API Presentation to U.S. CSB Panel Discussion

Process Safety Indicators for Major Accident Prevention

Monday, July 23, 2012

Mr. Chairman, members of the Board, thank you for allowing me to have this opportunity to present on behalf of the American Petroleum Institute and the team that developed the ANSI Standard, API RP 754.

In March of 2007 the Chemical Safety Board issued recommendation 2005-4-I-TX-6 to the American Petroleum Institute and the United Steelworkers to, "Work together to develop two new consensus American National Standards Institute standards. In the first standard, create performance indicators for process safety in the refinery and petrochemical industries. Ensure that the standard identifies leading and lagging indicators for nationwide public reporting as well as indicators for use at individual facilities. Include methods for the development and use of the performance indicators. In May, 2008, the API initiated its response to the recommendation using the ANSI principles of openness, balance, due process, an consensus.

Following extensive efforts to secure representatives from a broad spectrum of stakeholders with a direct and material interest in Process Safety, a consensus committee was formed to develop the ANSI standard for Process Safety Performance Indicators. It included representatives from academia, industry trade associations, engineering & construction companies, government, labor organizations, and owner / operators in the refining and chemical industries. As a result, the American Petroleum Institute was able to publish ANSI / API RP 754*: Process Safety Performance Indicators for the Refining and Petrochemical Industries* in April of 2010*.*

A starting point in the development of any set of indicators is to define the scope. As pointed out by the Baker panel, excellence in personnel safety statistics is no indication of process safety performance. The scope of Process Safety is multi-faceted in that it strives to prevent harm to people, the environment and to

property resulting from the loss of containment of materials from process facilities. Therefore, RP 754 has established performance indicators for Process Safety Events (PSEs), Challenges to Safety Systems, and Operating Discipline & Management System Performance. The performance indicators have been placed into four tiers as depicted on Slide 4.

Tier 1 represents LOPC events of greater consequence with Tier 2 being those events of lesser consequence. Tier 3 includes events described as "Challenges to Safety Systems" and Tier 4 includes records of events or measurements of performance of Operating Discipline and Management Systems.

For any indicator to be useful in benchmarking between organizations that indicator must be precisely defined such that it can be consistently and objectively used and interpreted. Therefore RP 754 includes standardized definitions for Tier 1 and 2 that can be applied unambiguously throughout the refining and petrochemical industries. Standardization of Tier 1 and 2 definitions results in their suitability for public reporting at any organizational level.

The refining and petrochemical industries include a wide spectrum of processes ranging from complex facilities operating at extremes of pressure and temperature and unit operations from simple blending to highly exothermic reactions. These differences require a variety of site and company-specific barriers and management systems to mitigate the hazards. As a result, a greater degree of flexibility is necessary in defining indicators of process safety performance in Tiers 3 and 4, which are intended to provide the greatest opportunity for learning to drive performance improvement at the site or company level. The RP 754 standard requires that companies shall develop and use process safety indicators at all four tiers. The 754 standard provides suggested indicators at both Tiers 3 and 4 along with guidelines for the selection of Process Safety Indicators and references to other sources that provide a more in-depth treatment of this topic.

The four-tiered approach to Process Safety indicators recognizes that there is a continuum from those indicators that are most lagging to those that are most leading. As Andrew Hopkins points out in Working Paper 53, *Thinking About Process Safety Indicators*, "The most important point to emerge from the HSE [United Kingdom Health and Safety Executive] document is that process safety

indicators must be chosen so as to measure the effectiveness of the controls upon which the risk control system relies. Whether they be described as lead or lag is ultimately of little consequence." The message is clear; the use of indicators to drive change that prevents LOPC events resulting in harm is what is important.

I will briefly describe the indicators at the four tiers. Tiers 1 and 2 are described as Process Safety Events (PSEs). They include any unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials from a process that results in one of the following consequences: harm to people, impact to the community, damage to property, or a release of a threshold quantity of material. Thresholds are based upon the UN Globally Harmonized System for classification representing the potential to cause harm. This standardized definition allows for normalization to allow performance comparisons of companies and sites of different sizes. The PSE rate is defined as the number of PSEs times 200,000 (representing 100 workers for a year) divided by the total workforce hours.

Tier 3 performance indicators represent challenges to barrier systems that progressed along the path toward causing harm, but were stopped short of a Tier 1 or Tier 2 PSE. These include exceedance of Safe Operating Limits, Demands on Safety Systems, results from inspection and testing on primary containment systems that fall outside accepted limits, and other LOPC events of lesser consequence than Tiers 1 or 2. Based upon the "Swiss Cheese Model" proposed by British psychologist James T. Reason in 1990, Tier 3 indicators are selected to identify weakness in or the absence of barriers that are intended to prevent LOPC events.

Indicators in Tier 4 represent the performance of individual components of process safety management systems and the operating discipline with which they are applied. These are also selected based upon Reason's model to be indicative of weakness or the absence of barriers that may contribute to future Tier 1 or 2 PSEs. Examples of Indicators in Tier 4 include performance at closure of Process Safety action items; Process Safety training completed per schedule, completion of inspection and maintenance checks on Safety Critical equipment as well as the performance results from those checks; and completion of emergency response drills by operating and emergency response forces. Conformance with RP 754 requires that companies develop and use Process Safety Indicators at Tier 4.

Selection of those indicators and the frequency of their measurement should be based on the management systems a company uses to manage the process hazards of the facilities they operate.

