TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE Program

SUBJECT: Gravel pit worker dies while cleaning off a stalled conveyor belt-- Iowa.

SUMMARY

A 41-year-old worker for a gravel company was killed while he was cleaning gravel off a transfer conveyor belt. The 30 inch wide rubber belt was moving raw gravel along a slight incline approximately 5-10 feet off the ground for a distance of 225 feet. For an unknown reason, this belt became overloaded causing the electrical breaker to trip. The foreman shut down the entire line and the victim proceeded to clean away spilled material on the sides of the belt with a front end loader, assisted by a truckdriver who was recently hired by the company. When they were finished, the yard foreman told the two men that he was going to the breaker panel to turn the power back on, instructing them to stand clear. When the foreman left this area, the other men were both standing on the ground.

The electric panel for the conveyor belts was at a location out-of-sight from the two workers, and there was a few minutes delay while the foreman walked over to the electrical panel area. During this time the victim suddenly noticed that the discharge chute from the incoming belt was also clogged and he quickly climbed up on the belt to clean this chute. At this time the foreman turned the breaker on, and the victim fell down on the moving belt. He was a very big man, in excess of 300 pounds, and could not easily get up or jump off the belt. The victim yelled at the truckdriver, who was running alongside, to shut off the belt, but the driver was unfamiliar with the conveyor system and could not find the emergency shut-off switch. The victim rode the belt for a period of 30 seconds, the entire length of the conveyor, before being pinned under an angle iron motor bracing , which fatally injured him.

RECOMMENDATIONS following our investigation are:

1. *Starting and stopping of conveying equipment should be possible from the same location, which is in visual sight range of all moving machinery. Starting should also include a warning alarm.*
2. *Circuit breakers and safety switches should be interlocked to all belts and conveyors on a conveying line.*
3. *All workers should be thoroughly trained in safety aspects of dangerous equipment, and made aware of all shut off switches and safety devices.*

INTRODUCTION

In May 1996 a 41-year-old front end loader operator for a gravel company was killed when he fell onto a moving conveyor belt which carried him to its head pulley end where he received fatal injuries. The Iowa FACE program became aware of the incident a week later from a newspaper article and began an investigation. This case was also investigated by the Mine Safety and Health Administration, and the Iowa FACE program conferred with MSHA before proceeding. A site visit was conducted in June by a field investigator for Iowa FACE and several photographs were taken.

The employer was a construction company which had been in business for 33 years. The company also owned this commercial crushed rock facility. The company employed up to 150 people in the busy summer months, producing gravel and asphalt products. The victim was employed by the company for 5 years, including the past 3 years as a front end loader operator. There were 4 workers at the gravel pit the day of the accident.

Each new employee receives a packet of safety materials, including training according to 30 CFI Part 48. The personnel director talks to new employees about safety relative to their area, and these sessions are documented. Annual refresher training had been completed in March 1996. It is a written company policy that employees are never to stand or climb on conveyor belts, even during periods of maintenance. Periodic inspection of the quarry is provided by MSHA and the construction company had complied with all previous MSHA requests. The last inspection by MSHA prior to this event was on October 19, 1995.

INVESTIGATION

The worksite was a gravel pit which quarried, washed, and separated various sizes of rock and gravel for construction purposes. The victim, a truck driver, and a foreman were present when the transfer belt stalled. The rubber belt was one of 4 belts used to transfer gravel to the rock washing station. It was 225 feet long, the tail end being 5 feet off the ground, and the head pulley end being approximately 10 feet off the ground. The flexible belt was formed into a U-shaped trough along its length by sets of angled rollers every 5 feet (see photo).

For an unknown reason the breaker for this transfer belt (#3) had tripped and the belt stopped. All belts were controlled with separate breakers, therefore gravel kept arriving from another belt (#4) and material quickly piled up and spilled over at the tail end of belt #3. After belt #4 was shut down the victim and the truckdriver proceeded to clean off the tail end of belt #3. The victim used his front end loader to remove gravel from the sides of the belt, then climbed onto the belt with a shovel to finish the job. When they were finished, the wash plant foreman instructed them to stand clear while he walked over to the electric panel to start the belts. When the foreman left, both men were standing on the ground, safely away from the belt.

Suddenly the victim noticed that the discharge chute from belt #4 was clogged and he quickly climbed onto the belt to clean this out before the foreman started the belts again. It is against company policy for anyone to climb onto a transfer belt at any time, even during maintenance. However the victim acted instinctively to prevent the belts from clogging again. During this time the foreman turned the belts back on and the victim fell onto the moving belt.

The breaker panel for these belts was located about 500 feet from this location, out of visual range of these belts. Belt #3 had emergency shut\-off controls adjacent to the belt at both ends of the belt; which were emergency OFF only. They were not designed to turn the belt ON from this position. Restarting the belts had to be done at the electric panel adjacent to the rock washing station.

