



Ammonia Inhalation

Purpose

To share “lessons learned” gained from incident investigations through a small group discussion method format.

To understand “lessons learned” through a Systems of Safety viewpoint.



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Lessons Learned

Volume 07, Issue 45

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Background Information

Before beginning this Lessons Learned, please review this and the next page which contain information that will introduce the concepts of Lessons Learned and Systems of Safety.

Creating a safe and healthy workplace requires a never ending search for hazards that sometimes are not obvious to us. These hazards exist in every workplace and can be found by using various methods. Lessons Learned are just as the name suggests: learning from incidents to prevent the same or similar incidents from happening again.

Systems Are Not Created Equal: Not equal in protection and not equal in prevention.

Using our Systems Focus to uncover system flaws or root causes is only one part of controlling hazards. We also need to look at the systems involved to decide on the best way to deal with the problem. The most effective way to control a hazard is close to its source. The least effective is usually at the level of the person being exposed. The system of safety in which the flaw is identified is not necessarily the system in which you would attempt to correct the flaw.



Major Safety System	Design & Engineering	Maintenance & Inspection	Mitigation Devices	Warning Devices	Training & Procedures	Personal Protective Factors
Level of Prevention	Highest—the first line of defense	Middle—the second line of defense				Lowest—the last line of defense
Effectiveness	Most Effective	←————→				Least Effective
Goal	To eliminate hazards	To further minimize and control hazards				To protect when higher level systems fail
EXAMPLES OF SAFETY SUB-SYSTEMS**	Technical	Inspection and Testing	Enclosures, Barriers Dikes and Containment	Monitors	Operating Manuals and Procedures	Personal Decision-making and Actions HF
	Design and Engineering of Equipment, Processes and Software	Maintenance	Relief and Check Valves	Process Alarms	Process Safety Information	Personal Protective Equipment and Devices HF
	Management of Change (MOC)**	Quality Control	Shutdown and Isolation Devices	Facility Alarms	Process, Job and Other Types of Hazard Assessment and Analysis	Stop Work Authority
	Chemical Selection and Substitution	Turnarounds and Overhauls	Fire and Chemical Suppression Devices	Community Alarms	Permit Programs	
	Safe Siting	Mechanical Integrity	Machine Guarding	Emergency Notification Systems	Emergency Preparedness and Response Training	
	Work Environment HF				Refresher Training	
	Organizational (must address a root cause)				Information Resources	
	Staffing HF				Communications	
	Skills and Qualifications HF				Investigations and Lessons Learned	
	Management of Personnel Change (MOPC)				Maintenance Procedures	
	Work Organization and Scheduling HF				Pre-Startup Safety Review	
	Work Load					
	Allocation of Resources					
	Buddy System					
	Codes, Standards, and Policies**					

HF - Indicates that this subsystem is often included in a category called Human Factors.

* There may be additional subsystems that are not included in this chart. Also, in the workplace many subsystems are interrelated. It may not always be clear that an issue belongs to one subsystem rather than another.

** The Codes, Standards and Policies and Management of Change sub-systems listed here are related to Design and Engineering. These subsystems may also be relevant to other systems; for example, Mitigation Devices. When these subsystems relate to systems other than Design and Engineering, they should be considered as part of those other system, not Design and Engineering.

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Lessons Learned Statement:

The delay in commissioning a new injection system for service, proper location of a condensate drain header and the absence of PPE added up to an injured employee. *Systems of Safety* are utilized to provide prevention from this type of incident. The protection afforded by replacing old, outdated equipment is accredited to a well-defined **Design and Engineering System of Safety** approach.

Despite previous reports of line pluggage, there was no action taken within the **Maintenance and Inspection System of Safety** to clean or repair the equipment.

