The Global Solution for Subsea Well Containment Requirements

June 2011
Offshore Well Control Incidents

- Typically infrequent.
- Risks minimized through –
  - Latest technology in Equipment
  - Best trained personnel
  - Focused
  - Controlled environment
- However, when they do occur –
  - Catastrophic
  - Large financial impact potential
Concerns Going Forward

- **GOM**
  - New regulations require further clarifications (TLPs / SPARs)
  - BOEMRE’s lack of resources for maintaining / enforcement of new regulations
  - New regulations focus more on Response versus Prevention (ie Training / Competency)
  - Threats to the Independents deepwater participation (52% of dw leases held by Independents))

- **International**
  - No regulatory deadlines
  - US Dept of Interior / Salazar pushing to instill US regulations
  - Lack of inter-company communication / coordination
  - Industry Organization / Committee delays
Number of Deepwater Fields Globally

- Arctic (2)
- UK / N Sea (8)
- N Africa (14)
- M East (4)
- Asia Pacific (41)
- Latin America (48)
- W Africa (58)
- Gulf of Mexico (79)
Subsea Source Control Response

Incident Response

Spill Response
- Booms & Skimmers
- Dispersant: Air & Surface
- In Situ Burning
- Beach Clean-up
- Waste Management

Source Control & Well Containment
- Capping & Containment
- ROV Tools
- Subsea Dispersant System
- Production Riser & Subsea manifold/controls
- Collection Vessel
- Debris Clearing
- BOP Access
- Capping
- Well Kill
- Relief Wells
- Fire Fighting
- On-site HSE
- Rig Management

Major Services

Tasks

= WWCI provides
Subsea Well Containment System Consisting of -

- Dedicated Equipment
  - Subsea Capping Assembly & Ancillary Equipment
  - Subsea Dispersant Injection System
  - Subsea Debris Clearing Equipment

- Ancillary Equipment & Facilities
  - Specialized Marine Firefighting / Well Control Equipment
  - Equipment Storage and Maintenance Facility

- Response Preparedness
  - Emergency Drills
  - Logistical Planning

- Incorporation of Subsea Containment Management System
  - Bridging Document into Operators Response System

- Experienced Well Control Personnel

This is a Containment SYSTEM – not multiple resources and components to be coordinated at the time of an emergency.
Major Components of Subsea Source Control

- DNV certified and designed for 10,000 ft water depth
  - Subsea Capping Stack
  - Subsea Debris Clearing Equipment
  - Subsea Dispersant System
  - Subsea Hydraulic Power Unit (SHPU)
  - Source Control Management System
Subsea Capping Stack: 18.3/4” 15K

- Re-entry connector
- Double rams, Cameron TL
- Spool w/ 4x4.1/16” outlets
  - 2- Masterflo chokes
  - 4- Vector 5” connectors
  - 4- double 3.1/16” MCS Valves
- Single ram, Cameron TL
- HC & H4 connector
- DNV certified to API
Subsea Capping Stack Schematic
## Subsea Capping Stack Data

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Type</th>
<th>Height (inches)</th>
<th>Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-entry connector</td>
<td>Cameron HC/H4</td>
<td>57</td>
<td>10,300</td>
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<tr>
<td>Double ram</td>
<td>Cameron TL</td>
<td>84</td>
<td>72,000</td>
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<tr>
<td>Spool</td>
<td>Cameron 4-4.1/16” outlets</td>
<td>47</td>
<td>12,500</td>
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<tr>
<td>Single Ram</td>
<td>Cameron TL</td>
<td>49</td>
<td>36,000</td>
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<tr>
<td>Connector</td>
<td>Cameron 2-HC &amp; H4</td>
<td>53</td>
<td>43,000</td>
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<tr>
<td>4-valves</td>
<td>Cameron 4-3.1/16 MCS</td>
<td>8,000</td>
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</tr>
<tr>
<td>4-gooseneck</td>
<td>Vector</td>
<td></td>
<td>12,000</td>
</tr>
<tr>
<td>2- chokes</td>
<td>Masterflo</td>
<td></td>
<td>8,000</td>
</tr>
<tr>
<td>Frame</td>
<td></td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>290 = 25ft</td>
<td>212,000= 106T</td>
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ROV Interfaces

Hydraulic / Chemical Injection Flying Leads - Thermoplastic Hose with API 17H Hot Stabs
Choke Operation - Class 4 Torque Tool
Gooseneck Connector - Class 5 Torque Tool with Class 4 Torque Tool Adaptor (Torque Multiplier)
Gooseneck Connector Running Tool - Class 4 Torque Tool with ROV Operable Lock Pins
Pressure and Temperature Sensor - ROV Wet Mate Electrical Connector
Acoustic Data Acquisition Unit - ROV Recoverable assembly with ROV Wet Mate Electrical Connector
Back-Up Acoustic Data Acquisition Unit Communications - Electrical Flying Lead with ROV Wet Mate Electrical Connector
Hydraulic and Chemical Injection Control Panels - API 17H Hot Stab Receptacles and ROV 1/4 Turn Ball Valves
Capping Stack Wire Line Running Tool - Split Clamp with ROV Operated Shackle
Capping Stack Drill Pipe Running Tool - Hydraulic 18-3/4” Connector with API 17H Hot Stab Receptacle
1200 Gallon Subsea Reservoir - API 17H Hot Stab Receptacle
Genesis Shears - API 17H Hot Stab Receptacle
Subsea Debris Clearing Equipment

