Outline – AADE Houston Chapter

I. OCS History Brief

II. Post Macondo Regulatory Reset & Well Assessment Criteria

III. HWCG Genesis & Mission

IV. HWCG Current Response Capabilities

V. HWCG Future Developments
IXTOC
June, 3, 1979
Risk Management Considerations

Location & WCD
- Spatial Location (Proximity to Shore or Protected Areas & Water Depth)
- Geologic Setting (Exploration, Development & Mechanical Earth Model Confidence)
- Infrastructure; Surface and Seafloor
- Quality of Geologic Prognosis; Shallow Hazards, Scenery and Target

Well Design
- Basis of Design Confidence (OBG/PP/FG)
- Casing Point Selection
- Casing Design for Drilling, Completion, Production & Abandonment
- Well Design for Life of Well (Cementing & Zonal Isolation)

Risk Assessment
- Blowout Risk Assessment (WCST; Level 1, 2 or 3)
- Broaching Study if Level 2
- Flow and Capture if Level 3
- Relief Well Planning
- Comparative and Quantitative Blowout Risk Assessment or Cost Estimate

Risk Management
- Project Management Policies (Design, Peer, Sanction and Pre Spud Reviews)
- Insurance Placement; OEE, General Liability, Pollution
- Partner Engagement & Collaboration
- Regulatory / Contractor Engagement & Collaboration with Onshore & Offshore Management Teams

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Well Design Considerations:

1. **Design Factors of Safety Established by Company**
2. **Maximum Wellhead Pressures & Temperatures;**
   i. Each Section & Total Depth
3. **Casing, Wellhead & BOP;**
   i. Metallurgy,
   ii. Derating for Temperature and/or Casing Wear
   iii. Impacts of Drilling, Completion & Production Loads - Annulus Pressure Buildup & Multi-String Thermal Analysis
   iv. Cement Integrity for Life of Well
4. **Ability to circulate mud and cement slurries for zonal isolation.**
Well Design vs Blowout Assessment

Blowout Assessment;
1. **FOS of 1.0 Acceptable for Survival**
2. **Internal Pressures**
   i. Well Evacuated and Flowing at WCD Rates at Wellhead
   ii. Seawater hydrostatic pressure at wellhead
3. **External Pressures**
   i. As Installed Hydrostatic Pressures; Mud/Cement
4. **Assumptions**
   i. Hydraulic Isolation; Midway in Cement Column
   ii. If inclination is > 30°, then Annuli assumed plugged.
   iii. If Annuli are in place longer than 1-Year, then Annuli assumed plugged.
5. **WCST Assessment Criteria**
   i. Level 1 – Cap & Contain
   ii. Level 2 – Cap & Contain
      - Deep UG Flow Possible – No broaching
      - Relief Well
   iii. Level 3 – Cap & Flow
      - Potential for Broaching
      - Relief Well
Benefits of Post Macondo Regulatory Reforms

I. Better Subsurface Evaluation
   - Scenic Section – More Details
     - Shallow Hazards
     - Mechanical Earth Model
     - Water/Permeable Zones
     - Broaching Assessments for Level 2 WCST Assessments
   - Reservoir Section – WCD
     - Defined Predrill Reservoir Parameters

II. Better or More Robust Casing Designs
   - Fewer Expendable Wells – Fit for Production
     - Designs assessed for WCD
     - Assessments using WCST Criteria for Blowouts
   - 14” Intermediate Casing – Enhanced Collapse
   - Use of 14” IC for Production – Enhanced Burst

III. Better Barriers
   - Defined negative test acceptance criteria
   - Better BOP Maintenance & Integrity Management
   - Better DP & Power Management Systems Maintenance & Integrity Management
   - Better & More Robust Shoe Track Barriers
Benefits of Post Macondo Regulatory Reforms

IV. Better Management Systems
- Operator SEMS & Contractor’s SMS
- Well Construction Interface Document
- Well Specific Operating Guidelines
- Well Specific BOP Turnaround Plans & Optimization

V. More Collaboration
- Operator & Drilling Contractor
- Operator’s Engineering & Subsurface Disciplines
- Operator & Regulator

