NSTF Wells Task Force

Right Scoping Group

Good Practice Guide to Rig / Unit Selection for Platform Well Decommissioning

July 2023

1. INTRODUCTION

The Wells Taskforce, under the North Sea Transition Forum, was established to integrate, streamline and add value to the well delivery, management and removal process. The Right Scoping Work Group is one of five groups created by the Wells Taskforce. Its objective is to identify, communicate, and promote good practice in well delivery across the UK industry. The Decommissioning Steering Group is another of the Well Task Force groups with an objective to drive alignment, accountability and action to deliver cost efficient well decommissioning and support the UK government's net zero ambitions.

The Oil & Gas UK Right Scoping Guidelines were produced by the Work Group in 2018. Since then, Well Operators, regulators and other stakeholders have collaborated in many workshops to review each other's well design challenges and to select the optimal design for those wells.
At the request of the Wells Task Force, the Right Scoping Group and the Decommissioning Steering Group agreed to use the right scoping approach to investigate rig / unit selection for platform well decommissioning.

A cross-industry workshop was held on 27th June 2023 with representatives from Well Operators, Regulators, industry groups and the service sector. The topic was split into four themes for discussion by separate groups. The themes were: Rig Condition, Well Stock, Options for other Units and Emerging Technologies. The aim of this brief document is to record good practices identified by the discussion groups. Many of these themes apply to all wells, but are considered particularly important for plugging and abandoning platform wells.

2. OUTLINE GOOD PRACTICE PROCESS FOR PLATFORM WELL DECOMMISSIONING UNIT SELECTION

- Establish a project team well ahead of decommissioning/CoP dates to define a strategy early to enable an informed decision to remove or maintain a platform rig. (The NSTA decommissioning stewardship expectation is at least 6 years before Cessation of Production (COP). Early planning with all disciplines is the strongest recommendation presented in this document.) Create a resource plan across wells, subsurface and operations/production which includes competence methodology
- Workup a clear understanding of each well's architecture and complexity to establish a P&A oriented subsurface and wells process to deliver a well decommissioning subsurface basis of design, defining plugging requirements, barrier types, quantity, sizes and depths (Subsurface Isolation Strategy - SIS). Identify more difficult wells and define a data gathering and diagnostics programme integrated with late life well integrity to improve understanding of the well plugging requirements
- Use the SIS and Basis of Design to develop an initial well decommissioning design and plan for barrier selection which informs rig or alternative unit selection and preliminary work such as wireline. Make initial selection of rig or alternative equipment for well decommissioning work
- Conduct a thorough survey of the rig and gap analysis against drawings, regulations and current standards to inform decision whether to retain or remove. Develop a clear understanding of available platform systems and their current capability, particularly cranes and skidding systems. Carry out HAZID/HAZOPs for well work and also reactivation of existing or modified platform rig and support equipment if retained
- Develop a cross discipline plan for the late life management of Safety and Environmentally Critical Elements. Continue to manage well integrity and late life well productivity

- Commence well preparation and plugging activities. Maximising well decommissioning work before CoP is likely to mitigate cost, resources and CO2 emissions.

3. WELL STOCK (understanding the decommissioning requirements)

Subsurface Isolation

Subsurface plugging requirements are a critical starting point for planning a well decommissioning campaign because they inform the type of barriers, location of barriers, rig requirements. A clear strategy needs to be developed which considers risks, consequences and mitigations from a well decommissioning perspective with abandonment specific reasoning rather than the standard field development approach. The conventional subsurface thinking should be challenged.

Industry wide well decommissioning work is expected to increase, with the result that skilled resources for this work maybe in short supply. An early start is essential with a proper process and project plan. A risk assessment needs to consider the fact that old information on well status may not be reliable or available.

Well integrity and barrier diagnostics form an essential part of the input to this subsurface planning process so that the architecture and pressure anomalies in a well are properly understood. There are two distinct elements to this:

- Define from a subsurface perspective what formations need to be isolated. This is field wide and not well specific. It may need to consider reservoir repurposing implications.
- Understand the well stock, including production history so that an efficient barrier design can be established for each well. This may require diagnostic testing. Integration of subsurface, wells, drilling, barrier integrity and production data and people is required to get the optimum result.

Wells should be categorised based on their complexity. This in turn allows a high level budgeting process to start (class 4). Consider the full toolbox of plugging options (alternative barrier materials) because this will inform the rig requirements or potentially make 'Rig-less' or 'Less rig' options more attractive.

