American Gas Association
Pipeline Safety Management Systems Workshop
API RP 1173 Development Perspectives
March 1, 2016
What is a Safety Management System?

Framework of goals, objectives, processes, and procedures -- applied by people, enabled by technology -- ensures organization can fulfill the tasks required to achieve safety and business success.

Enables people to execute tasks using risk management, established controls, assessment and continuous improvement to meet safety and business objectives.

Built on processes providing more discipline in use of data and other information for better decision making.

It is a journey, not a project
What Role Did the NTSB Play in the API Standard Development?

• U.S. National Transportation Safety Board (NTSB) review of past pipeline incidents and safety practices found that adoption of safety management systems would help operators improve their safety and organizational performance.

• In 2012, NTSB recommended the American Petroleum Institute lead a multi-stakeholder process to develop and adopt a pipeline specific industry-wide safety management system standard.

• Industry Commissioned a Work Team to develop API RP 1173.
What these accidents have in common:

- **Multiple contributing causes**
- Involve **people at numerous levels** within an system organization
- Pervasive **lack of measures to ensure** a positive safety culture
- **Catastrophic events**, often involving substantial loss of life, and/or significant damage to property.
- **Require complex organizational changes** to avoid them.
NTSB: Indicators of Organizational Failure

- Lack of top-level management commitment
- **Conflicts** between production and safety goals
- Poor planning, communications, monitoring, control or supervision
- Organizational deficiencies leading to blurred safety and administrative responsibilities
- Deficiencies in training
- Poor maintenance management or control
- **Oversight failures** by regulatory or safety agencies
Significant Improvements Offered By RP 1173

1. Leadership and Management Commitment

1. Stakeholder Engagement

1. Role of Safety Culture

2. Maturity Models

3. Management Reviews

1. Bibliography
Key Provisions

• “What, . . . Not How”
• Fostering a learning environment
  ▪ Other industries
  ▪ Among peers
• Non-punitive reporting
• Use of contractors
• Audits and evaluations
• Performance metrics
• Stop work authority
• Scale – “I am a small operator . . .”
Why SMS is the Right Thing to Do

• Pipeline operators no matter their size can benefit:

  - A PSMS will bring a more regular, formal structure to those already applying many of the PSMS elements

  - Operators with an SMS will be able to identify gaps and make improvements

  - Those new to SMS will benefit from a structured approach to track, measure, and improve their safety programs and performance

  - Decreases risk - organizational compliance risk
API 1173 Timeline

• Dec 2012 - API worked with trades to form work group
• Jan thru Dec 2013 – monthly meetings of Work Group
• Feb 2014 – PHMSA Workshop and draft of 1173 issued for public comment
• Monthly 2014 - Work Group met monthly
• July 2014 – PHMSA Workshop and draft of 1173 issued for public comment (official ballot)
• Oct 2014 – Comment period closed; work group resolved comments
• Early 2015 – Re-ballot
• July 2015 – Publication of API RP 1173
PSMS Development Committee Members

- Ron McClain, Kinder Morgan, Chair
- Mark Hereth, P-PIC, Content Editor
- Scott Collier, Buckeye Partners
- Tom Jensen, Explorer Pipeline
- Paul Eberth, Enbridge Pipelines
- Mark Weesner, Exxon Mobil
- Brianne Metzger-Doran, Spectra Energy
- Tracey Scott, Alliance Pipeline
- William Moody, Southwest Gas
- Nick Stavropoulos, Pacific Gas and Electric
- Steve Prue, Small Gas Distribution
- Bill Hoyle, Public – Subject Matter Expert
- Stacey Gerard, Public – Subject Matter Expert
- Jeff Wiese, PHMSA
- Linda Daugherty, PHMSA
- Robert Miller, AZ Corporation Commission
- Massoud Tahamtani, VA State Corporation Commission
- Bob Beaton, NTSB (Ex Officio)
- John Erickson, APGA
- Kate Miller, AGA
- Scott Currier, INGAA
- Peter Lidiak, API
- John Stoody, AOPL
- Edmund Baniak, API
How Have Other Industries Approached SMS?

