Enhancing Industry Capability for drilling Deepwater Wells – A Chevron Perspective

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Chevron is a Major Operator in Subsea and Deepwater Projects Globally.

- Current production 600 MBOED
  - Predicted growth to 800-1,000 MBOED by 2015
- CVX has the largest deepwater operated portfolio in Industry
- Over 50% of current portfolio is in water depths >3000’
- Currently has over 200 operated subsea production wells.

Source: E&P Magazine, Jan 2010

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Post Macondo and Montara, the Industry has focused on improvements in the areas of prevention, intervention, containment and response

1. **Industry Drilling Standards and Prevention:** Upgraded standards resulting in more robust well designs, which will help prevent well control problems.

2. **Well Containment and Intervention Capability:** Development and deployment of well capping and containment capability to improve capability to respond to future incidents.

3. **Oil Spill Response Capability:** A more robust Oil Spill Response Framework that enables the Industry to respond faster with increased capability.
Major Global and Regional Initiatives and Actions to Enhance Industry Capability.

A variety of Global, Regional and Local efforts have been implemented, post Macondo and Montara, to better prepare the Industry for responding to future incidents.

- **Globally** - Industry work groups, set up under the direction and governance of the Association of Oil and Gas Producers, to address Industry gaps.

- **Regionally** – Joint Industry Task Force in Gulf of Mexico (GoM) to develop and upgrade existing Industry and API standards and practices.

- **Locally** – Formation of Industry Organisations and Consortiums to develop and provide well capping and containment capability, such as Marine Well Containment Company (in GoM) and the Oil Spill Response Group Advisory Forum - OSPRAG (in North Sea).

Chevron has been active in supporting, or leading efforts, in all of these various efforts to build and strengthen Industry preparedness and capability.

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Formation of the Marine Well Containment Company in Gulf of Mexico – A Timeline of Events.

After the Macondo incident, the Executive Leadership of 4 Operators agreed to the formation of an accelerated project to enhance the GoM Industry capability to respond to, and to contain, a subsea well control incident.

- July, 2010 - Marine Well Containment Project founded by ExxonMobil, Chevron, ConocoPhillips and Shell.
- Oct, 2010 – Award of design contracts for containment systems.
- Feb, 2011 – Interim Containment System ready for use by Industry
- Feb, 2011 – Marine Well Containment Company (MWCC) formed.
- April, 2011 – Membership of MWCC expands to 10 GoM Operators.
- 2012 – Expanded Full Containment System ready for industry use.

Chevron has continued to play a key role in providing funding, personnel, equipment and subject matter expertise into the development and formation of this GoM Industry Capability.
Three Major Components to the Well Containment Capability Development for Gulf of Mexico.

- Rapid development of the Interim Containment Response System (ICRS)
  - ICRS is the system developed to provide interim containment capability for drilling operations until full MWCS is in place.
  - BOEMRE approved the first drilling permit utilising ICRS in April 2011
- Startup and operation of a new independent company, Marine Well Containment Company (MWCC)
  - MWCC is set up similar to Marine Spill Response Company (MSRC) as a third party company that will eventually support all well containment response requirements
- Development of long term Marine Well Containment System (MWCS)
  - MWCS will eventually provide a purpose built system for all GOM well containment response needs.
Interim Containment Response System (ICRS) – Deployed in March 2011.

Ready to deploy

- Approved for use by BOEMRE on March 4, 2011

Equipment

- “Mutual Aid” from Member companies
  - Chevron DW drill ships, well test kits, and mooring
  - BP & Others providing DW drill ships
- BP equipment (manifolds, risers, flowlines, top hats)
- Purpose Built Capping Stack

Capabilities

- 10,000’ Water depth
- 18 ¾” Bore and 15K psi Pressure
- Process / capture 45-60 KBD, 120 MMSCFD gas
- Dispersant injection with 10-15 day stockpile (~200,000 gals)

Other Equipment Available:

- Top Hat Oil Collection Devices
- Oil Containment Domes
- Riser Insertion Tools
- 2nd Light Duty Intervention System (LDIS)
- 2 Free Standing Risers (mid 2011)
- Subsea Autonomous Dispersant Injection System (SADI – mid 2011)

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Marine Well Containment System (MWCS)  
Long Term Expanded System- Deployed in 2012

Ready to deploy
- 2012

Equipment
- Upgraded lightering tankers to be Marine Capture Vessels with modular processing equipment
- Enhanced Subsea Containment Assembly
- Dedicated MWCC equipment (capping stack, manifolds, risers, flowlines, dispersant, top hats, etc.)

