Deepwater Horizon / Macondo Blowout
Source Control and Regulatory Response

International Regulators Forum
Vancouver Conference
October 18, 2010
DW Horizon
Presentation Outline

• Pre Accident Approvals
• Accident Insight
• Post Incident Regulatory Response
  – Safety Alert
  – 30 Day Report
  – Notice to Lessees
  – Notice to Lessees
  – Rulemaking?
• Path Forward
Deepwater Horizon Oversight

- Regional Oil Spill Contingency Plan approved for 250,000 BOPD. Macondo well worst case discharge calculated as 162,000 BOPD
- Permits were reviewed and approved for drill, plug back, bypass, and temporarily abandon in accordance with 30CFR250- Oil and Gas and Sulphur Operations in the Outer Continental Shelf
- Inspectors conducted site visits
  - February 17, 2010
  - March 3, 2010
  - April 1, 2010
  - No violations were discovered
Horizon BOP Stack

Transocean Deepwater Horizon
BOP Stack Test Space Out Measurements (prespud)
MC 252 #1 Macondo Location

FROM RISER ADAPTER DOWN TO WELLHEAD
FROM TOP OF WELLHEAD UP

4797.36
49.64

10 K UPPER ANNULAR
4807.41
39.59
38.63

5K LOWE ANNULAR (Stripping)
4813.27
33.73
32.77

LMRP CONNECTO
4819.13

BLIND SHEAR
4827.60
19.40
18.44

CSG SHEAR
4830.44
16.56
16.6

3 1/2 TO 5 5/8 VBR
4834.53
12.47
11.61

3 1/2 TO 5 5/8 VBR
4838.63
8.37
7.41

3 1/2 TO 5 5/8 VBR Test Ram
4841.47
5.53
4.67

Top of HP Wellhead Housing
4847.00

Tag out in open position for all operations other than BOP testing.
Tag out as non-primary well control use only.
Pre-Accident Operations

- Full production casing string (tapered 7x9-7/8) run and cemented and positively pressure tested.
- Being temporarily abandoned for a future completion.
- Well was in the process of conducting a negative pressure test in preparation of setting a “surface” cement plug.
- Well began to flow up riser.
Accident Investigation

- Multiple hearings have been held to date, with at least one more hearing left.
- Target date for completion by the team is January 27, 2011
- Testimony is posted at: www.deepwaterinvestigation.com
Marine Board of Investigation

- Investigative Areas
  - Flow Path
  - Ignition Source
- BOP Failure
Flow Paths

- Production seal assembly
- Production casing leak or collapse at crossover joint
- Casing cement shoe “check” valves at total depth
Horizon BOP Stack

Transocean Deepwater Horizon
BOP Stack Test Spacing Out Measurements (prespud)
MC 252 #1 Macondo Location

Top of HP Wellhead Housing

Tag out in open position for all operations other than BOP testing.
Multiple Causes

- Proximity of Air intakes to Hazardous area
- Risk Based Decisions
- Human Error in detecting flow
- BOP Failure

Vessel & Equipment Design
Organizational Cultures
Procedures/Training
Equipment Maintenance

Multiple Causal Factors

Undesired Event
Source Control
Unified Area Command Structure

Unified Area Command (UAC) (New Orleans, LA)

- Source Control Command (Houston, TX)
- Unified Incident Command (Galveston, TX)
- Unified Incident Command (Houma, LA)
- Unified Incident Command (Mobile, AL)
- Unified Incident Command (Miami, FL)
Improvised Attempts to Contain the Macondo Well

