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

REPORT OF INVESTIGATION

Underground Metal Mine
(Lead-Zinc Ore)

Non-Injury Mine Fire Accident
January 21, 2010

Doe Run Company
Viburnum #29 Mine
Viburnum, Washington County, Missouri
Mine ID No. 23-00495

Investigators

Robert D. Seelke
Supervisory Mine Safety and Health Inspector

Keith S. Markeson
Mine safety and Health Inspector

James L. Angel
Mechanical Engineer

Originating Office
Mine Safety and Health Administration
South Central District
1100 Commerce Street, Room 462
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Edward E. Lopez, District Manager

Overview

On January 21, 2010, an underground haul truck caught fire while operating in the Czar drift. The fire was not extinguished within 10 minutes of discovery so a mine evacuation was initiated and the Mine Safety and Health Administration was notified. Three miners were unable to evacuate because the burning haul truck blocked their escape route. They entered a 'Designated Point of Safety' and waited until rescuers arrived then exited the mine via an escape capsule that had been lowered down a 60-inch ventilation hole.

The accident occurred because the haul truck had not been properly maintained. Management did not have an effective procedure to ensure that mobile equipment was routinely inspected and did not provide any maintenance schedules to correct any safety defects prior to use. Leaking hydraulic oil ignited and caused the fire.

GENERAL INFORMATION

Viburnum #29 Mine, an underground lead-zinc mine, owned and operated by Doe Run Company (Doe Run), was located at Viburnum, Washington County, Missouri. The principal operating official was Robert W. Roscoe, General Manager. The mine operated one 10-hour shift per day, 4 days a week. Total employment was 19 persons.

Lead-zinc ore was mined underground and hoisted to the surface. The ore was crushed and transported by truck to other Doe Run mines where it was milled to form a concentrate. The finished product was shipped to a smelter where it was refined for a variety of industrial uses.

The last regular inspection at this operation was completed on January 14, 2010.

DESCRIPTION OF ACCIDENT

On the day of the accident, the miners started work at their normal time of 6:30 a.m. Allen Mercer, General Mine Supervisor, held a safety meeting with the miners and then made work assignments for the day.

Michael Byers, Loader Operator, was assigned to load ore from the Czar drift undercut. Jeffrey Asher, Truck Driver, and Robert McClain, Truck Driver, were assigned to haul the ore to a grizzly located at the main shaft. About 9:00 a.m., Timothy Yount, Mechanical Scaler Operator, moved a scaling machine into the Czar drift and began scaling at the overcut.

About 10:28 a.m., Asher passed the explosive storage area, smelled what he thought was hydraulic oil and then heard a grinding noise. He observed flames coming from both sides of the engine compartment of his truck.

Asher stopped the truck and attempted to exit but was hindered by flames. He tried again, exited the truck, and retrieved the fire extinguisher mounted on the right side of the truck. The height of the flames increased and three or four small explosions occurred before Asher unsuccessfully attempted to activate the extinguisher. He dropped the extinguisher and ran toward the shop.

Asher arrived at the shop about 10:39 a.m. and notified David Skaggs, Maintenance Foreman, that his truck was on fire and they needed to evacuate the mine and call MSHA. Skaggs notified Gary Gilliam, Hoist Operator, and directed him to start an evacuation. Gilliam called the MSHA emergency hotline at 10:45 a.m. and asked Ronald Dees, Electrician, to dump stench into the mine to notify miners of the emergency.

McClain had stopped his loaded haul truck in the Czar drift at a pre-determined location to permit Asher's truck to pass when returning from the grizzly. When Asher did not

return in a reasonable time, McClain drove toward the grizzly and encountered heavy smoke.

McClain turned his truck around and traveled back to the overcut to inform Byers that Asher's truck was on fire. He then went to get Yount at the scaler and the three miners met at the nearest 'Designated Point of Safety' (DPOS). Byers attempted to call the surface but did not get a response. The three miners discussed their options and decided to reverse the underground fan at #58 ventilation hole to exhaust and prevent some of the smoke from following them to the DPOS.

Yount went to the fan in Byer's loader and encountered smoke but succeeded in reversing the #58 fan before returning to the DPOS. The three miners waited outside the DPOS to see how the air flow was reacting to the fan change. They noticed that smoke was still traveling toward them and decided to seal themselves in the DPOS about 11:00 a.m.