Capabilities
- 10000’ Water depth
- Process / Capture: 2x 50 MBPD total fluids (water + oil), gas to continuous flare up to maximum feasible flare design (~2x 100 MMSCFD)
- 18 ¾” Bore and 15K psi Pressure capability
- Dispersant injection with 10-15 day stockpile (~200,000 gals)

Source: Marine Well Containment Company
Global Response Activities, led by the International Association of Oil and Gas Producers (OGP)

International Association of Oil & Gas Producers consisting of,

- More than 70 members around the world
  - Integrated oil & gas explorers/producers
  - Small independent oil & gas companies
  - National oil companies
  - Service sector companies (associate members)

- 15 national and other associations
  - Including API, IADC, APPEA, IPIECA, OLF, NOGEPA, IBP, O&G UK

- Based in London, UK, with an European Union office in Brussels.
OGP Commissioned Three Global Industry Response Groups

Three dedicated Global Industry Response Groups were created to investigate and developed specific recommendations to deliver:

- Better capabilities and practice in deepwater well engineering design and well operations management

- Improved capping response in the event of an incident and to study further the need for – and feasibility of – global containment solutions

- Effective and fit-for-purpose oil spill response preparedness and capability

The three Initial GIRG Reports were made available to Industry and Regulators in May 2011.
OGP Well Engineering Design & Well Operations
Recommendations

- A 3-tier review (Audit) process to govern well operations.
- Promotion of human competence management systems and culture that fosters adherence to standards and procedures.
- Recognition of existing agreed standards – both international and national – as a baseline for industry improvements.
- New and improved technical and operational practices for the overall execution of well construction.
- A“two (independent and physical) barrier” policy during the life of the well.
- Expansion of some API Well Standards into Global ISO well standards.
- A global database and analysis of well control and operational events.
Subsea Well Capping Response and Intervention
Recommendations and Progress

Recommendations:
The concept selection, design and development of capping “toolboxes” and associated equipment that can be deployed internationally

Progress:
- Subsea Well Response Project established in April 2011 – based in Stavanger, Norway, with some 40 secondee staff, from 9 Operators.
- Work on capping stack and subsea dispersant equipment design is underway. Sourcing activities also being progressed.
- Further work on need for and feasible concepts for full surface capture systems, is also underway.
- In parallel, work is on-going to review possible deployment models for capping, dispersant hardware and/or containment.
The “Capping Toolbox” High Level Solution

- Readily air transportable anywhere around globe in 48 Hours.

- Range of capping tools – 10K psi and 15K psi capping systems being developed (both gate valve & ram configurations being worked)

- Full bore and reduced bore systems.

- Sets of different well connectors.

- Sets of collection caps (Top Hats)

Could provide China subsea operations with access to this global inventory of capping systems.

Source: OGP GIRG Report May 2011
Surface Containment and Common Subsea Systems
(Only required when full subsea shut in not fully possible)

- The “common subsea system” includes flexible risers, top-tensioned risers, riser bases, jumpers, flowlines, and manifolds.
- Uses existing surface fleet vessels - drill ships, well test vessels, FPSO’s and working semi submersibles.
- Gas would be flared; oil and associated water would be treated for offloading or incineration.
- Ongoing work to fully define the different subsea & surface elements in more detail including the differences by geographical regions.

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Source: OGP GIRG Report May 2011
Chevron’s Chairmanship of the API Upstream Committee, guided the establishment of a number of Task Forces and Work Teams, including:

- Leading development of new API 96, a standard for Deepwater Well Design and Construction
- Leading development of new API 97, a standard for Well Construction Interface Document between Operator and Rig Contractor.
- Completion of API 17G, Recommended Practice for Design and Operation of Subsea Completion/Workover Riser Systems.
- Significant enhancement to the existing API 53 standard for BOP Equipment.

Chevron has brought highly skilled and experienced personnel, along with Chevron’s strong “Operational Excellence” culture, disciplined processes and keen sense of risk management, to fully support, and in some cases lead, the above efforts.
• Define BOP Classifications based on the quantity of rams and annulars installed, with some relationship to pressure.

• More intensive testing requirements for pre-deployment and initial testing subsea, when a BOP is deployed.

• Frequency and acceptance criteria for testing of Secondary and Emergency BOP control systems.

• Clarification on the use of API 16C and 16D hoses (gas & flame requirements) as they relate to BOP controls and service loops.

• More consistent use of Maximum Allowable Pressures, and their applicability to subsea BOP operations.

• New definition added for pipe shearing ram considerations in drilling operations.

• Introduced requirements for 20K, 25K and 30K psi BOP systems.
Chevron’s Internal Organisational Capability Technical Differentiators

Chevron maintains and operates a number of unique practices that we believe substantially strengthens our capability to operate safely in Deepwater.

- In House Subsea BOP Team – exclusively dedicated to understanding all aspect of subsea BOP’s operations and reliability.

- In House Cement Testing Laboratory
  Fully Equipped facility to test cement slurries under critical field conditions, to independently verify their performance and suitability for complex well situations.

- In House Well Control Training and Competency Assessment – Ensuring all Chevron drilling staff are consistently trained to Chevron’s well control standards and “tested” against Chevron’s internal competency requirements.

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Key Conclusions and Closing Remarks

- Chevron has and continues to be active, and at the forefront in many cases, in leading the Industry to strengthen well design and operational practices, and also improve its response capability to subsea incidents.

- Greater focus on preplanning and prevention will yield the most effective outcomes in eliminating potential future subsea incidents
  - Rigorous adherence to standards and practices (with specific enhancements) is key to prevention
  - Analysing well incidents and sharing lessons learned are vital

- An on-going commitment from the entire Industry is required to work together for continuous improvement, and to raise standards.

- Active international co-ordination and collaboration is crucial.