

MIFACE INVESTIGATION REPORT #14MI086

SUBJECT: Frozen Custard Store Co-Owner Electrocuted While Servicing an Energized Frozen Custard Machine

Summary

In summer 2014, the co-owner of a frozen custard store in his 50s was electrocuted while servicing an energized frozen custard machine. The store had three frozen custard machines; he was servicing the middle machine. All three frozen custard machines used a twist lock 240-volt plug and cord power system and were connected to an energized outlet. The back panel of the incident custard machine had been removed. A plastic crate guiding drain hoses was in the workspace where he would stand to conduct repairs. Four towels/rags had been placed inside the incident machine. Live electrical spade type connectors and a terminal screw were adjacent to the towels in addition to an unguarded dual belt and pulley system (See Figure 1). He was working alone; the incident was unwitnessed. He was found unresponsive lying on his back behind the three frozen custard machines by a customer who immediately called 911 and began CPR.

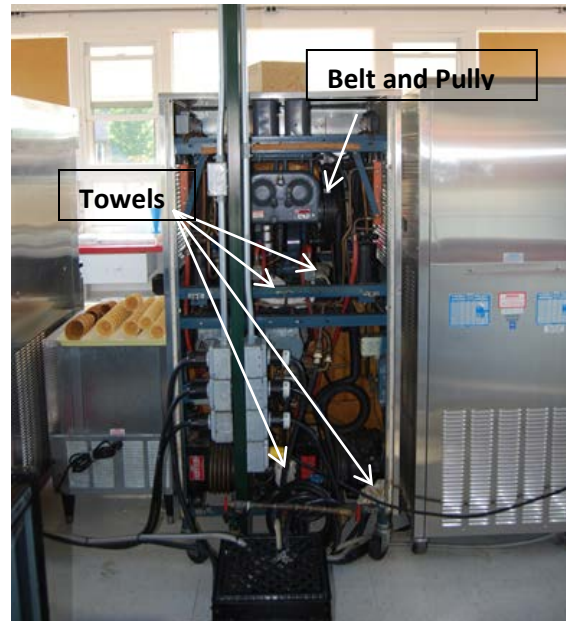


Figure 1. Incident frozen custard machine with back cover removed and plastic crate positioned over drain.

Responding emergency response personnel arrived and assumed care. The co-owner was declared dead at the scene. The County Medical Examiner autopsy report determined electrocution was the cause of death based on microscopic skin changes consistent with electrocution on the front of his left hand at the base of his thumb.

MIFACE identified the following key and possibly contributing factors:

- Working on an energized machine without adequate personal protection equipment.
- Rigid black plastic crate on floor guiding/supporting drain hoses.

RECOMMENDATIONS

- Ensure cord-and-plug machines are de-energized by unplugging them, stored energy is released, and appropriate electrical safety work practices are implemented prior to service or maintenance activities.

- Follow machine maintenance manual when performing service activities and keep manuals at the location of the machine for easy access.
- Equipment maintenance activities (especially high risk ones) should only be performed by persons qualified to do so. I am wondering, however, if there should be a recommendation (or some discussion in the report, anyway) that That doesn't mean he has to be a journeyman electrician, etc. but it seems like they should have some basic training in that trade (~electrical work). That could even mean paying the equipment supplier a one time training fee for such activities. It is one thing to be trained in energy control / lockout, but if they fail to take those precautions (as in this case) at least they know where the hazards are. An electrician would know what to check if the equipment had been delivering "electrical shocks" - perhaps this guy didn't have a clue.
- Keep walkways/work areas free from tripping hazards.
- Place a warning label on the back cover of the frozen custard machines reminding individuals to unplug the machine before removing the protective back cover and performing work.

BACKGROUND

In summer 2014, the co-owner of a frozen custard store was electrocuted while servicing an energized frozen custard machine. MIFACE learned of this incident from the MIOSHA 24-hour ASAP reporting system. MIFACE contacted one of the decedent's family members who also co-owned the business. The family member agreed to speak with the MIFACE investigator about the incident as well as share police photographs taken at the time of the incident. The MIFACE investigator met with the family member at her home. During the writing of this report, the death certificate, police and medical examiner reports, and the MIOSHA compliance file were reviewed. The pictures used in this report are courtesy of the MIOSHA compliance file and the police department. MIFACE altered all of the pictures to maintain confidentiality.

