TerranearPMC Safety Share

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Performing an accident/incident investigation is an integral part of controlling accidents as well as other unwanted events. They can help us identify root causes and contributing factors within a process –whether that process is a workplace activity such as a critical lift for a crane or trying to ensure that the right pizza is delivered to a customer in a timely manner. True, someone getting a pepperoni pizza when they ordered Canadian beacon does not warrant the same attention as a piece of heavy equipment failing; but nevertheless, both are unplanned and unwanted events that can result in unfavorable consequences. Therefore, no matter what the situation, if one wants to correct an undesired event, whether effecting the profits of a business or an accident at a construction site – understanding the causal effects and developing the appropriate corrective actions is vital for any organization.

The fact is, there are many techniques available that can help identify reasons for an unwanted event. And not all techniques will provide a suitable solution. So it goes without saying that to understand the various investigation techniques and to choose the most applicable to a given situation is crucial. Below are five formal investigation techniques:

1. Change analysis
2. Barrier analysis
3. Extent and causal effects analysis
4. Management Oversight and Risk Tree (MORT)
5. Cause and Analysis (aka "Fishbone")

Change Analysis: This is typically used when a cause for the unwanted event (i.e. accident) involves equipment (as opposed to a process) is not clearly evident. The premise is to distinguish the steps of sequence of events as it is expected to occur and compare these steps that relate to how the events actually occurred. This takes considerable time for interviews with numerous personnel. To identify the differences between actual occurrence and the desired steps is the key to understanding what went wrong. Questions that pertain to "What, When, Where, How, and Who" are valuable to determine the difference between "actual vs intended design."

Barrier Analysis: This technique requires the identification of the controls that have been implemented for a particular process and to see the failure points associated with these controls. For instance, an incident that involved a forklift: Operating a forklift requires specific training and if it was determined that an operator was deficient per training requirements, a breach of a barrier would be evident. Of course a lack of training, by itself, may not automatically lead to an accident - especially if other controls were instituted. Now, say the forklift was defective – like a hydraulic line was damaged. Without proper training and maintenance, we can now see how an accident can arise. By adding another "missed: control, such as poor housekeeping the path of operation may not have been assessable for the forklift. Now, without proper training, a defective forklift and poor passage (which also might involve poor visibility), we can now understand how defective barriers (i.e. training, maintenance, housekeeping, etc.), could have all played a role in a forklift accident. Thus, according to "Barrier Analysis," theory, the incident was the result of numerous control failures being breached via a specific sequence of events. Therefore, by recognizing these breached

control points, numerous corrective actions would need to be instituted to prevent a similar reoccurrence.

Extent and Causal Effect Analysis: This is an investigative techniques that starts with the unwanted event and then, working backwards through the various steps, the investigation can identify the specific steps needing strengthening.

Management Oversight and Risk Tree: Better known as MORT, is without a doubt, the most complex and in depth assessment method for understanding causal analysis and subsequent corrective actions. This is due to the nature of MORT where all possible points of failure are identified during the planning stage. MORT has been the primary investigative tool by NASA for the Space Shuttle program. This process begins with the failure event and then flows down, identifying immediate conditions that would directly cause this event. Sometimes multiple events need to happen. For instance, when a person slips due to moisture on the floor AND the spill was not cleaned up. Both events needed to occur. Of course, at this point, each contributing factor could then be analyzed for finding the reason why moisture was on the floor (was some equipment leaking oil OR did someone just spill water from a bucket?) and why wasn't the moisture cleaned (did the moisture collect during the evening from a leaking pipe that no one noticed OR did someone not bother to practice proper housekeeping?). As we can see, an event may be the result of numerous incidents. And sometimes, while several events may need to occur, there are instances where only one is necessary. For instance, take a cracked living room window. This damage could have been the result of someone accidentally throwing a ball that struck the window OR due to weather damage. Both incidents were not required for the window to break. Thus MORT is an extensive flow diagram consisting of multiple and simultaneous events as well as single event points where choices exist (this is typically referred to as "AND" and "OR" gates) for each "sub-event" being the result of AND or OR conditions. Systems engineers are typically tasked to develop numerical values in terms of probability occurrences for each potential contributing factor. MORT is quite a complex and involved process and should only be considered for the most extensive processes where root causes and contributing factor may be buried deep within a process.

Cause and Analysis: Also known as the "Fishbone" analysis, this techniques can be simple while being very effective. It is a diagram that presents an incident at the end of a straight, horizontal line while having branches (similar to a fish skeleton or the structure of a leaf with the midrib and veins). The branches represent the categories of machines, people, materials, methods, etc.: all related to the components of an incident. Each branch can then be further divided into specific conditions within that category. For example, the branch of "people" could be an important component regarding an incident and the branch extensions could be proper training or experience, or even being absent from their assigned task (which could be a direct factor in a failed process). It is typical that after three layers of branching, the root cause and contributing conditions emerge.

These investigative methods can be quite effective for identifying root causes and contributing factors; However, depending on the specific circumstances the right investigative tool needs to be applied so that the root cause and contributing factor can be determined and therefore, allowing the appropriate corrective actions to be implemented.

You can no more make someone tell the truth than you can force someone to love you – Philp Roth (American Author: 3/1933-5/2018)