- **April 22**: ROV made unsuccessful attempts to seal off the well by closing the BOP's rams until May 5.
- **May 8**: 100-ton containment dome was installed, providing limited containment.
- **May 16**: ROV made several attempts to seal the well, but none were successful.
- **June 3**: Top Hat #4 riser was installed, providing limited containment.
- **June 11**: Recovery of hydrocarbons through a choke line to a semi-submersible platform reduced flow into the Gulf.
- **July 12**: Containment cap was lowered on the ruptured well, stopping the flow of oil into the water.
- **August 4**: The "static kill" involved pumping mud and cement into the well was declared a success.
- **September 19**: The relief well was successfully completed by intersecting and cementing the Macondo Well nearly 18,000 feet below the surface, effectively killing the well.
Drilling of Relief Wells Initiated May 2nd and May 16th

OVERVIEW
BP intends to drill two wells designed to intersect the original wellbore above the oil reservoir. This will allow heavy fluid to be pumped into the well which will stop the flow of oil from the reservoir. Cement will then be pumped down to permanently seal the well.

PROGRESS
- DD II - MC 252 #2
  - Spudded well - May 16th
  - Set 30” casing at 5,471’ - May 16th
  - Set 29” casing at 6,014’ - May 21st
  - Set 22” casing at 8,094’ - May 24th
  - Set 18” casing at 9,899’ - June 20th
  - Set 15” casing @ 11,630’ - June 27th
  - Set 13 5/8” casing @ 13,870’ - July 4th
  - Set 11 7/8” casing @ 15,874’ - July 11th

- DDII - MC 252 #3
  - Spudded well - May 2nd
  - Set 36” casing at 5,491’ - May 2nd
  - Set 38” casing at 6,730’ - May 5th
  - Set 22” casing at 8,702’ - May 10th
  - Set 18” casing at 9,845’ - May 24th
  - Set 15” casing at 12,057’ - June 2nd
  - Set 13 5/8” casing at 13,699’ - June 9th
  - Set 11 7/8” casing at 15,836’ - June 19th
  - Set 9 7/8” casing at 17,664’ - August 1st

Manned Intersection Depth: ±18,000’ MD RKB

RESEIVE
Containment – Coffer Dam- May 8
Riser Insertion Tube - May 16

1. Insertion tube is guided into riser.
2. Rubber diaphragms conform around drill pipe to plug riser as much as possible.
3. Hydrocarbons are then flowed to the drillship.
Riser Removal - June 3
Capping Stack – July 12
Containment Vessels

**Capacity Range**
28-35 MBOPD Total Containment

**Helix Producer**
20-25 MBOPD

**Q4000**
8-10 MBOPD

**DDIII Relief Well #1**
**DDII BOP**
**DDII Relief Well #2**

**Free Standing Riser #1**
**Free Standing Riser #2**
**Free Standing Riser #3**

**Cascade**
**Enterprise Rig**
**Talisa Pisces**
**Evi Knutson**
**ROV Vessel**

**Holliday**
**Loch Rannoch**
**HOS Achiever**

**West Sirius Rig**
Installing Free Standing Riser #2

**Skandi Neptune**

**Q4000 - Helix Producer - Capping Stack Containment**

Rev - C 07/11/2010
Hydrostatic Kill – August 4
Spill Response
Skimmers

1.2 million BOPD skimming capacity
Over 700 skimming vessels deployed
Fire Boom
Controlled Burns

411 Controlled Burns

Bureau of Ocean Energy Management

October 18, 2010
Containment Boom

14 Million feet mobilized
4.2 Million feet of containment boom deployed
9.1 million feet of sorbent boom deployed
Regulatory Response
Safety Alert- April 30, 2010