The decedent owned three ice cream/custard stores in Michigan, but was in the process of selling one of the stores. He had co-owned the store where the incident occurred for 10 years and other stores since 1985. The three stores employed 14 individuals. He was a 1978 graduate of an electronics training program. The family member indicated the decedent was a "hands-on" type person and routinely made in-house repairs if he could because of the scheduling issues and cost of repair services.

The co-owners routinely opened the custard stores for business each day. The family member indicated that communication between the two of them occurred throughout the day, to discuss any arising problems and to just touch base with each other. The co-owners meet with the store managers and discuss the "game plan" for the day.

The Electro-Freeze custard machine he was servicing was 32 years old. The owners had the maintenance manual (but did not have it at the location of the interview). A log was kept on each

machine to detect trends on the machine, e.g., consistency of product, maintenance log, etc. The employees were instructed to never make any repairs on the custard machines; they were to contact the co-owners if a problem was detected.

The decedent had been complaining of chest pains prior to the incident but had not yet seen a doctor for the medical condition.

MIOSHA General Industry Safety and Health Division issued the following Serious citation to the firm at the conclusion of its investigation.

SERIOUS: The Control Of Hazardous Energy Sources, Part 85, Rule 1910.147(c)(4)(i):

Procedures were not developed, documented and utilized for the control of potentially hazardous energy when employees were engaged in activities covered by Part 85:

(A lockout program was not developed, documented, and utilized for the control of hazardous energy. Employee removed cover, exposing energized electrical terminals and unguarded belt and pulley. Employee reached inside middle Frozen Custard Machine in Front Store Area and contacted exposed electrical parts.)

INVESTIGATION

The store had three frozen custard machines; he was servicing the middle machine. To make custard, the custard product was drawn by tubes into a water-cooled chamber. Within the chamber were blades, placed in motion by pulleys and belts which turned a spindle and powered the compressor. All three frozen custard machines used a twist-lock 240-volt plug-and-cord power system and were connected to an energized outlet. Due to the age of the machine, he was required to remove the entire back panel to access the machine components. An upside-down rigid plastic crate guided drain hoses to the drain (See Figure 2).



Figure 2. Plastic crate over drain. Note rag in bottom right corner of machine.

The decedent arrived at the store at approximately 3:00 p.m. on the day of the incident. He would normally work alone from 2:00 p.m. - 6:00 p.m., and then other employees would arrive to accommodate the increase in the number of customers. He was wearing a cotton shirt and shorts and was not wearing jewelry, ring or watch. It was common practice that the store's back door was open when the store was open.

The first order of business was to turn on and prime the custard machines, and then prep for business (towels ready, cash in cash drawers, test machines (temperature and consistency of custard), custard toppings available, etc.). The incident was unwitnessed.

It is unknown why the decedent removed the back of the machine and placed it in the back room. Several hypotheses were offered by the family member regarding why he was working inside the machine: he heard something unusual and was investigating the sound or perhaps he was cleaning the machine. The co-owner indicated that the decedent did not mention any problem with the machine prior to going to open the store. Four towels/rags had been placed inside the incident machine; it is unknown if the towels/rags had been placed previously or were placed just prior to the incident. Tools, electrical troubleshooting equipment and personal protective equipment, including insulated gloves, were not observed at the incident scene. The floor was dry.

Energized electrical spade type connectors and an energized terminal screw were adjacent to the towels in addition to the unguarded dual belt and pulley system. At some point, in some way, the base of his left thumb contacted electricity. It is unknown if the decedent directly contacted an energized part of the machine or if the electricity arced. The decedent was right-handed and there were marks on a custard machine to the right of the incident machine.

The decedent had been communicating with an employee via text message; his last text message was 15 minutes prior to him being found by a customer. His daughter had also been at the store during this time. The last transaction on the register was at approximately 10 minutes prior to his discovery by a customer.

