

Fluorine Gas Mist Pot Fails

Lessons Learned

Volume 03 Issue 09

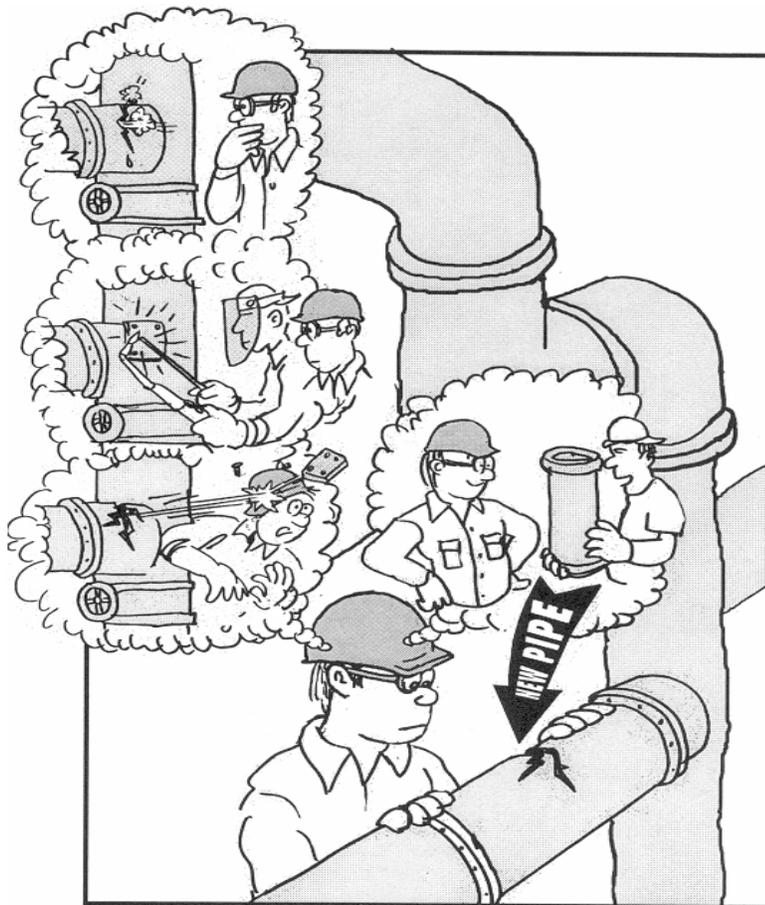
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Fluorine Gas Mist Pot Fails

Purpose

To conduct a small group “lessons learned” activity to share information gained from incident investigations.

To understand “lessons learned” through a systems of safety viewpoint.



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The incident and recommendations made are from an actual USW represented facility. These recommendations are a product of the site’s analysis of the incident and not meant to represent the USW official view on the topic(s). In fact, one of the goals of this exercise is evaluate the recommendations made and to suggest improvements.

Introduction

One Hour “Lessons Learned” Safety Training Activity

This is a Small Group Activity Method (SGAM) exercise. It is designed for use in toolbox style meetings where a group of craft persons, operators, or other small group is assembled for a safety training session. The whole group should be further divided into smaller discussion groups of four to six people.

The tone of the meetings should be informal to create as much discussion as possible within the groups and among the groups. Active participation by group members is essential for this exercise to be successful.

If you plan to present a Lessons Learned Activity and have not been trained in the USW worker trainer program, you should contact the USW Health, Safety & Environment Department:

Phone (412) 562-2581

email: safety@steelworkers-usw.org for trainer information.

For this exercise, each person in the group should have their own copy of this activity printed in its entirety. The exercise consists of three tasks. Each task is designed to provoke thought and generate discussion about the incident at hand. Each discussion group should designate a scribe to keep notes and report back to the facilitator and class after each task. When the exercise is completed, review the Summary on page 13.

Definitions of terms used in this exercise are provided throughout the activity. A glossary of terms is also provided in the appendix.

The incident(s) depicted in this activity are based upon real occurrences. The names of persons and corporations are fictitious.