• Requires well control equipment examined to ensure that it is properly maintained. Function test ROV stabs on BOP stack.
• Review drilling/casing/ completion programs to ensure that BOP equipment is not compromised at any time.
• Review emergency shutdown and dynamic positioning systems and interfaces with emergency well control operations.
• Inspect lifesaving and firefighting equipment
• Ensure all crew members are familiar with emergency / firefighting equipment
• Exercise emergency power equipment to ensure proper operation
• Ensure all personnel involved in well operations are properly trained for performing their tasks under normal drilling and emergency well control operations
• Recommendations on BOPs and related safety equipment
  – Certification that the BOP meets the manufacturer’s design specification
  – Requirement for two blind shear rams with 4 foot space out
  – Overhaul testing, inspection and reporting requirements for BOP systems to ensure proper functioning
• Recommendations on well control systems
  – Development of enhanced deepwater well control procedures
  – Verification that safeguards are in place prior to displacement of kill weight fluid
  – New design, installation, testing, operations, and training related to casing and cementing
  – Study of methods for more rapid and effective response to deepwater blowouts
• Recommendations on systems based safety
  – Certification of compliance with existing regulations
  – Enhance requirements for improving organizational and safety management for companies operating drilling rigs
  – Require offshore operators have in place a comprehensive systems based approach to safety and environmental management
• Increased Safety Measures for Energy Development on the OCS (Lessee Certifications)
  – Certify:

  • That well control equipment has been examined to ensure that it is properly maintained. ROV stabs on BOP stack have been function tested.
  • That drilling/casing/completion programs have been reviewed to ensure that BOP equipment is not compromised at any time.
  • That emergency shutdown and dynamic positioning systems interface with emergency well control operations.
  • That all personnel involved in well operations are properly trained for performing their tasks under normal drilling and emergency well control operations.
  • General compliance with all regulations.
Notice To Lessees 2010-N05
June 8, 2010

• Increased Safety Measures for Energy Development on the OCS (BOP Systems)
  – Submit:
    • BOP and well control configuration
    • BOP and well control system test results
    • BOP and loss of well control events
    • BOP and well control system downtime
  – Certify:
    • BOP will operate as originally designed
    • Any modifications to the BOP system have not compromised the BOP operation
  – Maintain:
    • Records of maintenance and inspections of BOP system
  – Independent 3rd Party must verify:
    • Shear rams are designed for the project
    • BOP stack has not been damaged from previous service
    • BOP will operate in conditions to be used
Notice To Lessees 2010-N05
June 8, 2010

• Increased Safety Measures for Energy Development on the OCS (Control Systems)
  – Dynamically Positioned rigs must have BOP control systems that include:
    • Deadman system
    • Auto shear system
    • Acoustic system may be included in addition
  – ROV hot stab systems must:
    • Be tested on the stump with similar rate pump as the ROV pump
    • Be capable of closing the blind shear ram, a pipe ram, and unlatch from the LMRP
  – After a well control event, BOP system must be:
    • Inspected and tested
• **Increased Safety Measures for Energy Development on the OCS (Well Design)**
  
  – Certified Professional Engineer must verify:
    • Casing design is appropriate for the expected well conditions
  
  – While installing the casing, the operator must:
    • Ensure casing hanger latching mechanism or locking mechanism are engaged when set in the subsea wellhead
    • Ensure installation of dual mechanical barriers after cementing (dual floats or one float and a mechanical plug)
Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents

- Operator must submit:
  - A scenario that addresses the highest volume of oil discharge including:
    - Flow rate, total volume and duration
    - Potential for the well to bridge over
    - Potential for surface intervention
    - Availability of rig for relief well
  - A description assumptions and calculations used to determine the daily worst case discharge including:
    - Well design
    - Reservoir characteristics
    - Fluid characteristics
    - Pressure, volume, temperature characteristics
    - Analog reservoirs
Interim Final Rule- Safety Measures

• Codifies into regulations many of the requirements outlined in the Safety Measures Notice to Lessees- N05.

• Codifies some additional requirements of the original safety measures report to the President
Rulemaking

- Looking into various rules to incorporate into the Code of Federal Regulations
  - 2nd Blind Shear Ram?
  - Casing Shear Ram?
  - Safety Environment Management (Issued)
  - Containment requirements?
Path Forward

- Reorganization of the former MMS
- Addition of numerous new resources
  - Engineers, Inspectors, and Scientists
- Inspectors witnessing subsea BOP stack testing (stump testing and initial on bottom test)
- Inspectors witnessing other critical activities?
- Inspections versus audits?
Questions