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FACE
Fatality Assessment and Control Evaluation Program
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Worker Dies From Crushing Injuries After Falling Into a Baling Machine - North Carolina

SUMMARY

A 24-year-old male baler operator (the victim) died after he fell into a baling machine (Figure 1) and was crushed when the machine automatically cycled. The baling machine was used to compact and bale waste cardboard for recycling. Although the fall was unwitnessed, it is believed that the victim may have climbed up the outside of the conveyor to the top of the baler's loading chute to dislodge a cardboard jam. He may have lost his balance and fell 14 feet to the bottom of the baling chamber. Upon hitting the bottom, the victim's body broke the beam of a sensor light which sent a signal to the baler's computer that the hopper was full, triggering the machine to automatically cycle, crushing the victim. At approximately 9:30 a.m. the next day, the victim was discovered by the first-shift baler operator, after he had processed a few bales of cardboard. After noticing what looked like a piece of company uniform sticking out from one of the bales of cardboard, he looked closer and discovered what he thought was a body. The day shift operator then went to the production supervisor's office to report his findings. After calling maintenance, they returned to the baler and after observing what looked like a body, the production supervisor called the police and the Emergency Medical Services (EMS). After the police determined there was no foul play involved, they allowed EMS and representatives from the Medical Examiner's office to remove the body from the bale.

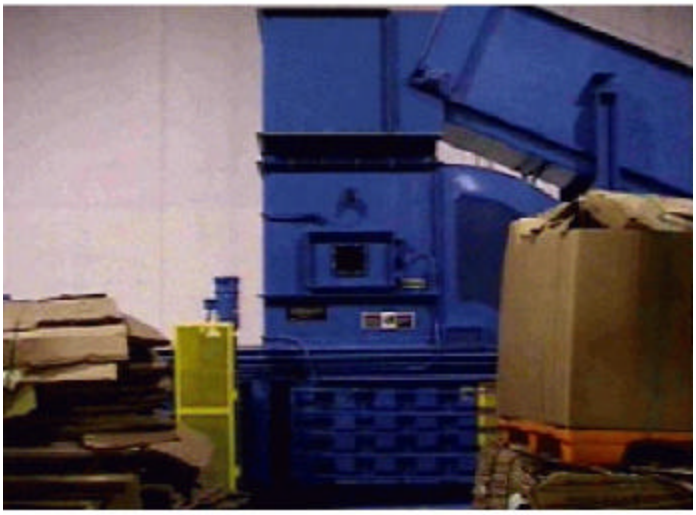

Figure 1. *Seglo Baler*

NIOSH investigators concluded that, to help prevent similar incidents, employers should

- ***ensure that workers are protected from the unexpected movement of machine parts by implementing and enforcing the use of lockout / tagout procedures***

Fatality Assessment and Control Evaluation (FACE) Project

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatality Assessment and Control Evaluation (FACE) investigations when notified by participating states (North Carolina, Pennsylvania, South Carolina, Tennessee, and Virginia) or the Wage and Hour Division, Department of Labor. The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

- ***establish written operating procedures for machinery that include training in safe operating practices and a safe method for clearing jams***

- ***provide a safe means of access to eliminate the need to climb onto the equipment in the event of jamming***

- ***establish a systematic communication procedure by which employees are accounted for during their shift***

In addition, manufacturers should

- ***evaluate the designs of baling and compaction equipment to eliminate or reduce the likelihood of jammed materials***

INTRODUCTION

On September 30, 1999, a 24-year-old male baler operator (the victim) died from crushing injuries after he fell into a baling machine used to compact and bale waste cardboard for recycling. On October 5, 1999 the Division of Safety Research (DSR) was notified of the incident by the North Carolina Occupational Safety and Health Administration (NCOSHA), and initiated an investigation. On November 22, 1999, a DSR occupational safety and health specialist met with the NCOSHA compliance officer to review the incident. On November 23, 1999, the NIOSH representative made a site visit to the facility and met with and interviewed the company's corporate safety director. During that site visit, information was collected regarding the company's safety programs, a tour of the facility was conducted, the baling machine was observed and photographed, and information pertaining to this incident was collected.

The company's primary business is to repair and recondition mailing containers and mail trays for the U.S. Postal Service. The company has been in business for nearly 20 years, but for only 5 years at this site. The company has similar operations in three other states and employs nearly 2000 workers. At the time of the incident, there were approximately 250 workers at this site, working two shifts per day. The first shift, or day shift, starts at 6:30 a.m. and ends at 2:00 p.m. The second shift, or afternoon shift, starts at 3:00 p.m. and ends at 11:30 p.m.

