



Oil & Gas
Authority



Norwegian Ministry
of Petroleum and Energy



UK and Norway Technology Hackathon Output Report



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Foreword

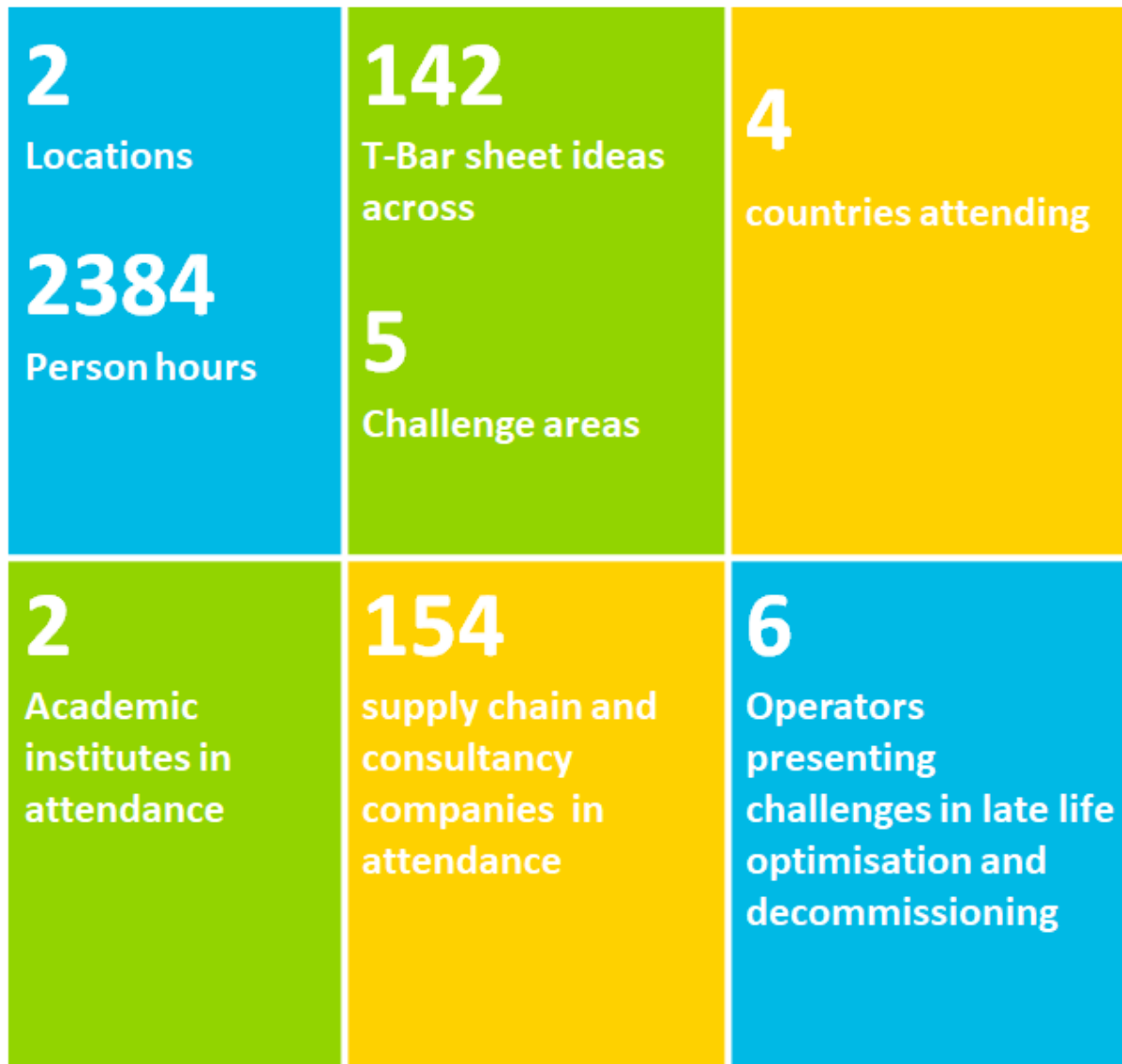
Norwegian Energy Partners (NORWEP), supported by the Norwegian Ministry of Petroleum and Energy (MPE), is a strong supporter of the cross-border co-operation between UK and Norway within the area of offshore oil and gas exploration and production. Operators, contractors and suppliers came together in Aberdeen and Stavanger to suggest solutions to late life field production, decommissioning, and plugging and abandonment of wells. The format of brainstorming (hackathon) at this scale was unusual to the industry, but it was perceived as a good tool for creating new ideas. The learning from the process is that it requires well defined topics up-front and skilled facilitators to capture the new ideas springing out of the group discussions. In the annex of this document, you will find T-charts reflecting each topic sorted by operator company. We believe that the challenge now is for the industry to actively use this knowledge base to pursue solutions for improved safety and enhanced performance of their ageing assets around the North Sea, in Norway as well as the UK. Norwegian Energy Partners will focus on brownfield challenges in the North Sea as a part of its mission and we expect that this Hackathon document can serve as an inspiration to pursue new ideas and solutions. We thank the OGA and especially Bill Cattanach for his enthusiasm and commitment to this joint North Sea initiative. We expect the North Sea to keep its position as a world leading offshore province with a rich and innovative offshore industry for decades to come.

