Subsea Production Market and Industry Teaming

Presented by:
Bruce Crager
Executive Vice President: Expert Advisory Group
Endeavor Management

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Worldwide Progression of Water Depth Capabilities for Offshore Drilling & Production

1. Deepwater drilling began long before we had production capability
2. New drilling record of 11,155 ft. set offshore Uruguay in April 2016
3. New floating production record of 9,500 ft. set at Stones project in GOM in Sept, 2016

Courtesy of Offshore Magazine, Data as of March 2016
Subsea Market Segment Overview

• Subsea is a growing subset of the offshore oil and gas industry which includes:
  – Field architecture planning and systems design
  – Hardware design and manufacturing
  – Installation activities, including vessel design and operation
  – Project management and offshore project supervision
  – Operators (oil and gas companies), especially those who are continually pushing the envelope using subsea

• Subsea is still a relatively young industry and will be a significant industry segment for the future, especially for deepwater.
Subsea Acronyms

Subsea Production Systems (SPS)
- Subsea Christmas Trees
- Manifolds
- Subsea Processing Systems
- Control Systems

SURF
- Subsea (Hardware-PLEMs, PLETs, Jumpers)
- Umbilicals
- Risers
- Flowlines
Example of a Small Subsea Project

Petrobras **Cottonwood** (2200 ft water depth)

*Courtesy of FMC Technologies*
Example of a Large Subsea Project

Petrobras **Roncador** (6600 ft water depth)

*Courtesy of FMC Technologies*
Two Types of Trees

Horizontal

Vertical

Courtesy of GE Oil and Gas
Subsea Tree Configurations

- Horizontal Tree
  - Tree Cap
  - Crown Plugs
  - Tubing Hanger
  - Treehead
  - Tree Connector
  - Wellhead

- Vertical Tree
  - Tree Cap
  - Master Valve Block
  - Tree Connector
  - Tubing Hanger
  - Wellhead or Tubing Head Spool

*Courtesy of GE Oil and Gas*
Subsea Processing Overview

Source: FMC Technologies
Types of Subsea Processing

- Subsea Boosting (including pumping)
  - Subsea Raw Water Injection

- Subsea Separation and Processing

- Subsea Gas Compression
Benefits of Subsea Processing

- Increase a well’s recovery rate to enhance project economics (greenfield and brownfield)
- Moves “boosting and processing” to the seafloor from the surface (platform or floating production system topside)
- Reduce topside weight
- Can allow production from subsea to shore
Most Likely Subsea Processing Opportunities

- Deepwater - Generally in excess of 2000 ft
- Large Subsea Developments - Usually producing to a floating production system
- Major Oil Companies who have already tried subsea processing
- Geographic areas having the above criteria
  - Expected to be Brazil, GoM, W. Africa and North Sea
Legacy Subsea Manufacturers

Subsea Trees/Manifolds/Processing Systems

- Aker Solutions
- Dril-Quip
- FMC
- GE Oil and Gas (previously Vetco)
- OneSubsea (previously Cameron)

Other

- Proserve
- Oceaneering
Global Deepwater Project Executions - Greenfield

Source: Quest Subsea Database
Near-Term Impact on Global Subsea Market

2016-2020e = Preliminary August 2016 Forecast*

- 2016-2020e High, Mean and Case forecast represent preliminary revisions to May 2016 forecast and are subject to additional change prior to release or the Quest Subsea Database August 2016

Source: Quest Subsea Database
Production Risers

Free hanging

Lazy wave
Flexible Pipe Cross-Section

Typical Flexible Riser Structure
Flexible Pipe Manufacturers

- TechnipFMC
- GE Oil & Gas (Wellstream)
- NOV (NKT)
- Magma
Worldwide Pipeline Demand

2008 – 2021

West Nile Delta, Shah Deniz Phase 2, Bardegg 2, Baronia and Rota 3 Pipeline installations contribute to 20-24” increase in 2016 & Iran Oman India Gas pipeline in 2019.

