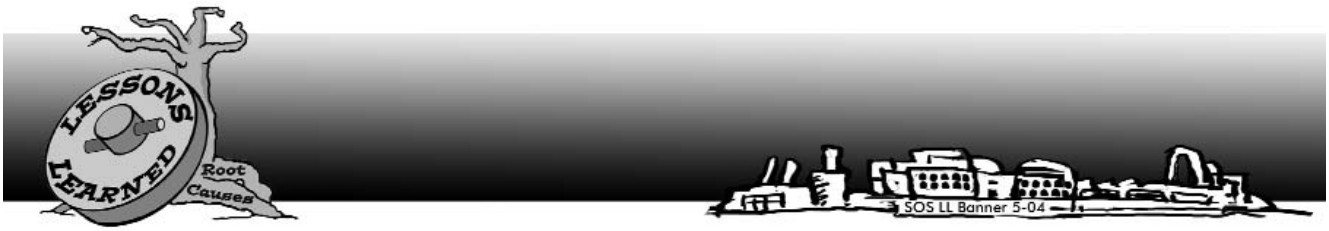


Acid/Olefin Release to Acid Blowdown Drum

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.

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

This material was produced by the Labor Institute and the United Steelworkers International Union under grant number 46DO-HT11 Susan Harwood Training Grant Program, for the Occupational Safety and Health Administration, U.S. Department of Labor. It does not necessarily reflect the views or policies of the U.S. Department of Labor, nor does mention of trade names, commercial product or organizations imply endorsement by the U. S. Government.

Lessons Learned

Volume 07, Issue 42

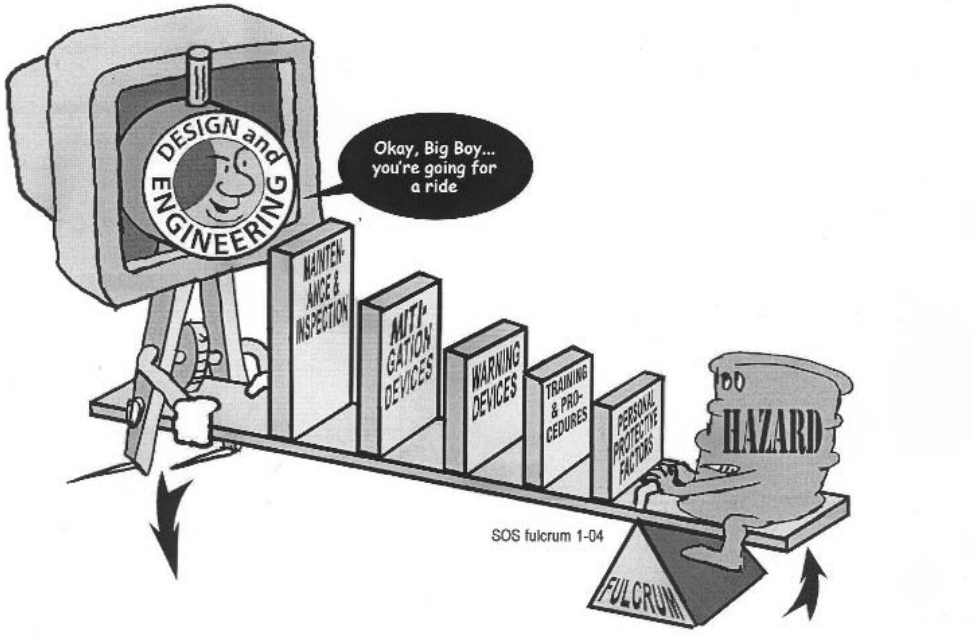
Background Information

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.

Revised October 2006

Title: Acid/Olefin Release to Acid Blowdown Drum

Identifier: Volume 07, Issue 42

Date Issued: July 1, 2007

Lessons Learned Statement:

By utilizing the **Mitigation Devices** ***Systems of Safety*** approach, the following recommendation was made to eliminate this and other circumstances like it. The need to increase the PRV setpoint of No. 4 Contactor was missed during the plant installation Piping and Instrumentation Drawing and HAZOP review. Recommend separating Piping and Instrumentation Drawing reviews from HAZOP reviews on future major projects. Piping and Instrumentation drawing reviews should be made on a separate basis and not in conjunction with the unit HAZOP.

A recommendation under the **Training and Procedures** ***Systems of Safety*** approach would be to create a special operating procedure to cover the operation of these contactor units; noting the increased pressure differential required to transfer acid; and also defining Settler pressure set-points critical to avoid PRV release. The procedures will give employees a detailed plan on how to operate and avoid circumstances like this one in the future.

Maintenance work needs to be properly prioritized and coordinated using the **Maintenance and Inspection** ***System of Safety*** approach. Maintenance work should not cause unacceptable consequences to the operating units, which in turn could expose workers to hazards of these acids and other chemicals The timely commissioning of No. 1 Contactor to replace No. 4 would have reduced the chance of over-pressuring the contactor by reducing the length of time other contactors were operated

in two-contactor mode. Because of the length of time the repairs took, the workers were unable to avoid the hydraulic risks of transferring acid from No. 4 to No. 3, without which this incident would not have occurred.

The runaway-type reactions cause accelerated corrosion that reduces wall thickness in the blowdown drum. This particular incident was responsible for 40 mils of corrosion in certain areas, placing workers in danger when wall thickness is reduced. It is imperative to have the ability to handle this type of corrosion.