The operation is located in a newly fabricated building constructed of metal and concrete block with approximately 1 million square feet under roof. The new facility has been laid out with all new production lines and repair stations, along with a new Selgo horizontal open end baler. The baler is used to compress and bale waste cardboard mailing trays and boxes for recycling. The employer had recently moved all production activities into the new building from two smaller locations, and had only been operational at the new facility for 30 days prior to the incident. A smaller baling machine had been used at one of the old locations to handle waste cardboard.

The company has a full-time safety director responsible for company-wide health and safety issues. Annual safety training is conducted for all employees and task-specific training is conducted where necessary. The company has written safety policies for specific plant operations and weekly safety meetings are held for all

employees. However, since moving into the new facility, some of the safety procedures, such as a lockout / tagout program specific to the new baler had not been updated. Baler operators were instructed in the event of a baler malfunction not to de-energize the machine or lock it out, but to simply leave the machine alone and call maintenance to make whatever repairs were needed to bring the machine back online. The victim had worked for the company for just over a year and his primary job was a forklift operator. He had recently been trained as a baler operator at the new facility. This was the company's first workplace fatality.

Figure 2. *Dumper*

INVESTIGATION

A baler was installed in the new facility to compress and bale waste cardboard for recycling. The baler is stationed at an isolated location at the rear of the facility away from most of the production areas. To perform the compressing / baling operation, the operator can place the machine in either the manual or automatic mode. Once the baler is energized, the operator uses a forklift to load the "dumper" with the material to be compressed (Figure 2). A light-curtain cage along the sides of the dumper protects the operator during loading. As long as the light beam is broken, the dumper will not close. The operator must be clear and outside of the light curtain to activate the dumper. When loaded, the operator pushes a button on the outside of the light-curtain cage that causes the dumper to raise dumping the material into a lower hopper of the belt conveyor. The belt conveyor carries the material up to a 28-inch by 49-inch feed hopper where it is fed into the hopper and falls down through a 14-foot chute to the baling chamber (Figure 3). Inside the baling chamber, an electronic eye senses the material height and when it reaches a predetermined level, a signal is sent to the baler's computer, activating the compressing cycle. In the compressing cycle, the baler's presshead rotates 180 degrees to close off and form a rectangle out of the baling chamber. Once closed, a ram is activated which presses the material into a bale measuring 41 inches high by 32 inches wide by 74 inches long, and weighing approximately 1000 pounds. The bale is secured with four wire ties. Once formed, the bale is then pushed out of the baling machine by a hydraulic ram. As a new bale is formed and pushed from the chamber, it pushes the previously formed bale out to a scale where it is weighed, the production number scanned, picked up by a forklift, and moved to either storage or shipping. If a problem were to

Figure 3. Conveyor and Chute

develop with the baler, operators were instructed to leave the machine alone and not to de-energize it, but rather call maintenance.

On the day of the incident, the victim reported to work early at 1:00 p.m., to work the second shift. He was assigned to work at the baler and worked alone loading, baling, and moving completed bales to a storage area. The victim was last seen around 5:00 p.m. during a break. At that time he placed a food order with the security guard for his lunch later that night. During the course of his shift, the victim had processed several bales of cardboard. Between 5:30 p.m. and 7:00 p.m. the victim may have climbed up the outside walls of the conveyor to dislodge a piece of cardboard that was jamming the conveyor belt, a practice he had been observed doing in the past. Workers reported that occasionally cardboard would become lodged in the top part of the hopper just under the conveyor (an area that measures 28 inches by 8 inches), causing the hopper to jam. During this action, the victim may have lost his balance and fell into the baling chamber thereby tripping the automatic sensor that indicated that the chamber was full, causing the baler to cycle.

During the remainder of the shift (approximately 6 hours), no one became alarmed as to the whereabouts of the victim, even when he did not show up at 7:15 p.m. to eat with his lunch group, or at the end of the shift when the victim had not clocked out, or picked up his paycheck before leaving for the night.

It was not until the next day that the victim was discovered in a processed bale, similar to Figure 4, by the first- shift baler operator. At approximately 9:30 a.m., while processing the third bale of the morning, the operator noticed something in a bale that looked like a piece of company work clothing. He then went to the production office and notified the production supervisor, who in turn notified maintenance of the finding. They all returned to the baler, and realizing that a body was in the middle of a bale, called the police and 911 for assistance. Both police and emergency medical services responded, and on seeing the condition of the body, notified the medical examiner's office to assist with removal. After the police determined there was no foul play involved, they allowed EMS and representatives from the Medical Examiner's office to remove the body from the bale. The victim was pronounced dead at the scene and was transported to the morgue.

Figure 4. *Processed Cardboard Bale*

CAUSE OF DEATH

The Medical Examiner listed the cause of death as multiple traumatic injuries due to compression by a baler recycling machine.