The use of alternative barrier material may significantly impact rig choice or alternative hardware solutions e.g. HWU. Batching and operational sequences may also affect the initial budget estimates.

Sustained casing pressure is one of the most common subsurface well defects which has a material impact on complexity and cost. A good understanding of the characteristics of each well with sustained casing pressure can be achieved through a programme of diagnostics (surface and downhole data gathering). This work can be carried out gradually over the glide path (e.g. 6 years) to COP.

A strategy developed around the 'worst case well' will potentially lead to an 'over spec' solution for most of the work and consequent higher than optimum cost. However a strategy based on the easiest wells will encounter higher costs only when working on the difficult wells therefore potentially achieving a lower overall cost.

Improvements in milling technology and multi-string perf-wash-cement are helping to open up other alternatives to the conventional drilling rig.

Well decommissioning should become an integral part of late life well management so that there is

continuity between well management and P&A as the priorities change from production operations to plugging and decommissioning. Good well integrity helps to keep options open when planning the well decommissioning campaign.

Summary requirements for assessing well stock:

- Process and project plan with integrated resources including subsurface and operations/production
- Understanding of quality and availability of well information. Clarity of well architecture and condition both downhole and wellhead/xmas tree. Categorise well complexity
- Field wide subsurface basis of design with abandonment specific reasoning
- Established plan for diagnostics and further data collection. Evaluate sustained casing pressure and other well anomalies
- Plugging design for each well or group of wells. Selection of barrier technology to inform choice of rig/other equipment
- Wells grouped according to complexity to allow execution planning

4. RIG CONDITION

Rig Capability

A clear concept select process is required to consider options for maintaining the rig. This needs to be established early to avoid excluding potential options such as rig removal after primary drilling.

The capability of the existing rig is likely to have changed over the life of the field due to:

- Downgrades
- Upgrades
- Modifications
- Regulatory changes

Often the rig status as seen from the maintenance system differs from reality. A thorough and reliable inspection is valuable to determine what the rig is capable of, its limitations and potential repair work. This needs to be matched against the well decommissioning scope defined by the wells so that the required inspections, repairs and modifications are carried out to meet the requirements of the well decommissioning scope.

Some platform rigs which have not been maintained may have decayed to the point where restoration to an operating state is not practical / possible. Deferrals need to be reviewed periodically (e.g. every 5 years) to make sure important capability is not lost unintentionally. Industry experience is that refurbishment of a rig can cost tens of millions of pounds and almost always exceeds the budget expectations.

A gap analysis should also be carried out between the existing equipment, as built drawings and historic and current regulations and standards e.g. API S53.

Platform Systems

In addition to the rig itself, centered on the derrick and associated drilling equipment, the well decommissioning activities may call on a number of platform services which may not have been used or no longer available such as:

- Normal and emergency power supply
- Closed and open drains
- Disposal wells (conversion of production wells to disposal is a time consuming process)
- Hand rails and grating
- Skid beams
- Cement unit
- Batch tanks
- Bulk systems

The requirement for these needs to be assessed and suitable solutions found before it is too late …lead times for old or obsolete equipment can be very long. Purchase of second hand equipment may be faster. Installation of retrofit equipment may have an impact on structural integrity.
Similarly, the local safety environment may have changed e.g. assumptions made in risk assessments about the number of people working near HP piping may no longer be valid during well decommissioning.

It is difficult to eliminate mud returns at surface during well decommissioning and if these are OBM or contaminated with oil, storage and disposal need to be thought through to ensure regulatory compliance and optimise cost. Disposal wells are often the best solution but these need to be carefully managed (monitor pressures, volumes, over flush) to avoid plugging. In addition, the plug setting basis of design can minimise the amount of contaminated fluid which reaches surface ….close integration and a common objective between subsurface and wells is required.

Skidding Systems
Access to all the well bores on the platform is likely to involve moving either the original rig or an alternate rig around above the well bays. The skidding systems for the rig have probably not seen much use and will need to be assessed. The skid beam and deck loading capacity need to be checked in the context of the rig / unit being used. Platform modifications may mean that not all the wells are accessible by conventional means and alternative access needs to be found. The sequence of movements on the skid deck can become complex if there is a wireline or slick line campaign followed by rig or HWU activity all using the same skid deck / beams.