Werner Karlsson, Norwegian Energy Partners

The “North Sea” (UK and Norway) has developed a global reputation being at the forefront of oil and gas technology with highly sophisticated solutions and skilled people being deployed from the UK to hydrocarbon basins in every corner of the world. As the global oil and gas industry evolves there has been a gradual shift in the development of advanced technological solutions from the operator community to the service sector with both UK and Norwegian suppliers at the forefront of this movement. It is now estimated more than 70% of operators are reliant on the supply chain for technology solutions. With this as a background it is paramount there is a visible flow of information between operators and suppliers both for the development community to understand project challenges, and for them to be able to promote to operators existing and enabling techniques which are readily available. The hackathon concept has proved to be a successful mechanism to bring both parties together. By extending the reach of this event across the boundary between our two countries, we have engaged some of the brightest brains to develop advanced and value adding solutions to extract every economic drop of hydrocarbon and to reduce the overall cost of decommissioning. I firmly believe these cross boundary hackathon sessions will stimulate the next tranche of innovation which will add value across the North Sea and will also be sought globally as other basins mature. Working collaboratively with Norwegian Energy Partners, this has the potential to add prosperity to supply companies on both sides of our median line.

Bill Cattanach OBE, Oil and Gas Authority

Hackathon in numbers



Introduction

In November 2017, two hackathon events were held, in Aberdeen and Stavanger, to stimulate innovation and solutions across six operators' challenge areas; including maximising late life production and decommissioning.

The North Sea is a mature basin where maximising late-life value is a major opportunity that will call for innovative solutions to ensure safe operations, minimise impact on the environment and create value for companies and governments by lowering costs.

Many of the solutions to unlocking this value lie with the contractor community; it is estimated more than 70% of operators are reliant on the supply chain for technology solutions. Hackathon events such as these provide a platform for the service sector to highlight an innovative approach directly with influential operator project specialists.

To bring together operators and supply chain from across the North Sea, the OGA, ITF NORWEP and MPE (UK/Norway workgroup) organised a single event over two locations. These featured presentations from operators AkerBP, ConocoPhillips, Point Resources, Repsol Sinopec Resources UK Limited, Shell and Statoil. They each shared their current challenges in optimising late life field assets and field abandonment, followed by interactive hackathon group sessions to discuss solutions to the challenges. These discussions form this report which will also act as an action plan to drive future activity.

How does a hackathon event work?

