The Safety and Environmental Management System (SEMS) Rule

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Background

- OTC Paper 21230 *The Safety and Environmental Management System Rule*
- Book: *Offshore Safety Management* (3rd Quarter 2011)
Objectives and Organization of this Presentation

1. Provide an overview and description of the new SEMS rule from BOEMRE
2. Background: How we got here
3. The SEMS rule
4. SEMS, Safety Cases and Process Safety Management (PSM)
5. Implementing a SEMS program
1. Background: How We Got Here

- Piper Alpha 1988
- Safety Cases 1990
- HSE Template 2003
- SEMP 1994
- SEAMS 2010
Piper Alpha: UK Impact

- 1990: The Cullen Report
- Major improvements to UK Safety Cases
- Other areas such as Australia, SE Asia
- Similar approach in Norway
Piper Alpha: OCS Impact

- Many more platforms than the North Sea – tend to be smaller and more uniform
- API RP 75: SEMP - a *Recommended* Practice
- Performance-based, but more prescriptive than Safety Cases (easier to audit) – excludes formal risk analysis and ALARP
Similar Events Onshore

Bhopal 1984

ACAA 1990

PSM 1992

RMP 1994
And Then Came Deepwater Horizon (and Montara)

- MMS → BOEMRE / BSEE
- All 12 elements included in SEMS
- Full compliance by November 15th 2011 (but no submission of plan)
- All types of operation
- No Safety Case requirement

Michael Bromwich
2. The SEMS Rule

- 30 CFR Part 250
- Covers Outer Continental Shelf (OCS)
- Published October 15th 2010
- Effective date: November 15th 2010
- No new public hearing
- 44 pages.
- Technical content: 6-10 pages
- Deadlines:
  - MMS-131: March 31st 2011
  - SEMS program: November 15th 2011
Public Hearings

Bromwich said his agency has no plans to make additional emergency rules. Rather, any changes will now go through the typical rule-making process that takes up to two years, he said.
Basis of SEMS

- Based on SEMP
- Holds operators responsible for overall safety of facility, including contractors
- BOEMRE has added more requirements
- Mostly Process Safety – with some occupational safety (JSAs)

All Phases
- Drilling
- Production
- Construction
- Well workover
- Well completion
- Well servicing
- BOEMRE regulated pipeline activities
“This rulemaking will incorporate in its entirety and make mandatory the American Petroleum Institute’s Recommended Practice 75 . . .”

No longer a *Recommended Practice*. The word “must” occurs 293 times

There is additional material (SEMS > SEMP)

Excluded Safety Cases (but IADC has template for drillers)

BOEMRE likely to be more assertive
SEMS Timeline

- First mention 2006
- Four elements 2009 (MMS public hearing)
  - Mechanical Integrity
  - Operating Procedures
  - Hazards Analysis
  - Management of Change
- Based on Incident Investigation data
- Order is significant
- AIChE session: *Management of Change – The Most Difficult PSM Challenge*
- October 2010: Final Rule
Industry Response (2009)

Combined Operations Recordable and Lost Workday/DART Case Incident Rates

- Recordable
- Lost Workday
Similar Onshore Occupational Safety Trends

![Graph showing incident trends per 200,000 work hours from 1993 to 2005.](image)

Courtesy DNV - 2008
Elements of SEMP

1. Safety and Environmental Information
2. Hazards Analysis
3. Operating Procedures
4. Training
5. Pre-Startup Review
6. Assurance of Quality and Mechanical Integrity of Equipment
7. Safe Work Practices
8. Management of Change
9. Investigation of Incidents
10. Emergency Response and Control
11. Audit of Safety and Environmental Management Program Elements
12. Records and Documentation
SEMP Appendices

- Appendix A  Contractor Selection Criteria
- Appendix B  Industry Codes, Practices and Standards
- Appendix C  References
- Appendix D  Definitions
- Appendix E  Performance Measures
SEMP: Performance-Based

- Not much detail, *e.g.*, Operating Procedures section has just 468 words
- Detail comes from company systems, publications, and industry references
- However, RP 75 does call out many prescriptive standards such as RP 14C
- API
  - Bull E2 Management of Naturally Occurring Radioactive Materials (NORM) in Oil and Gas Production
  - Publ 510 Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration
  - Publ 521 Guide for Pressure-Relieving and Depressuring Systems
  - Publ 2004 Inspection for Fire Protection
  - Publ 2007 Safe Maintenance Practices in Refineries
  - Publ 2015 Cleaning Petroleum Storage Tanks
  - Publ 2201 Procedures for Welding or Hot Tapping on Equipment Containing Flammables
  - Publ 2207 Preparing Tank Bottoms for Hot Work
  - Publ 2217A Guidelines for Work in Inert Confined Spaces in the Petroleum Industry
  - Publ 2510 Design and Construction of Liquefied Petroleum Gas (LPG) Installations
  - Publ 2510A Fire-Protection Considerations for the Design and Operation of Liquefied Petroleum Gas (LPG) Storage Facilities
  - RP 1107 Pipeline Maintenance Welding Practices
  - RP 2D Operation and Maintenance of Offshore Cranes
  - RP 4G Maintenance and Use of Drilling and Well Servicing Structures
Reference to Many Codes - 2