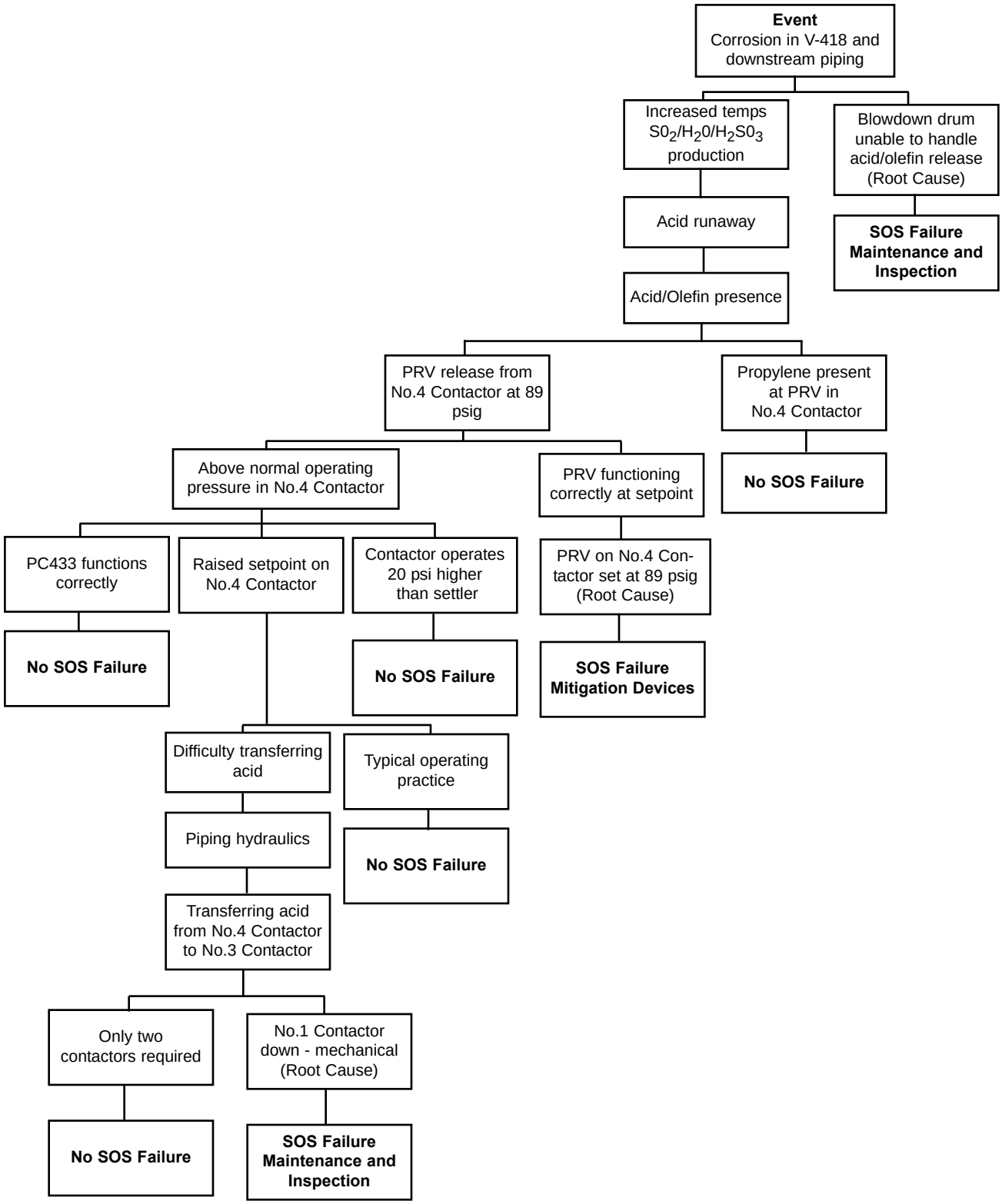
Discussion:

At approximately 3:40 and 3:55 a.m., the PRV on No. 4 Contactor (E-1827) lifted; releasing a mixture of acid and hydrocarbons into the Acid Blowdown Drum (V-1418). This resulted in a Notice of Violation for NOX emissions from the flare. The acid contained unreacted olefins, which led to an acid runaway in the Acid Blowdown Drum. The high temperatures caused by the runaway resulted in an episodic corrosion attack on the Acid Blowdown Drum and downstream spent acid piping. Also, there was the potential for an SO_2 release from the spent acid tanks when the runaway acid in the Acid Blowdown Drum was pumped to tankage.

The lifting of the PRV indicates a situation which could cause a hazard to workers in the area. These acids and hydrocarbons under pressure and high temperature exceeded set points and put wokers at uncecessary risk.

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. Consider design of piping system to spike V-418 with fresh acid in a runaway situation. Add nozzle at an elevation to optimize acid distribution during runaway condition.
   - Fresh acid addition slows down runaway reaction;
   - Currently no way to add fresh acid to V-1418; and
   - Fresh acid addition via dispersal mechanism for more uniform distribution.
2. Create an operating procedure for two contactor operation with No. 4 and No. 3:
   - Increased pressure differential required to transfer acid from No. 4 to No. 3.
   - Settler pressure setpoints critical to avoid PRV release.
3. Add contactor maintenance items to the equipment criticality list and prioritize during OEMI.
4. Investigate the application of coatings to the acid side of V-418, the blowdown drum.
   - Minimize corrosion during future release.
   - Protection from corrosive emulsion during normal operation from acid sampling.
5. Install TI on acid side of acid blowdown drum
   - No indication of internal drum temperature unless operators are pumping to tankage.

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: Acid/Olefin Release to Acid Blowdown Drum

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
3340 Perimeter Hill Drive
Nashville TN 37211

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

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