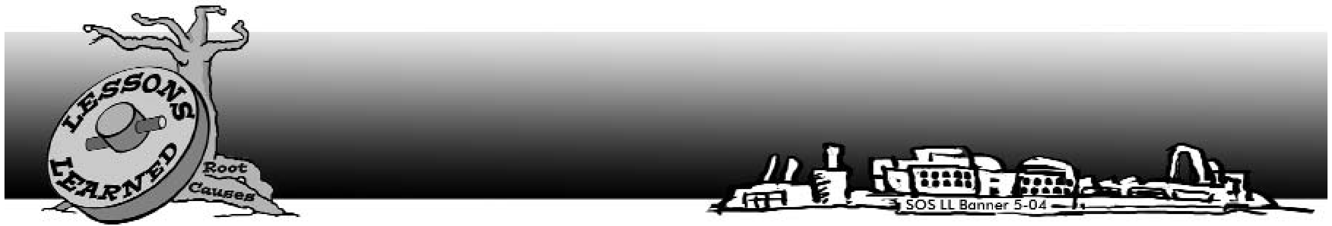
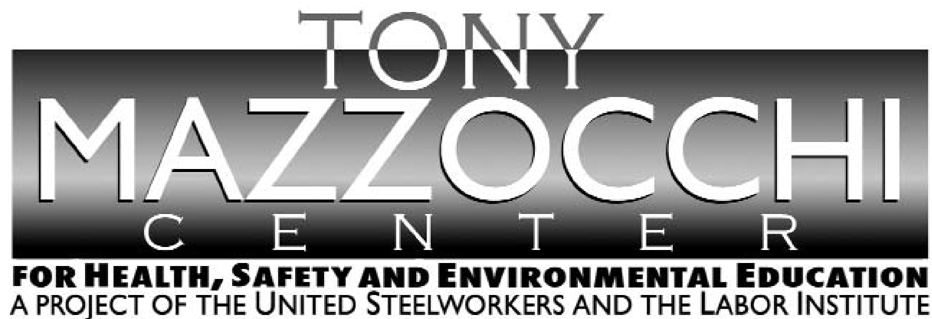


Detonation Occurs Inside Centrifuge

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 25

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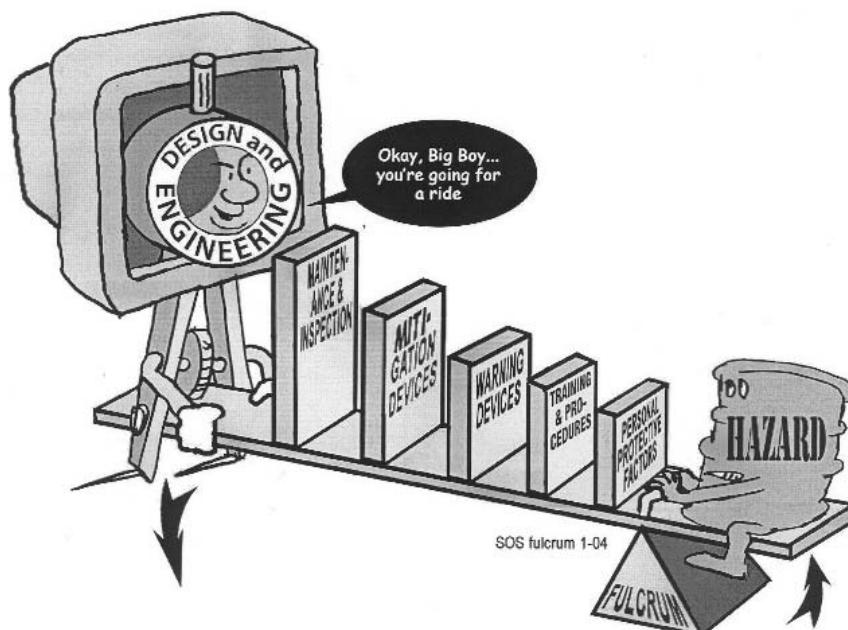
Background Information

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.

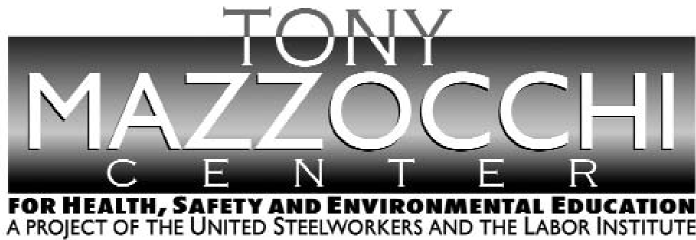
Using our Systems Focus to uncover system flaws or root causes is only one part of controlling hazards. We also need to look at the systems involved to decide on the best way to deal with the problem. The most effective way to control a hazard is close to its source. The least effective is usually at 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 sub-system 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 sybsystem 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 sub-systems relate to systems other than Design and Engineering, they should be considered as part of those other system, not Design and Engineering.

Revised October 2006



Title: Detonation Occurs Inside Centrifuge

Identifier: Volume 07, Issue 25

Date Issued: March 1, 2007

Lessons Learned Statement:

The inability to prevent the creation of an explosive atmosphere (fuel, ignition and oxygen) inside a centrifuge caused a detonation that blew off the top of the centrifuge.

The buildup of a volatile compound (fuel) and the creation of static electricity (ignition source) within the centrifuge could have been prevented by using a ***Systems of Safety*** approach in addressing these issues.

The **Design and Engineering** ***Systems of Safety*** could have ensured that static electricity was eliminated in areas where volatile compounds are present as well as preventing volatile compounds from being introduced into the system.

