

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

- OHS

- Measure injuries that have occurred
- Monitors health of barriers preventing OHS incidents

- Process safety

- Measures process safety incidents that have occurred
- Monitors health of barriers preventing process safety incidents

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

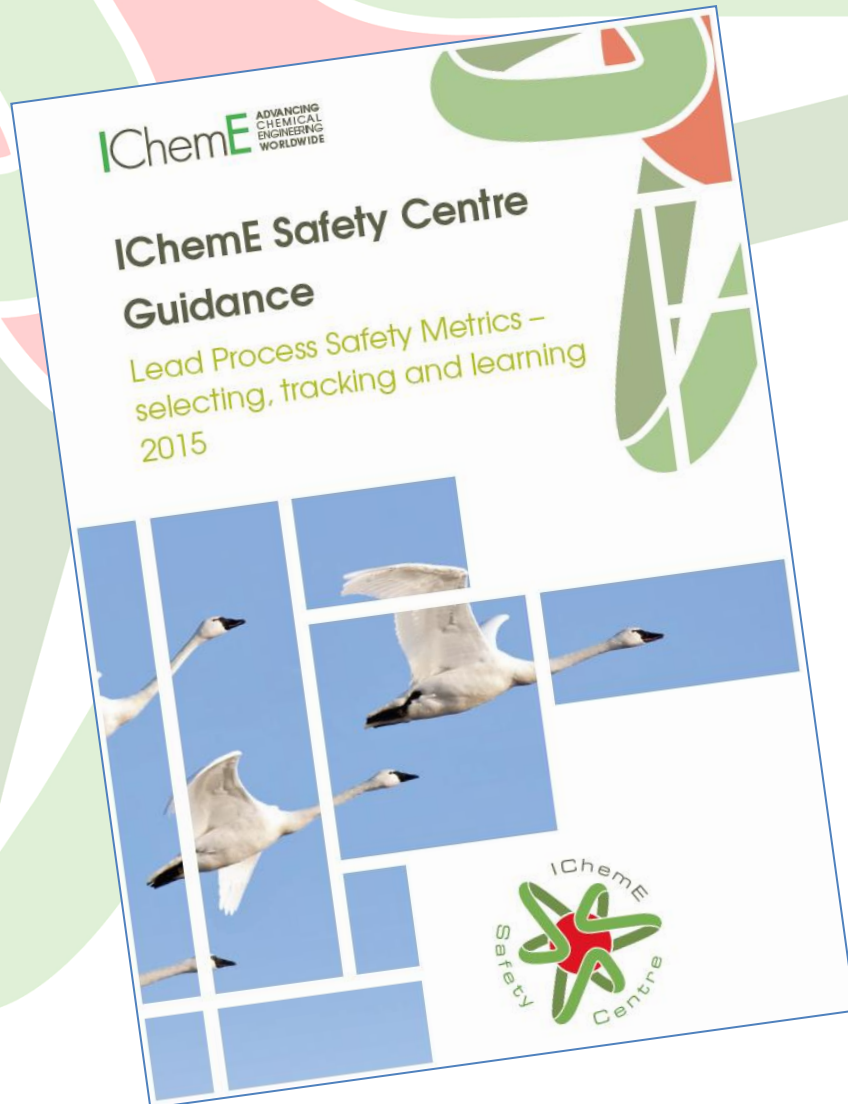
- Site induction training completed for new workers
- Number of safety interactions done to plan
- Inspections completed on first aid kits
- etc

- 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
- Available for free download from www.bit.ly/ISCLPSM
- 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



How the metrics are defined

- Title
- Purpose
- Description
- Metric consolidation
- Implementation
- Linkages



The metrics



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

Title

Permit to work checks performed to plan

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.

The permit to work check is a method to check that the system is functioning. As such, there should be a target set for the number of permit to work checks completed. As a rule of thumb, sample sizes can be the square root plus one of the total number of permits issued.

