

Fatality Investigation Report

OR 2003-40-1

Effort to clear rock jam in operating rock crusher fatal

SUMMARY

On Nov. 23, 2003, a 45 year-old construction worker was killed while operating a rock crusher. The operator used a pry bar in an effort to loosen a rock jam in the intake chute, while the equipment was operating. The pry bar made contact with the impactor and was thrown out with great force, striking the operator in the neck. A



Portable rock crushing system.

coworker dumping a load of rock onto the conveyor of the crusher noticed the victim missing from his normal position, and spotted him slumped in the corner of the lower platform. The victim was bleeding profusely from the neck, with the pry bar in his lap. Efforts to stop the bleeding were unsuccessful. The victim died at the scene.

CAUSE OF DEATH: Traumatic injury to neck

RECOMMENDATIONS

- **Never attempt to remove jammed material while machinery is in operation. Shut down, isolate, and block all hazardous energy before performing machine maintenance.**
- **Do not allow employees to position themselves directly over the intake of a horizontal impactor while it is actively crushing rock.**
- **Manufacturers should consider designing and installing viewing decks where worker's can safely access the equipment to observe operation.**

INTRODUCTION

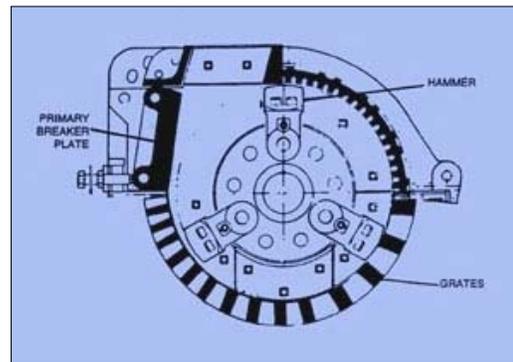
On Nov. 23, 2003, a 45-year-old co-owner of a general construction company was killed while working on a horizontal impact rock crusher. OR FACE was notified of the incident on Nov. 28. An interview with the employer was held on Jan. 23, 2004. The Oregon Mine Safety and Health Training Program also investigated this incident and supported the OR FACE investigation. This report is based on information obtained from interviews with those on scene, and law enforcement and medical examiner reports.

This small general construction company, co-owned by two brothers, was formed in 1981. The company got its start by building logging roads, and eventually built roads for the U.S. Forest Service. The company began supplying crushed rock for building roads in 1999. A subcontractor was not available, so the company rented a portable rock crusher to perform the work. The leasing agency set up the equipment and provided training for the worker involved in this incident. He was the only person in the company trained to operate and maintain the equipment. This was the third or fourth time the company had leased and operated the rock crusher.

On the day of the incident, three workers were at the quarry: a bulldozer operator, a skid-steer operator, and a rock-crusher operator. The bulldozer pushed the quarried rock to a central location, where the skid steer could move it to the loading bin connected to the intake table of the rock crusher.

INVESTIGATION

A horizontal impactor crushes rock by repeatedly hitting it with rotating metal hammers. The impactor rotates at a high speed, in this case at about 2400 rpm. A vibratory screen conveys rock toward the intake chute of the impactor. The intake is equipped with two curtains, one of chain and another of rubber, to prevent rocks from being thrown out. Directly below the curtains is the rotating impactor.



Drawing of a horizontal impactor.

The rock crusher had remote control capabilities, which means the unit could be shut down at a distance, but according to the employer, close observation of the impactor chute while the crusher is operating is important. Early recognition that rock is backing up may prevent many frustrating, dirty hours of digging out mud and packed rock from tight quarters. Digging out the intake by hand can take as long as 4 hours. Vigilance and preventive maintenance can eliminate costly down time.

This truck-mounted rock crusher was not equipped with a worker viewing platform, where an operator can safely stand and watch rock move into the crusher. The employer reported paint missing on the impactor housing, which he believed was an indication that other operators used the same spot where the victim commonly stood to observe the machine's operation. In this

location, an operator is head and shoulders directly over the intake of the impactor. On this particular rock crusher, there was no apparent protected position to observe the operation.