Source: Quest Offshore
Umbilical Cross-Section

Source: Technip
Umbilical Suppliers

- TechnipFMC (Duco)
- Oceaneering
- Nexans
- Alcatel
- JDR
- MFX
Global Subsea Production Umbilical Demand

Optimum Project Mix Drives Peak – Mega Projects & Long Tiebacks (50+KM)*

2004-2005 Steel Peak:
- Agbami
- Akpo
- Ormen Lange
- Rosa
- Tweedsmuir

2010-2011 Steel Peak:
- Tamar
- Greater Gorgon
- Laggan-Tormore
- Macedon
- Wide Berth
- West Delta Deep Villa

Future Outlook (+4% 2016-2020):
- Mega project oil price sensitivity
- Natural gas demand volatility
- Devp scenario shift – Brownfield

2016-2020e Mean Case

- S. America 17%
- Africa/Medit. 30%
- N. America 15%
- N. Sea 15%
- Asia/Pacific 23%

- 2016-2020e High, Mean and Case forecast represent preliminary revisions to May 2016 forecast and are subject to additional change prior to release or the Quest Subsea Database
  August 2016

Source: Quest Subsea Database
Subsea Construction Vessels

Source: Technip
Pipeline Installation Methods

S-Lay Pipeline Installation

During S-lay pipeline installation, pipe is eased off the stern of the vessel as the boat moves forward. The pipe is eased off the stern of the vessel as the boat moves forward. The pipe curves downward from the stern through the water until it reaches its final destination on the seafloor. As more pipe is welded in the line and eased off the boat, the pipe forms the shape of an “S” in the water.

*Definition Source: Rigzone*
Pipeline Installation Methods

J-Lay Pipeline Installation

J-lay pipeline installation puts less stress on the pipeline by inserting the pipeline in an almost vertical position. Pipe is lifted via a tall tower on the boat, and inserted into the sea. The pipe only curves once in J-lay installation, taking on the shape of a “J” under the water. The reduced stress on the pipe allows J-lay to work in deeper water depths.

Definition Source: Rigzone

Source: Quest Offshore Resources

Photo courtesy of Technip
Pipeline & Umbilical Installation Methods

Reel Lay Pipeline Installation

Reel barges contain a vertical or horizontal reel that the pipe is wrapped around. Reel barges are able to install both smaller diameter pipe and flexible pipe. Horizontal reel barges perform S-lay installation, while vertical reel barges can perform both S-lay and J-lay pipeline installation. Reel pipe is lifted from the dock to the vessel, and the pipe is simply rolled out as installation is performed.

Definition Source: Rigzone
Top 10 Operators All Types Pipelines – Project Count

Installation Year 2010-2016

Source: Quest Marine Construction Vessels

Source: Quest Offshore

Endeavor
Major Subsea Construction Vessel Owners

- Subsea 7: Approx. 27 Active Vessels (divested 4 chartered and 8 owned as of early 2016)
- Technip: Approx. 21 Active Vessels (divested 8 in 2015 and 2016)
- Saipem: Scrapped 4 vessels
- Allseas
- Emas Chiyoda
- McDermott
- Heerema

(Source: Quest Marine Construction Vessels)
Subsea Well Intervention

- The number of subsea wells continue to grow and the age of all wells becomes greater each day.
- Increased recovery from all wells, especially subsea, is becoming a key focus and sometimes a mandate (Norway).
- Operators are looking for lower cost options in well intervention.
- Larger intervention vessels with more robust capabilities can provide services not available in the past.
- Teaming of key players in the industry are offering new capabilities:
  - FTO (FMC and Chouest)
  - OneSubsea with Helix
  - Offshore Drilling Companies and ?????
Time to Team?
Extreme teaming!
Industry Collaboration

Seeking Design, Cost, & Execution Synergy across the Offshore Supply Chain

- OneSubsea
- AkerSolutions
- Schlumberger
- CAMERON
- BAKER HUGHES
- Technip
- HEEREMA
- Schlumberger
- Petrofac
- Xodus Subsea Joint Venture
- FORSYS SUBSEA
- Chiyou Corporation
- Xodus Group
- Saipem
- Technip
- Forsys Subsea Joint Venture
- io Consulting Joint Venture

Cooperation Agreement
Subsea Technology & EPCI Cooperation
Co-Operation Agreement
Production Services & Production Enhancement
Global Alliance Agreement
Subsea Well Intervention
Global Subsea Engineering (FEED, Eng, Consultancy)
Integrated Subsea, SURF Systems & Field Design
SURF & Field Design, FEED Studies

2012 - 2013
2014
2015

Emas Chiyoda Subsea JV
Offshore EPCI, Conceptual, and FEED Studies
KBR subsea 7
Global Alliance Agreement
Subsea Concept, FEED Engineering & Design

Courtesy of Subsea 7
Most Recent Combinations (2016 and 2017)

- Technip and FMC Merger
- GE Oil & Gas and Baker Hughes
  – What about Aker Solutions/ Baker Hughes Alliance?
  – Still teamed with McDermott?
  – io still intact?
- Do they remain independent?
  – Oceaneering
  – Dril-Quip
  – Proserve
OneSubsea, Subsea 7 form alliance

- OneSubsea and Subsea 7 entered into an agreement to form a non-incorporated alliance to design, develop and deliver integrated subsea development solutions for the oil and gas industry.

