

JOINT INDUSTRY
SUBSEA WELL CONTROL AND CONTAINMENT
TASK FORCE



DRAFT INDUSTRY RECOMMENDATIONS
SEPTEMBER 3, 2010

Subsea Well Control and Containment Joint Industry Task Force

In response to the Gulf of Mexico (GOM) incident, the oil and natural gas industry, with the assistance of the American Petroleum Institute (API), International Association of Drilling Contractors (IADC), Independent Petroleum Association of America (IPAA), National Ocean Industries Association (NOIA), and the US Oil and Gas Association (USOGA) has assembled a Joint Industry Task Force to Address Subsea Well Control and Containment (Task Force). Overall, the Task Force will review and evaluate current capacities, and develop and implement a strategy to address future needs and requirements in equipment, practices or industry standards to augment oil spill control and containment.

Wherever possible, information developed by the Task Force will be augmented with input from the Regulatory Agencies, oil spill response and well control specialists, investigation panels, and other public sector and other non-governmental organizations. Ultimately, materials produced through this effort will be delivered to Congress, the Administration, and the National Commission on the BP Deepwater Horizon (DH) Oil Spill and Offshore Drilling (Presidential Commission). It is important to note that recommendations will be formulated based on limited information, prior to agency rulemaking, and in advance of any investigative findings in relation to the current incident in the Gulf of Mexico. The contributing joint industry task force companies and trade associations express no views regarding the cause, fault or liability of the incident or regarding any mechanisms of prevention, nor should any recommendations be interpreted as a representation of any such views. The oil and natural gas industry remains committed to working with Congress, the Administration, the Regulatory Agencies, the Presidential Commission, and interested stakeholders as we work to enhance and augment oil spill control and containment.

Schedule and Work Plans

Short-term (Completed Tuesday, July 6)

- Review existing efforts and identify opportunities for augmenting capability, including examination of possible pre-staging of equipment, and research & development in the following subcategories:
 1. Well Containment at the Seafloor
 2. Intervention and Containment Within the Subsea Well
 3. Subsea Collection and Surface Processing and Storage
- Review industry data associated with operation and testing of subsea well control and response methods, with the objective of identifying issues, areas of concern, etc.
- Identify potential for enhancing capability.
- Develop a strategy and action plan to complete Mid Term commitments.
- Develop subgroups to focus on specific issues.
- Communicate initial findings.

Mid Term (Completed September 3, 2010)

- Review existing testing and inspection requirements, regulations, protocols for subsea well control and containment. Based on industry experience, incident data, overlaying current regulations and requirements, etc., make recommendations to Presidential Commission and other appropriate government entities that can enhance subsea well control and response.
- Review Section II. C. (Wild-Well Intervention, Recommendations 9 & 10) of the DOI May 27 Safety Report, make recommendations regarding implementation of this section, including possible volunteers to the technical workgroup.

- Confirm current capability within the industry, including capability used successfully for containing the Macondo well.
- Make immediate recommendations that make available near term subsea containment solutions in support of enabling the resumption of industry drilling operations.
- Make long term recommendations on subsea containment solutions.

Long Term (by December 31, 2010)

- Develop a strategy and action plan to complete Long Term commitments.
- Review information available from recent Deepwater Horizon incident, specifically associated with subsea well control and response. (Junk Shot, LMRP Cap, Top Kill, etc.)
- Provide detailed report on progress and activities of the Task Force.
- Identify next steps/milestones to enhance subsea well control and containment capability.

Task Force Participants

AMPOL, Apache, API, Anadarko, ATP, Baker Hughes, BHP Billiton Petroleum, Chevron, Cobalt, ConocoPhillips, Delmar Systems, Diamond Offshore Drilling, Dorado Deep, ENI, ExxonMobil, FMC Technologies, GE Oil and Gas, Halliburton, Helix, IPAA, McMoRan Exploration, Newfield, NOV, Petrobras, Schlumberger, Shell, Statoil, USOGA, Wild Well Control

Executive Summary

The Joint Industry Task Force was formed to review current subsea well control preparedness and response options to determine their efficacy throughout all offshore operations. The review includes equipment designs, testing protocols, R&D, regulations, and documentation to determine if enhancements are needed. The Task Force will identify actions necessary to move standards to advance industry performance and identify enhancements. Where appropriate, enhanced capabilities and other information developed from the DH incident will be considered.