Task 1

Please read the following scenario:

A Fluorine gas mist pot at a control valve station was found to be leaking at a flange. Upon inspection it was determined that a new gasket would not correct the problem because the metal on the flange had deteriorated badly. The mist pot was changed out by the maintenance mechanics but the mist pot had been washed and stored with all the flanges exposed to the building atmosphere prior to installation. The mist pot was pressure checked and leaks were found. The leaks were subsequently repaired and the vessel was rechecked for leaks and found to be leak tight.

The mist pot was put back in service during the evening shift. Fluorine was introduced through the mist pot and a short time later, the operator saw the mist pot glowing and notified the control room operator to shut the plant down. A hole was subsequently found in the bottom of the mist pot.

After the incident it was found that a dew point analysis had not been taken on the mist pot prior to putting it back in service. It was also determined that Fluorine had not been introduced to the vessel at a low enough rate to passivate the metal. There was no written procedure for checking and installing Fluorine gas mist pots.

Task 1 *(continued)*

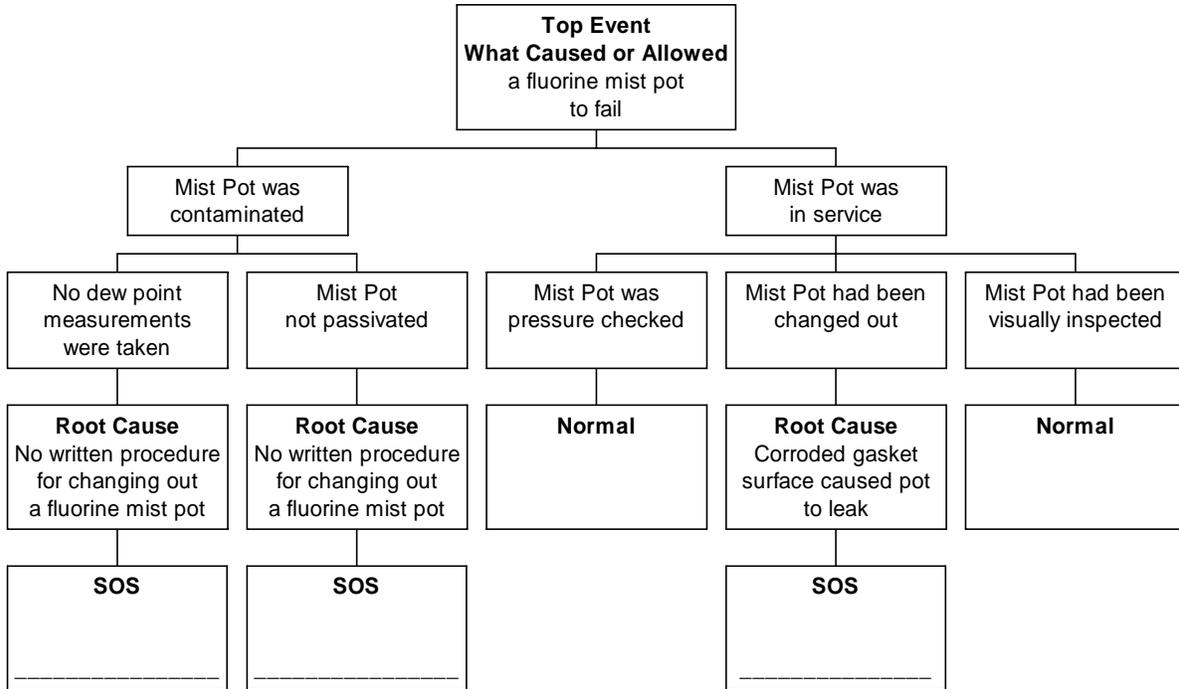
On the next page you will find a logic tree that shows how the investigators at this site linked the incident that occurred (the top event) to the facts described in the scenario and the incident’s root causes. Below each root cause in the logic tree you will find a block with the title “SOS” (System of Safety).

