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OREGON FATALITY ASSESSMENT AND CONTROL EVALUATION
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Center for Research on Occupational & Environmental Toxicology
OHSU OREGON HEALTH & SCIENCE UNIVERSITY

Fatality Investigation Report

OR 2005-08-1

Mechanic killed while inspecting masonry stacker machine

SUMMARY

On May 5, 2005, a 55-year-old experienced millwright maintenance mechanic was killed while inspecting repairs to a building materials setting machine. New parts had been installed a week earlier. The repaired machine, commonly called a "stacker," had been operating well for 4 days prior to the incident. On the morning of the incident, the stacker was in operation for 1 hour, and then put into idle mode for a few minutes while the operator added more unfired product by hand. While the stacker was idling, the mechanic entered a barricaded, posted area under the stacker to inspect the stacker's alignment chain. The mechanic failed to lockout the machine and did not notify the operator. The mechanic was apparently leaning over a support beam to inspect the chain alignment when the operator took the machine out of idle and resumed operation. The stacker's traveling bar, located under the deck, evidently crushed the mechanic's head against the support beam. The victim was discovered within minutes by the plant manager. Local law enforcement and medical crews arrived shortly thereafter, and the victim was declared dead at the scene.

View of stacker shows barricaded undercarriage where incident occurred.

CAUSE OF DEATH: **Blunt force head trauma**

RECOMMENDATIONS

- **Employers should ensure that all machine moving parts and pinch point areas are fully enclosed or fully barricaded from access, and that machine guards are properly installed.**

- **Employers should develop, implement, and enforce a comprehensive hazardous energy program.**

- **Interlock devices should be installed to automatically shut down energy when safety gates on equipment are opened.**

- **Alarm systems should warn whenever machinery is activated.**

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INTRODUCTION

On May 5, 2005, a 55 year-old experienced millwright maintenance mechanic at a building materials manufacturing company was killed while inspecting the underside of a large stationary building materials setting machine, commonly called a "stacker." OR-FACE was notified of the incident on May 5, 2005. An OR-FACE investigator visited the site and interviewed the employer on May 13. A second site visit occurred on June 2, to observe the machine in operation. The incident was also investigated by local law enforcement and Oregon OSHA. This report is based on information obtained from interviews and site visits, and reports from the medical examiner, local law enforcement, and Oregon OSHA.

The building materials manufacturer employs 400-500 workers in 11 plants located throughout the Pacific Northwest. This particular plant is one of two in Oregon, manufacturing masonry. At the time of the incident, the plant was operating at one-third capacity, 5 days a week, with 22 workers on one shift, including 2 maintenance mechanics.

The manufacturer purchased this plant in 1993 from an existing building materials firm that had been on the site since 1902. A new plant was built on the site in 1981, and the stacker was installed at that time. At the time of purchase, the new employer did not receive any written operating or maintenance instructions for the stacker. The original plant supervisor was hired and provided on-the-job instruction for the new employer.

The company had a written safety program with designated monthly safety meetings, but meetings were not held consistently. There were no current written standard operating procedures for this stacker. The employer had a generic written lockout program. Color-coded personal locks were placed at various locations in the plant. Personal locks for the stacker were located inside the barrier chain on the opposite side from where the mechanic was making his inspection.

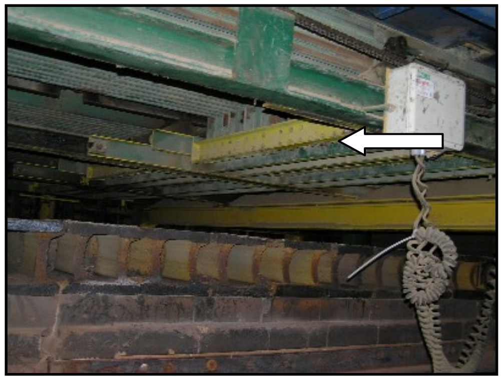
The maintenance mechanic was hired as a skilled mechanic and had worked for the employer in this capacity for nearly 5 years. As his prior millwright mechanic experience did not include stacker machine maintenance, he was provided initial on-the-job training by the plant supervisor. He had a history of some unsafe work behaviors, especially failure to lockout machinery. He had received warnings, but no disciplinary action or retraining occurred.

INVESTIGATION

The stacker is a large, stationary machine, about 48 ft long and 25 ft wide, raised on 6 ft high supports. Four sets of stairs access the top deck, one set at each corner. Metal walkways traverse the top deck along the sides and across the center. The operator's control panel is on the top deck. Activity below the deck of the machine is not visible from the operator's control station. The area under the deck is secured from access by metal mesh barricades with hinged access doors at the ends of the machine, and by a security chain attached to each support beam. The security chain is affixed with "Danger" signs on both sides of the machine.

The stacker moves unfired product onto firing cars by an electronic drive system, consisting of motor, V-belts, sprockets, alignment chains in tracks, and alignment bars. The alignment chains traverse the length of the deck, moving and stacking the product onto firing cars for transporting to the kiln. A traveling bar under the deck moves the alignment chains in their tracks. The bar traverses from mid-machine about 8 feet toward a horizontal crossbeam (point of impact) about 5 feet above the floor and over the beam into the offload section. The traveling bar takes 16-18 seconds to cycle back to the start position.

