vehicles). Another benefit of the system is its ability to monitor the short-term verification of the plug, while overseeing the long-term integrity status of the primary well barrier.

Conclusion

The abandonment and decommissioning market continues to grow and evolve amid continued changes in government regulation, volatile commodity prices and the resulting impact on company resource and capital expenditure. These peaks and troughs make the timing of abandonment difficult to forecast, leaving the industry increasingly challenged on how to deliver a holistic and sustained approach to decommissioning.

At the government level, it is important to focus on lobbying to deliver a stable and flexible fiscal regime allowing late-field assets to be transferred into the right hands pre-abandonment. This ensures the industry can maximise its incremental reserves, while safely and cost-effectively planning towards well abandonment and full decommissioning.

Operators are increasingly aware of the value of effective abandonment, which can deliver large cost savings if planned alongside continued investment in technology. In today's oil price, this has been extremely difficult, as capital budgets remains constrained and companies rely on the adaptation of existing technology. While these solutions can meet the industry's immediate need, further investment is required to deliver the economies of scale and increasingly complex, large-scale abandonment and decommissioning programmes.

However, the one constant that remains is access to a skilled resource. Where once the industry faced the 'great crew change', it now faces the 'lost generation' – ultimately meaning experience loss from both ends of the spectrum. While short-term measures were vital for the industry's survival, it is now losing some of its best talent to other industries and these people are unlikely to return. No matter how opportunity around abandonment and decommissioning is sold, attracting fresh talent to this market may become the industry's greatest challenge.

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