Subsea Standard & Rules – ‘What is Subsea?’

MEK4450 Standards and Rules

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Goals…

- General knowledge of subsea development and production systems
- Understand the building blocks forming a subsea production system
- Understand the hierarchy of codes, rules and regulations
- Be familiar with the control elements to execution of a subsea project
What is “Subsea”? 
What is Subsea?
Subsea example
History of Subsea Technology

- 1943 - First subsea completion (Lake Erie, USA, 30 feet).
- 1961 - First subsea well completed in Gulf of Mexico by Shell (50 feet).
- 1967 - First diverless subsea completion.
- 1971 - First North Sea Subsea development, Ekofisk Early Production (220 feet).
- **1978 - 140 operational Subsea wells worldwide.**
- 1997 - Shell Mensa, 68 miles, longest subsea tie-back (gas)
- 2001 - ExxonMobil Mica, 29 miles, longest subsea tie-back (oil)
- 2004 - Shell Coulomb, 7300 feet WD, deepest subsea tieback (gas)
- **End Dec 2004 - 2404 Operational Subsea Wells Worldwide.**
- 2005 - BP Thunderhorse, 6100 feet WD, deepest oil
- 2006 - Hydro Ormen Lange, 160 km (101 miles), longest subsea tie-back
- **2,121 Subsea wells are forecast to be installed in the period 2005/09**
- **3,222 Subsea wells are forecast to be installed in the period 2009/13**

Source: Quest Offshore Resources Inc., Nov. 05
Why Subsea Wells?
Why Subsea Wells?

- Subsea wells can be placed outside the effective drilling reach of existing platforms.
- Subsea wells can usually be installed faster than the construction time for a platform.
- If surface facilities are available, an expensive platform (Spar, semi sub or TLP) can be avoided.
- A less expensive platform can be installed if flowlines from subsea wells rather than casing riser are tied back to the surface (reduced platform load).
Subsea Wells Challenges

- Flow assurance problems can be costly.
  - Hydrates, Paraffin/Wax, Asphaltenes, Sand, Scale, Corrosion, Multiphase Flow (water injection and gas wells have less problems)

- Subsea wells cost more to drill, complete and workover
  - Rig spread cost is higher and more time per well

- Operating costs are higher per well than for dry tree wells

- Less reserves are recovered before reaching economic limit

- Compared to dry wellheads, the access to a subsea well is expensive, making workover less available
Subsea Development Concepts

TLP

SPAR

Moored Semi

Tie-back to Shore
Standards, Rules and Regulations

Safety Considerations, Subsea Production Systems

NPD “Innretningsforskriften” referring NORSOK D-010

Barrier Philosophy, mandatory requirements:

- During drilling and well activities at least two independent and tested barriers shall be available in order to prevent unintentional flow from well.
- If one of the barriers fail, immediate measures shall be taken to re-establish two barriers.
- It shall be possible to test the barriers. To the extent possible the barriers shall be tested in the direction of flow.
Standards, Rules and Regulations

- Relevant NORSOK, ISO and API standards
- Functional and Design Req’s
- Operation & Maint. Req’s
- Project Design Basis

 Authorities
 Operator
 Standards
Standards, Rules and Regulations

ISO 13628 series
References...

- ISO 10423/API 6A Recommended Practice for Design & Operation of Subsea Production Systems
- ISO 13628-4/API 17D Specification for Subsea Wellhead and Christmas Tree Equipment
- US Coastguard and Minerals Management Service (MMS) rules and regulations
- ISO 13628-1 to 9, Design and Operation of Subsea Production Systems
- DNV, Rules for Planning and Execution of Marine Operations
- NORSOK U-001 Subsea Production Systems - Norwegian Codes
- UKOOA – UK Offshore Operators Association
- AUS – Australian Codes
- CAN – Canadian Codes
- ASME, ASTM, AWS, NACE . . .
- OLF 066 & 070 – Recommended guidelines for the application of IEC 61511 in petroleum activity on Norwegian Continental Shelf
The Oilfield Glossary

Schlumberger web site:
http://www.glossary.oilfield.slb.com/

POSC Caesar web site:
http://www.posccaeser.com/
Abbreviations…”
Safeguarding life, property and the environment