- **API**
  - RP 14C *Analysis, Design, Installation and Testing of Basic Surface Safety Systems on Offshore Production Platforms*
  - RP 14E *Design and Installation of Offshore Production Platform Piping Systems*
  - RP 14F *Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1, and Division 2 Locations*
  - RP 14FZ *Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Zone 0, Zone 1 and Zone 2 Locations*
  - RP 14G *Fire Prevention and Control on Open Type Offshore Production Platforms*
  - RP 14J *Design and Hazards Analysis for Offshore Production Facilities*
  - RP 49 *Drilling and Well Servicing Operations Involving Hydrogen Sulfide*
  - RP 53 *Blowout Prevention Equipment Systems for Drilling Wells*
  - RP 54 *Occupational Safety for Oil and Gas Well Drilling and Servicing Operations*
  - RP 55 *Oil and Gas Production and Gas Processing Plant Operations Involving Hydrogen Sulfide*
  - RP 59 *Well Control Operations*
  - RP 64 *Diverter Systems Equipment and Operations*
  - RP 70 *Security for Offshore Oil and Natural Gas Operations*
  - RP 70I *Security for Worldwide Offshore Oil and Natural Gas Operations*
## Timing of SEMS

<table>
<thead>
<tr>
<th>Size</th>
<th>Annual Production Rate</th>
<th>Number of Operators</th>
<th>Percentage with SEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>&gt; 10 MMBOE</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td>Moderate</td>
<td>1 MMBOE &lt; 10 MMBOE</td>
<td>41</td>
<td>71</td>
</tr>
<tr>
<td>Low</td>
<td>&lt; 1MMBOE</td>
<td>76</td>
<td>37</td>
</tr>
</tbody>
</table>
Precedents

- OSHA’s PSM (May 1992)
  - All at once
  - But: PHAs and P&IDs were five years
  - Effectively a five year deadline
- Chemical Safety Board Hearing (December 2010)
  - Safety Cases
  - Australia/UK five years
Expansion of SEMP

In addition, BOEMRE is highlighting certain requirements from API RP 75 and further describing those requirements in the regulatory text to clarify compliance requirements.
Additional SEMS Requirements

- MMS-131 requirement annually (March 31st 2011)
- Expansion of detail in the technical elements
- JSA
  - Task level (PHA is facility level)
  - The terms JSA and JHA are different; therefore, in this final rulemaking we will require only JSAs. We have defined JSA in the general comments section of the preamble.
5.1 GENERAL

The management program should include requirements for written facility operating procedures designed to enhance efficient, safe, and environmentally sound operations. Within a given company the designs of several offshore facilities may differ only in the size and/or number of equipment items present. Consequently, standard operating procedures may apply to multiple facilities. By their very nature, operating procedures directly address human factors issues associated with the interaction between facilities and personnel. The human factors associated with format, content, and intended use should be considered to minimize the likelihood of procedural error.

5.2 CONTENT OF OPERATING PROCEDURES

Written procedures should include the following:

a. The job title and reporting relationship of the person or persons responsible for each of the facility’s operating areas.
b. Instructions for the sound operation of each facility that are consistent with the safety and environmental information including, as appropriate: startup, normal operations, temporary operations, simultaneous operations, emergency shutdown and isolation, and normal shutdown.

1. Refer to API RP 14J, Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities (latest edition), for information on startup, normal operations, and shutdown of production facilities.
2. Refer to the MODU Operations Manual developed in conformance with flag State requirements and/or the IMO MODU Code for information on routine operations and operating limits on mobile offshore drilling units.

c. The operating limits resulting from the information specified in Section 2 and, where safety and environmental considerations are present, a description of the following:

1. The safety and environmental consequences of deviation outside the operating limit envelope.
2. The steps required to correct or avoid a deviation from the operating limits.
d. Environmental and occupational safety and health considerations, including the following:
   1. The special precautions required to prevent environmental damage and personnel exposure, including engineering controls and personal protective equipment.
   2. The control measures to be taken if physical contact or airborne exposure occurs.
   3. Any special or unique hazards.
   4. Continuous and periodic discharge of hydrocarbon materials, contaminants, or undesired by-products into the environment is restricted by governmental limitations. These discharge limitations represent the degree of effluent reduction attainable by application of the best practicable control technology. Written guidance should be provided for facility operating personnel and contractors governing the disposal of materials within terms of the applicable permits.
   5. Any lease or concession stipulations established by the recognized governmental authority.

