MAI-2005-23

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

# REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Pumice)

Fatal Powered Haulage Accident
September 9, 2005

Tufflite, Inc.
White Vulcan Mine
Flagstaff, Coconino County, Arizona
Mine I.D. No. 02-02332

Investigators

Chrystal A. Dye
Mine Safety and Health Inspector

Enrique Y. Vidal
Mine Safety & Health Inspector

James L. Angel
Mechanical Engineer

Hilario S. Palacios
Mine Safety and Health Specialist

Originating Office
Mine Safety and Health Administration
Rocky Mountain District
P.O. Box 25367, DFC
Denver, Colorado 80225-0367
Irvin T. Hooker, District Manager

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## OVERVIEW

On September 9, 2005, Valdis G. Cody, equipment operator, age 26, was fatally injured when the scraper he was operating, descended a grade of an established roadway, veered off the roadway, and traveled over rough terrain. The victim, who was not wearing his seatbelt, was ejected from the cab of the scraper.

The accident occurred because the scraper's braking systems were not maintained in a functional condition. Policies, standards, and procedures were inadequate because equipment examinations had not been routinely performed and the equipment had not been repaired or removed from service. The victim was not wearing a seatbelt to prevent him from being ejected from the cab of the scraper.

## GENERAL INFORMATION

White Vulcan Mine, a surface pumice operation, owned and operated by Tufflite, Inc., was located 1 mile west of mile marker 429 – Highway 89, north of Flagstaff, Coconino County, Arizona. The principal operating officials were Clarence T. Morgan, president; Clarence E. Morgan, vice-president; and Clay Morgan, secretary. The mine normally operated one 12 hour shift a day, 6 days a week. Total employment was 6 persons.

Pumice was extracted from the pit with a bulldozer. A front-end loader transported the material to a crusher. The material was crushed, screened, and stockpiled. Finished products were sold for use in the construction industry.

Two pits were located at this operation. Active mining was conducted at one pit and stockpiles were processed and reclamation work was being done at the other pit. The accident occurred at the reclaimed pit.

The last regular inspection of this mine was completed on July 28, 2005.

## DESCRIPTION OF THE ACCIDENT

On the day of the accident, Valdis G. Cody, (victim), reported for work at about 9:30 a.m. His normal starting time was 7:00 a.m. His duties were to continue with the reclamation project of the old pit. Cody traveled a 0.7 mile loop operating the scraper collecting dirt from one side of a hill and dropping it on the other side of the same hill.

About 10:45 a.m., Cody got out of his scraper to talk with Nathaniel Yellowhorse, equipment operator. Yellowhorse told Cody he was going to shut down the plant and was going to operate another scraper to help with the reclamation work. Cody told Yellowhorse he was going to move his car and take an early lunch.

Around 11:05 a.m., as Yellowhorse was parking his front-end loader, he noticed that Cody's scraper was near a dozer. Yellowhorse went to check on Cody and found him lying on the ground behind the scraper. Yellowhorse contacted Sam Wilson, mine foreman, to tell him about Cody. Wilson and Yellowhorse called for emergency medical assistance. The victim was pronounced dead at the scene. Death was attributed to crushing injuries.

## INVESTIGATION OF ACCIDENT

MSHA was notified of the accident at 11:40 a.m., on September 9, 2005, by a telephone call from Connie Morgan, wife of the company vice-president, to Pete Gutierrez, mine safety and health inspector. An investigation was started that day. An order was issued under the provisions of Section 103(k) of the Mine Act to ensure the safety of the miners. MSHA's accident investigators traveled to the mine, made a physical inspection of the accident scene, conducted interviews, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management, employees, and the Arizona State Mine Inspector's Office.