This task force will review intervention and containment at the seafloor along with processes for conveyance and processing to the ocean surface. The primary focus will be on single wells in deepwater and on operations that can occur after a BOP has failed and ROV shut-in attempts have failed or are not possible. The primary objective of subsea containment is to minimize the total time and volume of hydrocarbons discharged to the environment. Each incident needs to be assessed and the best available response and containment measures employed. Consideration will also be given to containment of open casing or casing leaks. Although some technical solutions can be applied to subsea producing wells and templates, these will be focused on in future work. The review will not include Blow Out Preventers (BOPs) and control systems such as Emergency Disconnect Systems (EDS), Autoshear Systems, and Deadman Systems all of which are covered in the Offshore Equipment task force. The task force will focus on well control and containment procedures including well shut in, kill methods, subsea capping, and collection & processing methods.

This task force has initially identified 5 key areas of focus for Gulf of Mexico deepwater operations, the Focus Areas: well containment at the seafloor; intervention and containment within the subsea well; subsea collection and surface processing and storage; continuing R&D; and relief wells, developed by the Task Force respond to the recommendations published by the Department of Interior on May 27, 2010 (no.s 9 and 10 respectively, excerpted and included as Appendix 1 in this document).

We make 29 specific recommendations within these areas of focus. Fifteen of these recommendations are for immediate action and we recommend begin immediately and plan to facilitate. Others will take a longer time and are focused on research and developing capability.

One of the most important "Immediate Action" items is to provide near term response capability until longer term projects and capability are available.

The near term capability must be made available to the industry via a collaborative Containment Company (like MWCC, Marine Well Containment Company). This can be accomplished via four action items: inventory equipment and capability that has been proven fit for purpose through use in response to the Macondo blowout and acquire all appropriate equipment into a Containment Company; reviewing the services and contractors that are advertising immediate containment capability and contract those best able to deliver near term response to the Containment Company; review available equipment for containment that is available "off the shelf" from manufacturers and acquire appropriate equipment; and review vessels and vessel contracts from the Macondo response and contract for those vessels necessary to provide near term containment response. Discussions and negotiations are already under-way to make the BP owned containment equipment available via a Containment Company.

Well Containment and the Sea Floor

Our first set of recommendations are to address the goal of establishing a framework and capability for joint participation and cooperation in the industry in the area of subsea well control. We have the opportunity to enhance our capabilities through the acquisition of the equipment and technologies used in response to the Macondo event. Our immediate recommendations are to make the equipment and technologies used for the Macondo well available to all of industry through a Containment Company, and to make use of best practices and learnings from the Macondo response. The Containment Company will also do research into improved methods and equipment for subsea well control and containment. The Company will improve on designs used for Macondo and then procure, construct and test the needed equipment including over time drills, exercises and readiness reviews.

Our next recommendations involve industry improvements and research regarding the lower marine riser package (LMRP) release. We specifically recommend ensuring the LMRP can be removed from the lower BOP using a surface intervention vessel and ROV to get access to the connection mandrel on top of the BOP. In the future we recommend further LMRP development: developing a method to release the LMRP without riser tension; developing methods for high angle LMRP release without damage and high angle reconnects; and developing a new quick release for risers at or above the flex joint.

Additionally in the well containment and the sea floor focus area, we recommend the ability for a vessel to remove a damaged or non-functioning BOP stack to allow installation of a new BOP on the wellhead housing or the subsea containment assembly, and second, be able to repair or replace a non-functioning control pod to be able to regain full functionality of the BOP stack.