The police report stated the following: "I spoke with the decedent's wife and their daughters. They all explained that the decedent had been complaining of chest pains. They also explained that the decedent had been complaining of a machine that is located in the center of ABC's work area. He complained that the machine had been giving off electrical shocks. This machine does not have any rear cover to it. When the decedent was found, he was lying alongside the described machine. The PD officer

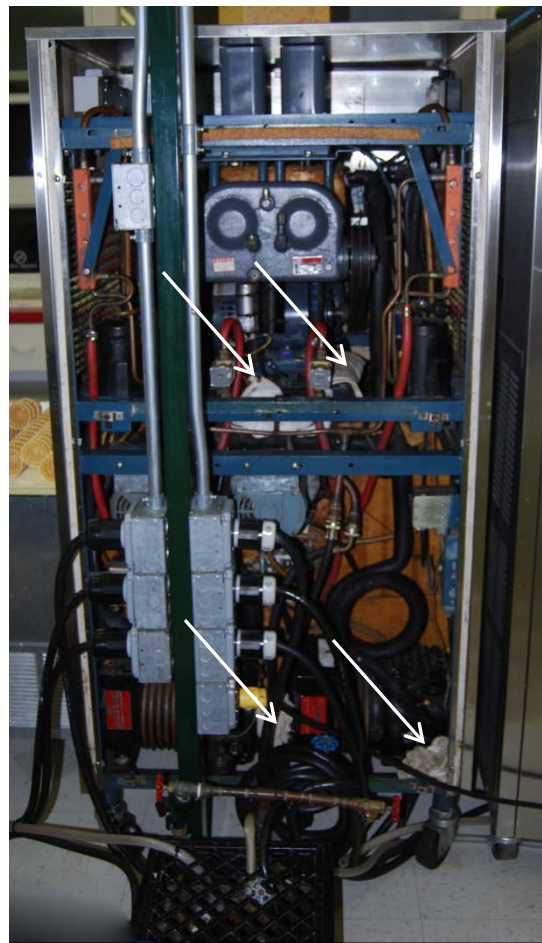


Figure 3. Back of frozen custard machine. Four arrows indicate location of rags placed inside machine.

observed four white rags inside the rear of the machine. The decedent's family explained that four rags is not normal. They believed that he may have been cleaning the machine or doing minor repairs." (*MIFACE removed the decedent's and family member's names and the name of the business*). (See Figure 3)

He was found unresponsive lying on his back behind the three frozen custard machines by a customer who immediately called 911, entered the store through the back door, and began CPR. Responding emergency response personnel arrived and assumed care. The co-owner was declared dead at the scene.

CAUSE OF DEATH

The cause of death as listed on the death certificate was electrocution. There were no toxicological tests performed. The County Medical Examiner autopsy report determined electrocution was the cause of death based on microscopic skin changes consistent with electrocution on the front of his left hand at the base of his thumb. The patient was noted to have heart disease, which may have increased his susceptibility to a fatal arrhythmia from an electrical shock. The decedent also had two lacerations to his head consistent with falling against a cabinet.

RECOMMENDATIONS

- Ensure cord-and-plug machines are de-energized by unplugging them, stored energy is released, and appropriate electrical safety work practices are implemented prior to service or maintenance activities.

MIOSHA requires employers to plan for the control of energy during servicing and/or maintenance of machines and equipment by doing the following:

- ✓ Establish an energy control program;
- ✓ Develop, document and utilize lockout/tagout procedures;
- ✓ Provide employees appropriate training;
- ✓ Provide, at no cost to employees, equipment required by the lockout/tagout procedures.
- ✓ Continuing competency through training.

MIOSHA General Industry Safety Standard, Control of Hazardous Energy Sources, Part 85 Control of Hazardous Energy and Safety-Related Work Practices, Part 40 address practices and procedures that are necessary to disable machinery or equipment and to control potentially hazardous energy while servicing and/or maintenance activities are being performed. General Industry Safety Standard Part 85 provides for control of all forms of hazardous energy, including, electrical, mechanical, hydraulic, pneumatic, gravity, steam, etc. General Industry Standard Part 40 addresses safe work practices, including lockout and utilization of personal protective equipment, where the hazard to the employee is electrical.