## DISCUSSION

### Location of the Accident

The accident occurred at the southwest end of the No.1 screen plant area, just to the left of the west pit access roadway. The roadway was approximately 23 feet wide and 168 feet long with an average grade of 10 percent. After the scraper veered off the roadway, the terrain along the machine's path was rough and included a drop of approximately 18 inches (26 degrees grade over 3 feet). This drop was located approximately 50 feet from the point where the operator started to descend the grade towards the No.1 screen plant area. Two other drops of 6 inches and 5 inches were also noted further along the vehicle's path. After the victim was ejected, the scraper traveled approximately 80 feet where it made contact with a parked dozer causing it to stop.

### Scraper

The scraper involved in the accident was a 1974 Terex, Model TS-14B, which was purchased and brought to the mine approximately two months before the accident. It was approximately 11 feet 2 inches wide, 39 feet 6 inches long, and 11 feet 9 inches high. The scraper had a capacity of 14 cubic yards, weighed approximately 26 tons empty and had a maximum weight of approximately 50 tons loaded. The bowl was approximately three-quarters full at the time of the accident.

The scraper was powered by two, 160 hp, Detroit Diesel, 4 cylinder engines. One engine powered the tractor portion and the other powered the scraper. The diesel engines were connected to automatic transmissions with 6 forward speeds, neutral, and reverse. The tractor engine/transmission drove the tractor's two wheels and the scraper's engine/transmission drove the scraper's two wheels. Separate accelerator pedals controlled the two engines but one transmission gear selector controlled both transmissions. The engines were reported to be running when the first rescuers arrived at the scene.

Both engines were tested during the investigation. No problems were noted with the engines or their throttle controls. Only the tractor's engine provided hydraulic power for the steering system and compressed air for the braking system.

## Braking System

The braking system was inspected. Investigators found that there were defects present prior to the accident that reduced the braking ability of the scraper at the time of the accident. Only the left rear brake showed evidence of producing significant braking.

On the left rear brake assembly, the service brake air line was connected but the emergency/park brake lock air supply line was not connected (brake chamber lock port open). The push rod was not locked in place indicating that the emergency/park brake lock was defective. With the application of the service brake at 100 pound per square inch (psi) air pressure the push rod's stroke was measured at approximately 3-7/8 inches. These chambers were designed to provide a 3-1/2 inch stroke. At a measured stroke of 3-7/8 inches, this chamber exceeded its maximum design stroke by 3/8 inches. The clean surface of the brake drum indicated that some braking force was still being developed at this wheel.

On the left front brake assembly, there was no push rod or clevis coming out of the brake safety chamber or a slack adjuster present to apply the brakes. There were no brake shoe assemblies present inside the brake drum. The left front brake was completely inoperative. The build up of dirt on the components indicated that these defects were present prior to the accident.

On the right front brake assembly, there were no air lines connected to the brake chamber. Paint on the chamber's service brake and emergency/park brake lock fittings indicated that the air lines had not been present at the time of the accident.

The service brake air line on the right rear brake assembly was connected but the emergency/park brake lock air supply line was not connected (brake chamber lock port open). The push rod was not locked in place, indicating that the emergency/park brake lock was defective. With application of the service brake at 100 (psi) air pressure, the push rod's stroke was measured at approximately 3-1/4 inch. The clevis attaching the push rod to the slack adjuster was broken, missing the arms that hold the clevis pin and connected it to the slack adjuster. The clevis pin was present in the slack adjuster. The push rod's broken clevis still contacted and moved the slack adjuster but there was no movement of the brake shoes. The brake drum was packed with dirt. There were no clean surfaces on the brake drum, indicating that no braking force was being developed at this wheel. The build up of dirt indicated that the defects found at this wheel were present prior to the accident.

An air compressor provided compressed air to the brake system's three reservoirs. The rear air reservoir was disconnected from the braking system. The air compressor's governor was designed to maintain the air pressure between a maximum of 125 psi and a minimum of 105 psi.

