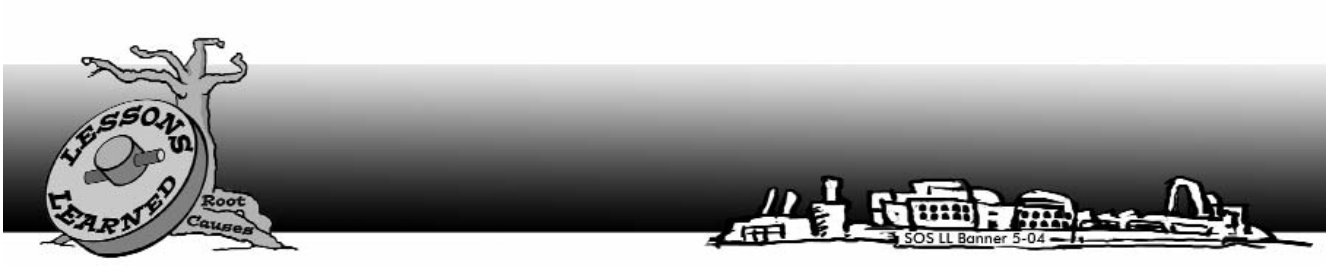

Near Overflow of Tank Endangers Workers

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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FOR HEALTH, SAFETY AND ENVIRONMENTAL EDUCATION
A PROJECT OF THE UNITED STEELWORKERS AND THE LABOR INSTITUTE

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Lessons Learned

Volume 10, Issue 1

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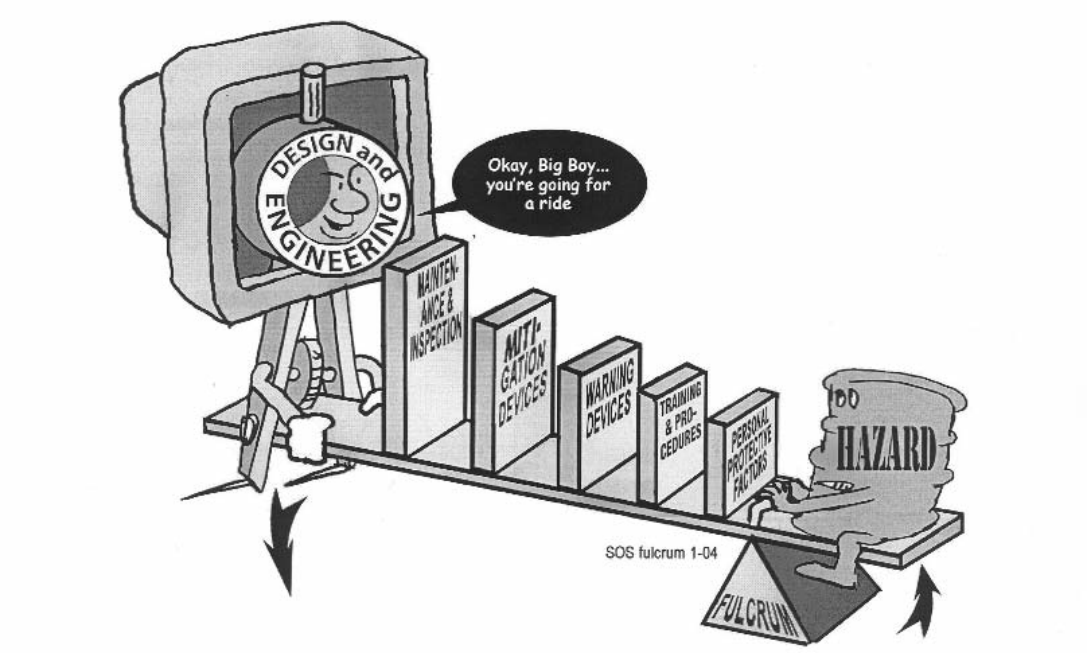
Background Information

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** Design and Engineering of Equipment, Processes and Software Management of Change (MOC)** Chemical Selection and Substitution Safe Siting Work Environment HF **Organizational *(must address a root cause)*** Staffing HF Skills and Qualifications HF Management of Personnel Change (MOPC) Work Organization and Scheduling HF Work Load Allocation of Resources Buddy System Codes, Standards, and Policies**	Inspection and Testing Maintenance Quality Control Turnarounds and Overhauls Mechanical Integrity	Enclosures, Barriers Dikes and Containment Relief and Check Valves Shutdown and Isolation Devices Fire and Chemical Suppression Devices Machine Guarding	Monitors Process Alarms Facility Alarms Community Alarms Emergency Notification Systems	Operating Manuals and Procedures Process Safety Information Process, Job and Other Types of Hazard Assessment and Analysis Permit Programs Emergency Preparedness and Response Training Refresher Training Information Resources Communications Investigations and Lessons Learned Maintenance Procedures Pre-Startup Safety Review	Personal Decision-making and Actions HF Personal Protective Equipment and Devices HF Stop Work Authority

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 subsystems 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 systems, not Design and Engineering.