With the **Training and Procedures System of Safety**, Operations should include a well-defined procedure that includes specific instructions to safely clear a plugged quill. It should also include personal protective clothing (**Personal Protective Factors System of Safety**) that would prevent any exposure to hazardous environments. (**Note:** PPE should be used as a last resort due to the fact that the hazard is still present.) An administrative policy that states that the job will not begin or that the job will be discontinued at the first failure of any of the mechanisms would provide maximum protection through the **Design and Engineering** safety sub-system of *Organizational Policies*.

Discussion:

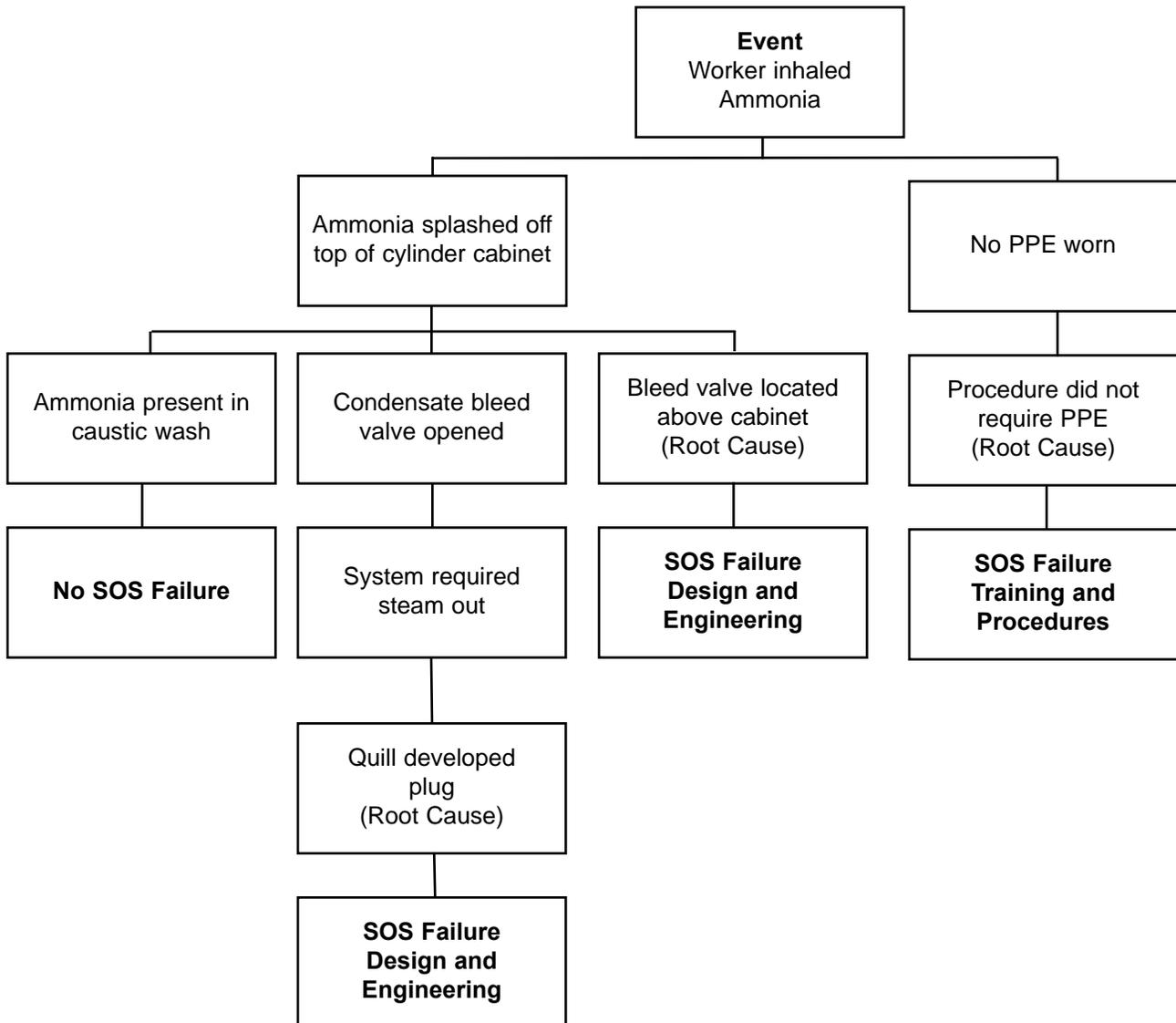
An operator on the alky unit was required to steam out the ammonia injection quill on a caustic treater. The operator properly valved out the ammonia. When steaming out this line, the operator felt the steam hose until he could no longer feel steam flowing. The operator noticed that the steam flow had ceased indicating the line needed to be drained and depressurized. This process was then repeated until the quill was unplugged. The operator cracked the bleed valve to drain the condensate. No condensate came out; so the operator slightly opened the drain valve some more. A sudden mixture of ammonia, condensate and steam came out with force; resulting in the operator getting sprayed with condensate and inhaling ammonia.

