ROOT CAUSE ANALYSIS IN ACCIDENT INVESTIGATION

Name

Course Title and Number
Instructor’s Name
Date
Executive Summary

Accident investigation is aimed to determine the root causes of the accident, to estimate its cost effects, and also to comply to government safety regulations. Safety practitioners have to use a scientific method for this. There are five simple steps in accident investigation: (1) collecting information, (2) reviewing information, (3) determining the causes, (4) recommending actions, and (5) evaluating the effectiveness of the actions. It starts with collection of evidence to analyze the problem better. Data is reviewed for authenticity and for differences. Determining the causes is best performed using the root cause analysis (RCA). Root cause analysis integrates using the Ishikawa diagram (fishbone diagram) integrated with the why-why analysis. Proximate causes are enumerated under the different categories such as man, materials, machines, methods, and environment. The head of the fish is the main effect which is the accident. The bones of the fishe are where root causes are enumerated. Backward questioning is then done by asking the question why unil the root cause is identified. When the root causes are identified and reviewed, corrective actions are proposed. Corrective actions need to implemented and evaluated for their long-term effectiveness. This paper summarizes the procedures in effective accident investigation. A sample accident is given to illustrate the use of root cause analysis in accident investigation. Although there are different approaches and steps in accident investigation from company to company and state to state, they have a common focus which is an effective root cause analysis.
Accident investigation is the task of obtaining evidence to find out the cause of the accident and preventing it from happening. The underlying root causes for the accident can be analyzed similarly to the domino effect. What are the first dominoes causing the next dominoes to fall? The first dominoes are the root causes which needs to be addressed. Yes, there are many root causes no matter how straightforward the situation seems to be. Accident investigation then is not about putting the blame on the proximate persons involved, but rather doing corrective actions on the root causes to avoid similar incidences in the near future. Aside from this, determining the costs of accident and compliance to safety regulations are also reasons why accident investigation is done in the workplace. This paper attempts to discuss the approaches in accident investigation, and the root cause analysis (RCA) as a powerful tool in the scientific method involved.

Gaasden discusses five simple steps in accident investigation: (1) collecting information, (2) reviewing information, (3) determining the causes, (4) recommending actions, and (5) evaluating the effectiveness of the actions.¹ The first step involves the collection of facts and evidence related to the accident. Urgency plays a key role for this step. People concerned are interviewed. Open questions on who, what, where, when, and how are asked. Also, records related to the accident are obtained such as monitoring sheets, medical certificates, etc. Second is the review of information where fact is separated from rumour. Data is sequenced in chronological information. Third is determining the root causes. This is where root cause analysis (RCA) integrates use of Ishikawa diagram and why-why questioning. The fourth step

involves recommending corrective actions which addresses the root causes. By implementing the necessary actions, future accidents can be avoided. Last is evaluating whether the corrective actions are effective or not. This might take some time usually 3 months to 1-year before the corrective action is closed. The safety committee needs to ensure that the corrective actions do not create new hazards. This feedback process promotes continuous improvement on workplace safety. Looking at the current setting, accident investigation procedures vary from company to company in terms of policies and from state to state in terms of regulations. Basically, Gaasden’s five steps summarizes the procedure in accident investigation. It is similar to the scientific method wherein a hypothesis is checked. In accident investigation’s final steps, the corrective actions implemented are evaluated whether they have eliminated the hazard or not.

Collecting evidence as part of accident investigation needs to be unbiased and reflecting the truth since it is one prerequisite to an effective root cause analysis. According to the UK Office of Public Center Information, there are three information sources one should consider in collecting evidence: (1) observation, (2) interviews and (3) documents.\(^2\) Observations refer to the information from physical circumstances including clinical evidence of physical injuries. Interviews refer to direct testimonies of witnesses. Documents refer to records, written instructions and monitoring sheets that can explain what happened. These forms of evidence have to be considered such that gaps are identified and differences between informations are settled. The five open questions are asked during the collection of evidence: who, what, where,

when and how. The truth is sought and it has to be unbiased. Fact must be separated from rumour. Curious attention detail and logical questioning are the two keys for gathering data.

