Air Compressor Electrical Fire

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

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Lessons Learned

Volume 07, Issue 1

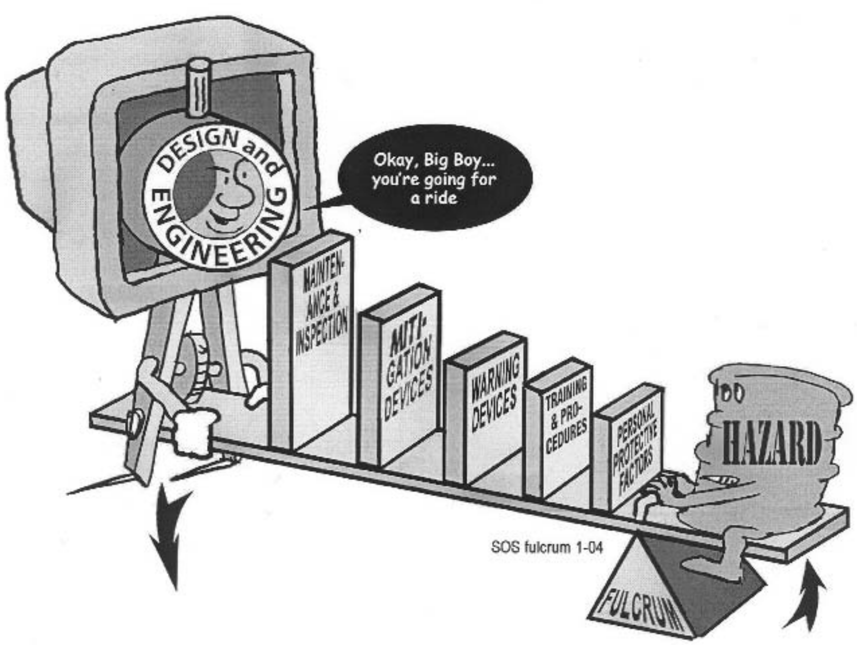
Background Information

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.

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<u>Lessons Learned Statement:</u>
A lack of the proper housekeeping, the inefficiency in the *Mechanical Integrity* of manufactured electrical components and the installation of a flammable material led to a workplace fire that had serious potential for harm and/or loss of life. With the implementation of ***Systems of Safety*** this type of incident is preventable.

A **Design and Engineering** *Technical* review is capable of providing for the appropriate selection and installation of materials into a working environment and could have eliminated the introduction of a flammable material into an electrical environment.

The addition of **Training and Procedures** to identify and address the need for required housekeeping during preventative maintenance, to eliminate the accumulation of oil, would have greatly reduced the possibility of the fire being able to spread.

Despite the past experience of failure on like equipment, there was no action taken within the **Maintenance and Inspection** ***Systems of Safety*** to maintain the proper selection of sound, proven components.

With the use of **Mitigation Devices**, to provide for the appropriate *Shutdown and Isolation Devices*, this entire incident would have been completely avoidable.

