



Offshore Decommissioning



Offshore Decommissioning Technology Challenge Workshop Output– 28 May 2014



Agenda

0800 - 0830 – Arrive, Coffee, Network

0845 - 0900 – Preliminaries

0900 - 0915 – Scene setting 1 – Brain Nixon (DNS)

0915 – 0930 – Scene setting 2 – Paddy O’Brien (ITF)

0930 - 0945 – Identifying the tech challenges – Process description

0945 - 1030 – Table work – Session 1

1030 - 1045 – Coffee

1045 - 1130 – Table work session 2

1130 - 1210 – Presenting the results of the tech work

1210 - 1230 – Voting to identify the “Top Ten”

1230 - 1315 – Lunch

1315 - 1330 – Brief and set up breakout groups

1330 - 1415 – Breakout discussions

1415 - 1515 – Breakout feedback / collective discussion

1515 – 1530 – Closing comments

1530 – Close



Morning Session – Round Table Discussions

Prior to the workshop, attendees had been asked to identify decommissioning technology challenges that they felt could be addressed by collaborative technology development. These challenges were subsequently grouped into five decommissioning areas: subsea, wells, removal and disposal, topsides cleaning and decontamination, and removal and disposal. During the morning round table discussions, attendees split into workgroups to discuss these challenges further and identify the top challenges in these areas. The identified challenges were subsequently voted on to prioritise.

The tables below detail the challenges identified and the number of votes for each.

SUBSEA

Subsea challenges	Votes
Non-intrusive characterization of content and composition of containers (including pipeline)	16
Integrated diverless system to cut and secure pipelines and bundles (including ability to lift)	17
Debris (small items) removal via autonomous and remote low cost vessel	9
Pipeline (vessel) cleaning – improved process with more effective and faster hydrocarbon reduction and less waste fluids produced (pigable/ non-pigable)	4
Mattress removal – diverless, fast, reliable, automated, multiple mattress removal	15
Non-intrusive characterisation of container – structure and integrity	1
Alternative: Rock dump for pipeline decommissioning in situ	5
Non-intrusive characterization (size, shape, composition) of debris/ drill cuttings	
Decom decision/ standards establishes. Stakeholder acceptance: “how clean is clean?”, “what can be left behind?”	1

WELLS

Subsea challenges	Votes
Confirmation of location and quality of cement bond in multiple annuli within a well	39
<ol style="list-style-type: none"> Achieve good through tubing cement jobs with centralisation reciprocation and rotation to clean well before cementing Cutting downhole gauge cables so that tubing can remain in approved and verified cement barriers 	29
Note: point 2 is a subset of point 1, but need to deal with it separately, i.e. a separate project	

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would be required to tackle it.

Make 100 feet of tubing at plugging depth disappear so that conventional tools can be used	35
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REMOVAL & DISPOSAL

Removal & Disposal challenges	Votes
'Piece Small' Decommissioning - Developing Technologies for Topside & Jacket Removal <ul style="list-style-type: none"> Identifying barriers to deploying 'known' technology Developing new custom-built technologies which combine or improve on existing (modified) 'plant' R&D on new/better cutting deployment for jacket removal 	5
Transfer Salvage Industry Technology to Offshore Decommissioning <ul style="list-style-type: none"> Research applicable existing salvage 'kit' and methods to decommissioning tasks Perceived barriers of technologies & procedures 'the scrap man!' Build understanding of what is currently being developed Simplify 	6
Lift & Removal <ul style="list-style-type: none"> Better crane technologies – low maintenance and more easily deployed (e.g. self-building) Minimise re-engineering or building to facilitate lifts Method for safely removing modules without re-instating pad-eyes Technology to identify module links, cross-over piping and services 'Big' steel cutting (large diameter members) on jackets (subsea) 	12
Load Transfer (Weather D/T) <ul style="list-style-type: none"> Methods and technologies to facilitate safe transfer of items from installations to barges; barges to vessels; hook to barges (with inclement/harsh weather capability) Safe lifting 'cages' for awkward configurations e.g. jacket nodes via a universal lifting 'tool' (Grillage?) 	5
Cutting Technologies <ul style="list-style-type: none"> Contemporary review of current state of the art technologies in the context of cut-to-dispose with minimised time (the most efficient/practical solution with easiest deployment) 	2
Gravity Base Structures (GBS) – cell integrity and long-term degradation of concrete <ul style="list-style-type: none"> There is existing joint industry funded collaboration at the University of Leeds and University of Dundee funded by CNR, Fairfield Energy and TAQA. 	5
Development of Environmentally Friendly Technology for Drill Cuttings Removal	20
Automation Related to Platform Conductor Recovery, Sectioning and Pining for Removal	19