We also recommend that there be an assured ability to connect the subsea containment assembly and other response equipment to all flanges and connector profiles used in the industry. We recommend that the Containment Company acquire and maintain a full set of equipment and design and construct subsea connectors. We also recommend developing more effective methods of connecting to and controlling BOPs with ROVs.

Intervention and Containment within the Subsea Well

This section recommends that industry begin researching and developing capability in wellhead structural support, subsea stripping and snubbing technology, subsea coiled tubing, subsea freeze plug techniques and improvement and enhancement of Top Kill Methods.

This task force will work with the API RP 96 Deepwater Well Design workgroup to review well designs and assure designs that provide for full shut-in with containment devices.

Subsea Collection and Surface Processing and Storage

This set of recommendations is focused on having the Containment Company immediately develop the means to rapidly deploy production and processing equipment that will interface with containment equipment to convey wellbore fluids to surface for flare and transport. Further, this section makes recommendations specific to the Containment Company development of the capability to make a full containment connection to the seafloor that can be installed over the BOPs or a casing stub.

Continuing Research & Development

These recommendations focus on industry developing capability so that we can extend containment concepts to Subsea Producing Operations and putting a focus on researching new technology for subsea containment. We also recommend publishing the findings from the Task Force work as an educational background for the public, regulators, legislators and other stakeholders.

Relief Wells

We recommend for immediate action holding focused workshops to determine the most effective methods and information that should be included in well plans regarding relief well drilling planning. We also recommend reviewing technologies for relief wells –immediately by reviewing already published work - and in the future working with experts and vendors of specialized equipment that could potentially improve relief well capability.

Conclusion

This report is the reflection of the Task Force’s identification of industry’s current capability – including the capability used for containing the Macondo well – and the identification of longer term recommendations to enhance subsea well control and containment.

Joint Industry Task Force (Subsea Well Control and Containment) - Key Focus Areas

Focus Area	Description	Summary of Recommendations
Well Containment at the Seafloor	Establish framework and capability for joint participation and cooperation in the industry in the area of subsea well control and containment.	<ol style="list-style-type: none"> <li data-bbox="1066 337 1839 610">1. Immediate Action: Establish coordinated industry capability for owning and providing subsea well containment technology and capability. Immediate containment capability will exist via acquiring and refurbishing capability used by BP, contracting GOM contractors with immediate existing containment capability, and acquiring containment equipment available off the shelf from suppliers. This immediate containment capability will be provided via a Containment Company. <li data-bbox="1066 646 1839 1003">2. Near Term Action: Establish long term coordinated industry capability for owning and providing subsea well containment technology and capability. This recommendation and action can be addressed by the Marine Well Containment Company (MWCC) This will be a non-profit Company open to all industry with capability which will include the MWCS (Marine Well Containment System) constructed by the four company consortium. Or by other Containment Companies with suitable capabilities and support that are established in the GOM. All Containment Companies and systems will make use of best practices and learnings from the Macondo response. <li data-bbox="1066 1039 1906 1432">3. Well Containment Systems should deliver a flexible, adaptable, and rapidly deployable tool kit of containment equipment. The equipment should be purpose designed and constructed for rapid deployment and successful subsea containment. It should fully contain the oil by full mechanical connection to the well or to the sea floor. The Containment Company should procure, construct, and test the needed equipment. This includes testing effectiveness over time through drills and readiness reviews. The Containment Company should also do research into enhanced methods and equipment for subsea well control and containment. The MWCS will become part of the non-profit MWCC which will be open to all industry. It will be managed via boards similar to existing spill non-profits. It will issue reports appropriate to its mission.

