Optimizing Development Efforts for Safety Management Systems

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Topic Overview

- Management System Basics
- Setting the Stage for Pipeline SMS
- Introduction to SMS Elements
- Getting Started

“Where do we begin?”

“How can we do this efficiently?”
A Management System refers to:

- What an organization does
- To manage its processes and activities
- Meet the objectives the company has set
- So that its products and services
**Fundamental to Governing the Way you Work**

- A Management System is a systematic way to
  - Ensure compliance with laws and regulations, and with company and customer requirements
  - Effectively manage risks
  - Communicate with stakeholders
  - Ensure the effective operation of key processes
  - Drive continual improvement of performance

*for effective Business Management*
Common Industry Challenges

- Gain better understanding of risk exposures and risk management in general
- Use experience, data, and learning from internal and external incidents
- Clearly define responsibilities and accountabilities
- Implement and maintain effective assurance processes
- Retain knowledge and capability
- Develop and maintain an effective management system

- Many ways to begin
  - “What do we already have?”
  - “What are our biggest problems?”
Setting the Stage for Pipeline Safety Management Systems
The Need for a Change

1937 – New London, TX 298 Fatalities
1967 - NTSB
1992 – Integrity Mgt. Regs
1993/4 – Edison, NJ & Reston, VA
1999 – Bellingham, WA
2000 – Carlsbad, NM
2002 – Pipeline Safety Improvement Act
2010 – Marshall, MI & San Bruno, CA
2011 – Allentown, PA & Laurel, MT
2012 – Springfield, MA
2015 – Refugio Beach, CA
2016
Why are we doing this in the first place?

NTSB Recommendations to API (Following Marshall, MI incident)

- Elevate SMSs Most Wanted List - Continuously identify, address, and monitor threats to safety operations:
  - Address issues **before they become incidents/accidents**
  - Treat human errors as system deficiencies, **not as reasons to punish/intimidate**
  - Require **management to commit** to operational safety
  - Continuously **identify and address risks**
  - Provide **safety assurance**
**SMS Scope**

**Broader than Integrity, Not the Same as Personal Safety**

- **Ensure** assets are designed and operated safely. SMSs **focus on major** events such as fires, explosions and the release of hazardous substances.

- When compared to Occupational Safety:
  - Not as intuitive – most people **lack personal experience**
  - Need **more robust analysis** tools to identify hazards
  - The unacceptable consequences need more reliable controls
  - Incidents can be massive and have **lasting impacts**
Jeff Wiese – View from the top

- A new pipeline rule can take three or more years, so PHMSA is looking to other avenues to persuade the industry to voluntarily improve its safety operations.
  - "We'll be trying to socialize these concepts long before we get to regulations."
- How to “Socialize” API RP 1173?
  - “Make good business sense”
  - “Pays for itself”
  - “Proven in other Industries”
  - Not mandatory (Like API RP 75) but will be used to evaluate incidents
The Goal of RP 1173: Improved Safety

- Key components:
  - Focus on top management
  - Processes to reveal and mitigate safety threats
  - Continuously improve
  - Make compliance and risk reduction routine
  - Expand on Safety Culture
  - Overarching set of ideals
Optimizing PSMS Efforts
Achieving exceptional safety performance, requires a holistic, seamlessly integrated approach.

Integrated Safety Management

Advising & Protecting
Assessing & Designing
Mobilizing & Engaging
What documentation already exists to support the SMS elements?

- Risk Management Program
- HSE and Operational Safety manuals and materials
- IMP/FIMP
- Process safety management (PSM)
- Emergency response plans
- Equipment files/equipment criticality information
- Inspection and maintenance reports, procedures, plans and schedules
- Operational history
- Operating procedures
- Training materials
- Incident investigation process/reports
- MOCs
- Start up reviews
- Organizational charts, job duties and responsibilities

It is important to know what is written vs. what is expected vs. what is interpreted in the field before moving forward.
Evaluate the Current State – Visit the Field

- Identify existing good practices and opportunities for improvement
  - Make it a conversation, not an audit
    - Ask Why...? Why not...? and How do we...?
    - What does safety mean to you?
  - Interviews
    - Positive practices
    - Opportunities for improvement
    - Initiatives that have been effective? Ineffective? Why?
  - Discussions
    - Field implementation of policies and procedures
    - Learning from experiences and industry events
    - Communication of elements
Management System Structure With Stakeholder Inputs

Policy
Procedures, work instructions, tools, software and data, communications
Processes
People
Plans
Framework