At about 2 p.m., the rock-crusher operator apparently tried to clear a rock jam while standing on the top of the impactor housing. He turned off the vibratory bed that feeds rocks into the chute, and inserted a 5-ft pry bar down the chute while the impactor was operating. He either pushed the bar too far or it slipped from his hands and came into contact with the rotating impactor. The pry bar was thrown back with tremendous force and struck the operator in the neck.

The coworker using the skid steer to dump rock onto the conveyor of the crusher noticed the rock-crusher operator missing from his normal position, and spotted him slumped in the corner of the lower platform. The victim was bleeding profusely from the neck, with the pry bar in his lap. He sustained severe blunt and penetrating trauma to his neck. Efforts to stop the bleeding were unsuccessful. The victim died at the scene.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Never attempt to remove jammed material while machinery is in operation. Shut down, isolate, and block all forms of hazardous energy before performing machine maintenance.

A rock jam in the intake chute of a rock crusher can cause considerable delay and extra work to clear it, possibly requiring the use of explosives. This incident emphasizes the danger of attempting to circumvent this tedious process by trying to clear a rock jam while the rock crusher is operating. All maintenance related to the intake chute of the rock crusher should be performed only when the equipment is completely shut down. To avoid a rock jam, monitor the size of the rocks on the conveyor, and adjust the conveyor to a slower speed to avoid a pileup in the chute – which may save time overall by avoiding a jam.

Recommendation #2: Do not allow employees to position themselves directly over the intake of a horizontal impactor while it is actively crushing rock.

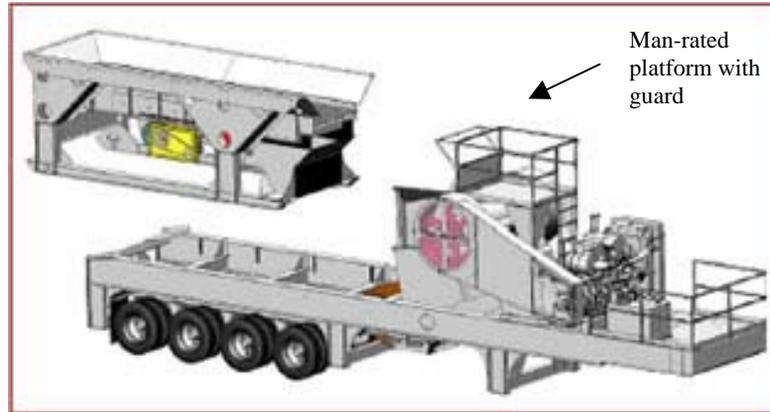
In no case should an employee stand over the intake chute of a rock crusher while the equipment is operating. Means should be found to monitor the operation from a distance. Following this incident, for example, the employer installed a 36-inch convex mirror directly over the intake chute of the impactor, so the operation can be observed from the ground at some distance from the unit. Workers no longer approach the area above the impactor unless the crushing operation has ceased.

Recommendation #3: Manufacturers should consider designing and installing viewing decks where worker's can safely access the equipment to observe operation.

Installing a man-rated viewing platform is a more certain way to eliminate the incentive for workers to position themselves directly over the intake to observe crushing operations. A

designated platform discourages an operator from attempting to access the machine from any other location. A protective guard of plexiglas or wire screen is typically mounted on front of the platform to protect an observer from rocks or debris ejected from the chute.

This drawing shows a typical truck-mounted horizontal impactor, with a man-rated viewing platform directly over the intake chute of the impactor unit. The platform is equipped with a guard to protect an observer from flying rock and debris. The guard also discourages any intervention with a tool to break a rock jam.



REFERENCES

Mine Safety and Health Administration. (2000). Sand, Gravel and Crushed Stone On-The-Job Training Modules: Module 17 - "Primary Crushing Operation." U.S. Department of Labor. Available online: <http://msha.gov/training/part46/ig40/ig40mod17.pdf>

For More Information

The Center for Research on Occupational and Environmental Toxicology at Oregon Health & Science University performs Fatality Assessment and Control Evaluation (FACE) investigations through a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR). 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.

Oregon Fatality Assessment and Control Evaluation (OR-FACE) Program

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