When the belt started, the victim fell onto the belt and began to ride down the length of it, feet first. During this 30 second ride the victim was yelling to his friend who was running alongside to shut off the belt. But the truckdriver was new to the company and was unfamiliar with the conveyor system and its emergency shut-off switches.

Belt #3 was not very high off the ground, and the victim had sufficient time to jump off the moving belt. However, he was a big man, weighing in excess of 300 pounds., and evidently could not easily get up or into position to jump off the belt. He was carried down the 225 foot belt to the head pulley region where he was pinned under a metal bracing for the motor. He was taken to a local hospital where he was pronounced dead two hours later.

At the time of our investigation, new electric controls had been installed for this series of conveyor belts. The breaker panel was in the same location, out of visual range of the belts, but the individual shut-off controls, adjacent to the belt, had been modified. Now these emergency OFF switches are also capable of turning the belts ON. In the future, final restarting of these belts will be done while standing next to the belts with direct visual clearance. In addition all belts in this series, from the gravel pit to the rock washer, are interlocked on the same switch, so that stopping of one will stop them all, preventing material overloading. Also, safety alarms have been installed for restarting the belts. A 20-second loud alarm sounds before the belts will start, followed by a 30 second delay before they are actually switched ON.

The company was sighted by MSHA for failure to have an alarm system on a conveyor which must be started out of visual range. They were also charged with failure to block machinery against motion while doing maintenance work. The company foreman reports periodic investigations by MSHA in the past with no previous warnings or recommendations for these oversights, however, the company complied with MSHA's requests and made necessary changes to their electrical controls.

CAUSE OF DEATH

The official cause of death from the Medical Examiner's report was *"traumatic asphyxiation due to industrial accident".*

RECOMMENDATIONS / DISCUSSION

Recommendation #1. *Starting and stopping of conveying equipment should be possible from the same location, which is in visual sight range of all moving conveyor equipment.*

Starting should also include a warning alarm.

Discussion: The foreman could not see the conveyor belt while he turned on the breaker switch. The only ON switch was at the electric panel near the rock washing station, which was on the other side of an elevated road over the conveyor system. The emergency shut-off switches for these belts have now been modified so they can switch the belt ON as well. This will ensure that circumstances that led to this fatality will not be repeated at this location.

The addition of warning alarms and time delays is an additional safeguard that is required to protect employees working on conveyor belts or moving machinery.

Recommendation #2 *Circuit breakers and safety switches should be interlocked to all belts and conveyors on a conveying line.*

Discussion: When belt #3 became overloaded and tripped its breaker, material kept arriving from belt #4 which piled up on the stalled belt. This situation would be prevented if all belts were electrically controlled together at the breaker panel. This modification had been completed at the time of our site visit. All ON and OFF switches are connected in series which prevents overloading of one belt if another is stopped for any reason.

Recommendation #3 *All workers should be thoroughly trained in safety aspects of dangerous equipment, and made aware of all shut off switches and safety devices.*

Discussion: The truckdriver who was helping the victim may have been able to stop the conveyor belt if he was aware of the exact location of the emergency stop switches. One was located at the tail pulley area and one at the head pulley end of belt #3. However, he would have had only 30 seconds to locate the switch, run and turn off the conveyor belt. This type of emergency training should be included for all employees who work with or near moving equipment of this kind.

Recommendation #4 *Conveyor systems should be designed to avoid clogging or overloading.*

Discussion: It is unclear why belt #3 became overloaded, whether it was a mechanical or electrical failure. Now that new breakers have been installed, this question may never be answered. Overloading of the conveyor system can lead to spillage of material, and hazardous cleanup and maintenance, therefore conveyor systems should be designed with this in mind and tested and inspected for load capacity, motor overheating, bearing failure, etc.

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Fatality Assessment
&
Control Evaluation Program
(FACE)

The University of Iowa, in conjunction with the National Institute for Occupational Safety and Health (NIOSH), is investigating the causes of work-related fatalities in the State of Iowa. FACE is a surveillance program that identifies all occupational fatalities, conducts in-depth, on-site investigations on specific types of fatalities, and makes recommendations for employers and farmers to help prevent similar fatal accidents in the future.

Iowa is a major farming state, and therefore the Iowa FACE Program deals with many occupational deaths on the farm. It is a very hazardous profession that claims hundreds of lives nationally every year. We publish detailed reports that are disseminated to key agricultural leaders in Iowa who share our concern for the safety of farmers. To reach and effectively communicate with this independent and vulnerable group is a worthy challenge here in Iowa.

NIOSH funded state-based FACE Programs include: Alaska, California, Colorado, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Wisconsin, and Wyoming.

Additional information regarding this report or the Iowa Face Program is available from:

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