With Stakeholder Inputs

Contractors
Regulation
Stakeholders
Environment
Goals for your Assessments

- Options to strengthen operational safety culture
- Build upon existing programs, processes, and strengths
- Compare safety programs to other companies and industry practices
- Understand how the company learns from experiences and industry events
- Secure engagement across the organization
- Prepare for anticipated regulatory and industry changes
Suggested Starting Points
Leadership & Management Commitment Element - Requirements

- New emphasis on the **check** phase through Safety Assurance
- More detail and deeper understanding in measurement/KPIs on risk management
- **Maturity Model** to set specific goals in areas of concern and checks actual progress against targets
- **Requires assessment of safety culture**
Leadership & Management Commitment Element - Suggestions

- Begin with this element
  - Should set the tone for the SMS
    - Formal PSMS policy
  - Need a strong, demonstrated commitment from leadership
    - Ensure leaders understand threats to the success
  - Need to understand maturity and pipeline safety culture
  - Ensure clear responsibilities, accountabilities and authorities
  - Put in place long-term strategic objectives with at least a 3-year horizon
Evaluation of PSMS Maturity

1173 Requirements
- “Pipeline operator shall establish a method to evaluate the growth and development of its PSMS”
  - Comprehensively applied?
  - Systematically applied?
  - Integrated throughout the organization?

Suggestions
- Look at each element thoughtfully
  - Are associated processes & procedures fully documented or are there undocumented practices that need to be formalized?
  - Is there a thorough review process for processes & procedures?
  - Are the elements properly linked to one another?
Evaluating Pipeline Safety Culture

What is Pipeline Safety Culture?

- Culture: “The collective set of attitudes, values, norms, and beliefs that the operator’s employees and contractor personnel share with respect to risk and safety”

- Often difficult to evaluate pipeline safety culture (or major accident safety culture)

Suggestions

- Measure aspects of pipeline safety culture, such as the following:
  - Effectiveness of PSMS on the culture
  - Culture survey: Perception of what pipeline safety is and how it affects individuals or groups
    - How is information communicated?
    - Who takes the lead on identifying hazards and risks?
    - What is the understanding of the risks faced in the operation?
**Stakeholder Engagement – Requirements**

- Identify *internal and external* stakeholders
- Identify *specific objectives* & define communication responsibilities
- Identify the types of information and how it is valuable
- Maintain a process and a *plan for communication* and engagement with internal and external stakeholders:
  - Risk identification and management
  - Safety performance
  - Other elements
Stakeholder Engagement - Suggestion

Facility Risk Register
- Locally managed dynamic list
- Assigned owner/facilitator
- Weekly reviews, communication to Area Mgr
- Risk scores (generally) 1-7
- Accountable: Facility management team

Business Unit Risk Register
- Reviewed Monthly by BU Lead
- Contents:
  - Risks from Facility HRRs with score 6 and above
  - Common facility risks
  - BU-level risks identified through studies / projects
- Accountable: Business Unit Leader

Corporate Hazard and Risk Register
- Reviewed Quarterly by Leadership
- Contents:
  - Risks from Business Unit HRRs with scores <8
  - Common facility risks
  - High Consequence/Low Probability company-wide risks
- Mitigated through company-wide policies or Major Projects
- Accountable: CEO

Support:
- Corporate Risk Group

Submit Facility HRR quarterly
Provide Technical Support

Feedback
Risk Management - Requirements

- Risk Management is more than Risk Assessment
- 1173 builds on the risk management fundamentals in integrity management – “Know your system and recognize potential threats”

- Maintain (a) procedure(s) for the performance of risk management
- Maintain a description of the assets to identify threats to pipeline safety.
  - Asset register – the first step in risk analysis
- Analyze risk considering the threat occurrence likelihood and consequence throughout the lifecycle
- Evaluate risk and make decisions on how to manage it through preventive controls, monitoring, and mitigation measures.
Risk Management – ISO 31000 Process and API 1173

- Communication and Consultation / Establish the Context
- Data Gathering and Quality
- Risk Identification and Assessment
- Risk Prevention and Mitigation
- Risk Treatment
- Monitor and Review
- Periodic Analysis
- Analysis Report
- Recording the Risk Management Process
Risk Management - Suggestion

Develop asset register → Identify hazards, threats, and failure modes → Use appropriate RA methodology

Maintain register of risks and controls → Determine risk benefit with additional controls → Evergreen
Operating Procedures – Requirements

- **Content**
  - “...maintain procedures that address operations for facilities to provide what is done for the safe operation of each facility consistent with the pipeline operator’s safety policy and objectives.”