- System includes:
  - 2500 Series Shear
  - 660 Series Shear
## Subsea Debris Clearing Equipment

![Subsea Debris Clearing Equipment Image](image)

<table>
<thead>
<tr>
<th>Model</th>
<th>Shear Weight (lbs)</th>
<th>Jaw Opening (Inches)</th>
<th>Jaw Depth (Inches)</th>
<th>Shear Force 5,000PSI</th>
<th>Shear Force 5,500PSI</th>
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<tbody>
<tr>
<td>GXP 660</td>
<td>13,300</td>
<td>32</td>
<td>32</td>
<td>1,475 tons</td>
<td>1,625 tons</td>
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<tr>
<td>GXP 2500</td>
<td>45,000</td>
<td>46</td>
<td>48</td>
<td>3,015 tons</td>
<td>3,317 tons</td>
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</table>
Subsea Dispersant System

- Routing Manifold
- Distribution Manifold
- Hoses
- Applicators
- API 17H hi-flo connectors
- Deployment
  - Shallow Water: Hose
  - Deepwater: Coil Tubing
- CT Deployed to Routing Manifold
- ~1,000’ Chemical Hose from Routing Manifold to Distribution Manifold
- ~250’ Chemical Hose from Distribution Manifold to Applicators
Subsea Hydraulic Power Unit (SHPU)

- 50 GPM @ 5500 PSI
- Redundant motors and pumps
- Standard and proven equipment
- Designed to operate on seawater, control fluid & methanol
- SHPU: Operated by Oceaneering
Subsea Well Incident Interfaces: One-Fluid Solution

- Subsea Hydraulic Fluid
  - Dedicated Hydrate System
  - Hydrate inhibitor

- Subsea Hydraulic Power Unit (SHPU)
  - Debris Clearing Shears
  - Debris Clearing Diamond Wire Saw

- Capping Stack
- Drilling Rig BOP
- Subsea Production Tree

- Subsea Production Manifold
Includes Comprehensive and Detailed Procedures -
Executive Summary
Cross Reference to Government Regulations
Well Intervention – Including Detailed Procedures,
Check Lists, Resource Requirements, Decision Matrices
  - Rig Management
  - Riser Severing
  - BOP Access
  - Dispersant Injection
  - Diversion Cap
  - Capping
- On Site Support Systems
- Appendices

Also addresses Subsea and Surface BOP (TLP and SPAR)
Deepwater Scenarios
Subsea Well Control Emergency Response

- People
- Procedures
- Equipment
  - Works 1st Time
  - Emergency Logistics
- Interface Management
- Experience
Rapid Deployment via Air Charter from Aberdeen
Rapid Deployment Capability Worldwide Basis

- Modular design concept
- 747 front-end load size criteria
- 80,000 lbs. lifts
  - Drilling rig cranes
  - Vessel cranes
  - Road & bridge limits
Deployment Pre-Planning for Offshore Vessel

- Deck lay-outs
- Detailed deployment procedures
  - Tower
  - Crane
- Experience handling trees and manifolds
Major Components in Possession

18-3/4” 15K CIW Type TL Single Ram BOP

18-3/4” 15K CIW Type TL Double Ram BOP
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<tr>
<th>Task Description</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
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<tr>
<td>Rams - Cameron</td>
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<td>Spool - Cameron</td>
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<tr>
<td>Gooseneck - Vector Connectors</td>
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<td></td>
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<td>FAT ship</td>
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<tr>
<td>Chokes (2) - Masterflo</td>
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<td>HC and H4 connectors - Cameron</td>
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<td>Re-entry connector - Cameron</td>
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<td>Install control system on stack</td>
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<td>SYSTEM SIT (HPU &amp; Stack)</td>
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<td>FAT ship</td>
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<td>Subsea HPU 50 gpm, 6500ft - Oceaneering - Aberdeen</td>
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WILD WELL CONTROL'S
Global Subsea Well Containment System

GLOBAL
EXPERIENCE & RESPONSE

Unmatched experience, dedicated resources, and international capabilities allow Wild Well Control to offer a Global Well Containment System to meet operators' expectations and align with their contingency plans in response to a subsea well control event on a global basis.

EQUIPMENT IN STATE OF READINESS
- 18 3/4 ISK Subsea Capping Stack
- Subsea Dispersant Injection System
- Debris Removal Equipment

ENGINEERING
- Source Control Management System
- Well Planning
- Preliminary Relief Well Planning
- Dynamic Kill Modeling

EMERGENCY RESPONSE
- Emergency Preparedness Drills
- Logistical Planning
- Experienced Well Control Personnel

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Any Questions?