Find the boxes marked SOS. Directly above those boxes will be a root cause of the incident. Your task is to complete the logic tree by identifying the *major* system of safety affected where the root cause failure occurred and list it in the box. These “systems” are listed in a chart on page 9. *Note: some of the SOS boxes may already be completed for you.*

Please select someone in your group to act as scribe to report back your answers.

A USW "Lessons Learned" Activity

A **Logic Tree** is a pictorial representation of a logical process that maps an incident from its occurrence to the root causes of the incident.



Task 2

A. Below you will find two lists. On the left are the root causes from the logic tree on the previous page. On the right are recommendations made by the team that investigated this incident. On the chart below identify which of the “recommendations” would eliminate or reduce each “root cause” by placing the number of the recommendation(s) on the line provided. More than one recommendation can apply to a root cause.

| | Root Causes | Recommendations |
|--|---|---|
| | 1. Did not passivate the Mist Pot with low volume of Fluorine before going to higher rates. | a. Make sure a dew point is taken before putting mist pot back in service. |
| | 2. No written procedure for changing out the mist pot. | b. Quality control measures need to be taken(Storage of the mist pots) before installation. |
| | 3. Mist pot was contaminated. | c. Passivate the mist pot with Fluorine before putting it back into service. |
| | 4. No dew point was taken before putting the mist pot back into service. | d. Have written procedures put in place for putting a mist pot into service. |

A USW “Lessons Learned” Activity

B. Use the concepts found on the factsheets on pages 9 through 12 and evaluate the recommendations from Question A. How would you strengthen or add to the list?

Task 3

Discuss ways in which the “Lessons Learned”(listed below) from this incident can be applied at your workplace. Please explain.

Lessons Learned

- All openings on mist pots must be covered when placed in storage to prevent moisture from collecting.
- There need to be written procedures for all Fluorine equipment changes.
- Training must be performed for all new procedures and must include both maintenance and production.
- Dew points should always be taken when new mist pots are put in service.
- All replacement Fluorine line equipment; valves, lines, mist pot, etc. need to be passivated with low rates of Fluorine.

All Systems of Safety Are Not Created Equal!

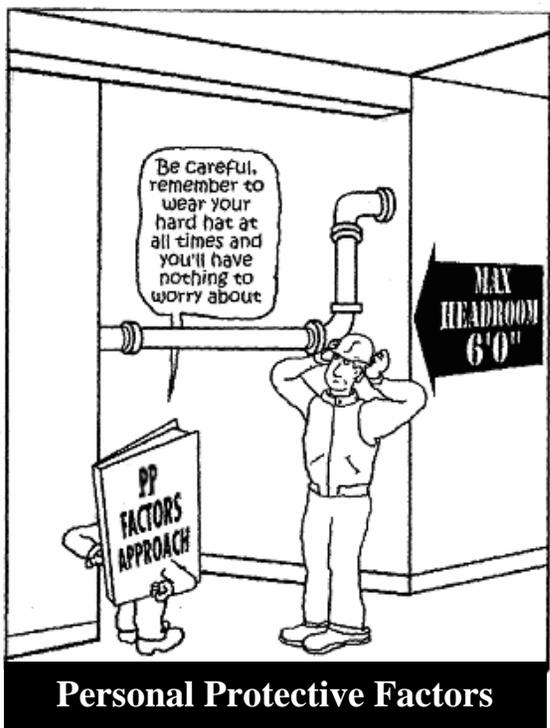


Surprisingly, the same hazard can often be addressed in more than one system. Take the low pipe in the doorway above, on the next two pages you'll see how this same problem could be handled by each of the major Systems of Safety.

Which is the best approach? Well, if you look at the Systems of Safety Chart on the previous page, you will find the SOS's arranged in order of strength: the most powerful – Design – on down to the least powerful – Personal Protective Factors.

A good investigation team will consider the full range of recommendations for each root cause.

A USW “Lessons Learned” Activity



Personal Protective Factors

Sub-systems that include a broad range of working conditions and situations that affect workers.

