Oil Leak Due to Failed Head Gasket

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 100

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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.
<table>
<thead>
<tr>
<th>Major Safety System</th>
<th>Design &amp; Engineering</th>
<th>Maintenance &amp; Inspection</th>
<th>Mitigation Devices</th>
<th>Warning Devices</th>
<th>Training &amp; Procedures</th>
<th>Personal Protective Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Prevention</td>
<td>Highest—the first line of defense</td>
<td>Middle—the second line of defense</td>
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<td>Lowest—the last line of defense</td>
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<tr>
<td>Effectiveness</td>
<td>Most Effective</td>
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<td>Least Effective</td>
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<tr>
<td>Goal</td>
<td>To eliminate hazards</td>
<td>To further minimize and control hazards</td>
<td></td>
<td>To protect when higher level systems fail</td>
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**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

**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: Oil Leak Due to Failed Floating Head Gasket

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Lessons Learned Statement
A gasket failed; resulting in an environmental occurrence. A System of Safety Maintenance and Inspection fix would ensure that the correct gasket is used when maintenance is performed on equipment. Most equipment manufacturers recommend a specific type of gasket be used. Also, the process may require a specific type of gasket be used in order to be compatible with the process, a use of the Design and Engineering System of Safety.
Discussion
An operator noticed an oil sheen on the cooling water effluent channel. No oil was detected in or on the river. A cooling water leak procedure was initiated; the exchanger units were sampled; and effluent levels were checked. The sample results showed hydrocarbons present. All other exchanger samples were clear of hydrocarbons. The exchanger was taken out of service and a shell side hydro test was performed. The bottom four rows leaked, indicating that there was probably a problem with the floating head gasket. A tube side test was performed and validated this assumption. History showed that in 2000 this exchanger was out of service because the floating head gasket failed and caused a leak to the effluent channel.
**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.

![Logic Tree Diagram]

- **Event**
  - Environmental incident due to oil sheen on the effluent channel

- **Coiling water exchanger leak**

- **Floating head gasket failed**
  - (Root Cause)

- **SOS Failure**
  - Maintenance and Inspection/Training and Procedures
**Recommended Actions**

1. Communicate to the Maintenance Department, inspection, planners and schedulers to only use titanium or 316/304 SS double-jacketed gaskets in all titanium cooling water buddies.

2. Update SAP database for exchanger parts to reflect the new specifications.
**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.
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: _________________________________________________________

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<th>Please Check One*</th>
<th>Print Name</th>
<th>Signature</th>
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*H = Hourly Worker  
M = Management or Salaried Worker
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