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UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
Metal and Nonmetal Mine Safety and Health

Report of Investigation

Underground Nonmetal Mine
(Trona)

Fatal Machinery Accident

February 1, 2004

Big Island Mine and Refinery
OCI Wyoming LP
Green River, Sweetwater County, Wyoming
Mine ID No. 48-00154

Investigators

Dale D. Teeters
Mine Safety and Health Inspector

Iredell J. Rogers
Mine Safety and Health Inspector

Kent Norton
Mine Safety and Health Specialist

Jerry Dransite
Electrical Engineer

Rob Holubeck
Electrical Engineer

Originating Office
Mine Safety and Health Administration
Rocky Mountain District
P.O. Box 25367 DFC, Denver, Colorado 80225
Irvin T. Hooker, District Manager

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OVERVIEW

On February 1, 2004, Keith L. Hodges, roof bolter operator, age 34, was fatality injured when he was struck by a continuous mining machine. He was operating the roof bolter that was stationed on the continuous mining machine. The victim exited the continuous mining machine as it backed up and was pinned against the rib.

The accident occurred because the miner operator was unaware that the roof bolter operator left the roof bolter station and walked between the rib and the continuous mining machine. The continuous miner operator could not see the roof bolt operator and was unaware that he had placed himself in this position.

GENERAL INFORMATION

Big Island Mine and Refinery, an underground trona operation, owned and operated by OCI Wyoming LP, was located off of U.S. Hwy 372, 25 miles northwest of Green River, Sweetwater County, Wyoming. The principal operating official was Tim D. Morrison, site manager. The mine normally operated two, 12-hour shifts per day, seven days a week. Total employment was 408 people.

Trona was mined using conventional room and pillar mining. Five sections operated in two seams approximately 40 feet apart. Ore was mined using continuous mining machines. Shuttle cars hauled ore from the continuous mining machines to loading pockets to conveyors that delivered the ore to loading pockets at the two ore shafts. Ore was hoisted to the surface, processed at a plant on the mine site, and sold for use in the glass industry. Trona was also used as an ingredient for sodium-based intermediates, such as sodium bicarbonate, and was used in the beverage, coatings, food, and personal care markets.

DESCRIPTION OF ACCIDENT

On the day of the accident, Keith Hodges (victim) reported to work at 6:45 p.m., his scheduled starting time. Jim Carter, supervisor, rode the man cage into the mine with his assigned “B” crew. Carter and the crew went to their work section (CM06), arriving at about 6:55 p.m. After Carter conducted the workplace examination for the section, the crew began to work. They mined a full pass on the right side of the cut in the cross-cut located in upper bed east, panel 2-south, room 91-west. They completed this side of the cut at approximately 9:00 p.m.

Lenord Hansen, miner operator, backed the continuous mining machine out of the full pass and began to mine the left side of the cut (half-pass). Work continued normally, except for a 50 minute stoppage, because the ore bins were full. Hansen finished mining the lift at about 11:20 p.m. Hansen signaled Hodges with his mine light that he had finished loading the last shuttle car. Hansen backed up the continuous mining machine a short distance, stopped, and helped Hodges reload the bolt carousel on the machine. Hansen told Hodges he was backing up and Hodges acknowledged him.

Hansen stood on the mine floor in front of the cab of the continuous mining machine. He was unable to see Hodges from this location. Hanson used the remote controls to back the continuous mining machine out of the completed cut. The continuous mining machine sank in the soft bottom and skewed as it trammed up a 4-1/2% grade. As the continuous mining machine approached its power cable, Hansen split the tracks on the machine to pivot it towards the rib to avoid hitting and damaging the cable.

Carter, Rick Lucero, mechanic, and Greg Gibson, shuttle car operator, were standing behind the continuous mining machine and saw Hodges step out of the roof bolter operator station. Hodges was caught between the rib and the end of the continuous

mining machine's conveyor tail piece boom when the machine pivoted. They shouted to Hansen to swing the boom of the continuous mining machine away from the rib.

The crew administered first-aid to Hodges, placed him on a back board, and started cardio-pulmonary resuscitation. Hodges was transported to the surface, and then to a local hospital were he was pronounced dead at 12:37 a.m., on February 2, 2004. The cause of death was attributed to abdominal and pelvic trauma.

INVESTIGATION OF THE ACCIDENT

MSHA was notified at 12:50 a.m., on February 2, 2004, by a telephone call from Terry Adcock, safety superintendent for OCI Wyoming LP, to Iredell J. Rogers, mine safety and health inspector in the Green River, Wyoming, field office. An investigation was started the same day. An order was issued under the provisions of Section 103(k) of the Mine Act to ensure the safety of the miners. MSHA accident investigators traveled to the mine, made a physical inspection of the accident scene, interviewed employees, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees.