These hackathon events brought together UKCS and NCS operators and the supply chain to find creative solutions to reduce costs and increase efficiency. In this case, the hackathon looked at the ability of the oil and gas industry to maximise the economic production from mature fields and reduce the cost of decommissioning activities through the application of new technologies. Hackathons started in Silicon Valley as a way to inspire new ideas, and were held internally by large software companies to promote new product innovation from staff. It's reported that the Facebook like button was the output of a Facebook Hackathon event. Operators such as Centrica have used the idea and used it internally for many of its business units.

The underlying idea behind generating new ideas at hackathons is based on:



One of the key aspects of a hackathon is for participants to stay expansive, offering new possibilities and opinions and to try to restrict reductive thinking (immediately judging ideas negatively). Any idea generated is developed and discussed in a figurative “greenhouse of ideas” where all ideas are understood and nurtured. While it is accepted that some of these seedling ideas may turn out to be weeds, equally there will be some seedling ideas that can flower.

The agenda for the day was based on a series of specific challenges from six operators, three operating in the UK and three from Norway.

1. **AkerBP**
2. **ConocoPhillips**
3. **Point Resources**
4. **Repsol Sinopec Resources UK**
5. **Shell UK**
6. **Statoil**

The hackathon

Prior to the event, each operator stated the current challenges they are experiencing within maximising late-life production and decommissioning. These challenges were further explained during the hackathon sessions and it was against this backdrop that participants were encouraged to generate new solutions and shared existing best practices.

Ideas generated at both events

Ideas generated during the event were presented, along with more in-depth explanation of each challenge area. In each of the six operator areas, T-bar sheets were drawn up for ideas generated. In the final breakout sessions, the top generated ideas were described by the relevant subject matter experts. All participants then reviewed each idea in each challenge area and voted for those they thought were best. The number of votes received for each idea is represented on each of the T-bar sheets on a yellow sticky note.

Following the event, the six operators reviewed all the ideas generated and identified those they believed had the highest potential for use and for success.

In the summary below you will see for each of the operators a summary of the challenges they presented the group with, as well as the potential offers, solutions and suggestions that were deemed to be of most interest by the operator in their reviews following the events.

Included in this report is a Hackathon Gallery which captures each individual idea that was generated on the day, associated to the specific operator challenge it was seeking to address.

Actions

The UK/Norway workgroup is committed to progressing specific programmes of work associated with developing new ideas from supply chain. The next steps towards achieving this goal are:

1. Publish this *UK/Norway Joint Hackathon Output Report* on the OGA and NORWEP websites.
2. High-grade (e.g. value vs do-ability) the ideas generated at the Hackathon to focus efforts and establish relevant business cases for specific opportunities and technology needs in support of operator requirements.
3. Engaged operators to continue conversations with supply chain present at the event, with multiple joint projects being kicked off.
4. In addition, it is expected that new technology ideas will be driven forward by the appropriate industry bodies. Examples of how such bodies are engaged with this work are shown in appendices at the end of this document.

Operator challenges

Operator 1: Aker BP

Challenge statement:

Challenges: Optimising safe, reliable and cost-efficient production from mature fields with significantly extended lifetime

1. Maintenance strategy and efficient application of new technology
2. Fabric maintenance philosophy
3. Mitigating increased scale potential and improving chemical treatment systems

Key ideas generated:

- 1) Scale removal – solutions for removal of Barium Sulphate including use of bacterial, ultrasonic and electromagnetic removal solutions and inhibitors and prevention through use of composite piping
- 2) Quick and consistent condition assessment
- 3) Coating standards – a request for coating standards to prevent the use of too much or too little coating

Operator 2: ConocoPhillips

Challenge statement:

Challenges: Decommissioning (Cost optimisation after cessation of production)

1. Power generation
2. Cranes
3. Simultaneous operations with well plug and abandonment (P&A)
4. Isolating and abandoning electrical cabling
5. Managing fire and gas systems during the decommissioning phase
6. Power supply/aids to navigation/remote monitoring for satellite platforms in warm suspension
7. Remote well monitoring (for periods between plug and lubricate (P&L) and P&A)
8. Temporary life support and temporary refuge (TR) solutions, (with or without making use of existing platform accommodation)
9. Wireless/distributed controls, fire and gas (F&G), platform monitoring (including ability to track and locate personnel locally and remotely)