The ANSI Board of Standards Review approved API RP 754: *Process Safety Performance Indicators for the Refining and Petrochemical Industries* on April 13, 2010. API published the standard nine days later on April 22. To ensure the broadest access to the standard it was made available at no cost and remains available for viewing without fee. To facilitate rapid adoption and use of the standard a task force of committee members was created to develop a series of Webinars, which are still available at the API website, to introduce the standard; to provide a means for companies to seek interpretation of the standard on an ongoing basis including posting a response to those questions on its website; to continue to host Webinars that help other companies use and interpret the standard; and to present the standard and its use at industry association conferences and symposia on Process Safety.

As a result of these efforts and the benefits companies expect from implementation and use of RP 754 it has been rapidly adopted throughout the refining and petrochemical industries and beyond. A number of trade associations have committed to collect Process Safety Indicator performance since 2010. They include the American Petroleum Institute (API), the American Fuels and Petrochemical Manufacturers Association (AFPM), the Oil and Gas Producers (OGP), and the European Oil Company Organization for Environmental, Health and Safety (CONCAWE). In fact, for 2011 thirty-two companies representing 92% of US refining capacity and twenty-five companies representing 98 petrochemical sites reported data to AFPM. Twenty-one companies representing 82 refineries and 91% of US refining capacity reported 2011 data to API. Twenty-two companies reported 2011 data to OGP. The American Chemistry Council conducted a pilot in 2011 that allowed companies to report required Responsible Care Process Safety performance on the basis of RP 754. The International Petroleum Industry Environmental Conservation Association (IPIECA) has endorsed RP 754 for corporate sustainability reporting. During the vetting and balloting period positive comments were provided by many external stakeholders including the United Kingdom Health and Safety Executive (UK HSE).

An indication of the usefulness of RP 754 in driving improvement of Process Safety performance is the average of 50+ attendees on quarterly webinars held since the third quarter of 2011 to discuss use of the standard. Another is the number of presentations being made by company users at Process Safety Conferences across the globe. Since the standard was published there have been many presentations from users including fifteen at recognized and well-attended conferences such as the International Symposium at the Mary Kay O'Connor Process Safety Center, the AFPM National Occupational & Process Safety Conference and Exhibition, the ACC Responsible Care Conference and the CCPS Latin American Conference on Process Safety. Many of the presenters highlighted the increased emphasis that Process Safety had received within their companies as a result of having a standard and objective means of measuring their Process Safety performance. Most presenters talked about focusing their efforts on the identification of process units and equipment most frequently involved in Tier 1 and / or 2 PSEs. They use the results of investigation of these events to identify causal factors and perform trend analysis on the aggregation of these incidents to identify the greatest opportunities for improvement. Furthermore, some identified the use of Tier 3 PSEs or some portion of those in their trend analysis.

RP 754 requires transparency in reporting of Process Safety performance. At the broadest level of public reporting each company is required to report Tier 1 and 2 PSE information on an annual basis. As with any system of measurement there is a period of implementation and validation before results are meaningful for publication or comparison across organizations. This time is required to educate employees, establish reporting systems, and to resolve questions of interpretation to assure consistent application of the standard. 2010 was a year of implementation of RP 754 for most companies. Based upon data submitted for that partial year opportunities for clarification of the standard were identified. These clarifications were delivered in a webinar held in February of this year. The API has also posted twenty-five or more new items clarifying the classification of Tier 1 or 2 events in the Frequently Asked Questions portion of its website devoted to the standard.

Reporting of Process Safety performance may be directly from an individual company or through industry trade groups, government agencies or other means. The API expects that following collection of 2012 data there will be a level of maturity whereby industry aggregate performance figures of Tier 1 for that year

may be published. For 2013 data, API expects to publish company blinded results that will allow companies to begin to judge their performance relative to their peers. Publication of industry and company transparent results is expected for 2014 data. The reporting of Tier 2 performance may lag that of Tier 1 by one year as a result of less mature reporting systems at that level.

At a local level each site must determine the appropriate methods to communicate PSE information based upon the size of the site and the size of the community that it has the potential to impact. Annually, each site must report its site-specific Tier 1, 2 3 and 4 PSE information to its employees and employee representatives. Each site must also make available a summary of site-specific Tier 1 and 2 PSE information and may report site-specific Tier 3 and 4 PSE information to its local community and emergency management officials.

Two complete years of PSE data will have been collected by the end of 2012. Following an analysis of the data submitted in 2013 to API and AFPM under the joint "Advancing Process Safety" program for Process Safety Indicators it is expected that the RP 754 standard will be opened for revision as recorded in the "Notes to First Edition." Throughout the development of RP 754 the standard was written with the belief that it should be applicable to any process industry, including those beyond the scope of the CSB recommendation. Since it was published, the standard has begun to find acceptance outside the refining and petrochemical industries such that the scope of stakeholders has broadened. To that end, the API 754 implementation task force has been working to gain the interest of an even more diverse group of stakeholders with a greater degree of international representation for this revision. CEFIC, the European Chemical Industry Council, and representatives of several Latin American organizations have already expressed an interest in participation.

The API believes that RP 754 has already made valuable contributions in the area of Process Safety. It establishes a means of measuring Process Safety performance in a precise, consistent and objective manner. It establishes the requirement for the development and use of leading indicators for companies to use for performance improvement. And finally, it sets requirements for transparency in the reporting of Process Safety information to the public, employees and their representatives, and the communities around process industry sites.

Thank you once again for the opportunity to share information related to the development, adoption, use and continuous improvement of API RP 754*: Process Safety Performance Indicators for the Refining and Petrochemical Industries*.