The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research NIOSH

Textile Worker (Fixer) Electrocuted When He Contacts an Energized Conductor in South Carolina

FACE 91-28

SUMMARY

A 44-year-old fixer (the victim) was electrocuted at a textile plant when he contacted an energized electrical conductor inside the 550-volt control box of a carding machine. The victim and a co-worker arrived at the plant 1 hour prior to the midnight-to-8:00 a.m. shift, to start the 42 carding machines. The victim proceeded down the line of machines, pushing the start buttons. Forty of the machines started and two did not. On his second round to check the machines, the victim restarted one machine; the remaining machine's control box had overheated for undetermined reasons, prohibiting the machine from being restarted. The victim positioned himself in front of the control box then opened the door. He held one end of a screwdriver against the reset button with his right hand, while the other end of the screwdriver rested against his abdomen. The victim held the metal nozzle of an air hose with his left hand and directed a stream of air into the control box. At some point the metal nozzle contacted an energized conductor inside the control box. Current passed through the nozzle and victim's left hand exiting through the victim's abdomen and screwdriver to ground, electrocuting the victim. NIOSH investigators concluded that, in order to prevent future similar occurrences, employers should:

- **perform periodic inspections of plant electrical systems, and initiate a procedure for correcting all identified hazardous conditions**
- **evaluate their current safety program and incorporate specific procedures and training designed to enable workers to recognize and avoid hazards, especially electrical hazards (e.g., exposed energized conductors)**
- **inspect hand tools on a regular basis.**

INTRODUCTION

On August 4, 1991, a 44-year-old male fixer was electrocuted when he contacted an energized conductor in a carding machine control box. On August 6, 1991, officials of the South Carolina Occupational Safety and Health Administration (OSHA) notified the Division of Safety Research (DSR) of this fatality, and requested technical assistance. On September 18, 1991, a safety specialist from DSR conducted an investigation of this incident. The investigator reviewed the incident with the company's personnel manager, industrial relations manager, one of the plant electricians, and the OSHA compliance officer assigned to the case. The investigator visited and photographed the incident site, and discussed the medical examiner's report with the medical examiner.

The employer in this incident was a textile manufacturer that had been in operation for 29 years. The company operated 27 textile factories; 506 employees/workers were employed at this plant, of whom 99 were fixers. A fixer performs mechanical maintenance tasks. The company had a written safety program with written safety procedures that were administered by the plant engineer and personnel manager. On-the-job training was provided to the employees, and drug screening was required of all new employees. The victim had worked for this employer for 12 years, 5 years as a fixer.

INVESTIGATION

On the day of the incident, a two-man crew, consisting of a fixer (the victim) and a machine operator trainee, arrived at the plant 1 hour before the start of the production shift (midnight to 8:00 a.m.) to start the carding machines. Forty-two carding machines (fiber preparation machines that smooth, flatten, and direct fiber into a coil), were normally started about 1 hour prior to the beginning of the shift in order to maximize production.

The fixer travelled down the line of machines, pushing the start buttons. Forty of the machines started on the first try and two did not. The victim made a second trip around the machines and started one of the two idle machines. The victim determined that the 550-volt control box on the remaining idle machine was overheating and would not allow it to start. He opened the unlocked control box door. The handle that opened the door served as an interlock switch to de-energize the line (incoming power) side of the control box. However, the handle was broken inside the box, and the line side of the box remained energized with the door open. The victim obtained a screwdriver, and an air hose equipped with a metal nozzle. The screwdriver had been previously damaged-the shaft had been pushed through the handle and rounded off-which allowed it to conduct electricity through the handle. The victim held the screwdriver in his right hand, positioned the handle against his abdomen, and pushed in the reset button with the tip. With his left hand, the victim positioned the metal nozzle inside the control box to direct the flow of air toward the reset button, presumably attempting to reduce the control box temperature. At some point the nozzle apparently contacted an energized conductor which allowed current to flow through the victim's body to ground.

The victim's co-worker ran to the plant's designated smoking area, where several employees were waiting to begin their shift, and summoned help. A card machine operator rushed to the victim and began cardiopulmonary resuscitation (CPR), while another employee called the emergency medical service (EMS). The EMS arrived in about 10 minutes, continued CPR, and transported the victim to the local hospital emergency room. The victim was pronounced dead about 70 minutes after the incident. The medical examiner's report identified three burn marks across the upper abdomen as exit marks of the electrical current. These burn marks correspond to the area where the handle of the screwdriver contacted the victim's body.

CAUSE OF DEATH

The medical examiner's report listed the cause of death as cardiac arrest due to electrical shock.

RECOMMENDATIONS/DISCUSSION

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Recommendation #1: Employers should perform periodic inspections of plant electrical systems, and institute a procedure for correcting all identified hazardous conditions.

Discussion: Electrical interlock switches are safety features incorporated into the design of electrical systems. These switches are designed to interrupt electrical power on the line side when the door of a control box, breaker panel, etc. is opened. This allows maintenance or repair to be performed on deenergized electrical components. Because this switch was broken and inoperable, electrical components within the overheated control box remained energized with the door open, exposing the victim to an electrical hazard. Employers should ensure that routine periodic inspections of a plant's electrical system are conducted by qualified persons. If damaged or overheating components of the electrical system are identified,

they should be immediately repaired, replaced, or removed from service. A routine inspection would have identified the inoperable interlock switch. Additionally, the unlocked control box which allowed access to any employee, could have been secured with a lock, and the key retained by designated personnel authorized to access the control box.

Recommendation #2: Employers should evaluate their current safety program and incorporate specific procedures and training designed to enable workers to recognize and avoid hazards, especially electrical hazards (e.g., exposed energized conductors).

Discussion: OSHA standard 29 CFR 1926.21(b)(2)(2) states that "the employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury." Employers should provide employees with adequate training to ensure that they can recognize potential hazardous exposures. Evidence suggests that the victim did not realize the hazard created by the inoperable interlock switch by introducing the metal nozzle into the control box which contained exposed 550-volt conductors. The safety program should be evaluated and specific procedures (i.e., a job safety analysis, which is an analysis of the basic tasks performed by a person in a specific job category) and applicable training designed to recognize and avoid hazards should be incorporated.

Recommendation #3: Employers should inspect handtools on a regular basis.

Discussion: Employers should require that employees visually inspect handtools on a daily basis. Damaged tools, such as the screwdriver in this incident, should be replaced.

REFERENCES

1. Office of the Federal Register: Code of Federal Regulations, Labor 29 Part 1926. p. 294. July 1, 1989.

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