- Weakest system
- Controls the hazard directly at the individual’s level



Procedures and Training

The instructions and knowledge necessary to maintain and operate equipment or processes

- Easier to affect groups of workers.
- Dependent on individuals’ memories and lack of distraction

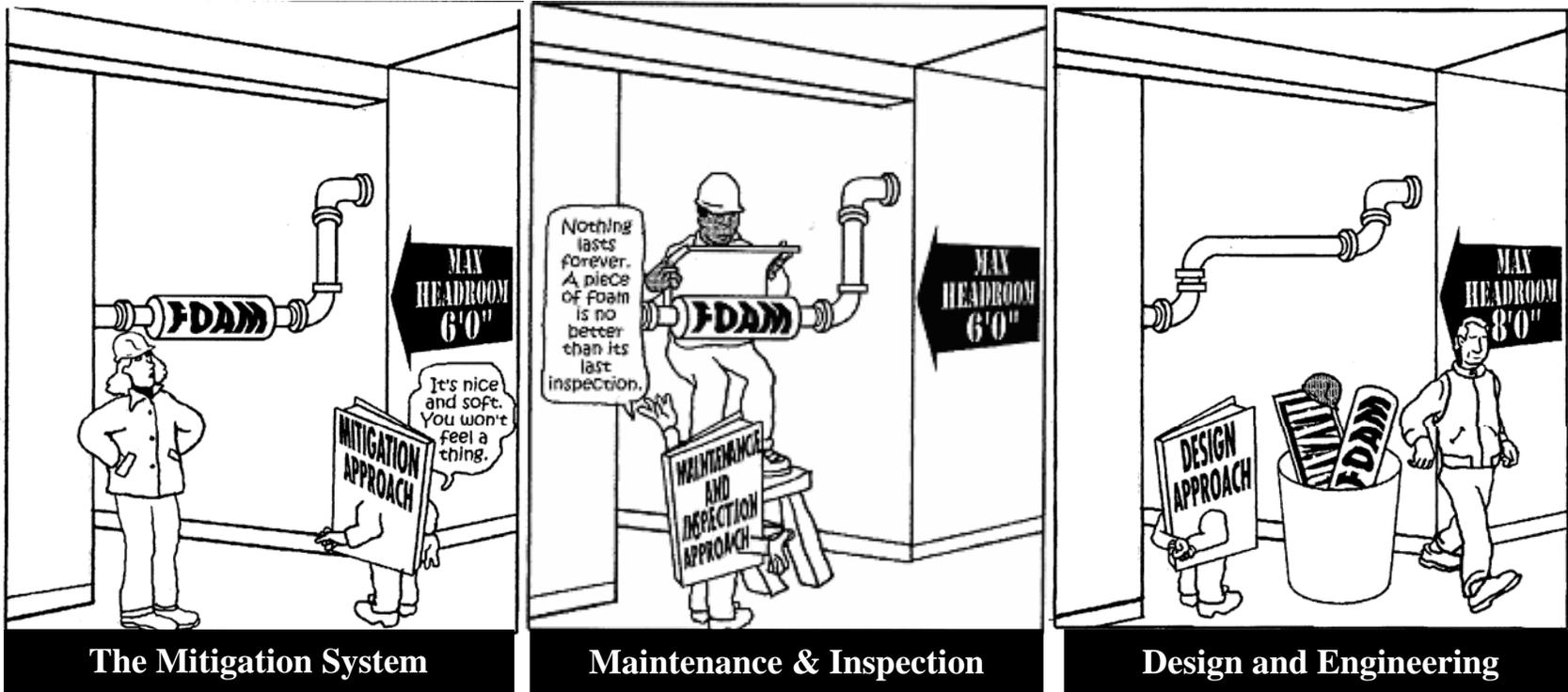


The Warning System

Devices that warn of a dangerous or potentially dangerous situation.

- Draws attention
- May be missed or ignored

A USW "Lessons Learned" Activity



Sub-systems that automatically act to control or reduce the effect of hazards.

- Workers protected automatically

The system responsible for maintaining, repairing and inspecting equipment and processes.