RECOMMENDATIONS / DISCUSSIONS

Recommendation #1: Employers should ensure that workers are protected from the unexpected movement of machine parts by developing lockout / tagout procedures.

Discussion: An updated lockout / tagout program had not yet been established for the new baler. In the case of a malfunction, workers were told *not* to shut the machine down or lock it out, but rather call maintenance. Maintenance personnel were the only workers trained in lockout / tagout procedures. However, there was no maintenance person in-house to cover the second shift. The company was using a non-maintenance employee to assess the need before calling a maintenance worker in to handle a situation. This could have possibly contributed to the baler operator's going beyond just operating the machine, but also trying to clear the baler jam.

Lockout / tagout procedures [OSHA regulation 29 CFR 1910.147 - Control of Hazardous Energy (lockout / tagout] are designed to protect those who must service, inspect, clean, or maintain equipment, from the unexpected release of hazardous energy. At a minimum, lockout / tagout procedures should include the following elements:

- a statement of how the procedure will be used;
- training for workers in the specific hazards of each machine;
- the steps required to shut down, isolate, block and secure the machines;
- the steps designating the safe placement, removal, and transfer of lockout / tagout devices and who has the responsibility for them;
- the specific requirements for testing machines or equipment to determine and verify the effectiveness of locks, tags, and other energy-control measures; and
- the employer or an authorized employee must notify affected employees before lockout or tagout devices are applied and before they are removed from the machine.

Recommendation #2: The employer should establish written operating procedures for machinery that include training in safe operating practices and a safe method for clearing jams.

Discussion: Training in the safe operation of the baling machine is essential. In this case, the manufacturer of the baler provided initial training to one of the company's engineers, who in turn, was to serve as the trainer to employees. However, information collected indicated that another company engineer, not trained by the manufacturer, conducted the employee training. The American National Standards Institute (ANSI) has developed standards for compactor safety. The ANSI Standard Z245.2 - 1992, Stationary Compactors - Safety Requirements, provides guidance in safe design, operation, and maintenance of stationary compactors. No specific procedure for clearing jams in the equipment existed. The practice of climbing the conveyor belt and kicking the jam clear exposed workers to the danger of falls and the mechanical

hazards of the baling machine. After conducting a hazard analysis, a written policy should be established including enforcement procedures on the proper operation of the baling machine and procedures for clearing jams. All baler employees, as well as maintenance employees, should be instructed in its use.

Recommendation #3: The employer should provide a safe means of access to eliminate the need to climb onto the equipment in the event of jamming.

Discussion: When the baler jams, workers have no method of clearing the jam other than climbing up the side walls of the conveyor belt. A movable ladder-platform (Figure 5), accessible by steps and protected by guard rails, would provide a safe alternative. Workers would be able to move the ladder-platform into place, climb to the top of the platform, and use a long pole or other device to clear the machine. This would prevent them from standing on any part of the baler or conveyor and alleviate the hazard of falling into or off of it.

Figure 5. *Movable Ladder Platform*

Recommendation #4: The employer should establish a systematic communication procedure by which employees are accounted for during the shift.

Discussion: The victim in this incident was unaccounted for almost 6 hours during his shift, and was not located until approximately 9:30 a.m. the next day. When he failed to clock out at the end of the shift, or when he did not pick up his paycheck, someone should have been alerted that something may have been wrong. To ensure safety, it is important that the whereabouts of each worker be known. A systematic method to accomplish this, such as visits to each department by supervisors or a buddy system, should be established as part of company policy.

Recommendation #5: Manufacturers should evaluate the designs of baling and compaction equipment to eliminate or reduce the likelihood of jammed materials.

Discussion: The top part of the hopper just under the conveyor (an area that measures 28 inches by 8 inches) needs to be evaluated and possibly redesigned to prevent jamming. In this incident, that area may have been jammed with cardboard or nylon mail bags which wrapped around the tip of the conveyor. A possible fix to prevent this wrap around could be a deflector installed at the end of the conveyor. This deflector would discharge away from the end of the conveyor and prevent materials from wrapping around the conveyor.

REFERENCES

Code of Federal Regulations [1999]. 29 CFR 1910.147. Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.

American National Standards Institute [1992]. American National Standard for Refuse Collection, Processing, and Disposal Equipment - Stationary Compactors - Safety Requirements. ANSI Z245.2 - 1992, New York, New York.

INVESTIGATOR INFORMATION

This investigation was conducted by Joseph E. Burkhart, Occupational Safety and Health Specialist, Fatality Assessment and Control Evaluation Team, Surveillance and Field Investigations Branch, Division of Safety Research.

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