- The duo will focus on combining subsurface expertise, subsea production systems (SPS), subsea processing systems, subsea umbilicals, risers and flowlines systems (SURF), and life-of-field services.

Source: [http://www.oedigital.com/component/k2/item/9725-onesubsea-subsea-7-form-alliance](http://www.oedigital.com/component/k2/item/9725-onesubsea-subsea-7-form-alliance)  
July 13, 2015
TechnipFMC Begins Operations as a Combined Company

January 17, 2017

- TechnipFMC (NYSE and Euronext: FTI) announced that it is operating as a unified, combined company following completion of the merger of FMC Technologies and Technip.
- The combined company can boost efficiency, lower costs, and accelerate schedules.
- Formed through the combination of two market leaders with complementary capabilities and technologies, the company builds on early involvement and integrated solutions to simplify field architectures and decision-making.
- Uniquely positioned to deliver greater efficiency across project lifecycles from concept to project delivery and beyond.

TechnipFMC ROV

A TechnipFMC Remotely Operated Vehicle (ROV) is deployed to provide subsea services. Might they focus on the ROV operations segment to compete with Oceaneering?

Source: © TechnipFPC plc
Improved field development planning (new and brownfield)

- Reduce Capex and Opex
- Increase recovery of oil and gas reserves
- Minimize interfaces between suppliers and installers
- Most new offshore fields are focused on deepwater which means floating production systems and subsea wells
- Teaming of key players in the industry is offering new combined capabilities.
Principal Effects of Subsea Alliances

- Concept
- SPS FEED
- SURF FEED
- Time & Risk

- SPS EPC
- Time & Risk

- Installation

- FIELD PRODUCTION

- Concept
- SPS FEED
- SURF FEED
- Time & Risk

- INTEGRATED SPS-SURF DELIVERY
- Time & Risk

- FIELD PRODUCTION

- TIME SAVING

Courtesy of Subsea 7
Principal Effects of Subsea Alliances

- Concept
  - Time & Risk
  - SPS FEED
  - SURF FEED

- SPS EPC
  - Time & Risk

- Installation

- Field Production

- SPS-SURF Design Competition
  - Time & Risk

- Time Saving

Courtesy of Subsea 7
Where is the Potential Value to Projects

Shorter schedule?

Increased recovery?

Better predictability?

Lower cost?

More production?

Courtesy of Subsea 7
What are the Key Issues?

- Trust between partners
- Client culture
- Risk sharing between partners
- Contractual Alignment of client and contractor goals
The Simplistic Perspective

Who is best placed to manage the SPS-SURF interface?

Can we afford to continue working as we have until now?

Courtesy of Subsea 7
OneSubsea has also initiated a JV with Chevron in order to develop subsea systems for HPHT fields.
A Focus on Economic Outcomes

- Adaption to new economic paradigm is underway within suppliers and contractors
  - And operators?
- Early indications illustrate significant value improvement
  - Cost, Schedule, Operability and Predictability
- Improvements need to be sustainable (cultural shift)
- Market receptivity will be fueled by trust
Subsea Market Segment Summary

- **New Order Volume Low**
  - Operators are into the second year of severely depressed award activity as they continue to re-assess projects, reduce cost and adjust to a lower-for-longer oil price.

- **Re-Designing Subsea**
  - Collaboration & Consolidation within the supply chain to concentrate efforts of innovative solutions
  - Phased Projects to reduce and space out capital commitment and add transparency to project queue
  - Brownfield Support through infill drilling, IMR and subsea processing will increase in importance as in-place infrastructure ages and processing capacity is realized

- **Life Extension/Life of Field Opportunities Exist**
  - Install-base of subsea infrastructure remains in place and as time goes by, the need to extend life or engage end of life services will grow

*Source: Quest Subsea Database*