Integrity Program Evaluation Using Meaningful Performance Metrics...
Pipeline Safety Management Systems (API 1173), the recent PHMSA guidance presented in ADB 14-05 and Asset Management (ISO 55001), have requirements for performance based program evaluation.

This presentation will cover the history of performance regulations, the formalization of P&M measures and the use of process management to ensure compliance through program formalization, data collection, investigation, analysis and corrective actions.
Does there seem to be a trend?
Evaluations shall be performed at least annually to provide a continuing measure of integrity management program effectiveness over time.

Program evaluation will help an operator answer the following questions:

- Were all integrity management program objectives accomplished?
- Were pipeline integrity and safety effectively improved through the integrity management program?
Process or Activity Metrics can be used to evaluate prevention or mitigation activities. These measures determine how well an operator is implementing various elements of the integrity management program. (Leading Indicators)

Operational Measures include operational and maintenance trends that measure how well the system is responding to the integrity management program. (Lagging Indicators)

Direct Integrity Measures include leaks, ruptures, injuries and fatalities. (Lagging Indicators)
Lagging Indicators

- Reportable requirements
- Collectible requirements (Table 9)

Industry understands the importance of these…

However, even though they are being collected… typically they have not been used to drive corrective action
Leading Indicators

- Written integrity management plan procedures and task descriptions are up to date and readily available.
- Activities are performed in accordance with the plan.
- A responsible individual has been assigned for each element.
- Appropriate references are available to responsible individuals.
- All required activities are documented.
- All action items or non-conformances are closed in a timely manner.
Leading Indicators (con’t)

- The risk criteria used have been reviewed and documented.
- Prevention, mitigation, repair criteria have been established, met and documented.

Industry has traditionally not understood the importance of these...

Typically they are not being collected and/or used

In the past there has been no push from PHMSA because they lacked the understanding as well
**Figure 2: Process safety indicator pyramid**
(from API RP 754*)

- **Tier 1**: LOPC events of greater consequence
- **Tier 2**: LOPC events of lesser consequence
- **Tier 3**: Challenges to safety systems
- **Tier 4**: Operating discipline & management system performance indicators

*LOPC: Large Occurrence Potential of Consequence*
Although B31.8s was incorporated by reference into 49 CFR 192 Subpart O, the nature of the original protocols suggests a limited understanding of the importance of “performance”

There were only 3 basic requirements
I.1. General Performance Measures

- **Measure**
  - Number of miles of pipeline inspected versus program requirements
  - Number of immediate repairs completed as a result of the integrity management inspection program
  - Number of scheduled repairs completed as a result of the integrity management program
  - Number of leaks, failures and incidents (classified by cause).

- **Collect**
  - The threat-specific metrics of ASME B31.8S, Appendix A
I.2 External Corrosion Direct Assessment Program Measures

- Validation Digs
- Establish long term effectiveness measures

I.3 Submitting Results of Performance Measurements to OPS

- Submission of the four measures in I.1
The original focus of the DIMP regulations were Leak Management and Damage Prevention.

With the publication of the NPRM for distribution integrity PHMSA made an attempt to address the importance of leading indicators w/ the section titled “Prevention Through People”

Industry pushed back and this requirement was dropped, again signifying the lack of understanding of the fact that proper implementation of programs is the foundation of performance…
The DIMP regulation was finalized with reporting requirements for performance measures; however, once again these were lagging in nature (results).

What they did do was to open the door to the consideration of effectiveness evaluation with the following performance requirement:

- Any additional measures the operator determines are needed to evaluate the effectiveness of the operator's IM program in controlling each identified threat.
The next iteration of performance requirements was provided through the publication of ADB 12-10 which stated:

- A critical program element of an operator’s integrity management program is the systematic, rigorous evaluation of the program’s effectiveness using clear and meaningful metrics. When executed diligently, this self-evaluation process will lead to more robust and effective integrity management programs and improves overall safety performance.