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Development of Containment Methods for Removal of Pipelines	1
Development of Technology for Long-term Mothballing of Structures for Future Re-use (oil, gas or renewables)	1
Series of Landscaping Studies to Look at the Big Remove and Dispose Issues	14

TOPSIDES CLEANING & DECONTAMINATION

Technology Challenge	Votes
Specialist (hazardous and normal) waste inventory and characterisation '3% mass.' Reduce uncertainty for time, cost and hazard management	1
Temporary stabilisation of hydrocarbon residues to support piece small transportation to shore	15
Develop standalone flare, draw and vent system that removes interdependence between large legacy infrastructures during end of life activity	5
Improved or enhanced additives, chemicals, catalysts and abrasives to allow effective and efficient flushing and cleaning	10

OTHER

Other challenges	Comment	Votes
Systems for internal remote inspection (e.g jacket, legs, pipes, pipework)	See subsea non-intrusive characterisation	16
Technology to enable the coring and sampling of drill cuttings mounds within a jacket footprint (Deep core)	Added to drill cuttings characterisation and removal	8
Long term environmental impact of scales and waxes in pipelines		
Remote , high definition mapping of subsea structures (e.g high frequency acoustic)		1
Survey method for more accurate quantification of norms in process pipework		1



TOP CHALLENGES – VOTING RESULT

The top challenges (by number of votes) were selected for discussion in the afternoon breakout session. Companies identified here are those who wished to take part in the discussion.

Position	Votes	Topic	Companies interested
1	39	Confirmation of cement bond in multiple annuli	Conoco Phillips, Talisman Sinopec, Fraser Offshore
2	35	Make 100ft of tubing of plugging depth disappear	SPEX
3	29	Cement jobs through tubing	Conoco Phillips, Talisman Sinopec, Fraser Offshore
4	28	Drill cuttings characterization & removal	Talisman Sinopec, Augean, DCSL, DNV-GL, DHI
5	19	More efficient and automated rigless conductor removal	Marathon Oil, Talisman, CNR
6	17	Diverless pipeline and bundle cutting, removal	
7	16	System for internal remote inspection	Shell, Total E&P
7	16 (32 total)	Non-intrusive characterization of composition and content of container (including pipeline)	Shell, Total E&P
8	15	Temporary stabilization of hydrocarbon residue to support transportation to shore	Talisman Sinopec, BP, Marathon
8	15	Diverless mattress removal	ConocoPhillips, Premier Oil
9	14	Removal & disposal – Landscaping study	Marathon Oil, Strategic Decom



Breakout Session – Top 10 Challenges

Confirmation of cement bond in multiple annuli and cement jobs through tubing

The problem

Need to be able to gauge the quality of cement through tubing. To do that will need a tool that fits through a four inch diameter pipe, can look through the wall of a pipe, fluid, another piece of pipe and tell what the cement is like on the other side.

- A number of people commented that work on this has been done by the big three logging companies but has not produced technology – they have more interest in other things.
- There might be two reasons for that: (1) it is a very difficult problem to solve; (2) it is not in their interest to develop technology that will result in loss of day rate.
- Need to trial a number of technologies using a scattergun approach with funding – seed a bunch of people who have great ideas.
- Could need a number of different technologies to come together to solve the problem.
- Do not believe that simple (existing) logging tools will solve this– there is more to it than that – it is a very difficult problem to solve.
- Need to look for fast failures i.e. fund quick trials – if not successful, score it off the list or use results to improve other approaches /combine with technologies to tackle the problem in a new way.
- Can't wait 5 years for a solution to this – ConocoPhillips are starting decommissioning now. If they have to wait for the results of long term R&D then they will be halfway through their decommissioning programme before the technology is available.
- COP think other companies that have not yet started abandonment will join up to this approach when they realise what the costs are.
- The suggested timescale doesn't fit naturally into the standard ITF approach but there are other processes for fast forwarding R&D that we can use.
- Use of a “crowd sourcing” approach was suggested i.e. use social media/ internet to put out challenge and see if alternative approaches can be identified. Has been done to solve other kinds of problems – can potentially be a route to getting ideas from lots of people who like solving problems – how do you tap into that kind of approach for this kind of problem?
- The IRC network model was also mentioned (don't think that exists anymore)
- If Steve Cromar sends ITF a definition of the problem – can disseminate through other bodies as well as ITF's own network eg TSB, SE, research councils, Innovus
- Look to other sectors for ideas e.g. nuclear industry, chemical industry, medical industry, IT, university sector, seismology.

