July 2012 Public Hearing
Using Performance Indicators to Drive Improvement – CSB Overview
July 23, 2012

Why Study Indicators?
# Process Safety - Personal Safety: Two distinct safety disciplines

<table>
<thead>
<tr>
<th></th>
<th>Process Safety</th>
<th>Personal Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scope</strong></td>
<td>Complex technical and organizational systems</td>
<td>Individual injuries</td>
</tr>
<tr>
<td><strong>Prevention</strong></td>
<td>Management systems: design, mechanical integrity, hazard evaluation, MOC</td>
<td>Procedures, training, PPE</td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td>Incidents with catastrophic potential</td>
<td>Slips, trip, falls, etc.</td>
</tr>
<tr>
<td><strong>Primary actors</strong></td>
<td>Senior executives, engineers, managers, operations personnel</td>
<td>Front line workers, supervisors</td>
</tr>
<tr>
<td><strong>Safety Indicators: Leading and Lagging Examples</strong></td>
<td>HC releases, inspection frequency, PSM action item closure, well kick response, # of kicks</td>
<td>Recordable injury rate, days away from work, timely refresher training, # of behavioral observations</td>
</tr>
</tbody>
</table>
OSHA and Safety Performance

- OSHA primarily measures safety performance using personal injury rates, including in high hazard facilities
- OSHA’s premier awards program, VPP, primarily based on personal injury rates
- VPP facilities continue to have potential catastrophic incidents and hazards
- OSHA’s inspection priorities mostly based on personal injury rates

What CSB Investigations Reveal About Reliance on Personal Injury Rates

- Valero McKee Refinery propane fire – Sunray, Texas - 2007
- Bayer CropScience pesticide waste tank explosion – Institute, West Virginia - 2008
What CSB Investigations Reveal About Reliance on Personal Injury Rates

Tesoro Anacortes Refinery had been scheduled to receive a NPRA safety award a few weeks after a 2010 fire and explosion that resulted in seven deaths.

CSB Study of Performance Indicators

- CSB investigations typically examine process safety risks and deficiencies tied to incident events
- Incident investigations usually identify precursor events that led to the incident; similarly, indicators reveal safety gaps before an incident occurs
- One goal of the use of indicators is to drive continuous safety improvement
Leading and Lagging Indicators

- Lagging indicators provide important data about process safety failures but allow for changes only after something has gone wrong.

- Emphasizing leading indicators can have a more preventative impact by identifying safety system deficiencies before potentially serious outcomes occur.

Lessons from Grangemouth
Lessons from Texas City

- CSB recommended formation of independent panel – Baker Panel
- CSB and Baker Panel reports both noted:
  - Lack of focus on process safety
  - Inadequate performance measurement indicators

Lessons Learned for Industry

- Focus on personal safety overshadowed process safety
- BP incentives program did not include incentives to improve process safety measures
- A good personal safety record does not equal a good process safety record
BP Texas City Indicators Progress

- Joint labor and management initiative
- Using USW Triangle of Prevention program
- Use of leading indicators, incident and near miss reporting exceeds scope of API 754
- Includes investigations, lessons learned, and follow-up to ensure closure of recommendations

History of Major Hazard Indicators

- UK regulators’ strategic aim: by 2015, “all major hazard establishments and duty holders will measure their performance on the control of major hazard risks by way of key leading and lagging performance indicators.”
Indicators must be targeted to reduce risks
A concurrent goal is to measure safety culture
Indicators must be comprehensive, considering:
- organizational and human factors
- process safety issues
- technical issues
Attributes of Effective Indicators

- Compiled and analyzed collectively
- Normalized and standardized for comparison
  - Company- and industry-wide
- Statistically robust
- Not susceptible to “gaming”
- Actionable

Indicators Must Drive Improvement

- Effective indicators are precursor events – they must follow from the activity to be avoided
- Workforce and management need appropriate incentives to collect and report performance data
- Role of regulator
  - Improving accuracy
  - Making incremental improvements
Where do we go from here?

- Collected data must be incorporated into process safety management systems and used to drive performance improvement
- Regulators can use it to target inspections, audits, and investigations
- Continuous improvement: preventing major accidents