Cranes
In the same way that platform drilling rigs can often be neglected, cranes commonly have their lift capacity progressively downgraded through their life as the day to day loads of initial construction and commissioning decline. Cranes often play a significant part in decommissioning work and sometimes the loads are high e.g. lifting conductor or multiple casing strings. Early assessment is recommended to determine the crane capability and repair, renewal, rental or replacement requirements over the late life and decommissioning phases of the installation.

Crane reach is often a critical part of well decommissioning planning and may be less than expected due to crane capacity downgrades. Crane capacity, radius, access, modifications and certification all need to be checked. A mobile or modular crane may be a useful addition. Platform crane operators will need to become familiar with supporting rig operations again.

Competence
Competent personnel and efficient and effective operation of the potentially very old equipment is a challenge. Not only does the equipment need to be operated and maintained on a daily basis but Competent Persons and Area Authorities need to be sufficiently familiar with the equipment to carry

out their formal responsibilities. A ramp-up and familiarisation process is required to manage this requirement. In the planning stage HAZID/HAZOPs (with correct disciplines) will help identify risks which can then be supported with competence management systems, audits, assurance monitoring and leadership engagement.

Competence requirements for well decommissioning planning in an environment with poor well records, obsolete wellhead equipment and uncertain integrity may be different from the norm / existing skills base in a wells department.

5. OPTIONS FOR OTHER UNITS

Selection of Rig or Alternative Unit

Jackups have traditionally been the low-risk option for well decommissioning because of their wide capability but HWUs, pulling units and wireline tools have progressed significantly. Now there are very few wells where rig based well decommissioning is the only solution. Alternatives to conventional rigs can be used on most wells though if technical challenges arise, they may become slow and or costly or both.

Modular rigs tend to be less attractive due to the time to rig up, footprint, higher cost, platform integration, weight, higher POB, higher crane capacity requirement. But they are operationally quite capable. The required space may prohibit other platform activities or make laying down tubulars difficult.

HWUs have suffered from a perceived weakness in the past but this may be out of date. They offer light-weight, lower cost, small footprint, quick and flexible installation, lower POB and less demanding crane requirements. The lower POB can unlock the ability to commence well decommissioning during the late life production phase of the asset. Overall project cost / benefit analysis may minimise critical path well time on the project by utilising HWU technology in the late life production phase. A LIDAR survey of the existing rig may be an effective way of managing the physical interface between old rig and the chosen solution.

Working through the subsurface decommissioning basis of design and well decommissioning basis of design to engineer the operating limits required of the unit will inform the choice of rig, HWU or other equipment. Down hole technology consideration can be used to reduce the maximum pull required by the unit, e.g. casing jacks.

Simpler units for a reduced scope offer lower maintenance, power consumption, POB and therefore emissions. The small footprint may create an opportunity not to remove the rig, or just to remove the internals from the derrick and run the HWU from inside the derrick.

If a jack-up is required because the work is heavy or complex, the jackup is likely to give good performance, quick rig up, zero reliance on platform POB and crane requirements. However, there are water depth limitations and there may be infrastructure clashes (post drilling modifications / flow lines) or cantilever reach constraints. Access to all wells may be limited as the jackup may not be able to work from all sides of the platform due to risers, pipelines and other infrastructure. A seabed survey is recommended to determine whether there are subsea constraints which may limit rig choice.

Existing Platform Rigs

Unless the platform rig has been well maintained and frequently used, it is likely that the cost of bringing it back into service will be high and often significantly more expensive than estimates. A strategy needs to be developed which minimises the cost over the life of the installation. This might include removal of the rig post-drilling to avoid maintenance costs or removal of parts of the rig. But

any components which remain will require management e.g. an empty derrick incurs significant annual expenditure for DROPS management.

Rig removal

If the original platform rig is to be removed the two main options are 'piece-small' disassembly or one or two lifts with a Heavy Lift Vessel. Piece-small has the advantage of fitting in with the ongoing brownfield work during the operation of a platform and in this respect is relatively easy to manage. The supply chain is simple, timing flexible but there is a risk of interference with platform operations. There is a however a large and long lasting DROPS risk. The duration of the work can be long and the costs mount up. Alternatively a HLV lift is quick and relatively simple but requires a major supply chain effort and is often expensive. HLVs are limited in number and availability may not suit the project schedule.

The key consideration for platform rigs is to make a decision early whether to maintain them well or remove them and define the appropriate mechanisms for each.

On occasions, operators have owned drilling rigs but this would seem to be appropriate only with a very large portfolio of well decommissioning work.