DISCUSSION

Location of the Accident

The accident occurred in section CM06 in the cross-cut located in the upper bed east, panel 2 south, room 91 west. The head of the continuous mining machine was approximately 48 feet from the face.

Continuous Mining Machine

The continuous mining machine was a Joy Remote Controlled Hardrock Miner, Model No. 12HM26-15DDJK, MSHA Approval No. 2G-4023A-0. The continuous mining machine was provided with a roof bolter station manufactured by Joy Mining Machinery. The machine was equipped with the Joy Network Architecture (JNA) control and monitoring system, which recorded and allowed a display of machine operational and fault events.

The continuous mining machine was equipped with auto-bolting systems, approved under the same MSHA Approval No. as the continuous mining machine. The bolters were used in the manual mode with the auto-bolting control functions disabled.

The continuous mining machine was equipped with a roof bolter operator station that included a protective cab on the left rear side of the machine and a continuous miner operator station with a protective cab on the rear right side of the machine. The roof bolter operator was normally positioned on the machine during cutting and roof bolting operations. The roof bolter could choose to be on or off the machine when the machine was trammed for a place change or for cleaning up spillage. The continuous miner

operator was normally positioned on the machine during cutting operations. The continuous miner operator usually was off the machine and operated the machine with the remote control unit during tramming for a place change or cleanup operations.

The continuous miner operator's station on the machine was equipped with manual controls to allow backing the machine, in slow speed only, if a failure of the master control unit (MCU) computer occurred. Four controls were present for left traction, right traction, pump, and lights.

The continuous miner operator's station was equipped with a computer "mouse" and monitor screen that allowed the miner operator to change the left and right tram drive sump parameters for the "half-pass" cut where the cutter head width was larger than the face cut. This allowed straight sumping into the face. The operator changed these parameters for balanced tram drives when sumping for the full-pass (full continuous mining machine head width) cut. When the machine was trammed in reverse, the tram drives were always automatically balanced, even if unbalanced parameters had been entered for the half-pass cut.

The roof bolter station on the continuous mining machine was equipped with a hard-wired E-Stop switch to allow the roof bolter operator to stop the machine if he/she was unable to get the attention of the continuous miner operator to stop the machine. There was a second hard-wired E-Stop switch, located on the left side of the continuous mining machine, near the tram motor gear case. A hard-wired E-Stop panic bar was located on the right side of the machine in the continuous miner operator's cab. A "stop" push button was provided on the remote control unit that activated a machine shutdown through a radio frequency link signal.

The continuous mining machine was equipped with three area lights on each side of the machine. Sight lines between the continuous miner operator's position and the roof bolter operator's position were checked. One of the area lights on the right side of the machine produced some glare at the continuous miner operator's position at the time of the accident. Simulations were made of the reported positioning of the miner operator and the roof bolter operator at the time of the accident with the area lights either on or off. During the simulation, the miner operator could not see the roof bolter operator or his cap lamp, even when the roof bolter operator's cap lamp faced the miner operator. The height of the machine, eight feet six inches, blocked visibility between the miner operator and the roof bolter operator.

The continuous mining machine was powered by a three-phase, 60 Hz, 2,300 volt power source.

Functional testing of the continuous mining machine demonstrated the machine and remote control system to be functioning properly. All E-stop devices functioned properly. The JNA system computer log indicated no machine fault codes during the time period the machine was being trammed prior to the accident. The log showed a

sequence of tram commands prior to the accident, consistent with the continuous miner operator's statement.

Key Accident Site Measurements

Machine cutter head width: 15.2 feet
Overall machine length: approximately 43 feet
Tail boom length: approximately 11 feet
Machine height: approximately 8.5 feet
Machine weight (estimated by Joy Mining Machinery): 235,000 lbs
Distance of left side of machine to rib: Approximately 21-24 inches (at roof bolter operator's cab)
Distance of tail boom tip to rib (before machine slewed toward rib): approximately 32 inches
Tail boom height (top of boom): approximately 48 inches
Distance from mine face to cutter head: approximately 48 feet
Entry width: approximately 27.8 feet
Entry height: approximately 9.8 feet
Location of remote control unit (after accident): approximately 7.5 feet from rib, 3 feet behind tail boom
Distance of spillage from right side of machine: approximately 8 inches
Spillage width: varied from approximately 3 feet to 4.5 feet
Spillage height: varied between approximately 1 to 2 feet

Environment

The environment was not considered a factor in the accident. The temperature was 62 degrees and the mining area was dry. Lighting from the equipment and the miners' lights provided adequate lighting.