- **Completion**
  - Shall be in place for new and modified facilities prior to startup

- **Review**
  - Ensure procedures reflect current operating practices and lessons learned
  - Frequency of review based on the levels of risk identified (no less than annual)
  - Document changes to procedures
  - Manage procedural changes
Operating Procedures – Suggestions

1. Start with the procedure review process
   - How often is it done? Always? Everywhere?
   - Personnel from other regions, assets, etc. as a second eye?
   - New/second reviewer to ensure the same person does not review each year (e.g., fresh set of eyes and “devil’s advocate”)?
   - Natural knowledge-sharing and sharing of best practices?
   - Utilization of unique backgrounds (e.g., teaching training, statistics)?
Operating Procedures – Suggestions

2. Determine if procedures state **consequences of deviation**
   - NOT consequences (punishment) for deviating
   - IS what happens to the equipment, facility, or mainline if the procedure is not done as intended

3. Safe operating limits & **actions to return to safe operation** stated in procedures?

4. Procedures to authorize if critical controls or processes are **bypassed or inhibited**?
   - Temporary changes via MOC
   - Are the roles that can provide authorization clearly stated?
System Integrity – Integration

1. QMS
   - Quality control procedures & processes - materials and construction in accordance with specifications
   - Inspection procedures – conformance with specifications and the manufacturer’s instructions prior to startup

2. IMP/FIMP
   - Maintenance, Inspection & Testing procedures

3. Documented handover process from Projects to Operations?

4. After-action reviews at the conclusion of projects?
   - Continual improvement opportunities

GOAL: Transition from looking at historical problems (failures, breakdowns, reliability issues, etc.) to looking at things that could fail (using the people in the field to improve preventive and predictive maintenance).
1. Strive for “mistake-proof” design
   - Consider human factors
   - Evaluate hazards at early stage

2. Incorporate SMS principles into Execution Plan
   - Include risk assessments
   - Track actions
   - Conduct design reviews
   - Ensure QA/QC activities are conducted

3. Use PM process w/SMS elements
   - All phases of project development
   - Select correct design conditions
   - Manage changes during project

   - Inherently safer design: eliminate/minimize risks
   - Use simple, reliable passive controls wherever possible
System Integrity – Suggestions

1. Equipment integrity programs - prevent or provide **early prediction of deficiencies**
   - Retain and analyze a complete, progressive history of SMS activities and repairs
2. Identify possible deterioration & failure modes
   - Use root cause analysis
3. Analyze MIT results for early indication of malfunction/deterioration
4. Promptly address equipment deficiencies/ anomalies
5. Conduct assessments to **determine needs for special emphasis programs**
6. Utilize the data and information in CMMS
Management of Change – Requirements

- **Identify the potential risks associated with the changes** and any required approvals prior to the introduction of such changes
  - Permanent and **temporary**
    - **Technical**
    - Physical
    - Procedural
    - **Organizational**

- Remember: Even when making changes for safety or efficiency, there are new or different risks!
MOC – Suggestions

Applying MOC

1. New, modified & relocated equipment? Changes to safe operating limits? Changes & updates to technology?
2. Temporary changes (e.g., “workarounds,” temporary equipment, settings)?
3. Risk analysis?
   - Changes to operating and maintenance procedures?
   - What-if walk through
4. Formal pre-start up reviews to verify readiness?
5. Organizational MOCs?
Incident Investigation, Evaluation & Lessons Learned - Requirements

- Maintain a procedure for investigating incidents and near misses that led to, or could have led to, a loss of life or serious injury.
- Initiate investigations promptly
- Follow-up and communicate findings and lessons learned
  - Document the responses to each
- Ensure actions are tracked to completion
- Share lessons internally and externally
- Maintain records of investigations
- Re-evaluate past events and learn from them
Common Industry Challenges

- Hesitancy to report minor incidents and near misses
  - Fear of the process and of discipline
- Inadequate definitions of incident and near miss
- Tendency to find human error as the root cause of an incident
  - This is improving in many companies, but there is still improvement to be made
- Barriers are not formally evaluated during investigations
Incident Investigation – Suggestions

- Transparent, consistent
- Root causes
- Near misses
- Positive practices
- 6 What-ifs
- Timelines
- Metallurgical & technical analysis
- Communicate

