Building Subsea Capability in a Major Operating Company

Marine Technology Society
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Subsea Manager
Building Subsea Capability to deliver Chevron’s Deepwater Assets.

- Chevron’s Global Subsea Portfolio
- Role of Technology
- Role of People
- Wrap Up & Key thoughts……..

“Right skills, right place, right time, ….working on the right thing…..”
Chevron Global Subsea Presence
One of the largest in the industry
Chevron’s Subsea Portfolio is Diverse and Growing:

- 20+ Major Capital Projects in queue
Technology plays a vital role
Projects Becoming More Complex / Technology Driven

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<tr>
<th>Project</th>
<th>15 KSI</th>
<th>Instrumented pipeline protection (HIPPS)</th>
<th>Multiphase Flowmeters</th>
<th>Subsea Sampling</th>
<th>Chem. Inj Distribution</th>
<th>Intelligent Well Completion</th>
<th>Subsea Boosting</th>
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- Oil & Gas Assets
- Deepwater > 1500m
- Long offsets > 50km
- Little/No infrastructure
- EOR potential/requirement

New Asset Solutions
Expand the Envelope

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Subsea Technologies: key part of overall DW Technology Investment

- **Subsalt Imaging**
- **Drilling**
  - Dual gradient drilling
  - Next generation drillships
- **Complections**
  - Single-trip multi-zone frac pack
  - In-Well artificial lift
- **Rigless Well Intervention**

- **Ultra-Deepwater Developments**
  - 10,000’ WD

- **Long Distance Tiebacks**
  - 50+ Miles Oil
  - 200+ Miles Gas
  - Sea-floor boosting & processing

- **Host Facilities with Small Field Tie-ins**
  - 50-200 MMBOE

- **Facilities**
  - Hull/mooring design standardization
  - Compact modular processing systems

- **Operations**
  - Intelligent wells and i-field
Technology Investment will be focused, collaborative & leveraged

Critical Elements for Long Distance Tieback

- Hydrocarbon / water separation
- Solids management
- Riser, Umbilical, Flowline Design & Integrity
- Boosting & Gas Compression
- Produced Water Reinjection
- Power distribution
- Reliable Monitoring & Control
• Integrate and mature technologies to deliver asset solutions

• Manage as single program

“Fully Autonomous, Flexible, Self Diagnosing, Self Healing Facilities for the full life cycle……”
Long Distance Tieback Technologies Fishbones

Low GOR Oil System
- Subsea Transformer
- Single Phase Pump Oil
- Stabilized Fluids Low GOR
- Flow Conditioning

Big Gas Systems
- DC Power
- Flow Conditioning
- Produced Water Discharge to Sea
- Produced Water Injection
- Gas / Liquid / Water Separation
- Wet Gas Compressor
Current goal
- Pursue seabed single / multiphase pump technology for DW / HP / long tie back
- Advance In-Well pump technology (initiate combination lift technology focus)

Mid term goal
- Gas liquid separation / water processing / seabed injection

Long term goal
- Seafloor compression systems
Subsea MPP Technology Gaps

- Water Depth: 10,000 ft
- Gas Volume Fraction: 70-
- Differential Pressure: >3500 psi
- Throughput: 250,000 bloepd
- Shut-in Pressure Rating: >10000 psi.
- Motor Power Rating: >3.0 MW

Field Proven or Deployment Ready by 2013 Timeframe

Major Technology Gap
People
People & Organizational Capability (OC)

- 4 Key OC Themes:
  - Growth: Acquiring Engineers
  - Accelerated Development: Transforming Engineers
  - Org Model Optimization: Managing Engineering Work
  - Leverage: Contractors, Standardization, Regional Models

“technology is great, but we can’t deliver it without the people…”
- Simple equation to solve: Go from 200 to 400+ in 4 years……
- Hire, absorb, train & retain
- Deliver the business and don’t change the culture
Acquiring Engineers: Global Hiring Program

- Simple equation to solve: how to go from 200 to 400 in 4 years.....
- Hire, absorb, train & retain.......plan and execute
- Deliver the business and don’t change the culture

- Conclusion: it is not easy.......but we are making headway and will continue to grow.
Transforming Engineers
Accelerated Development

- Subsea Graduate Program: structured curriculum plus 3 assignments in Subsea function
- Transform FE’s into SSE’s – Accelerated Development Program
- Develop International Workforce SSE’s
- Collaboration with major training groups
- Utilize latest SOA Adult Learning Models: “Fun vs Grind”
- Revamp Mentoring Program – value for Mentor and Mentee
- Implement 2 career paths: Consulting/Technical & Systems/Projects

Designed by Subsea Engineers for Subsea Engineers
## Subsea Accelerated Development – The needed skills to deliver our business

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<thead>
<tr>
<th>Critical Skills</th>
<th>Supporting Skills</th>
<th>Foundation Skills</th>
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<tr>
<td>Subsea Systems</td>
<td>Survey &amp; Positioning</td>
<td>Drilling</td>
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<td>Subsea Equipment</td>
<td>Materials &amp; Corrosion</td>
<td>Completions</td>
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<td>Subsea Controls</td>
<td>Flow Assurance</td>
<td>Reservoir Engineering</td>
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<td>Subsea Integrity &amp; Reliability</td>
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<td>Subsea Operations</td>
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<td>Technical Project Mgmt</td>
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- Assess selected candidates
- Develop a customized training plan
- Complete the Subsea Curriculum
- On the job training

Subsea Engineers need broader skill sets than initially thought
Some Keys to Success……

- Global Technology Investment: invest where the skills are.
- Leverage GTC capabilities globally. Deliver cross time zone workflows.
- Deliver Asset Solutions not new technologies.
- Chevron Engineering Standards will ask more of suppliers: but will ensure the reliability & availability performance we need to successfully deliver our resource base.
- Subsea infrastructure is the delivery vehicle for the reservoir: need to understand subsurface uncertainty and deliver the right system at the right time.
- Invest in people and meet their needs for challenge, growth, and a subsea career.
Subsea in Chevron: Summary

- **Subsea MCP are a significant part of Chevron growth strategy**
- **Upcoming large subsea projects will need strong project management skills and leadership with focus on improving on-time delivery performance, aftermarket support and experienced support personnel.**
- **Increased investment in R&D for subsea technologies over next 5 years**
- **Chevron will continue to operate a Center of Excellence model for Subsea – 3 hubs: Aberdeen, Perth, Houston.**
- **Organizational Capability & Operational Excellence focus to create business value: the right people in the right place, doing the right things every time.**