Champions

ConocoPhillips | Fraser Offshore | Talisman Sinopec

Next Action

ITF is looking for Champions to further scope the challenge and take it forward in form of the Call for Proposals. Please contact ITF for further information.

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Make 100 ft of tubing disappear

Problem

We don't currently have the technology available to gauge cement quality through tubing.

- If (at least) 100 feet of tubing could be removed then it would allow access for current cement logging technology to assess the cement behind the casing at that depth, without removing tree and tubing hanger.
- This could be another route to reducing the 14 days of rig time currently required to get to that point (i.e. an alternative to gauging the quality of the cement through the tubing).
- If we could achieve this it would not be as big a step change as developing the technology to assess cement through tubing, but it would still be a significant win/ have a big impact.

Work will involve

- Probably looking at a market search and R&D review to look and see what is out there now – not necessarily just from the oil and gas industry but including technologies that could be transferred from other industries such as the nuclear industry, defence sector, universities, aerospace, abrasive cutters, wireline companies.
- There would be two parts to consider – the tool that can dissolve/disappear the tubing and also the deployment method, which is why the list above includes wireline companies.
- If potential technologies were identified there would then be a selection process; engineering – impact on existing barriers of technology.
- Would have to find out if we could actually deploy it – get it down a 4 inch hole, then there would be trials etc. beyond that.
- Some potential approaches might be methods to cut the tubing into small pieces so that it falls down the hole; acidize it; use of lasers
- Need to think of lots of different approaches and get some fast failures.

Final solution

A piece of kit that could do this job.

Champions

SPEX Group | CUE

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Offshore Decommissioning



Drill Cuttings

Scope

(Need to Define 'Limits')

Assumption that currently there is no 'practical' technology to remove or relocate drill cuttings that has acceptable environmental impacts (outcomes).

Potential environmental impacts include: hydrocarbon release, heavy metal bio-accessibility, Naturally Occurring Radioactive Material (NORM), spill and sedimentation of adjacent seabed, over-extraction of the cuttings pile resulting in removal of original seabed.

Two Cases to be considered:

- 1) Where drill cuttings have to be removed or relocated
- 2) Where drill cuttings are dormant (encapsulation/encasement issues to consider validity)

Phase 1 (an assessment of available technology options)

- Assessment of contemporary technologies – test practical perceptions e.g. dredging, subsea aggregate excavation, deep sea mining
- Develop generic understanding of environmental impacts
- Validate the assumption
- Generic range of cuttings composition and waste streams – polluted water and sands/sediments
- Stakeholder engagement to capture interests and issues
- Scope Phase 2 and review feedback e.g. technology development plan & define additional studies.

Participants

- Not restricted to the usual oil industry participants, but include others with relevant expertise e.g. mining colleges & companies. An academic review should identify 'interested parties' for inclusion.
- Technical and environmental but also societal issues should be included in the scope.
- International perceptions should be sought.
- Regulators and their views should be included in any study/activity.

Champions

- Talisman-SINOPEC
- Augean
- D-Comms (Sctoland) Ltd/DNV
- DHI Group

Who can help?

- Academic Funding Sources
- UKOOA Drill Cuttings JIP (NW Hutton)
- Dr Gordon Picken
- BMT Cordah
- Prof John Shepherd
- Shell Brent Project
- Subsea UK

Next Action

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More efficient and automated rigless conductor removal

Challenge

Can you automate the system to make it easier, safer or reduce manning levels required. Conductors may need specifying for different configurations i.e. conductors may be attached together, they may be in very different condition and other issues may exist.

Involvement

- Seek existing companies. Is there something currently being developed?
- Alternative techniques in other industries e.g. mining.
- Is there something in other oil & gas regions e.g. Gulf of Mexico?

Steps

- Study on what exists – (note: the group that has worked on this challenge weren't experts in conductor removal)
- Call for proposals
- Technology selection
- Equipment specification
- Where this process should end? Are we looking to develop piece of equipment or gather information and describe problem in more detail?

Conclusion

Not realistic to develop equipment yet. Clearer understanding of equipment specification is required.

