How Industry Collaboration can manage an effective Source Control Emergency Response

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Responding to a Source Control event requires a significant amount of resources, both in terms of engineering complexity and skilled personnel. The pool of available hardware is ever increasing, not only in quantity but in operational complexity. Service providers store and maintain a range of equipment, including capping stacks, subsea dispersant application tooling, technology to allow landing of capping stacks in shallow water and flowback systems. To mount a response, it is highly likely that these assets would be mobilised from various global locations. It would also require the support from many organisations with expertise in various fields. Industry has invested significantly in workshops and exercises to test and continuously improve the service provisions in place. This paper aims to:

• Re-visit industry led source control exercises completed to date and identify the impact they have had on preparedness

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• Discuss key developments industry is taking to tackle complex planning activity, including regional expertise forums

• Work through the core subjects that require industry collaboration to develop a successful Source Control Emergency Response Plan (SCERP - detailed below)

Industry led exercises & workshops have identified several key items that require detailed analysis to develop a successful SCERP:

• Response Time Modelling – understanding and planning complex supply chain requirements

• Resource mapping – identifying global experts who can provide engineering, modelling and operational support

• Mutual aid – in the event of a mobilisation, how can industry work together to ensure the most experienced people can work collaboratively

• Equipment fabrication – whilst there is a range of hardware available, certain scenarios will require the fabrication of specific equipment. How can this be managed and pre-planned?

• Exercising and testing – how can the above subjects be effectively tested, with industry maximising experience and ensuring continuous development of lessons learned

This paper will explore the steps industry has taken to methodically work through these challenges to ensure that preparedness remains a high priority. The range of industry developed guidelines that have also been developed to act as a handrail for planning purposes will be discussed.

Whilst planning and executing Source Control exercises can take a significant amount of time and investment, the lessons learned, and experience gained is invaluable not only

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directly to industry, but wider support organisations (i.e. logistics providers). It is paramount that these lessons are built on and the experience gained is maintained for the future.

INTRODUCTION

Following the Macondo incident in 2010, there has been a significant development in the Source Control arena to manage a subsea loss of well control incident. Several commercial and industry collaborative initiatives have been employed to design, fabricate and deliver hardware solutions to combat a range of scenarios. This equipment has been pre-positioned around the globe for either single operator use or access via membership & subscription.

The Subsea Well Response Project (SWRP - an IOGP initiative following Macondo) was a joint project between 9 oil and gas organisations to design, develop and fabricate a range of equipment packages that could be deployed during such an incident.
Whilst a range of technical documents were of course provided with the hardware, the SWRP project team acknowledged that a range of guidance documents would be required in order to assist subscribers to aid:

- Pre-planning activities
- Organisation of Incident Management Teams (IMT) or other response structures
- Logistics requirements and resulting response times
- Understanding of operations and the interfaces between different equipment packages (and existing subsea infrastructure)
- Additional hardware that requires fabricating to compliment long-lead items in place
- Managing Simultaneous Operations (SIMOPS) in-field
- Final operation of equipment once on site

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The documents created to cover the above topics are collectively referred to as the "Subsea Well Containment Guidelines" (SWCG's).

Throughout the equipment hardware deliver stages of the SWRP project, various industry led exercises were conducted to test the SWCG's and allow for updates based on lessons captured. This was a critical phase in their development, as it allowed for scenario-based data to identify gaps and close them based on results captured. By using the SWCG's during these exercises, industry could simulate establishing an Incident Management Team (IMT), calling off all required contractors & hardware and begin working through the complex processes of commencing source control operations.

SWRP sponsored exercises were conducted in a range of locations, working against different scenarios. Mission plans, such as the application of dispersant ranging through to full installation of a containment system were tested, promoting awareness of system capability to members (and wider audiences such as regulators) and allowing in depth studies to be carried out.

The exercises conducted always achieved the following:

- Ensure that any response can be conducted in a safe manner and minimise further environmental impact
- Lessons identified will be assigned to action owners
- Documentation will be updated to reflect exercise findings
- Efficiencies in response times can be achieved by:
    - Understanding the entire response critical path and identifying interdependencies
    - Establishing industry projects to carry out Front End Engineering Design (FEED) feasibility studies to introduce either pre-designed components that can be fabricated at the time of a response *or*

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- Bring on-line new equipment that compliments existing response equipment

This paper will focus on tangible findings from these exercises and how industry have enhanced capability and continued collaborative working.

DISCUSSION

"Well Capping and Well Containment are complex, cross-functional activities with significant logistics and Simultaneous Operations (SIMOPS) considerations. The activities require the deployment of equipment not normally under contract to the Operator and requires specific detailed plans, investments, contracts and mutual aid agreements not specifically related to normal drilling and completion operations. Further, Operator investment of time and resources for planning, preparedness and the development of response organisational capability is necessary to effectively integrate the Operator's response equipment and incident response capabilities. Overall, the Operating company needs to own the plan and ensure all assumed interface points are robust."[1]

Industry has not stood still regarding developing well capping and containment capability. There are a number of initiatives promoting collaboration. Industry forums, training sessions and global exercises all play a critical role in this work.

There have a been a number of industry exercises directly related to the implementation of SWRP & OSRL. This include, but are not limited to:

- Capping and subsea Incident Response Toolkit (SIRT), including the physical mobilisation of subsea dispersant tooling from Norway to Angola (deployed subsea) – November 2013
- Capping, SIRT and containment desktop exercise – September 2014
- Capping, SIRT and containment desktop exercise – June 2015

[1] IOGP Report 594

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- Offset Installation System (OIS) desktop exercise – March 2019

These exercises (and other activities) have led to the developments in the items detailed below.