When tested with the engine at idle and the service brakes applied, the air pressure dropped from approximately 100 psi to 80 psi in 24 seconds (50 psi/min). The investigators noted air leaks at the left front brake chamber, both rear brake chambers, and at the service brake pedal.

When tested with the engine running at idle and the parking brake applied, the brake system air pressure dropped from approximately 100 psi to 82 psi in 45 seconds (24 psi/minute). Air leaks were noted at the left front brake chamber and near the reservoir relief valve and pressure switch.

When tested the emergency/park brake system automatically actuated both rear brake chambers when the air pressure dropped to approximately 55 psi (automatic application at approximately 45 psi per Terex specification). Only the left rear brake actually applied and neither brake chamber's push rod locking mechanism held the push rod in the applied position.

The scraper was equipped with a low air-pressure warning horn if the brake system started to lose air pressure. The horn was to activate as a warning when the pressure dropped to between 74 psi and 68 psi. If the pressure to the brake chamber lock ports dropped below approximately 60 psi, the brake chambers were designed to lock in the applied position the next time the brakes were applied. Any time the air pressure dropped to 45 psi the brakes automatically applied. The brakes would be fully applied if the pressure dropped to 22 psi. When tested, the horn did not sound as the air pressure dropped from 100 to 0 psi. The low air-pressure warning horn for the brake system did not function as required.

The scraper was also equipped with a "steering brake" lever mounted on the steering column. This brake was used to only apply either the left or right tractor (not scraper) wheel brake in order to maneuver (duck walk) out of slippery or soft material or to make sharp turns.

**Scraper Operator's Cab**

The scraper was equipped with a roll-over protective structure. There were no doors or windows attached to the cab.

Inside the cab, three spokes of the steering wheel were broken. The steering wheel was bent downward below the level of its center hub. The lever for a hand brake valve, also referred to as a steering brake, typically was attached to the left

side of the steering wheel column. This lever broke off and was found on top of the scraper's hood approximately 27 inches forward of the hand brake valve. Both the steering wheel and the hand brake lever appeared to have broken during the accident.

The operator's compartment was provided with a functional air cushioned seat that had approximately 6 inches of vertical travel. Because the scraper's axles were rigidly mounted to the frame, the movement of the operator's seat provided the only means to cushion the impact.

The seatbelt that was provided in the cab functioned normally when tested. The operator's compartment was clean and did not contain any items that might have interfered with the operation of the scraper.

## Weather

The weather at the time of the accident was partly cloudy skies and windy with gusts up to 40 mph and a temperature of approximately 75 degrees Fahrenheit.

## Medical Analysis

The toxicology laboratory report found the victim's blood alcohol level to be 0.126 percent. This level exceeded Arizona's impairment level and may have contributed to the accident.

## Training and Experience

Valdis Cody had been employed intermittently at the mine for approximately 5 years and had received training in accordance with 30 CFR, Part 48.

# ROOT CAUSE ANALYSIS

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

Causal Factor: Management policies, standards, and controls were inadequate and failed to implement corrective actions in a timely manner. Repairs had not been made to the braking systems on the scraper before it was placed into service.

Corrective Actions: Procedures should be established requiring that all mobile equipment is inspected prior to being placed in service. Self-propelled mobile equipment with brake defects should be removed from service and tagged to prohibit use until the defects are corrected.

Causal Factor: Management policies failed to ensure that mobile equipment operators recognize the hazards associated with operating mobile equipment without a functional braking system.

Corrective Actions: Mobile equipment operators should be trained to identify all safety defects. Procedures should be implemented to repair any defects that effect safety or remove equipment from service until the repairs are made.

Causal Factor: Management did not ensure that mobile equipment operators were wearing seatbelts when operating mobile equipment.

Corrective Actions: Management should develop and implement a written seatbelt policy to ensure seatbelts are worn when operating self-propelled mobile equipment and regularly monitor equipment operators for seatbelt usage.