Joint Industry Task Force (Subsea Well Control and Containment) - Key Focus Areas

Focus Area	Description	Summary of Recommendations
	<p>Remove LMRP in the event it is not released as part of the emergency disconnect sequence. Be able to use ROV and surface intervention vessel to unlatch and remove LMRP to get access to the connection mandrel on top of the lowermost BOP.</p>	<p>4. Immediate Action: Confirm LMRP can be removed from lower BOP using a surface intervention vessel and ROV. This should allow access to the mandrel on top of the BOP and the installation of subsea containment assembly. This assembly should have full shut-in capability in addition to choked flow from flow arms. If well flow is necessary it can be achieved by diverting flow to the capture vessels. The subsea containment assembly also allows vertical access to the well for intervention within the well if necessary. In almost all cases where there is confidence in the integrity of the well design, the well can be shut-in and top kill procedures executed. Well “capping” capability is available now through use of a second BOP stack or equipment used in the Macondo incident. Containment Companies should expand this capability.</p>
	<p>Develop new methods to release LMRP without riser tension.</p>	<p>5. Immediate Action: Ensure effective methods to release LMRP’s are included in BOP stack designs. This should include releases with no vertical tension is available as when rig is drifting without power. Releases should not damage the BOP or BOP connections. There are tools and techniques available now such as LMRP jacks but new methods should be considered.</p>
	<p>Develop methods for high angle LMRP release without damage and also high angle reconnects.</p>	<p>6. Research & Develop Capability – Ensure effective and non-damaging release of LMRP’s. High angle release connectors exist now. This recommendation is to ensure they work in non-riser tension situations and that there is no need for additional development. Review connectors and develop new capability if necessary to reconnect to BOP’s and wellhead housings when they are non-vertical.</p>
	<p>Develop new quick release for risers at or above the flex joint/stress joint</p>	<p>7. Research & Develop Capability – Develop new quick release that can be installed in the lower riser sections to enable quick release and reconnect when the LMRP does not release in the emergency sequence.</p>
	<p>Remove damaged or non-functioning BOP stack. Be able to use ROV and surface intervention vessel to unlatch and remove BOP stack to get access to a subsea wellhead</p>	<p>8. Immediate Action: Remove damaged BOP stack to allow installation of a new BOP on the wellhead housing, or the subsea containment assembly. With a good integrity well design the well can be shut-in and normal kill procedures can be used. This capability is available now through use of a second BOP or equipment used in the Macondo incident. The Containment Company should expand this capability</p>

Joint Industry Task Force (Subsea Well Control and Containment) - Key Focus Areas

Focus Area	Description	Summary of Recommendations
	Regain full control of BOP stack. Be able to repair or replace non-functioning control pods to be able to regain full functionality of BOP stack (ROV intervention provides limited functionality)	<p>9. Immediate Action: This can be done now with some hydraulically controlled stacks and on all rigs by pulling and repairing the LMRP/pods, and rerunning the LMRP.</p> <ul style="list-style-type: none"> • Research & Develop Capability: Research & develop ways to regain control over all important BOP functions in the case where the LMRP is damaged and cannot be removed and in cases where the LMRP is removed but cannot be repaired and re-run. This would be for cases where adequate control cannot be established with ROV intervention.
	Provide additional and more effective methods of connecting to and controlling BOP's with ROV's.	<p>10. Immediate Action: The Containment Company should acquire and maintain a full set of crossover spools, connectors, and hub combinations.</p> <p>11. Immediate Action: The Containment Company should design and construct subsea connectors to fully seal, connect and contain on damaged connector profiles and casing stubs. Also consideration should be given to inside well connectors such as packers.</p> <p>12. Immediate Action: Coordinate with the Equipment Task Force to ensure methods and equipment are providing effectiveness and reliability in delivery of control fluids and control to BOP's and ROV's.</p> <p>Considerations should include:</p> <ul style="list-style-type: none"> • Evaluation of methods other than shuttle valves, for the ROV intervention plumbing. <p>13. Research & Develop Capability – Review existing methods and number of connection points on existing BOP's. Determine if more outlets or different connections would enhance containment capability.</p>
	Deepwater cutting, metal, and debris removal	<p>14. Research & Develop Capability - Assess industry capability and conduct in-situ testing to determine what new technology and capability needs to be developed to remove a debris field and cut equipment like risers. Develop new equipment and capability as determined by testing.</p>

Joint Industry Task Force (Subsea Well Control and Containment) - Key Focus Areas