Incident Investigation

Pre-Investigation

- Initial Report of Incident
- Evaluation of Incident Potential
- Initiate Investigation

Evidence Gathering

Timeline Creation

Event Identification

Barrier Identification

Barrier Analysis

Causal Analysis

Reporting

Hypothesizing

Post-Investigation

Action Development & Allocation

Action Tracking

LFE & Sharing Lessons

Link back to Risk Assessment

Event Identification

Initial Report of Incident

Evaluation of Incident Potential

Initiate Investigation

Evidence Gathering

Timeline Creation

Event Identification

Barrier Identification

Barrier Analysis

Causal Analysis

Reporting

Hypothesizing

Action Development & Allocation

Action Tracking

LFE & Sharing Lessons

Link back to Risk Assessment
Follow-up and Lessons Learned – Suggestions

- Remember incidents are risks that may or may not have been known previously
  - An investigation is a risk assessment in reverse
  - Add/modify risk register(s)
  - Determine susceptibility of other assets to the same/similar risk
  - Ensure results can be used as inputs to risk assessments
- Monitor effectiveness of implemented actions
Learning from Past Events and External Events

**Past Events**

- Go back to previous events and near misses
  - Identify new learnings and opportunities for more improvement
  - Determine if the changes that were made have been effective or if other actions are required
  - Determine how effective the communication and lessons were

**External Events**

- “Learn from others’ mistakes. You can’t live long enough to make them all yourself.” (Eleanor Roosevelt)
- Ensure a process is in place to learn from industry events and from relevant incidents in other industries
Safety Assurance – Requirements

- Safety Assurance is closely linked to Management Review & Continuous Improvement
- The pipeline operator shall demonstrate the proper application of its PSMS and progress toward effective risk management and improved pipeline safety performance.

- Substantial sub-elements:
  - Audit
  - Evaluation
  - Employee Reporting and Feedback
  - Analysis of Data
  - Performance Evaluation
  - Evaluation of Safety Culture
  - Evaluation of Maturity
Audits – Suggestions

- Prioritize (risk based) audit findings and actions to address identified performance gaps
- Ensure audit actions are SMART and maintained in an established action register
- Audit contractor activities and contracting organizations having SMS impact
- Ensure audits are led by trained auditors who are independent of the asset or business unit being audited.
  – Also facilitates exchange of learnings
Management Review & Continuous Improvement – Requirements

- Answer the following questions:
  - Effective, working as intended, and in line with regulatory requirements and good industry practice
  - Meeting performance objectives
    - Tracking appropriate KPIs?
    - Using KPIs for risk-based decisions
  - Comprehensive system & processes
  - Adequate practices, procedures, and processes
  - Legal issues to be resolved
  - Adequate training
  - Conformance to internal PSMS requirements
  - Opportunities to improve the process
  - How do we measure up to the rest of the industry (benchmark)?
Management Review & Continuous Improvement – Requirements

- Review PSMS and performance at least **annually**
- Evaluate **risk management effectiveness** and foster improvement from the PSMS
- Use results, data analysis and management review to identify corrective and preventive actions
- Periodically evaluate new technology that may enhance pipeline safety
Management Review & Continuous Improvement – Suggestions

1. Use management reviews along with audit results, learning from events and SMS activities to drive continual improvement.

2. Establish SMS leading and lagging measures to provide a measure of how well the SMS objectives are being met
   – Evaluate adherence to the process and effectiveness of the process

3. Ensure the KPIs and other measures are periodically reviewed by management for trends

4. Analyze industry events and trends to identify improvement areas for the SMS *
   *Also important for the incident investigation element

5. Benchmark the SMS against industry peers to augment the management review program and stimulate new ideas for more effective management of the SMS
Find your Focus

- Begin by agreeing and documenting your company’s SMS Strategy and Policy
- Develop buzz and gain involvement of all personnel
- Provide field-level ownership to improve Operational/Process safety culture
- Develop a reasonable plan for SMS implementation
- Determine what software and/or tools will be required to support implementation
- Early in the process, determine the methods for data collection, management and trending
- Focus on continuous improvement of existing processes and programs
Prioritize Next Steps

- Prioritize what to build and improve first
  - Incident investigation is a good place to start
- Pick some low-hanging fruit
  - Fine tune existing processes that are close to the desired state
  - Document processes that are done informally
  - Add guidance to processes to ensure they are clear and well-understood
  - If MOC has been started as part of Control Room Management, it can be expanded relatively easily