Must It Be Ten Elements?

And How Do We Know This Will Improve Safety?
API 1173 Team Learned By Studying Other High Risk Industries Where Failure is Intolerable

• Commercial aviation, petrochemicals, petroleum refining, nuclear power and medical, are using SMS and adhere to standards to improve their safety performance.

• Their results really impressed the work group
U.S. and Canadian Operators Accident Rates by Year

Annual fatal accident rate (per million departures)

Year

1993 Through 2012

Rest of the world
U.S. & Canadian Operators
Experience From Petrochemicals

P Petrochemical Losses in Five Year Periods

Many Standard Platforms Already Exist…..

• Industry Standards already in publication
  ▪ API RP 75 – MS for Offshore Operations and Facilities
  ▪ API RP 750 – Management of Process Hazards
  ▪ ANSI Z10-2012 Standard on Occupational Health and Safety Management
  ▪ CSA-Z662-11 – Section 3.1- Management Systems
  ▪ API 1173

• Implemented Corporate Systems for Consideration
  ▪ Marathon – Responsible Care Management System
  ▪ Exxon Mobil – OIMS
  ▪ Kinder Morgan – Operations Management System
  ▪ Chevron – Operational Excellence Management System
  ▪ DuPont – Excellence in Safety
## Comparison of SMS Elements

### Table 1: Comparison of Various Management System Standards

<table>
<thead>
<tr>
<th>Management System Elements</th>
<th>Regulatory Requirements / Consensus Standards</th>
<th>International Standards</th>
<th>Industry Standards</th>
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<tbody>
<tr>
<td>1.0 Management commitment</td>
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<tr>
<td>2.0 Management Review</td>
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<td>3.0 Stakeholder engagement</td>
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<td>x</td>
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<td>4.0 Responsibility, accountability and authority (applied to each process)</td>
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<td>x</td>
<td>x</td>
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<td>5.0 Risk management</td>
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<td>6.0 Safety culture</td>
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<td>7.0 Work force planning, training, development and qualification</td>
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<td>8.0 Engineering and construction</td>
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<td>9.0 Learning culture and continuous improvement</td>
<td>o</td>
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<td>10.0 Management of change</td>
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## Comparison of SMS Elements (Continued)

<table>
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<th>Management System Elements</th>
<th>Regulatory Requirements / Consensus Standards</th>
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<td></td>
<td>ASME B31.8S-2010</td>
<td>ISO 14001:2004</td>
<td>API RP 75</td>
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<td>FAA</td>
<td>BS OHSAS 18001:2007</td>
<td>ExxonMobil OIMS</td>
</tr>
</tbody>
</table>

| 11.0 Quality assurance and quality control | X | X | X | X | X | X | X |
| 12.0 Performance measurement | X | X | X | X | X | X | X |
| 13.0 Incident investigation and lessons learned | X | X | X | X | X | X | X |
| 14.0 Emergency preparedness and response | X | X | X | X | X | X | X |
| 15.0 Documentation and records management | X | X | X | X | X | X | X |

**Legend:**
- X = the element is covered explicitly in the compared standard.
- O = the element is partially covered in the compared standard, but is not explicitly or completely addressed.
- Blank = the element is not addressed in the compared standard.