Discussion:

A detonation inside a dewatering centrifuge blew a 100-pound lid off the top of the centrifuge. Following the investigation it was discovered that, due to the centrifuge receiving a volatile organic compound from a mix tank, an explosive atmosphere was created.

The investigation also revealed the following facts:

1) An ignition source in the form of static electricity was present in the centrifuge;

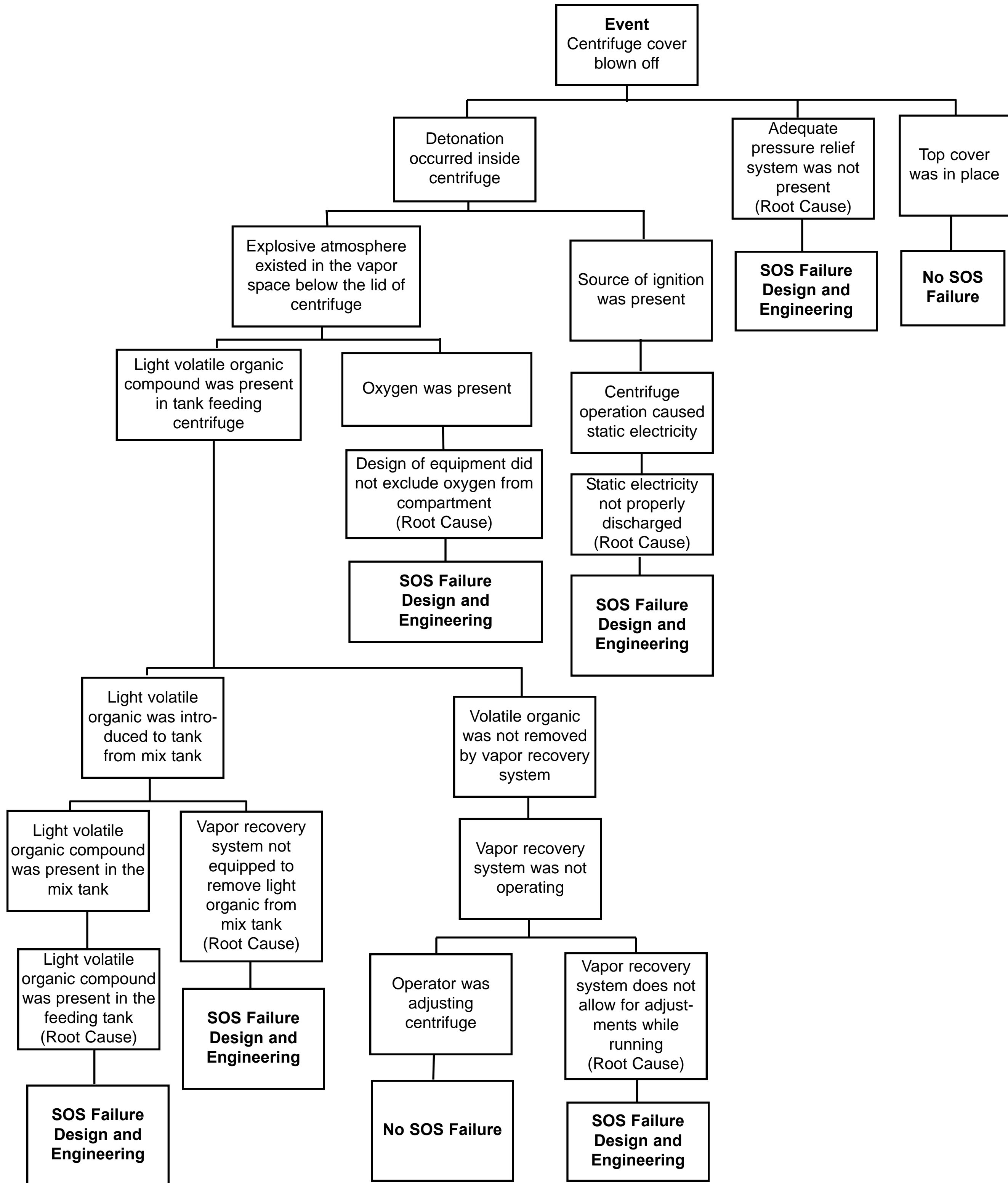
2) There was no pressure relief system designed into the closed centrifuge; and

3) The volatile vapor recovery system that would have prevented the explosive atmosphere was not operating due to the centrifuge being shut down to make adjustments. The vapor recovery system does not work when the centrifuge is not running.

No one was injured during the detonation, but the lid was blown about 20 feet away.

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. Conduct Management of Change to identify and develop a process for handling off-spec gasoline product from identified sources.
2. Sample and create baseline for all material being routed to recovered oil system.
3. Conduct PHA to address hazards associated with static electricity in areas containing light volatile organic compounds.
4. Determine if a centrifuge is available to allow for making adjustments while still running.
5. Establish a procedure that requires testing of material for light ends prior to pumping it into mix tank.
6. Review current training material to ensure that all new operators are properly instructed in the hazards associated with sending unapproved material into the system.
7. Install pressure relief valve on centrifuge.

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 ore 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: Detonation Occurs Inside Centrifuge

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 # _________________

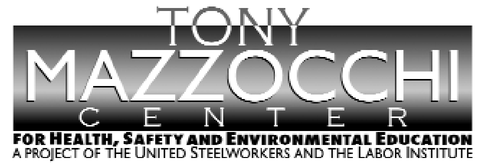
Send:

1. This page;
2. The Education Exercise (page 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:

Doug Stephens
United Steelworkers International Union
3340 Perimeter Hill Drive
Nashville TN 37211

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

Sign-in Sheet



Name of Class________________________________ **Date of Class**____________

Instructors: ____

Please Check One* H	M	Print Name	Signature

***H = Hourly Worker**
M = Management or Salaried Worker