Once inside the DPOS, the miners made several attempts to contact someone via the pager phone but were unsuccessful. Yount installed the regulator on one of the three oxygen bottles located inside the DPOS and turned on the oxygen. They caulked the door to prevent smoke from entering the DPOS and monitored the smoke outside by looking through a plexi-glass window in the door. They used a ball valve in the DPOS wall to lower the inside pressure that built up while using the compressed oxygen.

Allen Mercer, General Mine Supervisor, was notified of the fire at 10:58 a.m. He coordinated the underground evacuation, called for a portable escape hoist to be brought from the nearby Buick Mine then attempted to enter the Czar drift. He encountered smoke before reaching the truck, retreated, and reversed a fan located underground at #52 ventilation hole to exhaust and draw smoke away from the three miners located behind the burning truck. Mercer evacuated by way of the main shaft and arrived on the surface at 11:20 a.m. All other underground miners, except the three blocked by the fire, were also on the surface by 11:20 a.m.

At about 11:00 a.m., Robert Seelke, Supervisory Mine Safety and Health Inspector, was contacted by Fred Gatewood, Assistant District Manager. Seelke called the mine for additional information and was informed three miners were trapped behind the fire. He verbally issued a 103(j) order to Skaggs at 11:05 a.m.

Seelke called Keith Markeson, Mine Safety and Health Inspector, who was inspecting at a nearby Doe Run mine and instructed him to get to the mine immediately and notify the district office for further instructions. Markeson arrived at the mine at 11:53 a.m., modified the 103(j) order to a 103(k) order, and established telephone communications with the district office. MSHA headquarters personnel joined the conference call at 12:01 p.m.

The Doe Run mine rescue teams were mobilized at 11:00 a.m. and started gathering their equipment at the mine rescue station located at the West Fork training facility about 25 miles away. Eight mine rescue team members were at the mine at 12: 53 p.m.

Doe Run personnel submitted an initial rescue plan to MSHA that was approved at 12:52 p.m. The portable escape hoist had been set up and checked out at #64 ventilation hole. Seelke arrived at the mine at 12:59 p.m., went to the #64 ventilation hole with Greg Sutton, General Mine Manager, and joined the conference call from there.

At 1:24 p.m., Steve Setzer, mine rescue team captain, and Shawn Pratt, mine rescue team captain, were lowered into the mine inside a 30-inch diameter escape capsule. They reached the bottom of #64 ventilation hole at 1:36 p.m. About that time, the mine rescue team from the Mississippi Lime Company was mobilized and Emergency Medical Services (EMS) arrived at the mine at 1:44 p.m.

After lowering equipment into the mine and receiving word from Setzer there was heavy smoke in the mine, management submitted a revised rescue plan that was approved at 2:27 p.m. After minor problems with the portable escape hoist and rope were resolved, Wayne Marlin, Mine Rescuer, and Randy Hill, Mine Rescuer, were lowered into the mine at 3:01 p.m. Andrew Hampton, Mine Rescuer, and Brad Beck, Mine Rescuer, were lowered into the mine at 3:28 p.m.

After six mine rescue team members were in the mine, Pratt, Marlin, and Hill went to the DPOS at 3:41 p.m. They searched the mobile equipment parked outside the DPOS, took gas readings, then entered the DPOS and assisted the miners with their self-rescuers. Then the three mine rescuers walked the three miners back to the bottom of #64 ventilation hole at a rapid pace at 3:49 p.m. Upon arrival at the bottom of the shaft, the miners donned self-contained breathing apparatus.

Setzer and Yount were hoisted to the surface at 4:02 p.m. Pratt and Byers were hoisted to the surface at 4:31 p.m. Beck and McClain were hoisted to the surface at 4:50 p.m. The three miners were examined by EMS before they were transported to the Washington County Hospital in Potosi, Missouri. The three remaining rescue team members were hoisted to the surface and the rescue was completed at 5:30 p.m.

Mississippi Lime's mine rescue team had arrived at 4:20 p.m. and stood by until they were utilized to recover the mine.

