The petroleum pipeline industry has undertaken a voluntary environmental performance tracking initiative, recording detailed information about spills and releases and their causes and consequences.

The pipeline members of the American Petroleum Institute and the Association of Oil Pipe Lines believe that tracking and learning from spills will improve performance, thus demonstrating the industry's firm commitment to safety and environmental protection.

This is one of a series of Advisories about the Pipeline Performance Tracking System (PPTS) -- its evolution and its lessons.

PPTS ADVISORY FOR OPERATORS: SURVEY ON THE USE OF ROOT CAUSE ANALYSIS

Why a Survey on the Use of Root Cause Analysis?

The number of incidents caused by operator error has increased in the past few years, and the type of operator error that has increased most is "other human error."[1] It is difficult, however, to draw any helpful conclusions from such a broad category.

The experience of some operators represented on the Data Mining Team suggested that more thorough incident investigations might be leading to "operator error"-related cause determinations, such as "poor procedures" or "wrong equipment installed," for incidents that may have been classified as "equipment failure" or some other cause before improvements were made in the investigation process. If this is true for other operators, the uptick in operator error incidents is not necessarily a rise in more traditional operator errors such as incorrect valve placement, and, in fact, may indicate good news regarding the quality of root cause analyses. Furthermore, the increased use of "other human error" would not reflect haphazard reporting, but rather the PPTS survey's inadequate choices.

In order to gather data to either back up or disprove these ideas, a short survey was sent to the 40 operator companies that participate in PPTS.

Details of Survey

The survey contained seven high-level questions designed to provide some information about an operator's incident investigation procedures without being long and a burden to answer. These questions were:

1. Does your company employ a formal incident investigation/root cause analysis process for release incidents?
2. Does your company employ a consistent methodology/product for each investigation?
3. Has your company had any incidents reclassified as "Operator Error" as a result of incident investigations/root cause analyses?
4. What year did you begin employing the current incident investigation/root cause analysis process?
5. Have there been any changes in the process since its inception?
6. How would you characterize these changes on a scale of 1 to 5 where one is minor tweaking and 5 is a major overhaul?
7. Have these changes impacted how releases are categorized when making incident reports?

---

[1] Other choices in the PPTS release survey are more specific: "excavation or physical damage by operator or operator's contractor," "valve left or placed in the wrong position," "pipeline or equipment overpressured," and "damaged by motorized vehicle unrelated to excavation."

Survey Findings

Responses were received from 20 companies. All of these companies conduct root cause analysis for at least some of their release incidents. Sixty percent (60%) of the respondents have actually reclassified incidents as "operator error" based on the results of a root cause analysis. The majority of companies have implemented their current incident investigation programs in the past 10 years with 75% making modifications and improvements in the past 3 years. It has, in fact, been in the past 3 years that incidents with the cause of "other human error" started to increase. While there may be other factors involved, it is clear that improved investigations account for some of the increase in the failure mode of "other human error." Because this survey shows that root cause analysis is being used by many companies, the Data Mining Team will work on developing some appropriate failure modes to add to the PPTS reporting form to better capture some of the failure modes that might be uncovered by these analyses.

Survey Results

A brief summary of the responses to each survey question follows.

1. Each of the 20 companies employs some type of incident investigation for at least some incidents, with 4 of the companies investigating every incident. Of the 16 companies that investigate only some incidents, management judgment is used by 11 of them to decide what incidents to investigate. Other factors that drive investigations in a number of companies are injury/casualty or environmental impact (10 companies), fire/explosion (9 companies), and volume (8 companies).

2. Twelve companies (60%) consistently use a proprietary system for their investigations. Two companies (10%) consistently use an in-house system for all investigations. Six companies (30%) vary the method of investigation used depending on the severity of the incident.

3. As noted above, 12 respondents (60%) have reclassified incidents as "Operator Error" based on the findings of the root cause analysis.

4. One company has been using its current system since 1988, 2 companies started using the current system in the early 1990s, 5 started in the late 1990s, and 12 started with their current systems after 2000.

5. Fifteen respondents (75%) have changed their systems since inception. Nine have changed procedures, 9 have changed training, 6 have changed staffing or organization, and 4 have changed something else about their incident investigation. Only 1 of these 28 changes took place in 2000; the rest of the changes have taken place since 2005 with seven of them taking place in 2008.

6. None of the changes was a major overhaul of 5 on the scale of 1 to 5. One was a minor tweaking of only 1 on our scale. The rest of the changes (14 operators) fell between 2 and 4 on our scale, with 8 indicating a middle of the road change of 3. (As noted above, 5 operators did not make a change to their system.)

7. For 5 of the companies, the changes have impacted how releases are categorized. The changes made by the other 10 have not impacted how releases are reported. (Five companies didn't change their systems.)

Survey Data

Attached is an Excel database with the compilation of the survey data. Please note that all company labels are randomly assigned on each tab, i.e. "Company A" in one tab is not the same operating company as "Company A" in the next tab.

Root Cause Analysis Final Results.xls

Considerations for Operators

❖ In the drive toward zero spills, incident prevention requires an understanding of the underlying causes of incidents so that those true causes can be addressed instead of just treating the symptoms.

❖ Root Cause Analysis is an important tool to help uncover the underlying problems that might otherwise be overlooked.

❖ The Data Mining Team will be adding choices to Part OP (Operator Error or other incorrect operation) of the PPTS release survey to provide a better path for reporting these incidents and improved data analysis with regard to OE-related incidents.

NOTE: The "Considerations for Operators" contained in this document represent the experience of a limited number of subject matter experts from a variety of liquids pipelines operators. They were not developed under the process prescribed by the American National Standards Institute and do not represent a Standard or a Recommended Practice of the API or its member companies.

For additional information on the Pipeline Performance Tracking System and the Operator Advisories drawn from it, go to www.api.org/ppts.