In this advisory bulletin PHMSA began to reiterate the requirements originally included in the regulation by virtue of the incorporation of ASME B31.8s by reference.
For the first time the requirement for leading indicators was detailed

Specific threats that include both leading and lagging indicators for the important integrity threats on an operator’s systems. These include:

- **Activity Measures** that monitor the surveillance and preventive activities that are in place to control risk.
- **Deterioration Measures** that monitor operational and maintenance trends to indicate if the program is successful or weakening despite the risk control activities in place.
- **Failure Measures** that reflect whether the program is effective in achieving the objective of improving integrity. See QA/QC section in 192.911
In 2013 the gas transmission protocols were updated and although no new sections were added (actually there is one less) the trend continues to require more consideration of performance as a tool to determine program effectiveness, with a “Clear” inclusion of leading type metrics.
I.01 General Performance Measures

- Verify the process for measuring IM program effectiveness includes the elements necessary to conduct a meaningful evaluation.
- Verify the process to evaluate IM program effectiveness includes an adequate set of performance metrics to provide meaningful insight into IM program performance.
- Verify that performance is measured annually
- Verify that performance is measured annually in accordance with the threat-specific metrics of ASME B31.8S-2004, Appendix A
I.02 Performance Measures Records Verification

- The methods to measure program effectiveness provide effective evaluation of IM program performance and result in program improvements where necessary?
- That performance metrics are providing meaningful insight into integrity management program effectiveness.
- The four overall performance measures of ASME B31.8S-2004, Section 9.4 have been submitted to PHMSA annually in accordance with §192.951.
For the **THIRD** year in a row… PHMSA provided additional guidance on performance.

With each iteration the guidance is becoming more detailed with ADB 14-05 including 18 pages of performance metrics to consider.

These metrics were organized per descriptions in the previous ADB / B31.8s

- *Operational or Activity Metrics*
- *Operational Deterioration Indicators*
- *Failure or Direct Integrity Metrics*
Pipeline Safety Management System

- To be published this month
- A holistic approach to safety beyond integrity management
- Requires a performance based approach
- Tracking and analyzing
Looking at the growth in emphasis on the part performance plays in integrity management over the last 11 years...

The utilization of a performance based approach including the collection and analysis of meaningful performance metrics will be the expectation of the regulators going forward.
Compliance to many operators is “Check the Box”

- *This type of compliance is “NOT” Safety*

Operators have been good at planning and doing… but not so good at checking and acting

- *We have come full circle in that the latest guidance tells us what to do that was required 10 years ago!!!!*
SoCal Process Management

• We have been using process management for TIMP since 2003 to manage, schedule, track, document, communicate and report our activities

• We implemented process management for Public Awareness in 2009 and for DIMP in 2011

• Process Management tracks Who, What, When, Where and Why (or Why Not...)

• Process Management supports a performance based approach to integrity management

“If It Wasn’t Documented, It Didn’t Happen”
PROCESS MANAGEMENT

Element: Preventive & Mitigative Measures
Level: Element

- Preventive & Mitigative Measures
  - A P&M - Prevention & Mitigation Implementation
    - P P&M01. Update P&M Review (Eddie/Sam) (db)
    - P P&M02. Weather and Outside Force (WROF) Threat Mitigation (Cameron/Sam)
    - P P&M03. Additional P&M Measures Initiation (Sam/Bob)
    - P P&M04. Additional P&M Measure Implementation (Sam)
  - A P&M - Continual Evaluation
PROCESS MANAGEMENT

Element: Preventive & Mitigative Measures

Level: Element

- Preventive & Mitigative Measures
  - A P&M - Prevention & Mitigation Implementation
    - P P&M01. Update P&M Review (Eddie/Sam) (db)
      - T Review current Form 12-1
      - T Review the feature study
      - T Review field inspection reports
      - T Review assessment results
    - T Based on information review does this pipeline have a WROF threat?
    - T Based on information review is similar segment evaluation needed?
    - T Based on information review are potential changes to or additional P&M measures required?
    - T Update Form 12-1
    - T Based on information review were potential changes to threats identified
  - P P&M02. Weather and Outside Force (WROF) Threat Mitigation (Cameron/Sam)
    - P
    - P P&M03. Additional P&M Measures Initiation (Sam/Bob)
    - P P&M04. Additional P&M Measure Implementation (Sam)
### P&M Performance