INVESTIGATION OF THE ACCIDENT

On the day of the accident, the Mine Safety and Health Administration (MSHA) was notified at 10:40 a.m. by a telephone call from Gary Gilliam, Hoist Operator, to MSHA's emergency hotline. Elwood Burriss, Staff Assistant, was notified and an investigation was started the same day and an order was issued pursuant to section 103(j) of the Mine Act. The order was modified to section 103(k) of the Mine Act after MSHA personnel arrived on-site.

MSHA's accident investigation team traveled to the mine, made a physical inspection of the accident scene, interviewed employees and reviewed documents 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 the Czar drift between #52 ventilation hole and #58 ventilation hole (see Exhibit B).

Haul Truck

The haul truck involved in the accident was an MT31 Moxy articulated dump truck manufactured in 2002. It was used to transport broken rock from various working areas to the grizzly located near the main underground shop.

The haul truck was about 10 feet wide, 32 feet long, and 12 feet high and weighed 114,430 pounds. The truck was equipped with a 6-cylinder diesel engine that had a turbocharger mounted on the right side. All combustible components of the engine, hydraulic system, and operator's compartment along with the fuel lines and 70-75 gallons of fuel were consumed in the fire and a majority of the aluminum components on the engine melted and pooled in the belly pan below the engine.

The most likely cause of the fire was the ignition of oil leaking from a hydraulic hose. Investigators found a 467-foot trail of fluid (hydraulic oil) leading to the location of the fire. An arcing wire or the truck's turbocharger would have provided sufficient heat to ignite the leaking fluid.

Maintenance records indicated that the B99 biodiesel fuel used in the haul truck was deteriorating the fuel lines. Investigators inspected a similar truck after the fire and found damaged fuel lines that had been penetrated by the incompatible biodiesel fuel.

Training and Experience

Jeff Asher had 13 years and 2 weeks of mining experience, including 5 years at this operation. He had received training in accordance with 30 CFR Part 48.

Michael Byers had 13 years and 13 weeks of mining experience, including 1 year 26 weeks at this operation. He had received training in accordance with 30 CFR Part 48.

Robert McClain had 5 years and 37 weeks of mining experience, all at this operation. He had received training in accordance with 30 CFR Part 48.

Tim Yount had 31 years of mining experience, including 29 years at this operation. He had received training in accordance with 30 CFR Part 48

ROOT CAUSE ANALYSIS

A root cause analysis was performed and the following root cause was identified:

Root Cause: The operator's equipment examination and preventive maintenance program was not effective. Hydraulic oil leaking from a defective hose was ignited and caused the fire.

Corrective Action: The operator replaced numerous fuel lines and hydraulic hoses on mobile equipment in the mine in addition to implementing a more structured program of mobile equipment examination and preventive maintenance.

CONCLUSION

The accident occurred because the haul truck had not been properly maintained. Management did not have an effective procedure to ensure that mobile equipment was routinely inspected and did not provide any maintenance schedules to correct any safety defects prior to use. Leaking hydraulic oil ignited and caused the fire.

ENFORCEMENT ACTIONS

Order No. 6242694 An accident (mine fire) occurred at this operation on January 21, 2010 at approximately 10:28 a.m. As rescue and recovery work is necessary, this order is being issued, under Section 103(j) of the Federal Mine Safety and Health Act of 1977 (the Act), to assure the safety of all persons at this operation. This order is being issued to prevent the destruction of any evidence which would assist in investigating the cause or causes of the accident. It prohibits all activity at the #29 mine until MSHA has determined that it is safe to resume normal mining operations in the area. This order applies to all persons engaged in the rescue and recovery operation and any other persons on-site. This order was initially issued orally to the mine operator at 11:05 a.m. and is now being reduced to written form.

This order was modified to Section 103(k) of the Act after the first inspector arrived at the mine.

Citation 6467158 was issued on February 9, 2010, under provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 57.14100(b).

The Cat 120 road grader had a build up of fuel on top of the engine. The build up was approximately four inches by 2 inches and less than one-eighth inch deep. It was located on the engine head opposite of the turbo-charger. The condition exposed miners to a potential fire hazard. The unit was being used on an 'as needed' basis to grade roadways.