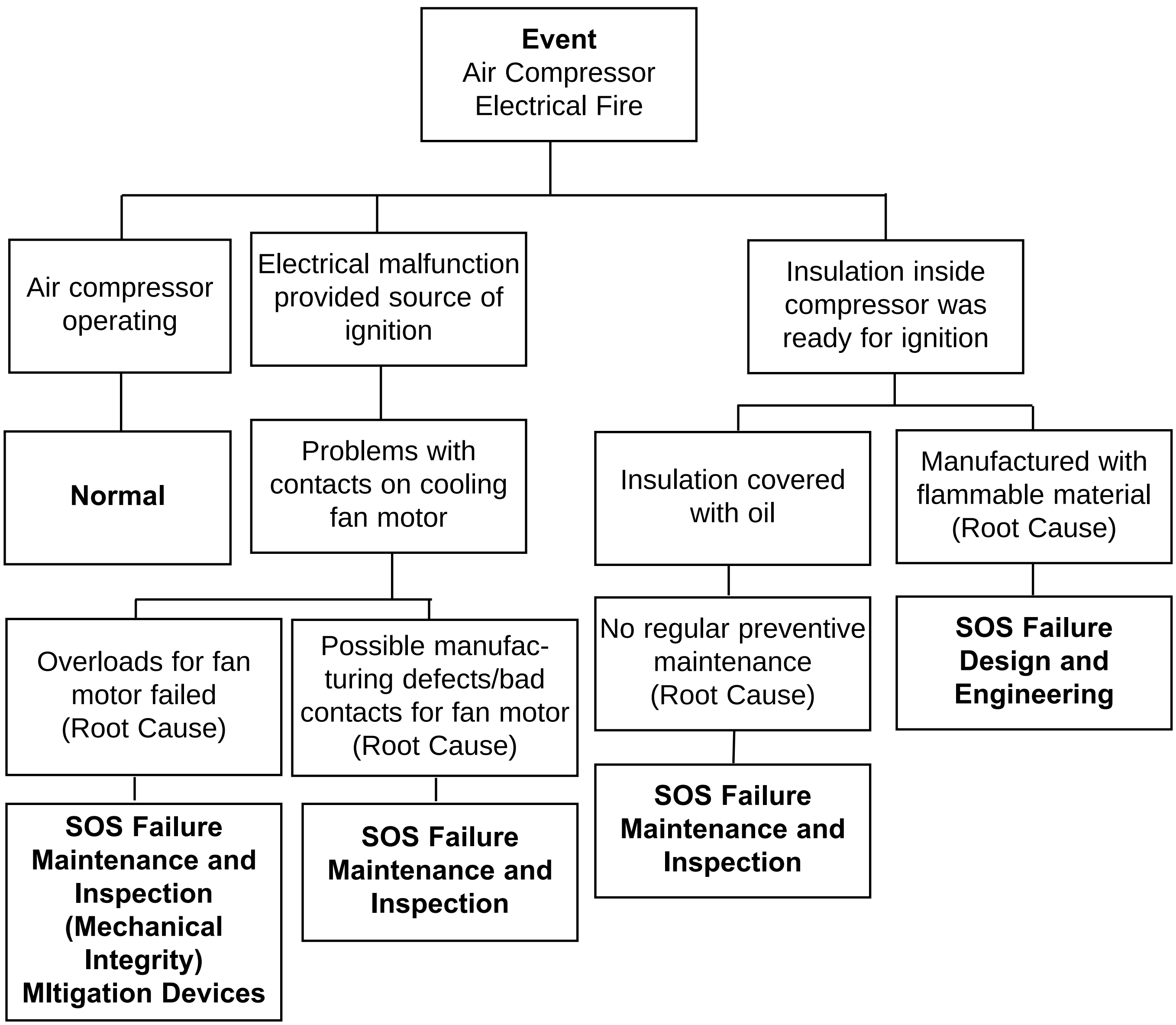
Discussion:

The overloads and contacts of an air compressor failed, causing a fire in the electrical compartment of the compressor. A substantial contributor to the fire was the sound-proof insulation that had become oil-soaked during normal operation of the compressor. As the oil soaked insulation burned, the internal compressor oil used to run the compressor during normal operation heated to a flash point of 450°F. This caused the compressor oil to boil off and further contribute to the fire; approximately 28 gallons of oil were consumed by the fire.

The operator had just conducted a walk-around and noticed nothing out of the ordinary. Shortly afterwards, an operator noticed a large drop in air pressure. About this same time a shift supervisor saw smoke coming from the boiler area. The supervisor activated a fire alarm and an ERT (Emergency Response Team) was notified. The ERT attempted to cool the building in which the compressor was housed using water, being careful not to make contact with the still energized compressor. At the time the ERT could not confirm the exact status of the energized state of the compressor. When the PTO (power take off) on the plant's fire truck failed, the local fire department was called in for assistance. Attempts were made to further extinguish the fire by utilizing fire extinguishers; but the fire persisted until electrical power was shut down to the compressor.

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. Install combination starters for fan motors on all compressors.
2. Upgrade and install new overload protection devices on each compressor.
3. Inspect and install proper electrical breaker devices on all compressors.
4. Test all compressors for proper safety interlocks after new equipment is installed.
5 Test wave synchronizer (electrical component capable of starting or restarting motor) for proper operation with safety interlocks on compressors.
6. Send safety alert to everyone on problems and suspected problems with motor overloads and electrical contacts.
7. Remove flammable sound insulation from Compressors #1 and #2.
8. Test noise levels after insulation is removed.
9. Install flame-proof insulation in all compressors.
10. Thoroughly clean inside of all compressors and put on a Preventative Maintenance schedule for future cleanings.
11. Recommend having a check-off sheet for compressors during shift.
12. Recommend relocating all compressors away from critical equipment.
13. Have plant fire truck checked regularly to ensure equipment efficiency.
14. Communicate the specific procedure for handling an electrical fire vs. other types of fire.

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.

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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.**)**

EVALUATION

Lessons Learned: Air Compressor Electrical Fire

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?**

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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 this page **plus the Education Exercise and Evaluation for each participant and the Sign-in sheet** 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.

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