The Canadian Centre for Occupational Health and Safety cites that the causes of accidents can be classified into these five areas: personnel, material, task, management, and environment. It is similar to the management areas man, materials, machine, method, and environment. This is more popularly known as the 4M+E in management. Materials and machines can be combined as one, but there is one difference. It is the role of management. A safety policy from the management have to be relayed to the employees in the company. Safety needs to become a way of life for the employees, and management has to support this endeavor.

The 4M+E are the areas to be considered in root cause analysis (RCA). RCA is a very powerful tool in the workplace. It incorporates the Ishikawa (more popularly known as cause-and-effect or fishbone diagram) diagram and the why-why analysis. This is a method introduced by Dr. Kaoru Ishikawa of Japan in the 1960’s. RCA wants to answer the question, “Why did it happen?”. Unless the root causes are not solved, possible occurrence of similar incidents is high. Enumeration is not enough. The different proximate causes are identified and put under the

---


categories of man, machine, materials, method and environment. These causes are the bones in
the fish, and the fish head is the main effect (the accident). The analysis goes deeper by asking a
series of why questions until the root cause is obtained.

Figure 1: Ishikawa Diagram of a Hypothetical Accident

To describe the process, In Figure 1 is an Ishikawa diagram of a hypothetical accident.
The accident concerns a process helper suffering from 2nd and 3rd degree burns. Prior to root
cause analysis, factual evidence is obtained using records, interview, and observations. That is
how the safety committee conducting the investigation know that the victim is tasked by
coemployee to check fluctuating temperature (man), that there is a pipe leak (machine), that hot
water used in cleaning is at 90°C (material), and that he was not wearing personnel protective
equipment (method). Asking a series of why questions on machine, why was there a pipe leak?
This is because of normal corrosion due to caustic and acid application during cleaning-in-place.
Why? Based on records, there was no preventive maintenance activity performed on it for the
past 2 years. This was also done on other mentioned causes. From this RCA, the safety committee realized that some safety conditions were not met such as no personal protective equipment, and there was no safety sign in a hazardous area.

In a workplace where quality management system (ISO 9001: 2008) is in place, there are three types of action involving accidents: correction, corrective action and preventive action. First, correction is the immediate action to fix the problem or nonconformity. Second, corrective action refers to a long-term strategic solution to address the root cause of the problem. Third is the preventive action whose function is to prevent potential nonconformities from happening. When the accident already happened, the approach is corrective in nature. When the accident does not happen yet, the strategies are preventive actions.

Usually, accidents are addressed directly. The immediate action is the correction. But, the underlying root cause of the accident is the one that needs to be addressed. This long term solution is the corrective action. From the example in Figure 1, corrections and immediate action done were to apply first aid treatment to the victim, to send him to the hospital, and to fix the actual leak. The corrective actions done were based on the results of the root cause analysis. A reevaluation was done on the piping system and a series of preventive maintenance activities are planned and implemented at appropriate time intervals (quarterly or yearly). Also, personnel protective equipment has to be made available by management such as safety shield and clothing

---

in doing tasks at hazardous areas. Furthermore, safety signages in the hazardous area has to be placed as added precaution to employees working there.

Corrective actions done are then recorded and evaluated after a period of time (usually 3 months to 1 year) to evaluate the effectiveness of the implemented actions. Similar accidents need to be prevented by the corrective actions. Clearly, the process goes back to the root cause analysis. Were there causes not identified? Were the root causes identified truly the roots of the problem? Were the proposed actions implemented and monitored by the safety committee? Thus, the root cause analysis is the heart of the accident investigation process. Although there are different approaches and steps in accident investigation from company to company and state to state, they have a common focus which is an effective root cause analysis. It links what has happened and what needs to be done. In the end, the main goal is clear: to address the problem and prevent it from reoccurring.
Bibliography