**Gas Transmission Integrity Management**

#### 12-1 Open Processes

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<tr>
<th>Year of Scheduled Date</th>
<th>Process Description</th>
<th>RAA</th>
<th>First Name</th>
<th>User</th>
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Status Colors:
- Open: Blue
- Pending: Orange
- Submitted: Green
## Closed Process List

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<th>Process Family</th>
<th>Element</th>
<th>Area</th>
<th>Process</th>
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**Process & Schedule Information**

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**Process Completion**

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<td>P&amp;M03. Similar Segment Evaluation</td>
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<td>P&amp;M04. Follow-Up To Review Conditions</td>
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Original P&M Limitations

• Assessment findings were the primary driver
• Limited evaluation of threats outside HCA to when assessment interval exceeded the HCA boundaries
• Threats were typically addressed through remediation as opposed to program improvement
• Minimal data from multiple sources integrated
• Risk was not effectively utilized
• *Execution performance metrics (leading indicators) were not utilized*
• *Did not determine effectiveness of current programs to drive improvement*
Historically, the need to integrate all the disparate requirements was minimal...

- Measure Performance
- Confirm Quality
- Integrate Data
- Identify Threats
- Evaluate Risk
- Continuous Improvement
- Record Keeping

With growing systems, more areas with potential consequence and considering aging infrastructure, these requirements needed to be addressed in an integrated systematic manner... planning, doing, checking and acting
• Development of a performance based DIMP allowed us to begin thinking how this approach might translate into TIMP, specifically centered on P&M

• *Post BAP TIMP... is P&M... is DIMP*

• *A PROACTIVE / SYSTEMIC “THREAT” SPECIFIC APPROACH* to identification, analysis, investigation, risk determination and corrective action...
• The revised approach will
  • Be applied systemically
  • Utilize additional programs for threat identification beyond assessments
  • Require data integration to support proper decision making
  • Include the use of Risk to prioritize investigation
  • Include analysis of execution performance metrics
  • Include measurement of program effectiveness
• PAAR - Programs and Activities to Address Risk
  • Identify – those that identify threats
    • Assessment
    • Surveillance
    • Patrol
    • Inspection
  • P&M – those that prevent or mitigate threats
    • Corrosion Control
    • Damage Prevention
    • Public Awareness
# EXISTING THREAT PREVENTION AND DETECTION METHODS

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Threat Identification

• ID PAAR
  • *Implementation performance analysis*
    • Doing it according to procedure / leading
  • *Data / information management*
    • Missing, inaccurate or incomplete data is a clear indication that we may not be implementing properly
  • *Threat Identification*
    • In DIMP we have leaks telling us our threats
    • In TIMP we have weaker signals
    • **We need to identify and address threats before they become problematic**
• Risk evaluation utilizing integrated data
• Investigation into P&M PAAR performance by “Location”
• Threat Specific P&M PAAR
  • Implementation performance analysis
    • Doing it according to procedure / leading
  • Are they enough or effective
    • Is procedure sufficient / lagging
• Performance Metrics
  • Leading – Implementation
    • If we are not documenting what we did, how will we know what to fix if the results are not as expected?
  • Lagging – Results or Findings
    • Indications that what we are doing may not be effective

• For ALL PAAR
  • If NOT being implemented properly, fix it
  • If NOT effective, fix it

• Which Performance Metrics are meaningful?
  • What metrics do we have?
  • What metrics have benefit?
  • Which ones drive improvement?
  • What other metrics do we need to collect?
• The approach taken by SoCal not only complies with the regulations, it meets the intent and supports the determination of potential threats to the system and drives corrective action
  • We track and analyze what we did...
  • We learn about threats before they become incidents
  • We take corrective action
  • Then we do it all again.... System Wide

• The approach also supports the requirements of a “Safety Management System”
Questions?

If it wasn’t documented, it didn’t happen.

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