Source: *The Role of Management Systems in Achieving our Goal of Zero Incidents, INGAA, October 2012*
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<tr>
<td><strong>Leadership and Management Commitment</strong></td>
<td>AM Policy (4.2), AM Strategy, Objectives and Plans (4.3), Structure Authority and Responsibility (4.4.1)</td>
<td>Management Commitment Policies and Principles</td>
<td>Management Responsibility Financial Resources</td>
<td>General (Leadership and Commitment)</td>
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<td><strong>Operational Controls</strong></td>
<td>Legal and Other Requirements (4.4.8) Management of Change (4.4.9)</td>
<td>Procedures and Performance Standards Management of Change Contractor Safety Management Pre-Start Up Review Mechanical Integrity</td>
<td>Operational Control Management of Change</td>
<td>Operating Procedures Management of Change Assurance of Quality and Mechanical Integrity</td>
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<td><strong>Incident Investigation, Evaluation and Lessons Learned</strong></td>
<td>Investigation of asset-related failures, incidents and nonconformities (4.6.2)</td>
<td>Incident Investigation</td>
<td>Incident Investigation (under O&amp;M, under Operational Control)</td>
<td>Investigation of Process-Related Incidents</td>
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<td><strong>Performance Plan</strong></td>
<td>Performance and Condition Monitoring (4.6.1); Evaluation of Compliance (4.6.3); Audit (4.6.4); Improvement Actions (4.6.5); Management Review (4.7)</td>
<td>Observations and Audits Quality Assurance</td>
<td>Continual Improvement Management Review (under Management Responsibility)</td>
<td>Audit of Process Hazards Management Systems</td>
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<td>QA/QC, Continuous Improvement, Performance Measures Audits, Feedback Into Management Review</td>
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<td><strong>Training, Qualification and Development</strong></td>
<td>Training, Awareness and Competence (4.4.3); Outsourcing (4.4.2)</td>
<td>Training and Development Motivation and Awareness</td>
<td>Resource Management (People and Budget)</td>
<td>Training Safe Work Practices</td>
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<td>Contingency Planning (4.3.4)</td>
<td>Emergency Preparedness and Contingency Planning</td>
<td>Emergency Preparedness and Response (Under Operational Control)</td>
<td>Emergency Response and Control</td>
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<td><strong>Documentation and Recordkeeping</strong></td>
<td>AM Documentation (4.4.5) Information Management (4.4.6) Records (4.6.6)</td>
<td>Process Safety Information</td>
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<td><strong>Stakeholder Engagement</strong></td>
<td>Communication, Participation and Consultation (4.4.4)</td>
<td>Effective Communication</td>
<td>Communications w/1 Mgt. Responsibility</td>
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Exxon Mobil – Operations Integrity Management System (OIMS)

“operations”
1. Management Leadership, Commitment and Accountability
2. Risk Assessment and Management
3. Facilities Design and Construction
4. Information/Documentation
5. Personnel and Training
6. Operations and Maintenance
7. Management of Change
8. Third-Party Services
9. Incident Investigation and Analysis
10. Community Awareness and Emergency Preparedness
11. Operations Integrity Assessment and Improvement
1. Leadership and Culture
2. Accountability
3. Knowledge, Expertise and Training
4. Understand and Prioritize Process Safety Risks
5. Comprehensive Process Safety Management System
6. Information Sharing
7. Monitor and Improve Performance
Risk Management
- Personnel
- Facilities
- Technology

Culture
- Leadership
- Organization
- Processes & Actions

DuPont Sustainable Solutions
Chevron
Operational Excellence
Management System

- Leadership Accountability
- Management System Process
- OE Expectations
One Operator’s Perspective: Spectra Energy Operations Performance Assurance

**Operations Performance Assurance (OPA) is designed to support systemic management of operations risk and support answers to these questions...**

- **What are our prioritized risks?**
  ... regarding asset integrity and reliability, compliance, personal safety and environmental performance

- **What are our operational controls?**
  ... that manage the risk to achieving our objectives for asset integrity and EHS and deliver compliance with internal and external requirements

- **How do we monitor our controls?**
  ... through audits and performance metrics to assess if controls are working as intended

- **How does management review and improve operations management processes?**
  ... through periodic management reviews and continuous improvement action plans