5.3 PERIODIC REVIEW

When changes are made in facilities, operating procedures should be reviewed as part of the management of change procedure described in Section 4. In addition, operating procedures should be reviewed periodically to verify that they reflect current and actual operating practices. The frequency of the review should correspond to the degree of hazard presented. Review of and changes to the procedures should be documented and communicated to appropriate personnel.
(a) You must develop and implement written operating procedures that provide instructions for conducting safe and environmentally sound activities involved in each operation addressed in your SEMS program. These procedures must include the job title and reporting relationship of the person or persons responsible for each of the facility’s operating areas and address the following:

(1) Initial startup;
(2) Normal operations;
(3) All emergency operations (including but not limited to medical evacuations, weather-related evacuations and emergency shutdown operations);
(4) Normal shutdown;
(5) Startup following a turnaround, or after an emergency shutdown;
(6) Bypassing and flagging out-of-service equipment;
(7) Safety and environmental consequences of deviating from your equipment operating limits and steps required to correct or avoid this deviation;
(8) Properties of, and hazards presented by, the chemicals used in the operations;
(9) Precautions you will take to prevent the exposure of chemicals used in your operations to personnel and the environment. The precautions must include control technology, personal protective equipment, and measures to be taken if physical contact or airborne exposure occurs;
(10) Raw materials used in your operations and the quality control procedures you used in purchasing these raw materials;
(11) Control of hazardous chemical inventory; and
(12) Impacts to the human and marine environment identified through your hazards analysis.
Contractors

- Contractors subject to rule
  - MODUs
  - Contractors brought onto platforms for painting/cleaning, etc.
  - Contract operating companies
  - Individuals working directly under company rules

- Domestic service providers exempt

- Contractors not required to develop a SEMS, but must have policies and practices consistent with the operator’s SEMS.

- Bridging Documents may be utilized to manage operations.

- BOEMRE holds Operator responsible
Contractors: Contractor Responsibility

- Contractor must provide employee work hours and injury/illness information to Operator for annual report to BOEMRE
- Operator/contractor must document agreement on contractor practices before commencing work
- Operator must document contractor selection criteria
  - Evaluate safety and environmental performance
  - Ensure contractors have their own written safe work practices
- Operator must have procedures to verify contracted employees' knowledge, expertise and performance
Contractors: Operator Responsibility

- Conduct periodic performance evaluations
- Maintain contractor employee injury/illness log for 2 years for work in operation area
- Report injury/illness data to BOEMRE on annual basis
- Inform contractors of known hazards at facility they are working
- Implement safe work practices to control presence, entrance and exit of contract employees in operations area
Independent Third Party/Designated and Qualified Personnel Qualifications

- Qualifications
  - Previous education/experience with SEMS or similar programs
  - Technical capabilities of individual or organization
  - Ability to perform independent third-party functions for specific project
  - Previous experience with BOEMRE regulatory requirements and procedures
  - Education and experience to comprehend and evaluate company’s offshore activities and operations

- Must have procedures to avoid conflicts of interest

- Qualifications subject to BOEMRE evaluation and approval
Part 3. SEMS, PSM and Safety Cases

- Three “Tracks”
- Track 1: SEMP / SEMS
- Track 2: Process Safety Management (PSM)
- Track 3: Safety Cases
- Other Industries, e.g., U.S. Air Force
- Many similarities: all result in a Safety Management System
- Are basically non-prescriptive
- Safety cases often include quantitative risk assessment and ALARP
- Getting more similar
# Process Safety Management

## SEMP
1. Safety and Environmental Information
2. Hazards Analysis
3. Operating Procedures
4. Training
5. Pre-Startup Review
6. Assurance of Quality and Mechanical Integrity of Equipment
7. Safe Work Practices
8. Management of Change
9. Investigation of Incidents
10. Emergency Response and Control
11. Audit of Safety and Environmental Management Program Elements
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## PSM
1. Employee Participation
2. Process Safety Information
3. Process Hazards Analysis
4. Operating Procedures
5. Training
6. Contractors
7. Prestartup Safety Review
8. Mechanical Integrity
9. Hot Work
10. Management of Change
11. Incident Investigation
12. Emergency Planning and Response
13. Compliance Audits
14. Trade Secrets
More individual

Many, but not all, calculate risk quantitatively

Need a measure of acceptable risk, “ALARP”

Review and acceptance by the regulator

Driver for many companies is economics: “HSE Cases”
Part 4. Implementing a SEMS Program

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- What happens on 11/15?
- Current status of SEMP
- Companies’ own programs
- Setting priorities
- In all cases:
  - Have a plan
  - Base actions on risk ranking
  - Follow the plan
Larger Companies

- Have active Safety Management Systems
- May not align with SEMP/SEMS
- Some mapping is needed
- Gap analysis check

Own Program

SEMS
Intermediate Companies

- Conduct gap analysis
- May need to map existing programs
- If there are gaps, suggested approach:
  - Focus on the original four SEMS elements:
    - Mechanical Integrity
    - Operating Procedures
    - Hazards Analysis
    - Management of Change
Smaller Companies

1. Get the Information Base/P&IDs up to date
2. Ensure MOC is working
3. Conduct a Major Hazards Analysis
4. Organize HAZOPs according to risk rank
5. Based on results pick an area of focus (one or more of the twelve elements)
6. Fairly frequent audits/reviews
Conclusions

- SEMS is SEMP plus additional measures
- Timeline is very tight
- Many companies have a lot to do
- Much industry experience with technical elements