Focus Area	Description	Summary of Recommendations
Intervention and Containment within the Subsea Well	Assure necessary wellhead structural support via design & practices in the event of strong side forces from drifting connected rigs and riser collapse from rig sinking.	15. Immediate Action: Coordinate with API RP 96 and ensure deepwater well design includes a system evaluation of the design and material for subsea well head support (e.g.: templates, structural pipe etc.), and the release control methodology of the LMRP.
	Subsea Stripping and Snubbing Technology to allow intervention inside damaged wells	16. Research & Develop Capability - Survey industry for feasibility of developing subsea snubbing technology or consider proposal to Joint Industry Groups (RPSEA/Deepstar etc) to develop preliminary designs for subsea snubbing equipment
	Subsea Coiled tubing to allow intervention inside damaged wells	17. Research & Develop Capability - Seek opportunities to accelerate development of subsea coil tubing deployment systems and make them available for subsea well intervention on damaged wells and BOP's. Consider all possibilities such as deepwater pipe-lay technologies for deploying pipe larger than conventional coil tubing.
	Subsea freeze plug techniques for subsea well containment	18. Research & Develop Capability - Survey industry experience, conduct research into basic science if necessary, and undertake field testing to develop industry capability for establishing and maintaining an 'ice plug', to provide subsea well containment while avoiding detrimental affects to the BOP operation
	Improvement & Enhancement of Top Kill Methods including evaluation of Reactant Pills and other Bridging Agents for subsea wells	19. Research & Develop Capability - The top kill method should be considered when the subsea well is contained by the subsea containment assembly or the BOP. This requires well integrity and containment integrity sufficient for the top kill. This effort should include a survey of capability, and development of supporting technologies for converting fluids into barriers in situ, augmenting bridging if desired, and pumping procedures and planning including hydrate management.
	Review well design criteria of RP 96	20. Immediate Action: The Task Force will coordinate with API RP 96 Deepwater Well Design team to ensure they understand the importance of full shut-in capability to the containment capabilities.

Joint Industry Task Force (Subsea Well Control and Containment) - Key Focus Areas

