Upstream Oil and Gas Industry Process Safety Event Data

OGP Report 2012

- Introduction
- Theory and definitions
- Data collection process
- Upstream process safety data results
- Industry process safety data benchmarking
- Conclusions
INTRODUCTION

- Major process safety incidents
- Metrics to improve asset integrity and process safety performance
- Industry safety and environmental data collected but not specifically process safety

API 754 widely implemented in downstream industry
- OGP Report No. 456 “Process Safety – Recommended Practice on Key Performance Indicators”

Theory and Definitions

The 4 tier approach to process safety indicators (from API RP754)
DATA COLLECTION PROCESS

- Pilot process in 2010 - 11 companies provided historic data
- Data reporting format developed
- Data collection:
  - 2010 – 24 companies
  - 2011 – 24 companies
  - 2012 – 33 companies
- Data validation process developed
- OGP report published in December 2013
  - Used 2011 and 2012 data
  - Data normalized against work hours to provide rates
  - Compared to safety performance database to provide an indication of the PSE database dimensions

RESULTS – OVERALL

Normalized process safety events per million work hours – Tier 1 and Tier 2 (total)

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of PSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 1 PSE</td>
<td>340</td>
<td>242</td>
</tr>
<tr>
<td>Tier 2 PSE</td>
<td>606</td>
<td>638</td>
</tr>
<tr>
<td>Number of PSE for normalized results*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 1 PSE</td>
<td>307</td>
<td>227</td>
</tr>
<tr>
<td>Tier 2 PSE</td>
<td>585</td>
<td>582</td>
</tr>
</tbody>
</table>

*Excludes PSE where no related drilling or production work hours were reported
RESULTS – ONSHORE AND OFFSHORE

Normalized process safety events per million work hours – Tier 1 and Tier 2 (onshore and offshore)

<table>
<thead>
<tr>
<th>Year</th>
<th>Tier 1</th>
<th>Tier 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>2012</td>
<td>0.3</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*Excludes PSE where no related drilling or production work hours were reported

RESULTS – DRILLING

Normalized drilling process safety events per million work hours – Tier 1 and Tier 2 (onshore and offshore)

<table>
<thead>
<tr>
<th>Year</th>
<th>Tier 1</th>
<th>Tier 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>0.09</td>
<td>0.21</td>
</tr>
<tr>
<td>2012</td>
<td>0.12</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Related work hours (millions) - Drilling
Normalized production process safety events per million work hours – Tier 1 and Tier 2

<table>
<thead>
<tr>
<th>Work hours with related Tier 1 PSE data</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onshore work hours with related Tier 1 PSE data</td>
<td>552</td>
<td>835</td>
</tr>
<tr>
<td>Offshore work hours with related Tier 1 PSE data</td>
<td>405</td>
<td>551</td>
</tr>
<tr>
<td>Hours with related Tier 2 PSE data</td>
<td>147</td>
<td>264</td>
</tr>
<tr>
<td>Onshore work hours with related Tier 2 PSE data</td>
<td>548</td>
<td>804</td>
</tr>
<tr>
<td>Offshore work hours with related Tier 2 PSE data</td>
<td>391</td>
<td>516</td>
</tr>
<tr>
<td>Overall</td>
<td>155</td>
<td>288</td>
</tr>
</tbody>
</table>

Related work hours (millions) - Production

Production process safety events by activity – Tier 1 and Tier 2 (2011 and 2012)
Table 1: Process safety events by material released – Tier 1 and Tier 2 (2011 and 2012)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fire or Explosion</th>
<th>PRD Discharges</th>
<th>Material Release</th>
<th>Recordable Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1&lt;br&gt;2011</td>
<td>19</td>
<td>4</td>
<td>28</td>
<td>8</td>
</tr>
<tr>
<td>Tier 2&lt;br&gt;2011</td>
<td>30</td>
<td>40</td>
<td>546</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 2: Process safety events by material released – Tier 1 and Tier 2 (2011 and 2012)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fire or Explosion</th>
<th>PRD Discharges</th>
<th>Material Release</th>
<th>Recordable Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 2&lt;br&gt;2012</td>
<td>30</td>
<td>40</td>
<td>546</td>
<td>40</td>
</tr>
</tbody>
</table>
OTHER INDUSTRY PSE BENCHMARKING

- CONCAWE published downstream industry PSE data since 2010

- API published 2011 and 2012 US refining data in 2013

- Centre for Offshore Safety intent to collect offshore Gulf of Mexico data

CONCLUSIONS

- Significant advantages to aligning oil and gas industry reporting on PSE on a global basis for upstream and downstream activities:
  - Company reporting systems
  - Regulators and stakeholders
  - Industry approach to enable benchmarking of performance

- First step in aligning process safety performance metrics
- Participation in voluntary reporting is increasing
A Tier 1 Process Safety Event (PSE) is a loss of primary containment (LOPC) with the greatest consequence as defined by this RP. A Tier 1 PSE is an unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO\textsubscript{2} or compressed air), from a process that results in one or more of the consequences listed below:

- An employee, contractor or subcontractor "days away from work" injury and/or fatality;
- A hospital admission and/or fatality of a third-party;
- An officially declared community evacuation or community shelter-in-place;
- A fire or explosion resulting in greater than or equal to $25,000 of direct cost to the Company;
- A pressure relief device (PRD) discharge to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences:
  - liquid carryover;
  - discharge to a potentially unsafe location;
  - an onsite shelter-in-place;
  - public protective measures (e.g., road closure);
- and a PRD discharge quantity greater than the threshold quantities in Appendix B in any one-hour; or
- A release of material greater than the threshold quantities described in Appendix B in any one-hour period
Tier 2 Indicator Definition and Consequences

A Tier 2 Process Safety Event (PSE) is a LOPC with lesser consequence. A Tier 2 PSE is an unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO₂ or compressed air), from a process that results in one or more of the consequences listed below and is not reported in Tier 1:

- An employee, contractor or subcontractor recordable injury;
- A fire or explosion resulting in greater than or equal to $2,500 of direct cost to the Company;
- A pressure relief device (PRD) discharge to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences:
  - liquid carryover;
  - discharge to a potentially unsafe location;
  - an onsite shelter-in-place;
  - public protective measures (e.g., road closure);
- and a PRD discharge quantity greater than the threshold quantity in Appendix B in any one-hour period; or
- A release of material greater than the threshold quantities described in Appendix B in any one-hour period.