VI. Well Containment Requirements
- For Floating Drilling Operations using Subsea or Surface Stacks
- Response Plans for Capping and Cap & Flow
- Minimum Equipment Mandates for Response
I. **Response Readiness**
   - Response Activation
   - Capping Response
   - Flowback Response
   - Member Assistance
   - Mutual Aide

II. **Facilitation**
   - Business Plans
   - Projects
   - Budgets
   - Contracting

III. **Regulatory Engagement & Outreach**
   - Board Members
   - DITC

IV. **Training**

V. **Administration**
   - Shared standardized procedures
   - Accounting, Legal and Management within the Company Agreement
HWCG Organization Structure

Member Owners
(Steering Committee - Appointed)

8 - Executive Board
(Owners - Elected)

- SC & Board Chairman
- DITC Chairman
- HSE Committee Chairman
- Five (5) Members At Large

3 - Executive Board
(HWCG Directors - Appointed)

- Managing Director
- Commercial Director
- Technical Director

- Response Coordinator
- Admin Assistant
- Advisory Committee
- HSE Committee ER Subgroup SEMS SubGrp
- Audit Committee
- DITC Committee

Approval Authority
HWCG Response

Member Coverage

Response Remit

Abandonment
Drilling
Completion
Production
Intervention
Workover
Life of Well

Capping
Abandonment - TA or PA
Full Cycle
Flow Back
Relief Well Kill
Top Kill
Deepwater operators in the Gulf of Mexico who have come together with a common goal of quickly and comprehensively responding to a deepwater blowout and protect people, property and the environment...
HWCG Current Capabilities

Core Contractors
&
Equipment
I. Rigging Supply;
- MODU Tow; Control, Offset & Distance
- Emergency Mooring Release
- Emergency Recovery/Relocation of LMRP/BOP
- Wellhead Straightening
- Capping Stack Installation via HCLS or Suction Pile
- Flexible Flow Line Installation
- Tanker Hauser Lines
HWCG Resource List

II. Dispersant Application & Monitoring

- Subsea Dispersant Injection Kit
- Dispersant & Water Column Monitoring Scientists
- Plume/Water Monitoring Column Kit
HWCG Resource List

III. Containment

- 10KPSI – 13 5/8” Capping Stack
- 15KPSI – 18 3/4” Capping Stack
- SAM – Subsea Accumulator Module
IV. Flow & Capture; 130,000 BLPD & 220 MMSCFPD

- Q4000 – intervention vessel
  - Top Hat for early Flow & Capture; 30k BLPD & 25MMscf/day Gas
  - PTS Production Kit; 70k BLPD & 140MMscf/day Gas

- Helix Producer 1 (HP-1)
  - Add’l processing via HP Transfer Line; 60k BLPD & 80MMscf/day

- Storage and Shuttle Tankers
SVS PRODUCTION TEST SYSTEM

130,000 BLPD
- Offload Oil to Tankers
- Water Suitable for Discharge

220 MMscf/day Flared

PTS Video
Single Vessel Solution

Flow & Capture Equipment | Scope of Supply
--- | ---
Capping Stack | HWCG; 15K Ram or 20K VBS
**Intervention Riser System (IRS)** | **Member Responsibility:** (Cross, Halliburton, HESG, WOM, Oceaneering)
Production Module | HWCG; ARR with PTS for 130 BLPD & 220 MMscf/day
MODU | HWCG; AAR with HESG or **Member MODU**
MODU Offloading Porch | HWCG; In 2019 Revised Budget
MODU to Storage Tanker Hose | HWCG; ~4800-ft 8” x 300-psi Hose stored at DCL in NOLA.
Storage to Shuttle Tanker Hose | In 2019 Revised Budget; ~1600-ft
Storage & Shuttle Tankers | HWCG; ARR with aet for Storage Tanker (760k BBLS) & Offloading Tanker (260k BBLS)
**Tanker & Hose Management Tugs** | **Member Responsibility**
Tug Rigging to Shuttle & Storage Tankers | HWCG owned Equipment; Storage @ DCL in NOLA
EVENTS IMPACTING HP1 – WITH SVS