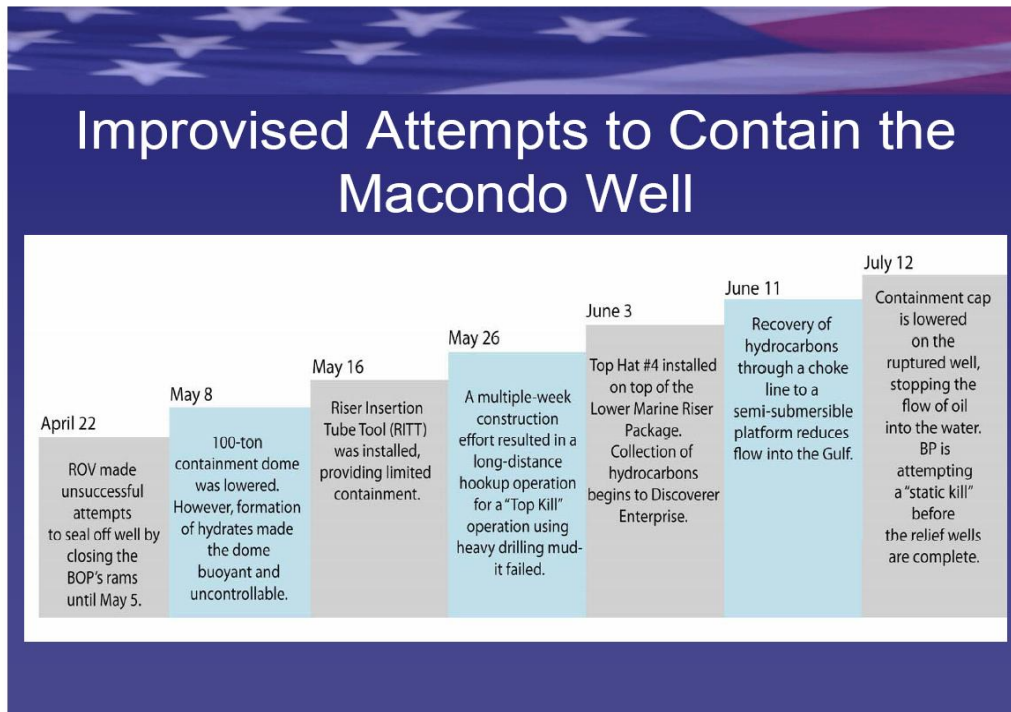
Focus Area	Description	Summary of Recommendations
Subsea Collection and Surface Processing and Storage	Develop means to rapidly deploy production and processing equipment that will effectively interface with containment equipment to convey wellbore fluids to surface for flare and transport.	21. Immediate Action: The Containment Company will deliver a modular solution for capturing, processing, and transporting production from subsea wells that need to be produced until well control is complete. Such a system should be adaptable to DW metocean and water depths up to 10,000 feet. It should consider free standing production risers to move production to the surface away from the area of the well. It should have processing capability that can be rapidly deployed on vessels. All the equipment should be purpose designed, pre-constructed, and held on ready stand-by. Any concepts forwarded through BOEMRE Alternative Response Technologies Program should be evaluated and researched and included if they enhance capability.
	Develop capability to make a full containment connection to the seafloor that can be installed over the BOP's or a casing stub.	22. Research and Develop Capability – The Containment Company will develop, test, and have available technology to provide full containment via seafloor connection. This system should allow connection of a Subsea Containment Assembly so well production can flow to the production and processing system. Such systems should include chemical injection for hydrate mitigation. The sea floor connected containment system would be used for oil capture until a relief well was drilled.
Continuing R&D	Extend containment concepts to Subsea Producing Operations and equipment	23. Research & Develop Capability – As the next phase of the Task Force, evaluate extension of containment concepts, equipment, and capabilities to subsea production operations including production from templates. Make recommendations for enhancing current practices as necessary and appropriate.
	Education	24. Immediate Action: Develop a historical context document of marine well control and containment that includes an extensive reference list. This could enhance Task Force work and will be a good base document for the industry.
	Evaluate new technology for subsea containment	25. Research and Develop Capability - Evaluate new and evolving ideas for subsea containment including open capture devices that would have separation capability. R&D should be a key part of the Containment Company in which all industry can participate. All the R&D programs will work collaboratively with appropriate organizations like RPSEA and Deepstar to ensure maximum leverage in the R&D program.

Joint Industry Task Force (Subsea Well Control and Containment) - Key Focus Areas

Focus Area	Description	Summary of Recommendations
Relief Wells	Relief well planning during well planning and permitting.	<p>26. Immediate Action: Via focused workshops, determine and make a recommendation on the most effective methods and information that should be included in well plans regarding relief well drilling planning. Ensure full coordination and eliminate duplication with other groups' initiatives.</p>
	Technologies for Relief Wells	<p>27. Immediate Action: Undertake desk research to revisit published work on relief wells.</p> <p>28. Research & Develop Capability – Conduct focused interviews with experts and vendors of specialized equipment (ranging tools, etc.) Understand and support, as necessary, plans for developing magnetic ranging tools that don't require tripping the drilling assembly and other equipment that should enhance relief well capability.</p> <p>29. Immediate Action: Write a white paper on relief wells that evaluates the feasibility and desirability of pre-drilling relief wells. This task is complete.</p>