In this incident, the custard machine was a “cord and plug machine” and the source of energy was controlled by unplugging the custard machine. Written machine specific lockout procedures required under Part 85 do not need to be developed for a cord and plug machine or equipment when the source of energy is controlled by simply unplugging the equipment. Part 85 requires that the machine be unplugged and the unplugged cord must be under the exclusive control of the individual conducting the service or maintenance activities.

The protective back cover of the custard machine was removed which permitted access to its energized components. Had the decedent unplugged the machine, this incident might have been prevented.

Part 40 requires safety related work practices to be used to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts when work is performed near or on equipment or circuits which are or may be energized,. The specific safety-related work practices must be consistent with the nature and extent of the associated electrical hazards. Such work practices must protect the individual from direct contact between energized circuit parts and any part of his or her body and from indirect contact through some other conductive object. The work practices that are used must be suitable for the conditions under which the work is to be performed and for the voltage level of the exposed electric conductors or circuit parts. Work practices could include appropriate personal protective equipment and insulated tools.

- Follow machine maintenance manual when performing service activities and keep manuals at the location of the machine for easy access.

The family member indicated that the maintenance manual for the custard machine was not at her home. It is unknown if the manual was kept at the custard store where the incident occurred or at another of their custard stores. MIFACE recommends that each of the stores have an operator and maintenance manual for each machine at each store to provide instruction for users and repair personnel.

- Equipment maintenance activities (especially high risk ones) should only be performed by persons qualified to do so.

Although the decedent had a background in electrical work, it is unknown if he background in equipment repair, especially regarding electrical issues with machines and the personal protective equipment necessary to work on an energized machine. The decedent’s spouse indicated in the police report that the decedent mentioned that he would receive shocks from the machine, indicating an electrical issue. Working on an energized machine poses many health and safety challenges. An electrician would most likely know what to check if the equipment had been delivering "electrical shocks" and where the electrical hazards were located; the decedent may not have known. MIFACE recommends that individuals performing electrical maintenance have basic training in that trade (~electrical work). Machine owners could approach the equipment supplier and request, for a fee, some basic training to perform basic equipment repair.

- Keep walkways/work areas free from tripping hazards.

Hoses were tied together when possible to minimize a tripping hazards (see Figures 1 and 2), but directly in the work area at the back of the machine was an upside-down plastic milk crate guiding machine drain hoses to the drain. This crate posed a possible tripping hazard and may have contributed to the incident. Other means of guiding the drain hoses should be explored, such as a hose ramp or a larger diameter pipe into which hoses may be run to the drain.

- Place a warning label on the back cover of the frozen custard machines reminding individuals to unplug the machine before removing the protective back cover and performing work.

A warning label placed on the back cover of the custard machine would alert individuals and serve as a reminder that an electrocution hazard is present if the machine cover is removed and work is performed without unplugging the unit.

KEY WORDS: Electrocution, Frozen Custard Machine, Accommodation and Food Service

RESOURCES

MIOSHA standards cited in this report may be found at and downloaded from the MIOSHA, Michigan Department of Licensing and Regulatory Affairs (LARA) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available by writing to: Michigan Department of Licensing and Regulatory Affairs (LARA), MIOSHA Regulatory Services Section, Stevens T. Mason Building, 530 W. Allegan Street, Lansing, Michigan 48933, calling (517) 284-7740, or by FAX (517) 284-7735.

- MIOSHA General Industry Safety Standard, Control of Hazardous Energy Sources, Part 85 Control of Hazardous Energy. http://www.michigan.gov/documents/CIS_WSH_part85_51275_7.pdf
- MIOSHA General Industry Safety Standard, Safety-Related Work Practices, Part 40. http://www.michigan.gov/documents/CIS_WSH_part40_51258_7.pdf
- MIOSHA General Industry Safety and Health Division Fact Sheet: Machine-Specific Lockout. http://www.michigan.gov/documents/dleg/machine_specific_lockout_292562_7.pdf

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