**Initiate Event**
- DP Incident
- BOP Failure/Leak
- Casing Failure
- Casing Shoe Failure

**Land Capping Stack & Shut In**
- Soft Shut In Failure
  - Casing Integrity
  - Shoe Integrity
- Top Hat ready for flowback in 7-11 Days

**R/U for Extended Flow & Capture**
- Assess restricted flow.

**R/U for High Volume Extended F&C**
- 130k BLPD
- 220MMscf/day

*Only if SVS Process System Fails*
- Position HP1
- Deploy & Commission HPTL

**Mobilize**
- 1. Capping Stack
- 2. Top Hat
- 3. Q4000 or MODU
- 4. PTS Test Kit

**Deploy**
- 1. Capping Stack
- 2. Top Hat / IRS
- 3. Q4000 or MODU
- 4. PTS Test Kit

**Mobilize**
- 1. Transfer Hoses
- 2. Tanker

**Deploy**
- 1. Transfer Hoses
- 2. Commission PTS Extended System

**Mobilize & Deploy**
- 1. HP1
- 2. HPT Hose

*6 days included for Debris Removal*
V. Response Plans & Collaboration

- Member Mutual Aide: ~220 Members
- Petroskills Response Venue
Safety & Environmental Management System (SEMS)

- 2019 Implementation
- Pre-Activation

Emergency Response Preparedness

- Iconic Based Response Information
Improved SC IMT Organization

Changes

I. SIMOPS
   A. Consolidated Vessels
   B. Added
      1. SS Assessment & Survey
      2. Well Access
      3. SSDI Operations

II. Well Capping (Name Change)
   A. Added BOP Intervention

III. Flow Engineering
   A. Consolidated
      1. Functions under Flow Calculations
      2. Functions under Chemical Team
   B. Restricted SSDI to Planning
   C. Added
      A. Well Integrity
      B. Kill Engineering

IV. Flowback Group
   A. Consolidated Vessels into Operations Team
   B. Added
      1. Temporary Production Systems
      2. Added Subsea Systems
      3. Added Heat Attenuation

V. Relief Well Group
   A. Added
      A. Rig Operations
      B. Kill Operations
   B. Renamed “Directional” to “Well Intercept.”
20k Valve Based Capping Stack

Notable Features

I. Built to API 17D TR8 Specifications
   I. Rated 20k @ 350°F
   II. HH Trim on Wetted Surfaces
   III. DQ DXe 20k Connector w/ SDH4 & DXe Inserts

II. Larger Center Bore Connector
   - 11”OD x 7”ID rated to 20k
   - Better Bending Loads for Vertical Access
   - Smooth Transitions Spools to 5” Valve

III. Rupture disks will be added on Tee.
   - Will address Well’s pressure relief needs.

IV. Upgrades Purchased
   - DQ 20K DXe Connector Inserts
   - 7”-20k Valve Upgrade in Q1-2020
     - Better Vertical Access
     - Increased Bending Capacity
     - Higher Landing Flow Rates (WCD)
   - TC 11/7 20k Hydraulic Connector
Offset Flexible Riser

Notable Features

I. 6” Nominal ID Magma m-Pipe™
   - Thermo-Plastic Composite Pipe – PEEK Material
   - Capable of Spooling with 16.5-ft MBR for Storage
     - 22-ft MBR for Operation
   - Low Friction Coefficients
   - High Erosional Resistance

II. Built to API 17D TR8 Specifications
   I. Rated 20k @ 350°F (Desired) & 300°F (Acceptable)
   II. Rupture Pressure > 19,500-psi
   III. Thermal Testing Ongoing

III. Water Depth Limits
   I. Minimum – 350-ft
   II. Maximum – 12,000-ft

IV. Operations
   I. Easily Deployed
   II. Rapid Installation
Offset Flexible Riser

Well Access Capability In Shallow Water and High Gas Rate

- Increases Watch Circle in Shallow Water
- Reduced Bending Loads on Capping Stack
- Moves Intervention Vessel Out of Plume for High Rate Gas Wells
Offset Flexible Riser

Well Access Capability Under a Floating Facility
Presented for HWCG by;

CTC OFFSHORE CONSULTING, LLC.

????QUESTIONS???