Personal Protective Equipment

Hodges was wearing all required personal protective equipment. Crew members reported his cap lamp was operational.

Training and Experience

Hodges had received training in accordance with 30 CFR, Part 48. Hodges had 13 years and 43 weeks mining experience. He had one year and 32 weeks experience as a roof bolter operator.

Job Analysis: Continuous Miner Roof Bolter Job Procedures

At the time of the accident, the procedures in place stated that the roof bolter operator should not be in the operator's compartment when tramming the miner beyond normal sumping functions.

These procedures were revised on February 4, 2004, following the accident. The new procedures require the roof bolter operator to communicate, (verbally and visually) with the continuous miner operator that he/she is exiting the machine. At that time, the miner operator is to shut off the pump motor and verify that the roof bolter operator is in the clear before beginning to retreat from the face. At no time other than when required to install roof bolts or drill gas holes, is the roof bolter operator to be in the continuous mining machine while it is moving.

ROOT CAUSE ANALYSIS

A root cause analysis was conducted and the following causal factor was identified:

Causal Factor: The roof bolter operator did not follow established procedures for remote controlled continuous mining machines. The roof bolter operator left the roof bolting station of the continuous mining machine while the machine was tramming and did not communicate his intentions to the miner operator. The miner operator was unaware that the roof bolter operator had left the roof bolting station.

Corrective Action: Job procedures should be modified and all affected employees should be trained to ensure that they understand and follow the remote control continuous mining procedures.

CONCLUSION

The accident occurred because the miner operator was unaware that the roof bolter operator left the roof bolter station and walked between the rib and the continuous mining machine. The continuous miner operator could not see the roof bolter operator and was unaware that he had placed himself in this position.

ENFORCEMENT ACTIONS

Order No. 6302696 was issued on February 2, 2004, under the provisions of Section 103(k) of the Mine Act:

> A fatal accident occurred at this operation on February. 1, 2004, when a miner was pinned against the rib by the tail boom of the CM06 miner as it was being backed out. This order is issued to ensure the safety of all persons at this operation. It prohibits all activity in the 91W room and the CM06 miner until MSHA has determined that it is safe to resume normal mining operations in the area. The mine operator shall obtain prior approval from an authorized representative for all actions to recover and/or restore operations to the affected area.

This order was terminated on February 5, 2004. Conditions that contributed to the accident have been corrected and normal mining operations can resume.

Citation No. 6300332 was issued on February 24, 2004, under the provision of Section 104(a) of the Mine Act for violation of 57.9316:

> A fatal accident occurred at this operation on February. 1, 2004, when a roof bolter operator was pinned against the rib by the tail boom on a self-propelled continuous miner, Model No. 12HM26-15DDJK, Serial No. JM5252. The roof bolter operator had been riding on the roof bolter platform mounted on the continuous miner. The miner operator standing on the opposite side of the continuous miner was backing it away from the face utilizing the remote control. The bolter operator did not notify the miner operator that he intended to get off the mobile equipment before he left the bolter platform.

This citation was terminated on February 24, 2004. The mine operator has revised remote control continuous mining procedures and trained all affected employees to ensure that they understand and follow the procedures.

Approved by, Date: March 25, 2004

Irvin T. Hooker
District Manager

APPENDICES

A. Persons participating in the investigation
B. Persons interviewed
C. Sketch of accident site
D. Survey of accident site

APPENDIX A
Persons Participating in the Investigation

OCI Wyoming LP

Tim Morrison	site manager
Barry Bundy	human resource manager
Roger A. Hoops	mine manager
Brad Slaughter	mine production superintendent
Doug DeGase	mine engineer
Terry Adcock	safety superintendent

State of Wyoming

Donald G. Stauffenberg	state inspector of mines
Hector Castillon	state inspector
Rudy King	state inspector

Joy Mining Machinery Representative

Dominic (DOC) Oliveto	senior service engineer

Mine Safety and Health Administration

Dale D. Teeters	mine safety and health inspector
Iredell J. Rogers	mine safety and health inspector
Kent Norton	mine safety and health specialist
Jerry Dransite	electrical engineer
Rob Holubeck	electrical engineer

APPENDIX B
Persons Interviewed

OCI Wyoming LP

Roger A. Hoops	mine manager
Terry W. Adcock	safety superintendent
James C. Carter	production supervisor
Lenord C. Hansen	miner operator
Richard C. Lucero	mechanic
Cheryl A. Crouch	shuttle car operator
Gregory S. Gibson	shuttle car operator
Donald B. Stoll	miner operator
William S. Moore	crew leader
Steven A. Maggio	bolter
Robert A. Torres	miner operator
Michael C. Martinez	utility man
William S. Bolt	underground construction utility