... using this framework, which is based on the Plan, Do, Check, Act cycle

**ELEMENT 1.** Establish operational expectations, implement and maintain systematic management processes

**ELEMENT 2.** Identify internal and external compliance requirements

**ELEMENT 3.** Identify, assess and prioritize operational risks

**ELEMENT 4.** Document and implement the operational controls needed to manage risk and achieve objectives

**ELEMENT 5.** Monitor the performance of operational controls through performance indicators, self assessments and incident reviews

**ELEMENT 6.** Carry out management reviews to identify gaps and continuously improve

API Pipeline Conference | April 2013
Formalizing a standard for Leadership and Management Commitment

Advancing the requirements for Risk Management

Adding new requirement for safety assurance – focusing on the “check and act” in Plan, Do Check, Act model (PDCA)

- independent audit and evaluation of performance;
- review and closure; reporting and feedback system

Raising priority on Stakeholder Engagement to help reduce risk

Strengthening requirements for Management Review
Essential Safety Management System Elements

- Leadership and Management Commitment
- Stakeholder Engagement
- Risk Management
- Operational Controls
- Incident Investigation, Evaluation, and Lessons Learned
- Safety Assurance
- Management Review and Continuous Improvement
- Emergency Preparedness and Response
- Competence, Awareness, and Training
- Documentation and Record Keeping
• PAS 55 – Asset management system
• Environmental management systems
• Nuclear operations - INPO
• OSHA Process safety management – operated gas plants and chemical plants – [CCPS]
• NEB Management System and Protection System

• All members can build from:
  ▪ Elements developed and matured during the first 12 years of Integrity Management
  ▪ AGA Safety Culture Statement
  ▪ AGA Lessons Learned Case Studies
Model for a High Level Self Assessment

Building Upon Existing Programs
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<th>TIMP</th>
<th>DIMP Public Awareness</th>
<th>Trans O&amp;M</th>
<th>Dist O&amp;M</th>
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Plan, Do, Check, Act - The Core of the Standard...

Continuous Improvement is the Goal
Starting the Journey

What other management systems do you have? And how will they be connected?

For example:
- IMP
- Environmental
- Quality Management

What is the scope of your system?
- Just pipeline operations?
- Design and construction?
- Other assets?

How integrated do you want to be?
- Each business unit with its own MS?
- One central system?

What resources do you need to support?

Implementing a Management System does not mean starting over; rather, build on existing programs to move to the next level of safety performance.
The Key:
Have a Plan in Mind: “Building a House…”

Needs, wants, future...

Future Use; Design, Construction Standards, Code, Budget...

Foundational Principles

Solid Frame built to the Standard and the Foundation

Moving in and Adapting (Remodel to a New Standard)

Interior Design and Material for Standard Function

Exterior Material designed for the Business/Environmental Standard
Challenges

• Top management commitment and participation
• Spans broad swaths across organization
• Organizational commitment
• Letting the Perfect Be The Enemy of Good
• Process owner accountability
• Process documentation
• Staffing – “Not My Day Job!”
• Pace – Not too fast and not too slow – organizational capacity
Critical Success Factors

- Intentional
- Iterative
- Safety Culture
- A Long View
- Organizational Capacity
PSMS Maturity
The DuPont Bradley Curve

Compliance

Injury Rates

Natural Instincts

Supervision

Self

Teams

Compliance and Choice

Reactive
- Safety by natural instinct
- Compliance is the goal
- Delegated to safety manager
- Lack of management involvement

Dependent
- Management commitment
- Condition of employment
- Fear/Discipline
- Rules/Procedures
- Supervisor control, emphasis and goals
- Training

Independent
- Personal knowledge, commitment & standards
- Internalization
- Personal value
- Care for self
- Practice & habits
- Individual recognition

Interdependent
- Help others Conform
- Being other’s keeper
- Networking contributor
- Care for others
- Organizational Pride

DuPont Sustainable Solutions
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### Example Maturity Models