Citation 6467159 was issued on February 9, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.4102

The floor of the shift extra area had an accumulation of oil about three feet by eight feet that was about one-quarter inch deep. The oil accumulation was not in the foot traffic area. This condition exposed miners to a potential fire hazard. The area was accessed by one miner on a daily basis.

Citation 6467160 was issued on February 10, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.4200(b)(2)

The sprinkler system in the tire storage area of the main shop was not maintained in fire ready condition. The on/off valve did not have a knob or handle and was taped to prevent it from being turned on. The condition exposed miners to a fire fighting system that would not work if needed. Mechanics accessed the area on an as needed basis.

Citation 6467161 was issued on February 10, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.8520(e)

There were four pieces of mobile equipment with internal combustion engines not listed on the mine's ventilation plan.

Citation 6467162 was issued on February 17, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.11053(a)

The mine escape and evacuation map did not identify the location of the controls for primary fans CDH 52 and CDH 20a. The condition exposed miners to a potential hazard if mine rescue teams did not know where to shut off or reverse the direction of the ventilation during an emergency.

Citation 6467163 was issued on February 17, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.11053(c)

The secondary escape route near the 60V119 area of the mine showed it going through an inactive area when in reality the inactive area's border was marked incorrectly on the map. The condition exposed miners and mine rescuers to the potential hazard of not knowing if the escape route was safe to use.

Citation 6242698 was issued on March 1, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.19007

The portable escape hoist used in the rescue on January 21, 2010 was found to have the over-travel device improperly adjusted. The top over-travel was set approximately ten to fifteen feet above and beyond the maximum upper travel limit of the escape capsule. The lower limit switch was set at approximately eleven hundred feet below the surface. The shaft used in the rescue operation measured five hundred eighty feet in depth. The

gearing for the over-speed device did not comply with the manufacturer's recommendations for the maximum hoist operating speed.

Citation 6242699 was issued on March 1, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.19030

The safety device attachment on the portable escape hoist was not installed and maintained according to manufacturer's specifications. The safety device was attached to the suspension rope at an incorrect position which resulted in the safety device attachment chains suspending the load of the escape capsule and the suspension rope termination not supporting the load.

Citation 6242700 was issued on March 1, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.19025(a)

The wire suspension rope on the portable escape hoist was improperly attached to the load by a method not recommended by the manufacturer. The manufacturer recommended that the dead end of the rope not be connected to the live load carrying portion of the suspension rope for wedge socket wire rope attachments. Four double saddle clips had been installed to connect the dead end of the rope to the live end after traveling through the wedge socket.

Citation 6242701 was issued on March 1, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.19037

The fleet angle on the portable emergency escape hoist exceeded 2 degrees due to an improperly maintained head sheave.

Citation 6242702 was issued on March 1, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.19007

The over-travel and over-speed devices on the permanent escape hoist were not operational due to a damaged weight unit on the hoist controller. This condition did not allow the over-speed device to shut the hoist down during an over-speed event.

Citation 6566801 was issued on March 1, 2010, under the provisions of Section 104(a) of the Mine Act for a violation of 30CFR 57.19017

The manually operated switch equipped on the permanent escape hoist interrupted power to the hoist motor but did not initiate emergency braking action to bring the conveyance safely to a stop.

Citation 6566804 was issued on May 3, 2010, under provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 57.14100(a).

Three miners became trapped underground on January 21, 2010, when a Moxy MT31 haul truck caught fire. The fire occurred when fluids liberated by defective lines contacted an ignition source in the engine compartment. An adequate pre-operation examination that should have identified combustible fluid leaks had not been performed prior to placing the equipment in service.

Approved: Fred L. Hatcwood, for Date: 5-21-10

Edward E. Lopez
District Manager

APPENDIX A

PERSONS PARTICIPATING IN THE INVESTIGATION

Doe Run Company

William J. Courtney	General Maintenance Supervisor
Allen L. Mercer	General Mine Supervisor
Scott Stluka	Safety Specialist

Mine Safety and Health Administration

Robert D. Seelke	Supervisory Mine Safety and Health Inspector
Keith S. Markeson	Mine Safety and Health Inspector
James L. Angel	Mechanical Engineer

APPENDIX B

Czar Drift Schematic