At startup, an alarm sounds on the stacker until manually turned off. The alarm does not sound when the machine goes in or out of idle mode. The traveling bar under the deck may stop in any position when put into idle. It is unknown what position the bar was in when the machine was put into motion at the time of the incident.



A traveling bar under the stacker moves an alignment chain. Arrow shows bar and direction of travel.

The stacker has needed only minor repairs since 1993. On March 16, 2005, one-third of the machine's aligner chain and track were replaced to resolve an alignment tracking problem. The remaining aligner chain and track were replaced on April 26-27.

The maintenance mechanic completed replacing the alignment chain and track on April 27. Before leaving work for a scheduled vacation, he reported a slight hesitation of the alignment chain, caused by a corner of a small moving sprocket hitting a corner of a support beam, making the chain jump. While he was on vacation, a maintenance coworker corrected the problem by slightly adjusting the tension on the chain, after which the machine operated correctly.

Arrow shows the horizontal crossbeam under the stacker, inside the barricaded area.

Upon returning from vacation on May 4, the maintenance mechanic was advised that the stacker was working normally. During the day, he was observed by his supervisor inside the chained-off area, without locking out the machine. He left the restricted area at the direction of his supervisor and was not seen in this area for the rest of the day.

When the mechanic reported to work on May 5, the day of the incident, he was informed by the stacker operator that the machine had been operating normally. The operator started up the stacker at 7 a.m. Shortly thereafter, the plant manager walked past the machine and noticed the security gate under the alignment area was open, but no one was in sight. He shut the gate and walked on.

The operator ran the stacker for 1 hour, and then placed it on idle for about 5 minutes while he added more unfired product by hand to the existing stack. The operator returned to the control panel at about 8:05 a.m., took the machine off idle, and started up the process, causing the traveling bar to move toward the crossbeam. The plant manager walked past the machine shortly afterward and found the unresponsive maintenance mechanic lying on his back with his head crushed. The traveling bar evidently crushed his head against the horizontal crossbeam. There were no witnesses to the incident. When local law enforcement and medical crews arrived shortly thereafter, the victim was declared dead at the scene.

RECOMMENDATIONS/DISCUSSION

Recommendation #1. Employers should ensure that all machine moving parts and pinch point areas are fully enclosed or fully barricaded from access, and that machine guards are properly installed.

The area where the traveling bar moves under this setting machine was secured only by a chain, and the mesh gate barring access to the alignment area was not secured. A permanently affixed barricade constructed from metal framework and mesh to fully enclose the traveling bar and alignment areas would prevent easy access to this hazardous area. Any access gates for maintenance repairs must be secured when machines are operating.

Recommendation #2. Employers should develop, implement, and enforce a comprehensive hazardous energy program.

A comprehensive hazardous-energy program (under 29 CFR 1910.147) includes developing written safe operating procedures (SOPs) for shutting down, de-energizing, locking out or securing machinery during maintenance activities within barricaded, hazardous areas. Written lockout SOPs must be specific to each machine. All maintenance and machine operators need to be trained in lockout SOPs, and employers need to consistently reinforce the procedures. SOPs should also provide for effective communications, such as between maintenance workers and machine operators. Retraining should be conducted whenever the employer has reason to believe that an employee has inadequate knowledge of or deviates from the use of energy-control procedures.

Employers need to maintain and update records related to hazardous-energy program training. SOPs should be reviewed on a regular basis for necessary changes, and should be consistently reinforced with all affected workers. Annual or more frequent inspections and disciplinary action should be made to ensure SOP compliance. Disciplinary action should be documented.

Recommendation #3. Interlock devices should be installed to automatically shut down energy when safety gates on equipment are opened.

There were no interlock devices installed on the security gates under this machine. Interlocked gates and access panels are commonly used on automatically controlled machines to protect workers against the risk of inadvertently being caught in or struck by moving machine parts.

An interlock system is especially important in cases where a machine operator has limited or no visibility to accessible hazardous areas. In this case, an interlock device mounted on the access gate and connected to the machine's operating controls would have automatically shut down the operation when the gate under the machine was opened.

Recommendation #4. Alarm systems should warn whenever machinery is activated.

The setter machine sounded the automatic alarm during the initial startup, but did not repeat the alarm when resuming operation after being put in idle mode. Because there is no machine motion while in idle mode, workers may not fully comprehend the risk of being struck or caught if the machine is reset to automatic mode. Alarm systems should sound every time the machine controls are moved from idle to automatic mode. In addition, the machine's control system should incorporate a time delay between the sounding of the alarm and the activation of the machine. The delay should be of sufficient length to allow workers that may have entered a hazardous area to evacuate before machine movement begins.

An alarm system, like an interlock device on security gates, provides a second line of defense for safety – and must not be considered as a substitute for an effective hazardous energy control program. Energy sources must still be locked out prior to performing maintenance on machinery or entering hazardous, restricted areas.

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CROET at OHSU performs OR-FACE investigations through a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research. The goal of these evaluations is to prevent fatal work injuries in the future by studying the work environment, the worker, the task, the tools, the fatal energy exchange, and the role of management in controlling how these factors interact.