Discussion

- Is this problem clearly defined? West Oil Tools is working on this problem and after speaking to number of operators they seem to have problems with different issues in this area.
- Rigless requirement is also often challenging. A lot of platforms can't take the weight.

Next Action

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Diverless pipeline and bundle cutting, removal

How to evaluate existing condition?

- Integrity – key issue and basis for the removal technique
- Location
- Re-engineering
- Cleaning – various options exist

Options for removal

- Reuse s-lay
- Re-reel
- Cut & lift
- Bundle – control depth tow
- Available equipment
- Diamond wire cutting bundles
- Onshore recovery
- Re-float options (especially for bundles)
- Cost effectiveness of removal versus living it in place is a key issue

Deliverable

- Not sure if the JIP model is the right solution here, maybe specific parts only.
- Feasibility report seen as the best route, however, this has most likely been done by individual companies internally.

Who can help?

Subsea 7, Technip, SMD, SAIPEM, ALL SEAS

Feasibility report (pipelines & bundles)

- Report issued May 2014 by PDi – Conclusion: “It is difficult”
- This report is part of ITF project

Next Action

ITF is looking for Champions to further scope the challenge and take it forward in form of the Call for Proposals. Please contact ITF for further information.

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Non-intrusive characterization of composition and content of container (including pipeline)

Challenge

To “see” without breaking containment e.g. inside a pipeline, subsea manifold, surface process vessel. In order to understand what your decommissioning problem is, you have to understand what is in container and what you are dealing with.

Work involved

Starting point would be cross-industry technology landscaping. Technology is likely to exist in other industries. There is a need to see inside containers across industries such as medical and aerospace. Key objectives of the study are:

- Understand top areas for inspections; what is it that we are trying to see? Is it composition of the fluid, pipeline wall thickness etc.
- Mapping possible technology against the needs and understanding existing technology gaps
- Adapt or develop technology with focus on study, design and trial
- There may be an element of marinisation to it e.g. surface to subsea adaptation

Final solution

In a nutshell: piece of equipment, subsea/zone rated, portable, robust, reusable, safe, doesn't break containment.

Approaches

MOD, ICL, Heriot Watt, Nuclear, Aerospace, Medical, Food, Manchester University, NASA, Bombardier, Qineti

Champions

Total E&P | Shell

Discussion

- Looking at classification societies: DNV and Lloyds may bring some useful results.

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Stabilisation & Hydrocarbon Residue

Challenge/Ambition

There is a need for the development (or adaptation) of a chemical/additive/catalyst that could stabilise fluids, scales etc. within subsea pipelines, pipes and process plants such that modules (or piece small) could be safely separated and removed without fear of fumes or spillages.

Benefits

This is an opportunity to transfer majority of cleaning, waste, capture and flushing etc. from offshore to onshore.

What will it involve?

Chemical companies / Universities – Develop new/adapt existing chemicals to have a cheaper chemical which is lightweight chemical to stabilise liquids/hydrocarbons and also prevent fume build-up particularly once the flare and vent system is isolated. The contents which need to be stabilised include hydrocarbons, benzene, H₂S, normal mercury etc.

Challenges

- Pressure handling
- Containment / venting
- Vent and drain

Who can help?

Manchester University (ICE) | Aubin (Gel) | Alchemy in Inverurie | Heriot Watt department of Chemical Engineering | Companies involve in gel pigs | Companies in Keith | “Uptake” at Golf Mats Company

Final Solution

This may be a foam-like chemical with a binary system of liquid and gel. It should be pumpable and not too expensive. It should be light and have high surface tension such that it adheres to the inside of a pipe or vessel.

Note: AMEC looked at technologies for this but further development is still required. The current best bet is a gel plug in the pipeline before plug. There are effective technologies available but they are expensive.

Champions

BP | Talisman Sinopec | Marathon

Next Action

ITF is looking for Champions to further scope the challenge and take it forward in form of the Call for Proposals. Please contact ITF for further information.

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Diverless Mattress Removal & Grout Bags

Challenge/Ambition

- There is a need for a safe, quick and cheap system for mattress removal. Current systems never designed to be recovered and have been degraded underwater. As a result, removal is difficult.

The following questions need to be answered:

- How do you pick these up?
- How do you dispose of the mattresses?
- How do you locate the mattresses when they are buried and not easy to spot?

Benefits

At this time, mattress removal is dictated by legislation. If there is no economical manner of recovering mattresses, then maybe E&P operators should not be obliged to carry out this task.