**Based on NEB Audit Protocol**

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<tr>
<th>MANAGEMENT SYSTEM ELEMENTS</th>
<th>Implemented</th>
<th>Systematic</th>
<th>Integrated</th>
<th>Comprehensive</th>
<th>Documented</th>
<th>Measured</th>
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<tr>
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<td>1.1 Policy and Commitment Statements</td>
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<td>2 Planning</td>
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<td>2.3 Goals, Targets and Objectives</td>
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<td>3.5 Documentation and Document Control</td>
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**Based on INGAA work**

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<th>Management System Elements</th>
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<td>I MANAGEMENT COMMITMENT</td>
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<td>a. Management commitment (e.g., policy, objectives, communication, advocacy)</td>
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<td>c. Stakeholder engagement</td>
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<td>d. Responsibility, accountability and authority (applied to each process)</td>
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<td>a. Work force planning, training, development and qualification</td>
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<td>b. Engineering and construction</td>
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<td>c. Incident investigation and lessons learned</td>
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<td>d. Emergency preparedness and response</td>
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<td>b. Quality assurance and quality control</td>
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Using Maturity Models to Assess Current State and Plan Areas of Focus

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A View of the Journey
Responsible Care®: 25 Years of Continuous Improvement

1985: Originates in Canada
1988: US Program Launch
1993: First Strategic Review: Peer review element introduced
2003: Second Strategic Review: Third-party certification and mandatory performance reporting
2009: DHS Recognizes Security Code
2013: +BEYOND: Defining the Future: New Product & Process Safety Codes; focus on energy efficiency/recycling

Source: American Chemistry Council
The Key…A Strong Safety Culture…

…What is the role of a strong safety culture in a successful Safety Management System?…….
“The collective set of attitudes, values, norms, beliefs and practices that the operator’s employees and contractor personnel share with respect to risk and safety”

“It is the glue”
Strong Safety Culture and Management Systems Are Both Needed

One Company’s View on How Culture and Systems Fit Together

Organizational Culture
- Ensure safety
- Execute work in compliance
- Improve reliability
- Manage risk
- Measure and continuously improve performance

Core Values
- Systems Thinking for Operational Excellence

Behavioral Norms
- Safe, reliable, and compliant operations programs that increase the long-term value of the company.

Management Systems
- Systems Thinking for Operational Excellence
- Integrates all dimensions of operations performance to achieve objectives

Operating Outcomes
- Explicit structure and processes
- Fostered by leaders

Operating Norms
- Accepted processes
- Learned through training, mentoring, practice
- Monitored by leaders

Plan
Act
Check
Do
SMS Elements Produce Safety
SMS Elements Result in Culture

- Leadership
- Stakeholder Engagement
- Risk Management
- Incident Investigation
- Safety Assurance
- Emergency Preparedness
- Vision, confidence, resolve
- Comprehensive commitment/partnership
- Employees connect to “Guardian” duty
- Insistence on learning
- Rigor, culture of trust
- Situational Awareness, resiliency & realism
Evaluation of Safety Culture

• Perception
  ▪ Questionnaires (surveys)
  ▪ Interviews
  ▪ Focus groups

• Effectiveness of Safety Culture Foundation
  ▪ Observations
  ▪ Audits
Indicators of a Positive Safety Culture

- Embraces safety (personnel, public and asset) as core value,
- Ensures everyone understands the operator’s safety goals,
- Fosters systematic consideration of risk, including what can go wrong,
- Allocates adequate resources to PSMS execution,
- Encourages employee and contractors engagement and ownership,
- Promotes a questioning and learning environment,
- Continuous vigilance and mindfulness
- Fosters mutual trust at all levels, with open and honest communication,
- Reinforces positive behaviors and why they are important,
- Encourages two-way conversations about learning and applying lessons learned.
- Encourages non-punitive reporting and ensures timely response to issues.
Leadership and Management Commitment
Leadership and Management Commitment