The investigation revealed the following facts:

- Ammonia is normally injected into the tower to prevent corrosion.
- The flow meter on the quill was not functioning properly.
- It is normal practice to steam out the quill to unplug.
- In past practice, it is normal to depressurize and drain the line through the bleeder.
- Frequency of plugging varies from minutes to as long as five days.
- It is believed that low pressure could be a contributing factor to the plugging.
- Fittings on the steam-out header are screwed with a number of them leaking.
- A new ammonia injection skid was in place but not yet commissioned.

Analysis

The Logic Tree is a pictorial representation of a logical process that maps an incident from its occurrence, “the event,” to facts of the incident and the incident’s root causes.



Recommended Actions

1. Commission the new ammonia skid mounted injection equipment.
2. Replace the steam-out header with a better design to eliminate possible exposure.
3. Review and change procedure to include instruction on safely unplugging of quill and to address PPE.
4. Train effected workers to the new procedure.

Education Exercise

Working in your groups and using the Lessons Learned Statement, Discussion, Analysis and Recommended Actions, answer the two questions below. Your facilitator will give each group an opportunity to share answers with the large group.

1. Give examples of ways to apply the Lessons Learned Statement at your workplace.

2. Of the examples you generated from Question 1, which will you pursue in your workplace? (**Note:** When we say something you may pursue, we mean a joint labor-management activity or a union activity rather than an activity carried out by you as an individual.)

Trainer's Lessons Learned Success Inventory

Following a Lessons Learned (LL) session, **the trainer who led the LL** should complete this form. This information will: 1) Help you reflect on the successes and challenges of the session; 2) Help USW with new curriculum development; and 3) Help USW as a whole better understand how the LL Program is supporting their workers.

By reviewing LL from different sites or from other areas of their workplaces, workers are able to analyze the information and apply these lessons to their own workplaces in order to make their workplaces healthier and safer.

1. Site name (if there are participants from more than one site, please list all).

2. Date of LL training _____

3. LL number used in today's Training _____

4. Your name _____

5. **Summary of Education Question 1:** Please summarize participants' examples of ways to apply this LL Statement to their workplace.

Please continue on reverse side.

- 6. Summary of Education Question 2:** Please summarize which actions or recommendations participants discussed pursuing at their workplace(s).

Thank you for completing this form.

EVALUATION

Lessons Learned: Ammonia Inhalation

Please answer the two questions below:

1. How important is this lessons learned to you and your workplace? (Circle one.) Rate on a scale of 1 to 5, with 5 being the most important.

1	2	3	4	5
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2. What suggestions would you make to improve this Lessons Learned?

End of Training Trainer's Instructions

Please complete the information below.

Trainer's Name _____
(Please Print)

Date of training: _____

No. of Participants: Total _____ Hourly _____ Management _____

Location of Training: _____

USW Local # _____

Send:

1. This page;
2. The Education Exercise (page 8);
3. The Trainer's LL Success Inventory form (pages 9 and 10);
4. The evaluation for each participant (page 11); and
5. The Sign-in sheet (page 13) to:

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Thank you for facilitating the sharing of this
Lesson Learned with your coworkers.

