2012 Process Safety KPIs

DSM

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DSM House of Process Safety

- **Process Safety Network**
  - Process Safety is held up by **3 pillars**, integrity elements
    - Operations: Training, Personal Discipline, Operability Limits, SOPs
    - Plant: Hardware design, Maintenance, Construction, Reliability
    - Design: Process design, SHE, Engineering
- Pillars are supported by 3 Bases
  - Requirements: Authorities, OSHA, EPA, PSN-GN, DSM SHE
  - Competence and Expertise: Identification of roles and qualification of people
  - **Performance Measurement:** **Key Performance Indicators**, indicators triggering continuous improvement
After using own thresholds, DSM adopted the reporting of Process Safety Incidents (PSI) as defined per CEFIC definition and targets reduction were defined compared to base year 2010 (193 PSI)

50 % in 5 years

75% in 10 years

Looking at PSI only is not sufficient...

Key performance indicators make process safety visible

To support the plant/sites with the improvement of their process safety performance and consequently achieve the target reduction

PSI is a low number (magnitude 1 incident per site per year)
New KPI Work Process Steps/Decisions

- Decide to Implement
  2) Selection of PS Key Performance Indicators
  3) Collection of Data
  4) Monitor & Evaluate

One example: a running pilot at a DSM site
# (2) Selection on suggested PS KPIs

<table>
<thead>
<tr>
<th>House of Process Safety</th>
<th>Barrier or RCS</th>
<th>Suggested KPI's</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MoC</td>
<td>Number of emergency MoC’s, Number of MoC’s and the % of in a reporting period ((# of MoC’s)/(# of MoC’s + # of emergency MoC’s))</td>
</tr>
<tr>
<td>2</td>
<td>Process design &amp; control</td>
<td>Percentage of plant change actions undertaken where an adequate risk assessment was carried out before change*</td>
</tr>
<tr>
<td>3</td>
<td>Risk Assessment</td>
<td>Number of demands on safety provisions</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Number of Cpk’s of critical process safety parameters (quarterly reporting is recommended)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Percentage of work permits issued on which the hazards, risks and control measures were sufficiently specified e.g. checks by the plant staff and operators themselves on a sample basis</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Percentage of work conducted in accordance with permit conditions e.g. checks by the plant staff and operators themselves on a sample basis</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Percentage of procedures (relevant to SHE aspects) that when used, proved to be effective, i.e. covering the correct scope (key actions and tasks) and/or sufficient detail.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Total number of overrides and number of RL safety provisions overrides</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Number of alarms per control room operator per hour</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Number of RL provisions that fails to operate as designed either in use or while being tested during a reporting period</td>
</tr>
<tr>
<td>11</td>
<td>Inspection/maintenance</td>
<td>Percentage of SHE &amp; regulatory PPM inspections completed within due date (MAT 21)/ total number of SHE &amp; regulatory PPM maintenance orders</td>
</tr>
<tr>
<td>12</td>
<td>PS Training</td>
<td>Percentage of planned PS training programs</td>
</tr>
<tr>
<td>13</td>
<td>Process Safety Life Cycle</td>
<td>Percentage of roles allocated within the PSLC (quarterly reporting is recommended)</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>Percentage of roles trained (quarterly reporting is recommended)</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Number of LOPC below corporate reporting threshold</td>
</tr>
<tr>
<td>16</td>
<td>Analysis and number of incidents</td>
<td>Number of LOPC below corporate reporting threshold</td>
</tr>
</tbody>
</table>
2.1 Reality check: analysis of recent incidents

![Bar chart showing the percentage of PSIs in different barriers]

- Operational Instructions: 35%
- Inspection/Maintenance: 34%
- Process Design & Control: 20%
- PS Training: 8%
- Work Permit: 6%
- Alarm Management: 1%
- Risk Assessment: 1%
2.1 Reality check: analysis of recent incidents

2010 & 2011 Data
- No Operating instruction KPI
- SHE Inspection KPIs in place

% of PSIs

0% 5% 10% 15% 20% 25% 30% 35% 40%

Operational Instructions 35%
Inspection/Maintenance 34%
Process Design & Control 20%
PS Training 8%
Work Permit 6%
Alarm Management 1%
Risk Assessment 1%

Barrier
2.1 Reality check: analysis of recent incidents

2010 & 2011 Data

No KPIs in place

Control Loop Failure

Improper Design, including alarm management

% of PSIs
## Selection of Process Safety KPIs

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<th>DSM Suggested KPI’s</th>
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</table>
| Design Integrity        | Process Design & Control              | • Number of demands on safety provisions  
                          |                                        | • Measurement of process control capability of critical process safety parameters |
| Risk Assessment         | Number open actions related to HAZOP  |                                                                                    |
| Operational Integrity   | Operational Instructions               | Percentage of procedures that when used, proved to be effective, i.e. covering the correct scope and/or sufficient detail |
|                          | Alarm Management                      | Number of alarms per control room operator per hour                                 |
|                          | Work Permit                           | Percentage of work permits issued on which the hazards, risks and control measures were sufficiently specified |
| Plant Integrity         | Inspection/ Maintenance               | Number of RL Provisions that fail to operate as designed either in use or while being tested during a reporting period |
| Competence & Expertise  | PS Training                           | Percentage of planned PS Training Programs                                         |
(4) Monitor & Evaluate: What the site opted for:

- **Implement KPI for Operating Instructions**
  - Definition in progress
- **Assess effectiveness of Maintenance integrity KPIs**
  - Assessment in progress

- **Focus Areas**
  - Control Loops in Manual Mode
    - Lagging Indicator
  - Assessed Alarm Management
    - Looked at gaps and corrective actions
    - Lagging Indicator

- **Monitoring**
  - Focus areas may change as Process Safety is improved
Challenges:

• Effective measurements of operating instruction KPIs?

What is your experience in implementing KPI for operating instructions?

Other comments?
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