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Using Incident Investigations as a Program Assessment Tool

**Michael L. Marshall, PE, CSP
U.S. Department of Labor--OSHA**

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Michael L. Marshall, PE, CSP
Program Coordinator Process Safety Services
U.S. Dept. of Labor - OSHA**

Introduction

After a process incident at a facility, the company involved has an opportunity to turn a negative event into a positive learning experience. By utilizing information obtained by the investigation team the company can assess the effectiveness of its safety programs and determine if and to what extent changes are needed in their safety program.

The purpose of this paper to: 1) emphasize the positive aspects related to incident investigations and the opportunities which are available to companies to use information obtained during investigations as a program assessment tool; and 2) stress the need to evaluate all information gathered by the investigation team, even if it is not related to a root or probable cause(s) of an event.

Investigating Incidents With Negative Consequences and Near Misses

Companies which experience an actual or near miss incident where a release of a covered chemical could have occurred are required by OSHA and EPA under their respective Process Safety Management (PSM) and Risk Management Program (RMP) standards to conduct incident investigations. The concept of conducting incident investigations to determine the cause(s) of an event to minimize the likelihood of a recurrence of a similar incident is rather simple. Unfortunately, many companies simply do not conduct incident investigations.

Companies that do not conduct incident investigations lose the fundamental information needed to learn about the cause(s) of these incidents. Additionally, the data which would be captured by the incident investigations and used to conduct a program assessment of companies' safety programs is lost when incidents are not investigated. The American Institute of Chemical Engineer's, Center for Chemical Process Safety (CCPS) and Lees show incident ratio triangles which depicts the relationship between near miss incidents to incidents with negative consequences (i.e. fatal incidents, serious injury, minor injury and property damage). The ratios of the relationship between the incidents with negative consequences and near misses varies by different studies, however, the concept is consistent, the number of near miss incidents to those of negative consequences is significantly higher. This gives companies the opportunity to investigate the near misses to reduce the actual number of incidents in all incident consequence types. Unfortunately, based on experiences of OSHA investigators, companies even when required, many times do not conduct investigations of actual events. Further, OSHA investigator's audits have shown companies seldom conduct investigation of near miss events. When auditing a companies incident investigation program, a key indicator as to whether near miss incidents are being reported is if the number of actual incidents is greater than the number of near miss incidents reported and investigated.

Personal experience in investigating some of the largest domestic process incidents in the past ten years has shown that most all events had some type of precursor(s) to the event. Had the companies involved with these events had an effective incident investigation program, it is likely the circumstances, e.g. causal factors, which led to the events would have been addressed and the incidents would not have occurred. This same information is stressed by CCPS and Lees. CCPS states, "*Almost all serious accidents are preceded by numerous precursor events that give the opportunity to detect and eliminate potential hazards, thereby reducing risk.*", and Lees states on the subject, "*It has long been appreciated that for every accident there are many lesser events, some with less material effect and others with no effect*

at all, and it is desirable to learn from these 'near misses'".

Most companies understand the importance of conducting incident investigations, however incident investigations also pose one of the biggest challenges to a company's safety program. If an incident investigation program is to accomplish all of its goals, a company needs to have a positive safety oriented corporate culture which is founded in a trusting relationship between its management and employees. Three of the primary reasons incidents do not get investigated include:

1) Negative employee consequences when investigations are conducted.

The natural response is for employees to fear disciplinary actions as a result of reporting near miss incidents, consequently, these type incidents are often not reported and therefore are not investigated. The remedy is a progressive corporate culture which encourages openness and trust between employees and management and through its actions shows its employees that its incident investigation program is for the purpose of learning and not for assessing blame;

2) Inadequate corporate procedures delineating when to conduct incident investigations

Sometimes it is easy to determine when an event meets corporate criteria as an incident which is required to be investigated, e.g. release of a hydrocarbon vapor cloud which may or may not be ignited. However, in many instances, lower supervision levels do not report near miss incidents because the corporate procedures are not specific enough to indicate whether "borderline" events should be reported and investigated. Without clear guidance, the decision process of first line supervision will most often be to classify the event as a "non-

incident" especially if the corporate culture is not one of trust.; and

3) Corporate liability concerns

Some companies elect to address issues presented by incidents in ways, i.e. no documented record, which do not offer the benefits that are derived by conducting formal incident investigations. In some companies, incident investigations, especially near miss incidents, are not started because of corporate fears of creating a record which might be used in potential future liability cases.

