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Presentation Outline

• Process Safety Management [PSM] Metrics
• PSM Metrics Implementation at Air Products
• Leading Indicators – CCPS Project
• API/AFPM – Industry Analysis “Deep Dive”
Process Safety Management Metrics

✓ Leading Metrics – a forward looking set of metrics which indicate the performance of the key work processes, operating discipline, or layers of protection that prevent incidents.

○ Lagging Metrics – a retrospective set of metrics that are based on incidents that meet the threshold of severity that should be reported as part of the industry-wide process safety metric.

✓ Challenges to Safety Systems, Near Miss and other internal Lagging Metrics – Although these events lagging indicator events, they are generally considered to be a good indicator of conditions which could ultimately lead to a more severe incident.
API-754 PSM Metrics

- **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
Air Products Related slides have been deleted from this presentation
Process Safety
Leading Indicator Metrics
A CCPS Survey Project
# Leading Indicator Metrics

## Project Team

### Team Chair: Kenan Stevick

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Presentation Outline

- Purpose / Intent
- Result Summary
- Data
- Leading Metrics Visibility
- Additional Guidance needed
- Barriers to Implementation
- Metrics Changed, New Metrics considered
- Next Steps
Purpose / Intent

- **Purpose:**
  - Provide an update on the use, direction, and effectiveness of Process Safety leading indicators in the chemical and petroleum industries.

- **Strategic Alignment / Intent:**
  - Leading Indicators are intended to help drive performance improvement and lead to reduction in the number and severity of process safety incidents. They do this by identifying improvement opportunities in the management systems for Layers of Preventative defense against Tier 1 and Tier 2 events.
Result Summary

- High percentage of companies recognize the value
- Industry is still ‘experimenting and discovering’ as to which indicators make the most sense
- Three different focus areas or approaches were identified as most effective in improving performance. These are:
  1. PSM Compliance
  2. Learning Experiences and Management of Deviations
  3. Management Engagement
Result Summary

1. PSM Compliance - Follow-up on actions across the spectrum of Process Safety Management Systems:
   
   – Audit Corrective Actions
   
   – PHA Actions
   
   – Completion of Safety Critical Equipment Inspections or Calibrations
   
   – MOC Actions
   
   – Unplanned Event Corrective or Preventive Actions
2. Learning Experiences and Management of Deviations

- Process Safety Near Miss Reporting including fires
- Challenges to Safety Systems in general and specifically calling out: Safety Instrumented Systems and Relief Device Activations
3. Management Engagement

– Picking the most pertinent measures to your operation and getting them in front of leadership;

– Including Leading Indicators in agendas of various operational reviews and ensuring action.
Data Summary

- 43 companies responded to the survey; 41 Companies [95%] responded that they use leading indicators.
- The use of leading indicators varies by company, from a low of 3 leading indicators to as many as 28 leading indicators for a company.
- Each of the 25 leading indicators was used by one or more of the responding 41 companies.
- 20 companies [45% of responded to the survey] are using 12 or more leading indicators
  - 5 Tier 3 leading Indicators
  - 7 Tier 4 leading indicators
All 25 leading indicators were used by one or more of the responding 43 companies.

12 or more leading indicators were used by 20 or more of the 43 companies, (45%)

The red box on the chart highlights the 12 leading indicators used by the 20 or more companies.
20 Companies or more Using these 12 Leading Indicators

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<th>Leading Indicator</th>
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<td>23. Number of past due and/or having approved...</td>
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<td>22. Number of past due and/or having approved...</td>
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<td>21. Number of inspections of safety critical items...</td>
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<td>20. Number of outstanding incident investigation...</td>
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<td>19. Activation of Pressure Relief Device (PRD)...</td>
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<td>18. Demands on Safety Systems</td>
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<td>17. Training for Process Safety Management...</td>
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<td>16. Procedures Current &amp; Accurate</td>
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<td>15. Activation of a Safety Instrumented System</td>
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<td>14. Safe Operating Limit Excursions</td>
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<tr>
<td>13. Number of past due and/or having approved...</td>
</tr>
<tr>
<td>12. Activation of Mechanical Shutdown System</td>
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### Frequently used Leading Indicators

#### Tier 3

1. Activation of Pressure Relief Device (PRD)
   - Not Counted as a Process Safety Incident (PSI) or Loss of Primary Containment (LOPC)
2. Demands on Safety Systems
3. Activation of a Safety Instrumented System
4. Safe Operating Limit Excursions

#### Tier 4

1. Number of past due and/or having approved extension of audit action items
2. Number of past due and/or having approved extension of PHA action items
3. Number of inspections of safety critical items of plant and equipment due during the measurement period and completed on time
4. Number of outstanding incident investigation action items closed
5. Training for Process Safety Management (PSM) Critical Positions
6. Procedures Current & Accurate
7. Number of past due and/or having approved extension of regulatory issue
Leading Metrics Visibility

Most companies indicated:

- Roll their measures up into meaningful scorecards:
  - prompting management action,
  - review with senior leadership, (in some cases all the way up to board members)

- Publish data on internal review reports, websites and in newsletters for communication and action across the company
More Guidance Needed

✓ 15 companies felt that the existing guidance was sufficient.

✓ 8 companies indicated they had been using these metrics and were comfortable in their understanding.

✓ 3 companies indicated that they were not yet using these metrics.

✓ 7 companies felt additional guidance would be useful to ensure that “challenges to safety systems” are used consistently within and between companies.
Barriers to Implementation [1]

- **Senior Management Commitment/support** is essential for the implementation and sustainability of a successful metrics program.

- There can be differences in **understanding metrics definitions** across the company, e.g., different geographies, acquisitions.

- **Resources** are needed in order to report metrics in a timely manner.
  - Maintaining trained resources who understood the definitions and how to extract the data from the computer tracking system presented a challenge due to transfers, turnovers and retirements.
Barriers to Implementation [2]

- **Data Collection Systems**
  - Data collection systems often do not readily produce the information companies want to track.
  - Significant time and money are needed to develop information relating to leading indicators.
  - Computerized / automated data collection systems are helpful in reporting in a timely manner.
  - Communication to the workforce about the criteria for inclusion can take a great deal of time and effort.
  - Employees need to hear that reporting is important, data consistency will not be perfect from the start but will improve over time.
Metrics Change, Discarded and New Metrics being Considered

• 12 companies said they changed or discarded metrics
  – No longer represent areas where improvement needed
  – Emphasis changed to better align with underlying issue
  – Improved performance moved some to background

• 29 companies stated they were considering new metrics. Examples:
  – Alarm management
  – Senior leadership time in the field
  – Fatigue risk management
  – Process Safety Culture
  – Monitor procedures and Incident investigation quality
Next Steps

The following activities are scheduled to continue the focus on the development of leading indicators in the chemical industry:

- Publication of the White Paper in CCPS website for comments after it gets presented in the 9th GCPS.
- Communication to CCPS Member companies to adopt leading indicators and inform CCPS of the list of indicators adopted along with the definitions and examples.
- The members of this Project Team to share their own company experiences in use of leading indicators.
- The review to be included in the 2014 Global Congress on Process Safety.
- Biannual Survey from the CCPS members.
API related slides have been deleted from this presentation
QUESTIONS??