Equipment handling – aircraft mobilisation

Following the physical load out of equipment and flight from Norway to West Africa, several improvements were made. The movement of cargo allowed for the realities of loading an Ilyushin-76 aircraft with response equipment to be identified. Process improvements were identified with the Original Equipment Manufacturer (OEM) who forms part of the mobilisation process and improvements to the lifting of containers into the airframe were completed.

Not only were there developments made in terms of handling procedures, but experience was gained in handing equipment over from the provider (OSRL) to the member company. This resulted in a more streamline handover process, resulting in reduced complexity and refined details that would be required in-field.

Equipment pre-design

Several of the above exercises highlighted the need to have drawings in place for key items of equipment. Given that emergency response equipment could be used on a global basis, any pre-fabricated hardware (or designs) need to take into account a range of environmental factors. Items such as sea-bed conditions have a wide range of requirements. As such, a full analysis needs to be completed to confirm if manufacturing hardware at the time of a mobilisation affects response time. Other factors such as ongoing maintenance for pre-fabricated equipment were also reviewed.

Following the exercises, several designs have been (or are in the process of) being developed ready for use in the event of a response.

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New equipment/enhancements

Continual industry engagement has resulted in hardware enhancements and new equipment being brought on-line. Examples include:

- Nitrogen booster system – reduces response time for critical first strike hardware
- Nitrogen generator – allows the charging of subsea accumulator units in remote locations, thus improving response capability
- Shipping stands – allows for safer, and rapid sea fastening of capping stacks to vessels during the load-out phase
- Improved shipping documents allowing for ease of equipment selection and shipping techniques – allows for faster decision making when making complicated, multimodal cargo movement
- Design for anchors allowing the securing and subsea operation of the OIS
- Air Freight Capping System (AFCS) – a new concept that allows a capping stack system to be air freighted in a single unit without the need to break pressure barriers
- Sea Response vessel tracking software – a system that allows specific source control mission plans to be selected thus helping to identify the most suitable vessels within a region. This further promotes knowledge of market availability, thus reducing mobilisation times
- IOGP 594 - Source Control Emergency Response Planning (SCERP) Guide for Subsea Wells – industry developed framework to promote standardisation globally when developing SCERP's.

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Industry forums

There are a number of industry forums that allow operators from around the world to contribute towards the enhancement of well control capability. Following the OIS workshop in 2019, regional forums have been planned for Australia, Mexico, Brazil and London. These workshops will not only maintain focus on actions identified from exercises but allow further collaboration between business units and headquarters. These workshops will address a number of key operational functions, including:

- Regional fabrication and manufacturing capability
- Vessel sourcing
- Soil analysis
- Mutual aid
- Response Time Models (RTM's)

Mutual aid

Given the complexity of mounting a source control operation, a number of key skills from a range of organisations would be required. Not only would support from service companies be needed, but also expertise embedded directly within oil and gas operators. Access to the correct skills ensures that the breadth of industry knowledge can be applied, resulting in the most successful outcome possible.

Liability and other legal complexities may add delays to gaining access to the most appropriate personnel, even during a high-profile response. To overcome this obstacle, several industry operators have agreed common terms and conditions ensuring the correct personnel can be utilised during a response. Different skill sets will be needed at different points during the response. Given that a response will take several months, a number of teams will be needed for an extended period of time. Very few organisations have the numbers of

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personnel required to support a protracted response effort, further highlighting the importance of this industry led initiative.

Response Time Models

By actioning lessons from exercises, analysing regional fabrication capability, having pre-designed components (or even pre-positioned hardware) and access to the correct people, the overall response time will hopefully be reduced.

Response Time Models utilise the Gantt chart format, most commonly found in project manage work. RTM's allow for easy identification of critical path activity and provide a simple method for operators to focus time on long lead, or complicated tasks. By efficiently identifying the critical path, significant time savings can be made, thus minimising hydrocarbon exposure to the environment.

The movement and assimilation of subsea hardware that has been transported from a range of global storage locations requires a great deal of coordination and where possible, pre-planning. Several guidelines have been developed to aid logistics execution planning and RTM templates have been developed and made available to OSRL SWIS subscribers.

In preparation for the OIS exercise, a significant amount of time was spent identifying efficiencies and supply chain complexities. The critical path of some tasks differs when comparing long transit times (sailing time of OIS to well site) to short sailing times. Several factors had to be considered when developing final actions for industry to review and ultimately address.

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CONCLUSION

The effectiveness of industry collaboration has clearly been demonstrated since a range of consortiums have been established. Each consortium provides a platform in which ideas can be shared and developments in technology have been raised. The ability to jointly participate in exercises has repeatedly demonstrated how developments can be made across a range of items within capping and containment activities. The inclusion of key service providers also contributes to developing seamless mobilisation and mission plans.

The findings and data from exercises allow operators to develop Source Control Emergency Response Plans (SCERP). A SCERP is an important document that provides a detailed handrail for an operator to follow during a response. By working together for exercises and sharing knowledge in forums, plans being developed following a common framework allow for ease of use in the unlikely event they are needed. In cases where mutual aid agreements are called upon, common standards and techniques will allow for a improved response. The IOGP 594 SCERP report provides a handrail to assist industry in developing aligned plans.

Strong commitments have been made to continue this collaboration into 2020 and onwards. Forums and other initiatives will ensure that improvements continue to be made, but where required, adapted to overcome new challenges. These challenges include deeper water, remote locations with limited infrastructure and other operational challenges.

REFERENCES

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