Progressive Company's Incident Investigation

Progressive companies which conduct incident investigations not only determine specific factors which contributed to the event, but they use information related to probable and root cause(s) to evaluate the effectiveness of their safety programs.

Example Process Incident Investigation

A progressive company experienced a release from a hydrocarbon gas line. Fortunately, the vapor which was released dissipated prior to being ignited which would have resulted in a fire and/or explosion. The company immediately established an incident investigation team as specified in their company procedures. The investigation team determined that the gas line failed due to corrosive effects over time. Further, the investigation team determined that the gas line had been inspected once in its 25 year operating history. When the investigation team evaluated the actual inspection of the line that failed against the company's piping inspection program, it was determined that the inspection frequency did not meet company standards and that the number of thickness monitoring locations (TML) was inadequate for the piping circuit which included the failed line.

Considering the above example, companies in the past which would have did this incident investigation would traditionally address only the specific findings of the investigation. Using this investigation as an example, companies in the past would have been expected to only

address the specific causes of the event. It would have been expected that the company would focus only on the piping circuit involved with the incident. Companies' actions probably would have been to increase the frequency and the number of TMLs in the circuit where the incident occurred.

Today, progressive companies will not only address the specific findings of the incident, but they will use the findings, probable and root cause(s) of the incident to do a program assessment. In the example, the progressive company will not only assess its mechanical integrity program to determine if their piping inspection program was effective in the area involved in the event, they will also conduct an overall assessment of their inspection and testing programs for all equipment which is part of its process safety program. Additionally, the program assessment may have the company look beyond its mechanical integrity program into other management systems or organizational structure which may have been involved with the event.

Using Pertinent Information Generated by the Incident Investigation

In almost all cases information which is captured and reported by an incident investigation team is related to probable cause(s) and root cause(s) of an event. Conversely, information, related to potential scenarios which an investigation addressed but later rejected because evidence could not support the scenario, is in almost all cases not captured, reported, or as a result, used as input data from the incident investigation for program assessment purposes. The investigation process has investigators evaluate many potential scenarios which are ultimately rejected. During the evaluation of these potential scenarios, the investigators many times learn information about deficiencies in company safety programs. However, the information related to program deficiencies as they relate to potential scenarios is not captured or reported. Generally, when an incident report documents a potential scenario it is to only show that the investigators considered it and the technical basis for rejecting it. Consequently, any program safety information which may have been generated related to the potential scenario is not reported and therefore not used to assess the effectiveness of the program.

Why is it important to capture information related to safety deficiencies which were discovered as "only" potential problems of a rejected scenario? The next incident may be the result of programmatic issues related to a previous rejected scenario. The difference between having an incident and a near miss is only a slightly different set of circumstances - in many cases these circumstances are not the result of the safety program creating a barrier where the event could not occur, but they are the result of the circumstance of chance. For instance, in the example of the hydrocarbon gas release given above, the wind could have been still, there could have been more confinement of the released vapor or any number of other circumstances which were outside the design of the company safety program. But in this case as a result of a slightly different set of circumstances, what ultimately was a near miss could have resulted in a catastrophic unconfined vapor cloud explosion.

Figure 1 depicts a typical incident investigation. The figure shows the investigation considered three scenarios and ultimately concluded the "mechanical scenario" as the most probable cause. In a typical investigation, the investigation will capture information related to the events which led to the incident, conditions or causal factors and barriers which did and did not work in the prevention of the incident. This information related to the most probable cause(s) and root cause(s) is captured, retained and reported in the incident report. From the incident report, the information is then further used in a program assessment. However, as shown in Figure 1, information generated on safety barriers which did and did not work related to the rejected scenarios ("operational" and "design") is usually not captured, retained or reported. Therefore, this information is not available for program assessment.

Conclusions

1. Companies need to conduct incident investigations, especially for near miss incidents. Given the relationship of near miss incidents to incidents with negative consequences, companies can reduce the number of incidents with negative consequences by investigating and acting on recommendations from near miss incident investigations.
2. Companies have an opportunity to utilize information generated during incident investigations to evaluate the effectiveness of their safety programs. When incident investigations are used to look beyond the specific cause of an incident or to assess blame, the information generated can be used as a program assessment tool.
3. The incident investigation should capture, retain and report on information not just associated with probable cause(s) and root cause(s), but on information which was generated related to program deficiencies which were part of rejected scenarios.

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