Reviewing this metric will indicate whether permit to work checks are occurring at an adequate frequency and therefore whether there is sufficient priority given to assurance of the performance of the permit to work system.

Description

This metric requires knowledge of the planned number of permit to work checks, versus the number of permit to work checks conducted. The normalised metric is based on the following equation:

$$\frac{\text{Number of permit to work system checks executed in period}}{\text{Number of permit to work system checks planned in period}} \times 100 - \%$$

This metric should trend towards 100%, to demonstrate that the permit to work system is being undertaken as required.

Alternatively, the metric could use the number of permit to work system checks executed in period versus the number of permits raised in the same period. In this case the target for the metric should be a proportion of permits raised. Checks should cover high hazard tasks such as hot work or confined space entry as well as routine tasks.

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

Metric consolidation

This metric can be consolidated into a running 12-month trend for the site. Consolidating upwards across sites is possible but may be biased if the number of permits raised at each site varies significantly.

Implementation

This metric only indicates that permit to work checks have been undertaken, it does not measure the effectiveness or appropriateness of the checks.

An example

This metric monitors the number of checks done on the permit to work system

Linkages

This metric is aided by auditing the following areas:

- permit to work



Title

Permit to work non-conformance

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:

Number of PTW non conformances _____ x 100 = %
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 are as:

- permit to work

An example

This metric monitors the quality of the permit to work, and gives an indication of how effective the permit to work system is, such as highlighting if there are isolation, handover or hazard identification issues, to name a few

An example

Permit to work non conformance – a quality based metric



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

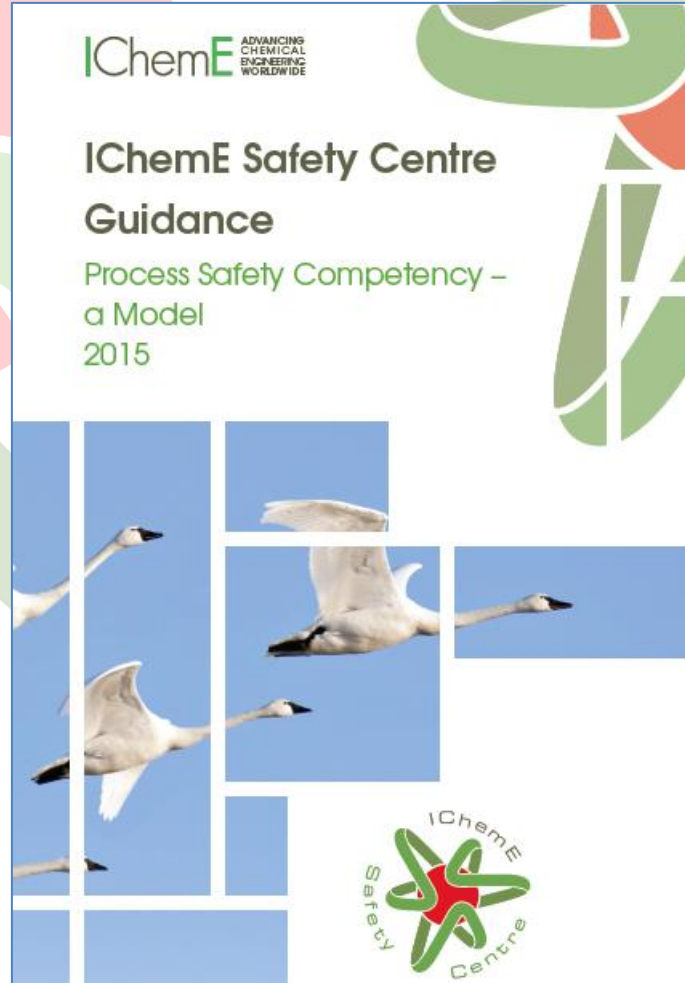


How to use the guidance

- Partial implementation verses full implementation




Other ISC guidance



www.bit.ly/ISCKC





Thank you for your kind
attention.
Questions?



How to find out more..

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