Key ideas generated:

- 1) Cranes are a focus area and are currently working with Opportunity North East (ONE). In Viking area decom this has been sorted, but now looking at how to get back onto main complex. There is appetite for vessel cranes and rental cranes
- 2) Seabed clearance – ConocoPhillips recognises that there is potential high cost exposure in this area, eg Murdoch field
- 3) OilBay – a platform to record decommissioned equipment, in case it can be used by other operators, especially important with equipment obsolescence. For initial inventory management, can operators look at supply chain companies like Score, ASCO, UNISIS?

Operator 3: Point Resources

Challenge statement:

Drilling

Point Resources is planning a drilling campaign at Ringhorne starting 2019 and looking for solutions in the following areas:

1. Electro submersible pumps (ESPs); project experiences, reliability, change out strategies, technologies, hydraulic workover units, etc
2. Cost effectively drilling Paleocene "Injectite" play - i.e. getting the right wellbore stability modelling to drill and complete long trajectories
3. Technology related to narrow drilling margins (managed pressure drilling (MPD), stability modelling, drill-in liners, etc)
4. Multilateral technologies – reliable junction in shale

Operations of mature fields

Point Resources are operating Jotun A FPSO, Ringhorne WHP and the Balder FPSO. The FPSOs have been in operation since 1999. We are working to extend the life of Balder until 2020, and plan drilling at Ringhorne starting 2019. Ringhorne will also operate until 2030. Areas of interest for mature assets include:

1. New technology related to inspections, painting, repairs
2. Metering, in general; multiphase meters, clamp-on meters – new technologies to improve metering and reduce cost
3. Slop handling technologies

Key ideas generated:

Point Resources has shared all ideas within relevant departments and are internally looking at how to further drive this. They are looking to directly contact the personnel and companies they see fit.

- 1) Produce thicker crudes at lower temperatures: using chemicals in separation for optimisation. Outsource separation optimisation-risk reward sharing; use of big data and share the benefits of findings
- 2) Metering: embed transducers into composite materials; water in oil and flow; automation of chemical injection/dosing; virtual flow metering/virtual flow modelling
- 3) Alternative ESPs: slim line fit and tubular to surface; Real time ESP monitoring optimising workover timing; soft start ESP then transfer to main power; bring suppliers into ops
- 4) Maintenance Inspection: hydrophobic paints; coating with nano technology; baselining integrity data to look for future changes

Operator 4: Repsol Sinopec Resources UK

Challenge statement:

Challenges: Decommissioning (cost optimisation after cessation of production)

1. Converting assets from manned to unmanned facilities
2. Accommodation strategies in decommissioning
3. Drill cuttings sampling: technologies/innovations
4. Late life crane management/decommissioning lifting operations
5. Survey technologies

Key ideas generated:

- 1) Converting assets from manned to unmanned facilities: large OPEX costs involved with platforms after cessation of production including labour, logistics and materials when moving from reservoir abandonment, warm stack to cold stack; estimated 75% cost saving from manned to unmanned potential; RSRUK are speaking to technology developer post hackathon to integrate technologies; proof of concept already complete, internal workshops planned.
- 2) Survey technologies: challenge is to reduce burden of continual surveys on platforms being decommissioned; RSRUK feel this is area for supply chain to deliver, impression is that this is happening, and new idea and innovative thinking is already being seen
- 3) Drill cutting sampling: innovation to provide a better way to cost effectively obtain a drill cutting profile; current offerings poor, can an environmental sampling company drive this forward- keen on ONE work in area
- 4) Cranes/lifting: aligned with cessation of production and conversations taken place between companies

Operator 5: Shell UK

Challenge statement:

Challenges: balancing late life production with decommissioning

Late-Life:

1. Power (whole package – including fuel/power storage, distribution and fumes)
2. Deck space/offshore storage
3. Cranes/lifting
4. Maximising platform POB
5. Utilities – portable, standalone

Decommissioning:

1. Efficient subsea debris/pipeline decom
2. Moving from “permanent” utility to temporary utilities; small, light plug n’ play modularized equipment which can supply power, potable water etc
3. Working at height (and particularly underdeck) takes a lot of time consuming, high exposure scaffolding effort, particularly for cutting pipes and cables; robotics that don’t require scaffolding would be beneficial
4. How clean is clean? Lots of effort spent cleaning pipes/vessels and even then, there remain residual traces which drive us to have controls similar to “live platforms”; development of environmental friendly bugs or chemicals which can reliably turn bulk cleaned pipework into hydrocarbon free scrap

5. Still use air and cabled tools; move to hands-free power tools? Much quicker, less preparation time and less tripping hazards

Key ideas generated:

- 1) Wet storage: technology to store bulks and fluid on the seabed to reduce load on platforms and increase available deck space
- 2) How clean is clean: technology to make pipelines and topsides hydrocarbon free and within government limits for contaminants
- 3) Let the market decide: operators to set challenges and scope of work and allow supply chain to propose specific solutions to presented challenges
- 4) Transition of power: technologies to sufficiently power platforms through the multiple stages of decommissioning
- 5) Circular economy: recycling and finding other uses for removed equipment

Operator 6: Statoil

Challenge statement:

Facility/topside challenges:

1. Smart and cost-efficient maintenance strategies while securing integrity; smart and cost-efficient inspection methods
2. Smart condition monitoring
3. Smart ways to handle obsolescence in equipment/spare parts
4. Cost efficient preservation of rig/plant during low activity periods

Subsurface/wells:

1. Drilling in heavily depleted/pressure differentiated reservoirs
2. Cost efficient scale strategies
3. Well integrity – new technology in retaining and detection/monitoring
4. ESP-pumps – efficiency, durability and reliability

Decommissioning:

1. Permanent plug & abandon – new and cost-efficient technologies
2. Tools for conductor pulling

Key ideas generated:

- 1) OilBay: a platform to record decommissioned equipment, in case it can be used by other operators, especially important with equipment obsolescence; could potentially expand the life time of some fields
- 2) Digital twins: Statoil is already involved in work on digital twins, as this is an area of high interest
- 3) How clean is clean: innovative ways of cleaning old pipelines, currently no specific regulations on what clean actually is
- 4) Crack finder: new systems for detecting maintenance ahead of, and when issues appear

Appendix A: Organisers and participants

Thanks to the following persons, for organisation of the event:

Bill Cattanach, Oil and Gas Authority
Sylvia Buchan, Oil and Gas Authority
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Håkon O. Dale, Point Resources
Colin Hopkins, Repsol Sinopec Resources
Duncan Manning, Shell UK
John Gillies, Shell
William Lindsay, Shell
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Lars Jetlund Hansen, Statoil
Thomas Bjørn Thomassen, Statoil

Appendix B: Industry engagement

United Kingdom

It is a key element that any potential technology development areas are driven by these organisations with OGA support to expedite the time to market through the Technology Readiness Level (TRL) scale. A summary of the efforts in this area include:

The Oil and Gas Technology Centre (OGTC)

The OGTC (which now incorporates ITF) has a solution centre which solely focuses on decommissioning and have launched a call for ideas which includes outputs from the hackathon. See below Focus areas:



Opportunity North East (ONE)

ONE has a programme aligned with hackathon objectives. The following projects are being run, with support from the operators listed below.

- 1) Drill cutting piles sampling (Repsol Sinopec Resources UK)
- 2) Platform cranes (ConocoPhillips & Repsol Sinopec Resources UK)
- 3) Platform deck space
- 4) Unique conductor removal
- 5) Subsea debris clearance (Shell & ConocoPhillips)
- 6) Unique cleaning and flushing (Shell)



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