- Vital to make sure even the best designed system continues to function safely

The primary (highest level) system that designs the hazard out of the process.

- Strongest system
- Hazard eliminated

Summary: Lessons Learned

1. The objective of “lessons learned” is to prevent accidents through identifying and correcting underlying defects in systems of safety. To achieve maximum prevention, all recommended changes should be made.
2. Corrective action resulting from lessons learned is one of the best methods for achieving proactive health and safety. Maximum prevention is achieved by correcting the conditions that led to the incident at other sites in the plant and at other sites.
3. Systems of safety-based analysis help identify the underlying causes of incidents and are valuable for determining what corrective measures should be taken as a result of the lessons learned.
4. Many times the result of an incident investigation is that worker error is identified as the main contributing factor. When a systems of safety-based analysis is used, multiple root causes are usually uncovered.
5. The most effective controls of health and safety hazards are those which are integrated or designed into the process, such as engineering controls. The least effective controls involve personal protective equipment and procedures that merely acknowledge the hazard and do nothing to eliminate it.
6. All work-related hazards must be evaluated before work begins to eliminate or reduce worker exposure to hazards and to prevent injuries.

Glossary of Terms (Appendix)

Several unique terms are used while doing the “Lessons Learned” exercises. Their definitions are listed below.

Contributing Factor—something that actively contributes to the production of a result, an ingredient.

Fact—a piece of information presented as having objective reality, an actual occurrence or event.

Hierarchy of Systems of Safety—the ranking of systems of safety as to their relative effectiveness in providing accident prevention. This hierarchy is represented by the “Fulcrum” with the most effective system of safety residing on the left side of the lever. Less effective systems reside further to the right on the lever.

Lessons Learned—A summation of an investigation that describes safety hazards or conditions with general educational recommendations to identify and correct similar conditions. These differ from investigation recommendations as illustrated below:

Investigation recommendation: Replace the carbon steel gate valve on the vacuum tower bottoms line with a chrome valve. The valve failed due to corrosion.

Lessons Learned: Verify that carbon steel valves and piping are not used in vacuum tower bottoms service because corrosion can cause them to fail.

Logic Tree—a pictorial representation of a logical process that maps an incident from its occurrence to the root causes of the incident.

Recommendations—calls for specific changes that address each root cause of an incident or accident to prevent its reoccurrence.

Root Cause—basic cause of an accident found in management safety systems.

Glossary of Terms (*continued*)

Supports and Barriers—“supports” are conditions that promote or render assistance to implementing recommendations while “barriers” are conditions that obstruct the implementation of recommendations.

Systems of Safety—management systems that actively seek to identify and control hazards before they result in an incident or injury.

- Design and Engineering
- Maintenance & Inspection
- Mitigation Devices
- Warning Systems
- Procedures and Training
- Personal Protective Factors

Conducting a “Lessons Learned” Activity

Circle the number that best shows your response to each of the following questions.

1. How easy was it for you to understand the “systems of safety” approach presented in this activity?

| | | | |
|------------------|----------------------|----------------------|------------------|
| 4 | 3 | 2 | 1 |
| Very easy | Somewhat easy | Somewhat hard | Very hard |

2. How useful do you think this “systems of safety” way of thinking could be for tackling safety and health problems at your workplace?

| | | | |
|--------------------|------------------------|------------------------|------------------|
| 4 | 3 | 2 | 1 |
| Very useful | Somewhat useful | Not very useful | Of no use |

3. How much do you agree or disagree with the following statement:

The logic tree diagram approach can be helpful for analyzing the root causes of safety and health incidents.

| | | | |
|-----------------------|--------------|-----------------|--------------------------|
| 4 | 3 | 2 | 1 |
| Strongly agree | Agree | Disagree | Strongly disagree |

4. Overall, how useful was this “lessons learned activity” for considering safety and health problems at your workplace?

| | | | |
|--------------------|------------------------|------------------------|------------------|
| 4 | 3 | 2 | 1 |
| Very useful | Somewhat useful | Not very useful | Of no use |