Why no degradation? The E&P industry should speak with the government about changing the law on mattress removal.

What will it involve?

It will involve an initial characterisation of mattresses that cannot be recovered. An initial reconnaissance study may be carried out based on information provided by operators such as mattress types, location, size, water depth etc. This will allow for the problem to be well-defined. As part of this exercise, completed decommissioning projects could be addressed for possible lessons learned from mattress recovery operations. Feedback could then be information on prior comparable operations (e.g. Shelley). The output from this would be an understanding of how a mattress would degrade. Once potential failure mechanisms are understood, guidelines/design basics/functional specifications could be developed for handling (BOD) engineering problems during mattress recovery.

As part of this study, it may be concluded that some mattresses are simply not recoverable. In this case, it may be necessary to challenge the requirement to recover the mattresses.

Relevant companies

A wide net should be cast, for example Gill Dykes of JCB – a company not currently involved in the subsea industry but may have ideas that could lead to finding a solution.

- Marin Subsea (Ellon) has actually started the development of a tool for mattress removal
 - Contact is George Stroud
- IHC Merweddie
- Other industries such as agriculture, mining and earth diggers

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Final solution

- ROV
- Underwater mining equipment
- There is also an argument for leaving the mattresses in place

Champions

ConocoPhillips | Premier Oil

Next Action

ITF is looking for Champions to further scope the challenge and take it forward in form of the Call for Proposals. Please contact ITF for further information.

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Removal & disposal – Landscaping study

1. PIECE SMALL

What is the challenge about?

- How to make it acceptable?
 - Identify barriers and uncertainties

What do you think the work will involve?

- “Framing session” with focus on topsides and jackets
 - Using Decom program as a framework
 - Outcomes: identify enabling technology and overcoming barriers

What will the final solution look like?

Piece small is a viable option

Can you suggest any company, universities etc. that we should be approaching about it?

HSE/ Operators/ Environmental Agency/ Practitioners

2. SALVAGE – DITTO (separate session)

3. LIFT AND REMOVAL WORKSHOP

What is the challenge about?

- Minimise prep for lift
- Optimise module separation
- Faster deck to deck cutting technology (jackets)
- Mechanical handling

What do you think will the work involve?

Framing session

4. LOAD TRANSFER – Ditto to no 1

Next Action

ITF is looking for Champions to further scope the challenge and take it forward in form of the Call for Proposals. Please contact ITF for further information.



Summary: Options for Addressing Challenges

Following the workshop, ITF and Decom North Sea reviewed the output of each breakout session and subsequently developed an action plan to address each. These are summarised below with an approximate timeframe for initiation of work on each.

For ITF Calls for Proposals, the first stage will be to work with ITF and Decom North Sea members to assess their willingness to champion this activity, that is to assist ITF in developing a Call for Proposals and potentially be willing to fund new technology development projects. A final decision on whether to take the proposed actions forward, and in what form, will depend on clear support from members. On identification of champions, ITF will then work with the champions to prepare a Call for Proposals. Depending on the nature of the challenge and how well it is understood, this may take the form of a teleconference or a round table discussion. Both ITF and Decom North Sea members will be able to see the proposals submitted under the terms of a confidentiality agreement.

	Topic	Action	Timeframe
1	Confirmation of cement bond in multiple annuli	To be addressed by ITF in a Call for Proposals (combine with 3)	Q3 2014
2	Make 100ft of tubing of plugging depth disappear	To be addressed by ITF in a Call for Proposals	Q1 2015
3	Cement jobs through tubing	To be addressed by ITF in a Call for Proposals (combine with 1)	Q3 2014
4	Drill cuttings characterisation & removal	To be addressed by ITF in a Call for Proposals	Q1 2015
5	More efficient and automated rigless conductor removal	To be addressed by ITF in a Call for Proposals	Q4 2014
6	Diverless pipeline and bundle cutting, removal	To be addressed by Decom North Sea	
7	System for internal remote inspection	To be addressed by ITF in a Call for Proposals (combine with 8)	Q3 2014
8	Non-intrusive characterisation of composition and content of container (including pipeline)	To be addressed by ITF in a Call for Proposals (combine with 7)	Q3 2014
9	Temporary stabilization of hydrocarbon residue to support transportation to shore	To be addressed by ITF in a Call for Proposals	Q2 2015
10	Diverless mattress removal	To be addressed by Decom North Sea	
11	Removal & disposal – Landscaping study	To be addressed by Decom North Sea	

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