Leadership

- Top Management
- Management
- Recognized Leaders
Use of Contractors

- Communicating requirements of the PSMS
- Defining RAA for managing the outsourced activities
- Incorporating work and findings
- Training and orientation on safety policies
- Evaluating contractor safety performance
- Communicating risks at the work sites, and
- Communicating the MOC procedure.
Management Review and Continuous Improvement

The pipeline operator’s PSMS and safety performance shall be reviewed at least annually by top management to evaluate whether the performance goals and objectives have been met.
Management Review and Continuous Improvement

- Management review ensures the connection with top management
- Inputs are work products of PSMS elements
- Continuous improvement is an important theme
- At least annually
- Yields a summary of effectiveness and opportunities to continuously improve
- The RP explicitly addresses the need to evaluate technology improvements
Performance Measurement
Performance Measures

Integrity Program Example

Goal: Reduce Incidents to Zero
Measure focus: Outcomes and Program Maturity

Goal: Reduce Risk with IMP
Measure focus: PSMS Program Performance and Maturity of Management System Elements

Goal: Continuously Improve
Measure focus: Integrity Improvement initiatives intended to improve performance or maturity

Tier 1 Measures
• # program related incidents/ injuries/ fatalities

Tier 2 Measures
• # near term repairs identified
• # conditions being monitored

Tier 3 Measures
• # program/ process improvement initiatives planned
• # program/ process improvement initiatives completed
Performance Measures
Safety Management System Example

Tier 1:
Aggregate Outcomes

Tier 2:
Aggregate Risk Reduced

Goal: Continuously Improve
Aggregate Improvement Initiatives

Outcomes
Risks Reduced
Improvements

Design, Quality, Construction

Outcomes
Risks Reduced
Improvements

Integrity Management

Outcomes
Risks Reduced
Improvements

Emergency Management

Outcomes
Risks Reduced
Improvements

Stakeholder Engagement

Outcomes
Risks Reduced
Improvements

Others...
Incident Investigation, Evaluation and Lessons Learned

- Investigation of Incidents
- Follow-up and Communication of Lessons Learned
- Learning From Past Incidents
  - Generating new lessons learned from past events.
  - Evaluating the effectiveness of organizational learning from the known lessons learned
- Learning From External Events
In Summary: Outcomes Sought in API 1173

- Enlisting employees top to bottom in a commitment to safety
- Driving leaders to engage stakeholders inside and out
- Clarifying responsibilities for safety initiatives and oversight
- Driving leaders to proactively address safety issues early
- Routinizing and formalizing safety procedures
- Advancing investigating, learning from failures as an opportunity to improve, not punish, and tracking correction
- Ensuring a safe environment for employees to report safety concerns and widening communications up, down and sideways
- Systemizing regular evaluation of operations to identify and address risks, and measure risk reduction
Questions?

Mark Hereth
MLH@P-PIC.COM
713 249-6650
Make The Tie to “Organizational Values”

- Values serve as a foundation – but how do you use them?

- An ideal starting point for driving leadership and management commitment
  - Re-commit to the company’s values
  - Re-align the leadership team and communicate across the organization
  - Use as a vehicle for extending commitment across the business
  - Present the values in the context of the desired culture and performance

- Use as a basis for defining how we work together...
  - Consistent set of behaviors demonstrating and reinforcing commitment
  - Tool for hiring employees, setting expectations, measuring and rewarding
  - Platform for engaging and aligning third party team members

... basis for defining and advancing Safety Culture
Expectations and Behaviors

- **Top Management**
  - Connect values to culture to behavior and process
  - Empower and create environment of trust
  - Demonstrate commitment, integrate into business rhythm
  - Create leaders and extend across the organization

- **Management**
  - Clearly understand the vision and foster across the organization
  - Wire into every aspect of the work (hiring, performance management, goals)
  - Recognize role as a leader in driving culture
  - Create leaders and extend across the organization

- **Employees**
  - Empowerment – Employees must own and advance
  - Recognize leadership is not a title, it’s a set of behaviors that advance the culture
  - Establish systems and processes to facilitate alignment