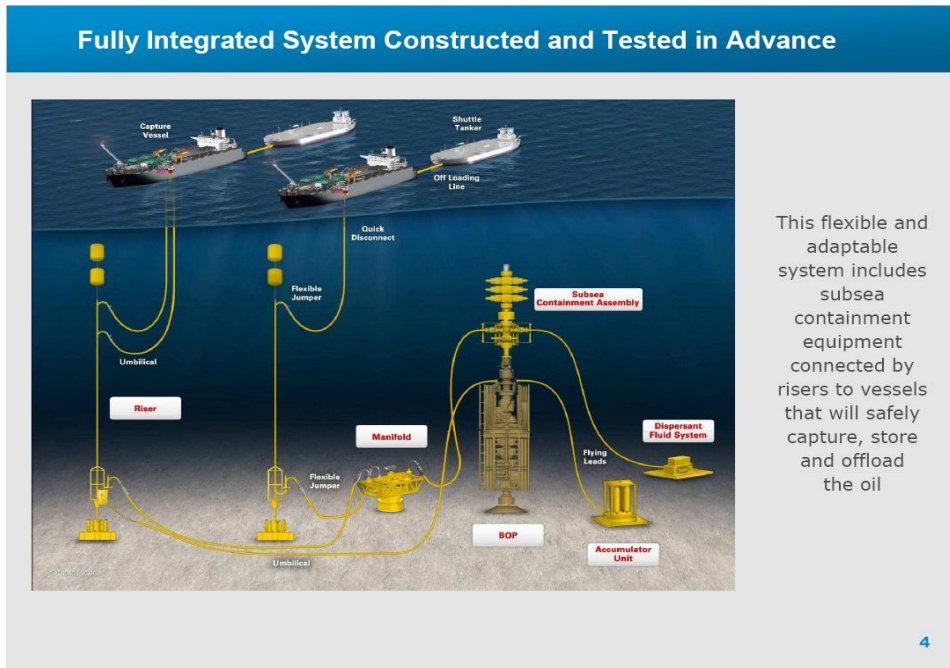
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Figure 1: Excerpt from Michael Bromwich presentation at BOEMR Forum on August 4, 2010 ¹



The slide above illustrates, generally, the actions and decision process employed to contain effluent from the Macondo well. The Task Force intends to deliver more rapid response with full containment via Containment Company such as the MWCC.

Figure 2: Well Containment Systems ⁵



The figure illustrates the initial design concept of the recently announced Marine Well Containment System. Other subsea containment system concepts are available for contractors in the GOM.

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Appendix 1: Excerpt from DOI publication dated May 27, 2010 – Recommendations relating to Wild Well Intervention

C. Wild-Well Intervention

Recommendation 9 – Increase Federal Government Wild-Well Intervention Capabilities

Blown out, or —wild wells, involve the uncontrolled release of crude oil or natural gas from an oil well where pressure control systems have failed. The Federal Government must develop a plan to increase its capabilities for direct wild-well intervention to be better prepared for future emergencies, particularly in deepwater. Development of the plan should consider existing methods to stop a blowout and handle escaping wellbore fluids, including but not limited to coffer dams, highly-capable ROVs, portable hydraulic line hook-ups, and pressure-reading tools, as well as appropriate sources of funding for such capabilities.

Recommendation 10 – Study Innovative Wild-Well Intervention, Response Techniques, and Response Planning

The Department will investigate new methods to stop a blowout and handle escaping wellbore fluids. A technical workgroup will take a fresh look at how to deal with a deepwater blowout. In particular, the workgroup will evaluate new, faster ways of stopping blowouts in deepwater. The technical workgroup will also address operators' responsibility, on a regional or industry-wide basis, to develop and procure a response package for deepwater events, to include diagnostic and measurement equipment, pre-fabricated systems for deepwater oil capture, logistical and communications support, and plans and concepts of operations that can be deployed in the event of an unanticipated blowout, as well as assess and certify potential options (e.g., deepwater dispersant injection).

References

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4. Izon, D., Danenberger, E. P., Maynes, Melinda, *MMS study of OCS blowout incidents 1992-2006*. Drilling Contractor, 2007(July/August, 2007).
5. Sara Ortwein, ExxonMobil; Melody Meyer, Chevron Entergy Technology; Charlie Williams, Shell Oil; Steve Bross, Conoco Phillips, *Safe, Protective Drilling Practices in the Deepwater Gulf of Mexico*, in *BOEMR Forum*. 2010: New Orleans, Louisiana.

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