Electrification of the North Sea is at a very early stage so it is too early to reach a recommendation on the use of grid electricity to power rigs for well decommissioning but it is considered that in the future, electrification via a North Sea wide or local grid will be an important differentiator.

Safety & Environmentally Critical Equipment (SECE)

A plan needs to be developed for management of the SECEs as the platform progresses through late life into the decommissioning phase and primacy of activity switches from production operations to decommissioning. Early decommissioning of suspended wells and reservoir abandonment of wells not actively producing reduces the workload and complexity post COP. This can significantly reduce post COP running costs. The essential aspect is integration…..good integration of wells, operations and projects to deliver an integrated plan with clear responsibilities for each of the SECEs and their associated performance criteria and management.

Campaigns

Campaigning work across fields is a useful consideration to reduce cost not only for well activity but also for rig and facilities modifications/repairs/upgrades. Though the maturity of fields will vary, decisions may be possible to remove a number of rigs or reinstate a number of cranes across more than one asset with a common time-frame.

6. EMERGING TECHNOLOGIES

Scope Reduction

Scope reduction is one of the main drivers for well decommissioning cost reduction by reducing the requirement for conventional rigs. An in depth understanding of well architecture and pressure boundaries / integrity allow a more focused well decommissioning solution. The following are useful tools for improving understanding of wells:

- Surface data gathering -pressures over time, bleed off behavior, fluid sampling
- Surface deployable fibre optic cable sensing -eg FLI
- Wireline and slick line inspection tools
- In depth subsurface review (historic subsurface work not usually focused on overburden)

The improved understanding of a well informs the choice and location of decommissioning barriers

and may open up the opportunity for alternative barrier materials which are easier to deploy pre-rig arrival. This is an important aspect of scope reduction.

Alternative barrier material deployed through tubing, wireline and slick line tools and plugs and identification of shale/salt as a barrier can significantly change the specification of rig/HWU or other unit required for the remaining well decommissioning scope..

Currently some of these new technologies are only emerging and not fully tested in the North Sea but the situation is developing and changing quite quickly. The process can be accelerated by knowledge sharing, the application of guidelines for material qualification and the development of industry standards / good practices.

Hybrid solutions are emerging such as a bismuth plug combined with perf-wash-cement for wells with gas behind casing at shallow depths.

One alternative rock-to-rock barrier technology has now been qualified for Canadian monobore wells, and work is on-going to develop a North Sea well architecture application.

For those considering alternative technologies in future well decommissioning programmes, the following approach is recommended:

1. Establish a joined up industry agreement on how to deploy alternative barrier material (ABM) barriers focusing on:
    a. Technology application and qualification plans
    b. Installation and verification of alternative barrier material barriers for well decommissioning
2. Enhanced well diagnostics (right scope well decommissioning)
3. Alternate plugging materials can be applied to intervention based well decommissioning operations as well as enhanced conventional well decommissioning workscope
4. Descope rig based well decommissioning operations by:

    Pre-scoping intervention based well decommissioning (rig less)
    - Thru tubing reservoir well decommissioning barriers (AB1)
    - Thru tubing overburden well decommissioning barriers (AB2)
    - Verification & use of Shale / Salt formations as Barriers

    Descoping rig based well decommissioning (less rig)
    - Use of alternative barrier material to remedy sustained casing pressure
    - Use alternative barrier material to reduce barrier heights
    - Alternatives materials for cement based section milling and perf-wash-cement

5. Development of OEUK good practice guidelines for:

    - Alternate barrier material deployment for well decommissioning
    - Road map for alternate barrier material technology qualification (material, deployment and verification)

Underlying Challenges:

- Shift focus to emerging technology for ‘standard’ wells
- Completion designs with cables, capillary lines, flatpacks
- Limited access to North Sea wells for field trials.

7. ADDITONAL LINKS TO NSTA WELLS TASK FORCE & OEUK

NSTA NSTF Wells Task Force: https://www.nstauthority.co.uk/about-us/north-sea-transition-forum-task-forces/wells-task-force/

NSTA Wells Insights: https://www.nstauthority.co.uk/news-publications/wells-insight-report-2023/

OEUK Guidelines for the Right-Scoping of Wells: https://oeuk.org.uk/product/https-oeuk-org-uk-wp-content-uploads-2022-09-guidelines-for-the-right-scoping-of-wells-pdf/

Thank you

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