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Title: Near Overflow of Tank Endangers Workers

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Lessons Learned Statement

A storage tank almost overflowed when several ***Systems of Safety*** failures occurred. A breakdown in *Communication* was the major contributing factor in this incident. **Design and Engineering** and **Training and Procedures** ***Systems of Safety*** failures were identified after the project was completed.

The **Training and Procedures** ***System of Safety*** requires proper training on new equipment and implemented lockout/tagout procedures to improve safety. In addition, the procedure should make communication at shift changeover a high priority and include written and verbal communication, as well as logs and computer displays, for the operators.

A lockout/tagout procedure should be developed for all new equipment and implemented before the equipment is put into service. Workers should be trained on the procedures and the design and operation of all new equipment.

Safety information and communication in shift changeover between operations and maintenance/contractor workers are all critical in maintaining a safe workplace.

Designing an overflow system that would transfer chemicals from one tank to another in the event of an overflow situation would be a well-defined **Design and Engineering** ***System of Safety*** fix.

Discussion

A new chemical storage tank was being installed. An internal Hazard and Operability study revealed that a pipe had to be rerouted because it would be in close proximity to the new pumps. A chemical reaction would create chlorine gas if product leaked onto the pumps.

The pipe was flushed out with water to remove any residual chemicals prior to cutting and rerouting the pipe. There were no drains in the system, so the cover of the strainer was removed to flush the water out. Once the system was rinsed out, it had to be isolated and locked out before handing it over to the contactors. The operator closed all the valves, but could not lock them out because there was no lockout/ tagout procedure for the system.

Once the system was isolated, it was handed over to the contractors. The contractors locked out the discharge pump and closed the valve on the discharge side of the pump. Prior to cutting the line, the contractors drilled a hole in the piping to ensure that any remaining chemical residue would drain out of the line. The contractors then proceeded with rerouting the line. The contractors did not turn the system back over to Operations once they were finished. They left for the weekend.

The product is stored in three separate tanks. The three tanks are located close to each other. The product is unloaded into one pipe which then divides into three separate pipes, with each pipe leading to the top of the storage tanks. The unloading system was designed to discharge into all three tanks at the same time, but favors the center tank. The three tanks are interconnected at the bottom so they level out when the valves are open.

continued

Discussion *(continued)*

The delivery truck driver and helper connected the hose at the loading station and started to unload the product. The helper went into the basement to observe the level of the storage tanks. After some time, the helper realized that only the center tank was filling up and was near overflowing level. The helper was unsure why the levels of all three tanks were not rising. The helper immediately went upstairs to inform the operator what was happening and the operator double-checked the computer, which indicated that the automatic valves were open. The operator informed the supervisor of the problem and proceeded to investigate the situation in the basement. There is not enough room in one tank to unload a full delivery truck. A high-alarm went off and the truck driver immediately closed the discharge valve of the truck. Upon observation, the supervisor and operator realized that the valves at the bottom of the tanks were in the closed position and the cover of the strainer was off.

