

## **Yellow Alert- Evaluate old or deteriorating equipment prior to use**

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**Statement:** Employees should not use equipment that shows deterioration of parts due to age or usage.

**Discussion:** A new Technician perceived an electrical shock when they depressed the "On" switch to energize a blower on a Recirculating Hot Air Dryer. The amber cover of the lighted switch was missing. The Technician used a fingernail to depress the white nylon push tube surrounding the small light bulb to turn the equipment on. The cover was loose for several months, would come off and was often not put back into place. The equipment is a commercial air dryer and is used to dry parts after aqueous cleaning.

The Lab Owner was in the lab at the time of the shock. The Lab Owner reported hearing the Technician "yelp" and when asked what was wrong the Technician reported they had been shocked. The Lab Owner sat the Technician down, contacted the Manager and the Center ES&H Coordinator. The Technician was transported to Medical immediately as a precaution. The equipment was administratively locked out until repairs could be made.

The Center ES&H Coordinator and Manager reviewed the equipment drawings to determine that the voltage to the switch was 110v. This information was relayed to Medical to assist in assessment. There was no physical evidence (burn, blister, EKG anomaly) of the shock. Medical sent the individual home for the remainder of day.

The Center ES&H Coordinator and the Division Safety Engineer reviewed the equipment and using a voltmeter probe, attempted to recreate the shock event. They were unable to recreate the shock, measure any voltage or identify any exposed electrical connection.

The Lab Owner provided on-the-job training (OJT) for all new users of the laboratory. The Technician had worked in this and other labs for about 1 1/2 years as a student. The Lab Owner had instructed the Technician on the processes to be used and the equipment. The Lab Owner stated that they were not aware that the Technician was operating the equipment in this manner.

The dryer is approximately 15 years old. It is a relatively simple machine with few hazards. No preventive maintenance is required and the equipment is operated in a 'run to failure mode'.

The Manager and Center ES&H Coordinator had performed a self-assessment in the laboratory two days prior to the event. The potential for this event was not identified at the time. It is not known if the amber cover was present at the time. The switch location is such that it would not necessarily be obvious that a cover was missing. The cover provides an amber glow when the small light bulb is lit, indicating that the equipment is turned on. Unless the equipment is turned on, it would be unlikely to notice the missing cover.

When the amber cover is off of the switch, the small light bulb and the white tube (push tube)

surrounding the bulb are visible. No electrical contacts are visible, even when the push tube is depressed. It was not evident that any path existed for an electrical shock and so this configuration was not perceived as hazardous.

## **Analysis:**

### Human Factors

- Individual had recently cut their fingernails. Nails were approximately 1/4 inch shorter, which may have allowed skin contact that previously had not occurred.
- Individual had been ill and hands felt cold and damp.

### Hazard Awareness

- Lab Owner and Technician knew the switch cover was missing, but it was not evident that there was a safety hazard. The missing cover simply meant one had to push onto a vertical surface rather than a horizontal surface (with respect to the switch). No electrical contact was anticipated.
- No previous shocks had occurred.
- Lab Owner was not aware that Technician was starting the equipment using their fingernail. When Lab Owner had last tried to use the equipment, the amber cover was in place; however, the equipment did not operate. Lab Owner assumed the unit was broken. Lab Owner mentioned this to the Technician who replied that the equipment was working. Lab Owner did not question the statement.
- Because no one anticipated the potential hazard, a sign or tape was not placed over the switch to assure others did not use.
- Lab Owner assumed that the amber cover was being used. Did not anticipate the work-around that was being used.
- Lab Owner assigned work, but did not specify which equipment should be used. Multiple pieces of equipment could have been used. Work assignment incomplete.
- Lab owner had known the switch was broken because the equipment wouldn't turn on with the switch.

### Communication

- The staff person who owns lab had been working alone. Had not been using equipment. The new LTE Technician was familiar with the lab. They had used the equipment at least once and used their fingernail to operate.

### Mechanical Systems

- The cover on the lighted switch was broken. The amber cover was off. The amber cover screwed onto the white nylon push tube.
- The switch had been broken for a while and the nylon push tube had degraded.
- Unsure when the amber cover came off.
- Threads on push tube are degraded, so may have been damaged by a loose button.
- There is not a process to check equipment for broken parts on a routine basis.
- 110 V switch (determined by reviewing drawings).
- Equipment is common in industry, but not at SNL.
- Equipment is at least 15 years old.

- Even without the amber cover, the contacts are behind the nylon push tube.
- Center Coordinator and Safety Engineer review could not recreate shock with voltmeter probe. No physical evidence of shock (on equipment or individual).
- Will not know exactly how far down the contact is until the switch is removed to replace.
- Equipment is not one that would usually get preventive maintenance. Normal operation is run to failure.

### Training

- Training: Technician received OJT on operation of the equipment. Equipment is considered low hazard (turnkey operation).
- Technician had electrical safety training. Knew shocks must be reported.
- Electrical safety training did not specifically address this event

### Management Systems

- Manager new to the organization (8 months).
- Had done management surveillance two days prior to the event.
- The location of the switch is low on the front of the equipment and not easily visible. Do not know if the amber cover was in place or not. Likely not evident if it was missing.

### Management Expectations

- Manager's expectation is that if a component is significantly damaged, it would be replaced.
- Manager has not specifically reviewed reporting of incidents with staff, but relied on their corporate training.
- Both the Lab Owner and the Technician felt their manager supported reporting and correcting ES&H concerns. Did not take the broken switch to manager as they did not see it as an ES&H concern.

**Actions:** When equipment shows deterioration of parts due to age or usage, shut down the equipment and repair or replace parts prior to reusing.

**Keywords:** Shock, electrical

**Hazard(s):** Electrical / NEC

**ISM Code(s):** Analyze Hazards, Perform Work

**Work Function(s):** Other

**References:** ALO-KO-SNL-1000-2004-0006

**Priority Descriptor:** Yellow / Caution