API 17O – Recommended Practice for Subsea High Pressure Protection Systems (HIPPS)
Agenda

- Introduction and background
- HIPPS overview
- Codes and standards
- Regulatory issues
- API 17O - HIPPS
- Conclusions
Introduction

• Subsea HIPPS predominantly in North Sea
• GoM seeing increasing reservoir pressures and temperature in deep water
• No regulatory framework in GoM
• Presentation covers:
  – Key differences
  – API 17O RP
  – Work with regulatory authority (MMS/BSEE)
Background

- HIPPS is a key enabling technology
- Impact of increased water depth on systems
- Impact of high flow rate wells
- Lack of clear position by MMS/BSEE
**Background contd**

<table>
<thead>
<tr>
<th>Project</th>
<th>Operator</th>
<th>Location</th>
<th>Fluid</th>
<th>Installation</th>
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<tr>
<td>Kingfisher</td>
<td>Shell</td>
<td>North Sea</td>
<td>Gas</td>
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<td>Juno</td>
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<tr>
<td>Kristin**</td>
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<td>Rhum**</td>
<td>BP</td>
<td>North Sea</td>
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<td>2005</td>
</tr>
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- Globally ~20 projects with HIPPS installed
- GoM is different to the North Sea
  - North Sea projects do not perform routine subsea valve leak tests (routine annual maintenance shutdown only)
  - Regulatory approval based on safety cases
Benefits of HIPPS

• Reduce topside pressures:
• Reduce flowline and riser wall thickness;
• Reduced offshore welding time;
• Reduced temperature induced axial force
• Improved riser design; and
• Potential to use existing, lower pressure flowlines and risers.
Risk reduction

ACTUAL REMAINING RISK

TOLERABLE RISK

PLANT RISK
(Initial risk)

Necessary risk reduction

Actual risk reduction

Partial risk covered by SIS

Partial risk covered by non-SIS risk reduction facilities

Risk reduction achieved by all SIS and other risk reduction facilities

INCREASING RISK

ANSI/ISA-84.00.01-2004 Part 3 (IEC 61511-3 Mod)
HIPPS components
Codes and standards

- GoM based on proscriptive approach
- IEC 61508 & 61511 (risk based approach) – ISA 84
- API 14C (traditional approach)
- API 17O – HIPPS – Published 2009
Regulatory issues – in the past

- Unknown requirements leading to HIPPS not being selected in a number of projects
- DeepStar regulatory committee
- New Technology Application
Current position with BSEE

- NTA March 2006, approved July 2006
- BSEE plans to use the DWOP process to approve a HIPPS project
- First HIPPS application being developed for GoM - Julia
BSEE Position

- SIL 3 rated
- Fail safe
- Failure away from facility
- Quarterly function test, partial stroking not accepted
- Zero leakage for HIPPS valves
- Closure on loss of communication or power
- Redundant pressure sensors
API 17O Typical HIPPS

SIL 3 system with two valves

Designed to be tested to zero leakage (some leakage may be tolerated due to the inclusion of a surface PSV)

HIPPS could be mounted on the tree, Jumper or manifold

No burst zone designed to allow sufficient time for the HIPPS valves to close

Fortify zone designed to protect the host

Designed to ensure that the Protective Segment fails before the riser

A PSV is included to prevent valve leakage over pressurizing the system during platform abandonment

HIPPS

Subsea Fortified Zone

Protective Segment Section

Host Fortified Zone
API RP 17O - HIPPS

Operators
- Anadarko
- BP (Chair)
- Chevron
- Devon
- Hess
- Murphy
- Nexen
- Shell
- StatoilHydro
- Williams
- US Government
- BSEE

HIPPS Suppliers
- Aker Solutions
- Cameron
- Dril Quip
- FMC
- GE

Engineering Cos
- Creative Systems International
- Intec
- J P Kenny
- KBR
- Paragon
- Stress Subsea
- Technip
Conclusions

- Systems available for 15,000 psi
- First project now appearing in GoM
- HIPPS is an enabling technology for deep water HP
- Regulatory position is now well understood, still need NTL
- API 17O Published 2009
- API 17O revision being balloted as a Standard
Questions?