Causal Factor: Standards, policies, and controls were inadequate. Management failed to implement a procedure to recognize alcohol use on mine property.

Corrective Action: Management should develop and implement a procedure for recognizing alcohol use on mine property.

## CONCLUSION

The accident occurred because the scraper's braking systems were not maintained in a functional condition. Policies, standards, and procedures were inadequate because equipment examinations had not been routinely performed and the equipment had not been repaired or removed from service. The victim was not wearing a seatbelt to prevent him from being ejected from the cab of the scraper.

## ENFORCEMENT ACTIONS

**Order No. 6309466** was issued on September 9, 2005, under the provisions of Section 103(k) of the Mine Act:

> A fatal accident occurred at this operation on September 9, 2005, when the scraper operator, operating the Terex scraper was run over by the machine. This order is issued to ensure the safety of all persons at this operation. It prohibits all activity at the southwest end of No. 1 screen plant area and any action to restore/recover the equipment involved in the accident. 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 September 14, 2005. Conditions that contributed to the accident have been corrected and normal mining operations can resume.

**Citation No. 6291493** was issued on September 10, 2005, under the provisions of Section 104(d)(1) of the Mine Act for violation of 56.14101(a)(3):

> A fatal accident occurred at this operation on September 9, 2005, when a scraper left the roadway as it was traveling down a grade. The scraper operator was ejected from the cab and fatally injured. All braking systems installed on this scraper were not maintained in functional condition. The service brake system was defective due to missing and inoperable parts. Management officials were aware that the service brakes on this scraper were not operating properly and the failure to promptly repair this brake system constituted more than ordinary negligence and was an unwarrantable failure to comply with a mandatory safety standard.

This citation has not been terminated.

**Order No. 6291494** was issued on September 10, 2005, under the provisions of Section 104(d)(1) of the Mine Act for violation of 56.14100(c):

> A fatal accident occurred at this operation on September 9, 2005, when the employee was ejected from and run over by the scraper he had been operating. The scraper had several safety defects that created a hazard to the operator and other miners. The service brake system was defective due to missing and inoperable parts. Management officials engaged in aggravated conduct constituting more that ordinary negligence in that they failed to take the scraper out of service and park it in a designated area until defects could be corrected. This violation is an unwarrantable failure to comply with a mandatory safety standard.

This order has not been terminated.

**Citation No. 6291495** was issued on September 10, 2005, under the provisions of Section 104(a) of the Mine Act for violation of 56.14130(g):

> A fatal accident occurred at this operation on September 9, 2005, when a scraper left the roadway as it was traveling down a grade. The victim was not wearing his seatbelt to prevent him from being ejected from the cab.

The citation was terminated September 10, 2005. All employees were re-instructed to wear their seatbelts at all times.

**Citation No. 6291650** was issued on November 18, 2005, under the provisions of Section 104(a) of the Mine Act for violation of 56.20001:

> A fatal accident occurred at this operation on September 9, 2005. The victim's blood alcohol test result was 0.126 percent. Therefore, the victim was under the influence of alcohol. Persons under the influence of alcohol shall not be permitted on the job.

This citation has not been terminated.

Approved by, Date: January 9, 2006

Irvin T. Hooker
District Manager

## APPENDIX A
## Persons Participating in the Investigation

**Tufflite, Inc.**

| | |
|---|---|
| Clarence E. Morgan (Ed) | vice-president/foreman |
| Connie D. Morgan | spouse of vice-president |
| Samuel Wilson | mine foreman |

**Arizona State Mine Inspector's Office**

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|---|---|
| John C. Stanford | Arizona state mine inspector |
| Wes Cruea | Arizona state mine inspector |

**Mine Safety and Health Administration**

| | |
|---|---|
| Chrystal A. Dye | mine safety and health inspector |
| Enrique Y. Vidal | mine safety and health inspector |
| James L. Angel | mechanical engineer |
| Hilario S. Palacios | mine safety and health specialist |