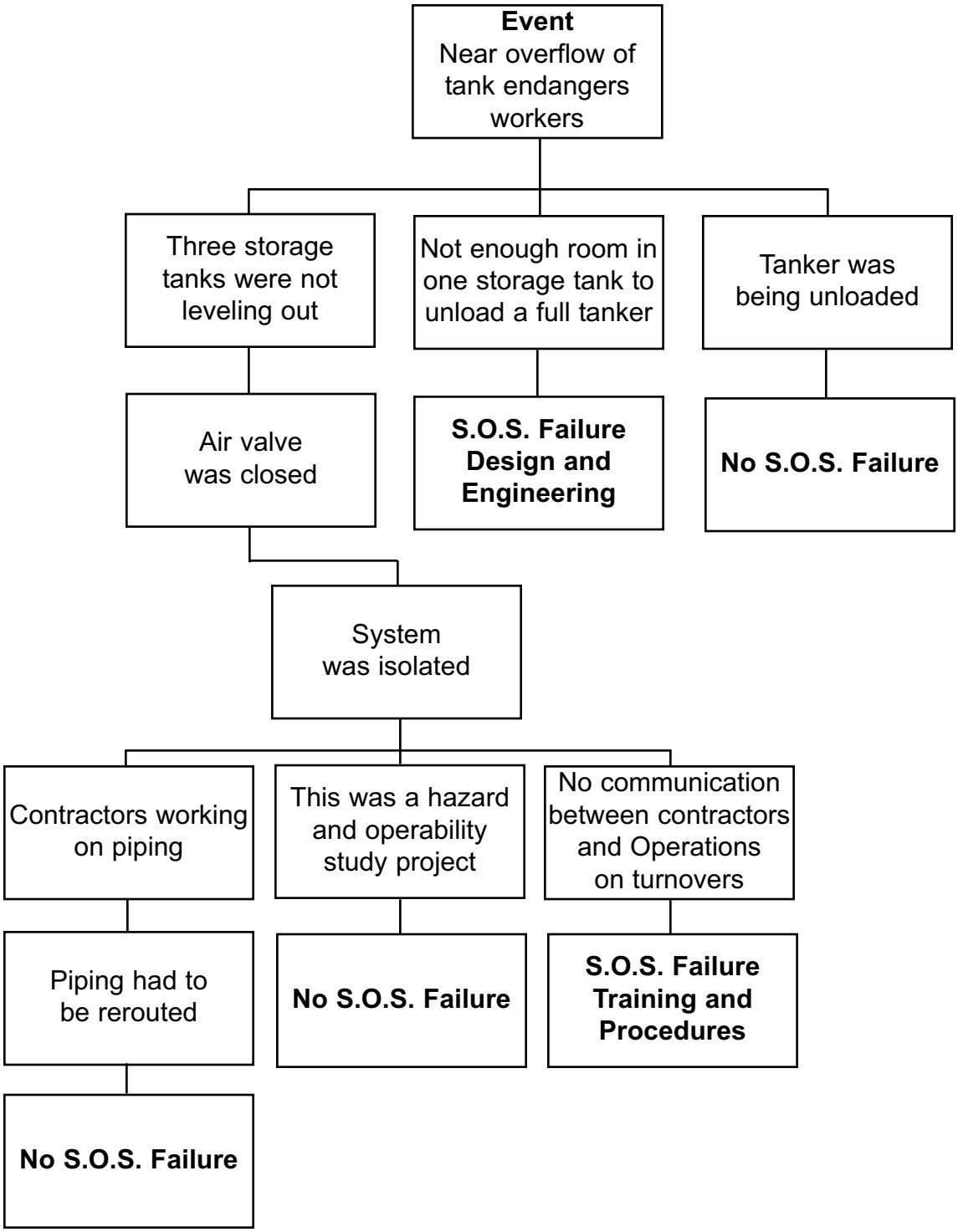
The operator informed the supervisor that operators had not been trained and were unfamiliar with the system. The supervisor was unaware of the work that had been performed on the system and was concerned about getting the product unloaded so that the delivery truck driver could leave. The supervisor replaced the cover on the strainer and realized that the air supply valve that controls the auto valves was closed. When the supervisor opened the air valve, the three tanks leveled out. The delivery truck finished unloading.

A chemical supplier employee was making the rounds and observed that the tank level was getting low. The chemical supplier employee told the supervisor to have product transferred into the tank. Neither the supervisor nor the operators were aware of the changes that had been made to the system.

The operator was instructed to open the valves to the system, but refused because he was not trained; was not familiar with the system; and was concerned for workers' safety. The product was never transferred during the weekend.

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. Write and communicate a lockout/tagout procedure for all new systems.
2. Develop a procedure for proper communication between Maintenance, contractors and Operations about the importance of inspecting and testing new systems and repairs prior to handing over projects.
3. Train workers on the design and operation of all new systems.
4. Design the unloading system so that chemical deliveries unload into the top of each tank individually and overflow situations are automatically transferred to other tanks.

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.

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

Thank you for completing this form.

EVALUATION

Lessons Learned: Near Overflow of Tank Endangers Workers

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

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 9);
3. The Trainer's LL Success Inventory form (pages 10 and 11);
4. The evaluation for each participant (page 12); and
5. The Sign-in sheet (page 14) to:

If you are a TOP Site (excluding DOE TOP Sites)	**Send to: Steve Cable 2915 Gradient Drive St. Louis, MO 63125**
All other sites (including DOE TOP Sites)	**Send to: Doug Stephens United Steelworkers 3340 Perimeter Hill Drive Nashville, TN 37211**

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

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SIGN-IN SHEET *(Please print clearly.)*

Class Title: _____ **Class Completion Date:** _____

Location (City, State)/Facility: _____

Grant Program: _____ **Dist. & LU #:** _____

Instructors: 1) _____ **2)** _____

3) _____ **4)** _____ **5)** _____

	Name (print first and last)	Check one: Hourly	Management
1			
2			
3			
4			
5			
6			
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