Lead process safety metrics

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Scope

• Presentation about the IChemE Safety Centre guidance on lead process safety metrics
You manage what you measure

- Traditional focus on occupational safety lag metrics
- Occupational safety metrics don’t inform you about process safety
Lead process safety metrics could have been useful…

• Longford Natural Gas Processing 1998
• Texas City Refinery 2005
• Deepwater Horizon semi-submersible drilling rig 2010
A word of caution

“When a measure becomes a target, it ceases to be a good measure”

Goodhart’s Law
Why process safety leading metrics?

- Leading metrics were identified as area for development of consistency
- The ISC developed a suite of leading process safety metrics that can be applied across various industries
- These metrics have been developed by current members, based on their experience in operating with metrics
Focusing on the leading side of safety

- Looking mainly for when things go right
- Measure the presence of safety rather than the absence of incidents as a proxy for safety
- Challenge the “green” results, not just for validity, but for how it was achieved
### Difference between OHS and process safety metrics

<table>
<thead>
<tr>
<th>OHS</th>
<th>Process safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure injuries that have occurred</td>
<td>Measures process safety incidents that have occurred</td>
</tr>
<tr>
<td>Monitors health of barriers preventing OHS incidents</td>
<td>Monitors health of barriers preventing process safety incidents</td>
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Barriers preventing OHS incidents are often not the same as the barriers preventing process safety incidents.
Difference between leading and lagging metrics

- Lagging metrics
  - Measures incidents that have occurred
  - Reflects history only
  - Not a predictor of future

- Leading metrics
  - Two types
    1. Looks for barriers working – Safety II
    2. Monitoring weakness in barriers before incidents occur
  - Allows system to be managed before incident
Examples of leading OHS metrics

• OHS leading metrics
  – Site induction training completed for new workers
  – Number of safety interactions done to plan
  – Inspections completed on first aid kits
  – etc

• Process safety leading metrics
  – Deviations to safety critical elements
  – Failure of safety critical elements on test
  – Safety critical element inspections performed to plan
  – etc
ISC metrics guidance

- Guidance published in July 2015
- Currently ongoing: development of tool kits for implementing lead process safety metrics
Relationship to other publications

• CCPS – Process safety leading and lagging metrics, you don’t improve what you don’t measure
• API - Recommended Practice 754 process safety performance indicators for the refining & petrochemical industries
• HSE – Developing process safety indicators
• IOGP – process safety – recommended practice on key performance indicators
How the metrics were selected

- Survey conducted of current leading process safety metrics in operating partners
- Common metrics established
- Metrics tested for value and ease of collection
- Metrics clearly defined
The metrics

Leadership

- Systems & procedures
- Engineering & design
- Assurance
- Knowledge & competence
- Human factors
- Culture
Knowledge & competence

- Conformance with process safety related role competency requirement
Engineering & design

- Deviations to Safety Critical Equipment (SCE)
- Short term deviation to SCE
- Open management of change on SCE
- Demand on SCE
- Barriers failing on demand
Systems & procedures

• SCE inspections performed verses planned
• Barriers fail on test
• Damage to primary containment detected on test/inspection
• SCE maintenance deferrals
• Temporary operating procedures
• Permit to work checks performed to plan
• Permit to work non conformance
• Number of process safety related emergency response drills to plan
Assurance

- Number of process safety related audits to plan
- Number of non-conformances found in process safety audits
Human factors

• Compliance with critical procedures by observation
• Critical alarms per operator hour
• Standing alarms
Culture

- Open process safety items
- Number of process safety interactions that occur
An example

Permit to work checks performed to plan – a task based metric
An example

Permit to work non-conformance – a quality based metric

Purpose
A measure that work activities on the facilities are planned and executed in a controlled and efficient manner in accordance with mandatory company requirements and expectations. High levels of non-conformance might indicate problems with competency and training and possibly a culture of acceptance of not following procedures. Consistently very low values of this metric could also indicate inadequate checks of completed permits.

Decision making will occur initially at the technician and supervisor level, which is escalated to the ops manager level if additional training programmes or a cultural change is required.

Description
This metric requires knowledge of the number of permit to work non-conformances found during the checking process, as well as the number of checks conducted. The normalised metric is based on the following equation:

\[
\text{Number of PTW non conformances} \times 100 \%
\]

\[
\text{Number of PTW audits or checks completed}
\]

A non-conformance would occur when a step in the procedure has not been executed correctly. This metric should trend downwards towards 0%. However, it assumes that the number of audits conducted is not zero. This shows the percentage time when the permit system was not functioning as designed or expected.

Frequency of capture: Weekly or fortnightly
Frequency of analysis: Monthly

Metric consolidation
This may be broken down into minor and severe non-conformances so that minor non-conformances are distinguished.

Implementation
PTW non conformances numbers may not be tracked electronically and may require manual calculation and categorising of the severity of non-conformance.

Following PTW audits, the number of minor and major non-conformances should be logged in an electronic system by the auditor.

Linkages
This metric is aided by auditing of the following areas:
- Permit to work
How to use the guidance

1. Determine scope
2. Map current metrics to those in the guidance
3. Identify any gaps in the metrics
4. Where gaps exist determine if other metrics cover them
5. Develop action plans to address gaps
How to use the guidance

• Partial implementation verses full implementation
Other ISC guidance

IChemE Safety Centre
Guidance
Process Safety Competency – a Model
2015

www.bit.ly/ISCKC
Thank you for your kind attention.
Questions?
How to find out more..

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