The National Institute for Occupational Safety and Health (NIOSH)

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# Worker Electrocuted in Mushroom Cannery in Ohio

FACE 85-11

## Introduction:

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), is currently conducting the Fatal Accident Circumstances and Epidemiology (FACE) project, which is focusing primarily upon selected electrical-related fatal injuries and confined space fatalities. By scientifically collecting data from a sample of fatal accidents, the FACE will identify and rank factors which increase the risk of fatal injuries for selected employees.

On March 5, 1985 a 21-year-old male was electrocuted while attempting to unclog a drain trough located beneath a piece of mushroom processing equipment. Two additional workers received an electrical shock while attempting to rescue the electrocuted worker.

## Contacts/Activities:

The Division of Safety Research was contacted by the Industrial Commission of Ohio for purposes of providing technical assistance in this fatality. It was determined that this fatality would be included as part of DSR's FACE project. A research team consisting of a safety specialist, an electrical engineer, and a medical doctor visited the site of the fatality. Discussions were held with a representative from the Industrial Commission of Ohio. An extensive interview was conducted with the owner of the plant. At the time of the site visit the plant was not in operation. Thus, no employees were available to interview. The plant and the location of the electrocution were photographed by the NIOSH team using 35 mm and video cameras.

## Synopsis of Events:

The site of the fatality was a wholesale mushroom canning operation. The company has been in operation for many years and employs approximately 14 people. The work force includes a secretary, salesman, vice-president, foreman, and 8 to 10 production workers. The production workers man various stations throughout the mushroom canning process. A normal workday is from 6 a.m. to 2 p.m. Workers begin the day by affixing labels to cans of mushrooms which had been processed the previous day. At mid-morning the workers begin the mushroom canning process. The mushrooms are washed, processed through a shaker table, baked in a large oven, placed in a 68 ounce metal can, sealed with a lid, and processed through a retort operation.

Several days prior to the accident, the cannery owner was ordered by the City to reduce the solid waste material leaving his plant. Because this waste was a significant contributor to the plugged drains and resultant flooding on public property, the owner was given 30 days to eliminate the conditions. To comply with the order, the owner made several attempts to filter the larger waste prior to entry into the drain system. Employee acceptance, however, was not widespread because each, at some time, had to place the filter over the drain, later remove the filter for cleaning, and finally replace the filter again. Consequently, none of the filters were being replaced. On the night before the accident, the owner made a filter from a steel grate and bolted it to the floor over the drain. The grate was intended to provide the necessary filtering while eliminating the practice of removing the filter. The employees would then remove the larger solids from the top of the grate and discard them elsewhere.

At 9:30 a.m. the 21-year-old male victim was working in the retort room when his supervisor requested that he report to the mushroom processing room where he was asked to unclog a drain trough located directly beneath the shaker table. A 7 inch wide trough runs beneath the entire mushroom processing area. Attached midway and beneath the shaker table is a motor connection box. The motor connection box is located 42 inches above the clogged trough. The water backed up around the drain and formed a pool about 3 feet in diameter and 4 inches deep. To clean the filter, the victim had to crawl on his hands and knees under the table and remove the debris by hand while kneeling in the pooled water. While there were no witnesses to the electrocution, co-workers of the victim felt he was unclogging the drain with one hand and holding on to a 3 phase, 220 volt power cable which supplied electrical energy to the table's drive mechanism. The cable, not being properly fastened, was partially pulled from the mechanism's connection box. The victim was in contact with electric current for approximately 15 seconds. During that time one co-worker reached for the victim and received a shock. A second co-worker contacted the shaker table and received a minor shock. Another co-worker immediately de-energized the equipment and the victim fell face down into the water. The medics arrived 8 minutes after the incident and attempted to revive the victim. The worker was pronounced dead on arrival at a local hospital.

## Conclusions/Recommendations:

Examination of the motor connection box attached beneath the shaker table showed it to be rusted and had many sharp edges. The box was not waterproofed. When the cover was removed for inspection, approximately 8 ounces of water fell from the connection box. The electrical connections were good, but there was no strain relief to hold the power cable in place. The insulation on the power cable conductors was badly deteriorated. This may have been caused by the constant immersion in water. Inspection showed that while some of the insulation was still in sound condition, much of it was easily chipped away with only the abrasive force of a finger nail.

One large section of the white conductor's insulation had been torn almost off. By examination of the torn segment of insulation and the improper strain relief, it was very likely that the cable was abruptly pulled (but not detached) from the box and across the sharp rusted edges. This force would have been sufficient to tear back the deteriorated insulation and directly connect the three phase power to the ungrounded frame of the motor and table. This was the most likely source of electrical energy which caused the electrocution.

In general, parts of the electrical distribution system for the plant were very old, constructed in a piecemeal fashion, and did not meet the National Electric Code. Specifically, visual examination of the shaker table's electrical service revealed several unsafe electrical conditions:

1. The shaker table was not grounded. The ground wire was brought to the local disconnecting means but not continued to the table.

2. The power cable was not properly fastened and sealed in a water-tight conduit. The motor rating was not suitable for wet applications.

Additional factors associated with this electrocution include: the victim was not wearing appropriate personal protective equipment specific to the task he was performing, the task and body position of the victim immediately prior to the electrocution, the accumulation of 4 inches of water under the shaker table, the worker used electrical cable to support himself (either intentional or unintentional), and no system was in place to catch the mushrooms before they entered the drain trough, thus contributing to the water accumulation problem.

While not an exhaustive list, specific recommendations include:

1. The electrical system of the plant should be inspected and modified to satisfy requirements of the latest edition of the National Electric Code.

2. Where appropriate, ground-fault circuit-interrupters should be installed.

3. Persons working with the equipment should be required to wear the appropriate personal protective equipment.

4. The use, where practical, of insulating barriers mechanically attached to the processing machinery will prevent direct contact with the conductive parts by the line workers.

5. The processing procedure should be modified so that it reduces the number of mushrooms falling onto the floor and prevents mushrooms from flowing into the trough. This would not only prevent the city sewers from becoming clogged with mushrooms but will also prevent the drain inside the plant from becoming clogged.

6. Management should implement a hazard identification program and make the employees aware of their role in the program.

7. The employer should request technical assistance from the Industrial Commission of Ohio for the development and implementation of a more comprehensive occupational safety and health program.

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