#### MAI-2016-05

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

#### **REPORT OF INVESTIGATION**

Surface Metal Mine Titanium Ore

Fatal Machinery Accident April 11, 2016

Brown and Root Contractor I.D. No. B3167

at

The Chemours Company TT, LLC Mining Unit 39 Starke, Clay County, Florida Mine I.D. No. 08-00225

Investigators

Darren A. Conn Supervisory Mine Safety and Health Inspector

> Thomas G. Galbreath Mine Safety and Health Inspector

Ronald Medina Mechanical Engineer – Technical Support

Norberto Ortiz Mine Safety and Health Specialist (Training)

**Originating Office** 

Mine Safety and Health Administration Southeastern District 1030 London Drive, Suite 400 Birmingham, AL 35211 Samuel K. Pierce, District Manager



## **OVERVIEW**

James M. Henderson, Heavy Equipment Operator, age 61, was fatally injured on April 11, 2016. Mr. Henderson had been using a dozer to perform maintenance on the haul road into the MU 39 pit. The victim either fell or stepped onto the left-side dozer track as the machine started moving backwards down a slope. He was found lying approximately 30 feet in front of the dozer's stopping point.

The accident occurred because proper parking procedures were not followed and contractor management did not provide consistent oversight to ensure proper and safe work procedures were observed.

## GENERAL INFORMATION

The Chemours Company (Chemours) is a titanium ore mining pit located in Starke, Clay County, Florida. The Plant Manager is Clement Hilton and the Safety and Health Manager is Chris Thomas. The mine operates seven days per week with two twelve-hour shifts per day and employs 113 people.

Titanium is mined from an ore body using either a dredge or heavy equipment. The titanium is concentrated and then transported to one of two dry mills for separation, packaging, and shipment. Chemours contracts Brown and Root, Inc. (Brown and Root) to conduct various tasks at the mine, including using heavy equipment, dredging operations, operating the dry mills, and operation of the concentrators.

The Mine Safety and Health Administration (MSHA) completed the last regular inspection at this operation on March 24, 2016.

## DESCRIPTION OF THE ACCIDENT

James Henderson, a contract employee with Brown and Root, reported to work at his normal starting time of 6:00 a.m. At 6:05 a.m., Joe Baxter, Brown and Root Leadman, assigned Henderson, a Heavy Equipment Operator, the task of operating an excavator to load trucks in the MU 39 pit area. Henderson loaded trucks with the excavator until lunch at 11:30 a.m.

At approximately 12:00 p.m., Henderson was assigned the task of operating the Komatsu D65PX-18 dozer in the MU 39 pit due to the lack of operable trucks to load. Henderson was to smooth and level the MU 39 pit ramp to facilitate travel for haul trucks. At approximately 1:15 p.m., Henderson communicated via radio that he needed more material to level the pit ramp.

At approximately 1:30 p.m., John Barry Van Zant, Haul Truck Driver, started into the MU 39 pit and noticed an unoccupied dozer at the bottom of the ramp. The left door was open and the dozer was still running. Van Zant observed a hard hat on the ground and exited his truck to look for Henderson. Van Zant found Henderson's body in front of the dozer and it was immediately evident that he was deceased.

Van Zant went to Hosea Dean, an Excavator Operator loading trucks in the MU 39 pit, to report the accident. Dean called Baxter to report the accident. Baxter traveled to the pit and observed the victim. The dozer was idling in neutral with the left door open. Baxter leaned into the cab and the turned the ignition off, but did not touch any other controls in the dozer cab. Baxter then notified Tim Murrhee, Brown and Root Supervisor, of the accident.

At 1:42 p.m., Murrhee contacted Clay Co. Fire and Rescue, which arrived at the mine site at 1:58 p.m. Upon assessment by Deputy Sheriff J. Wright, Henderson was

pronounced deceased. Henderson's body was transported by B&B Transport to the Duval County Medical Examiner Office for an autopsy.

The cause of death was attributed to multiple injuries.

## INVESTIGATION OF THE ACCIDENT

Chris Thomas, Chemours Safety and Health Manager, notified MSHA of the accident at 2:16 p.m. on April 11, 2016, by a telephone call to the Department of Labor's National Contact Center (DOLNCC). The DOLNCC notified Judith Etterer, Southeast District Staff Assistant, and an investigation was started the same day. To ensure the safety of miners until an investigation could be conducted, an order pursuant to Section 103(k) of the Federal Mine Safety & Health Act of 1977 was issued. Due to the length of time between the discovery of the accident and the notification made to MSHA, the contractor and the mine operator each were issued a non-contributory citation for failure to notify MSHA within 15 minutes as required under 30 CFR § 50.10 under a separate event.

MSHA's accident investigation team conducted a physical inspection of the accident scene, interviewed employees, reviewed training documentation, and examined work procedures relevant to the accident. MSHA Technical Support participated in the investigation to determine if any equipment-related factors contributed to the accident. The investigation was conducted with the assistance of mine management, contractor management, and mine and contractor employees. There were no eye witnesses to the accident.

## DISCUSSION

#### Machine Information

The Komatsu Model D65PX-18 Crawler Dozer (Product Identification Number KMTOD127KFA090062) was equipped with a straight tilt dozer blade and no ripper. The tracks were thirty-six inches wide with a grouser height of approximately two inches. The rated operating weight of the D65PX-18 dozer was 48,444 pounds. It was powered by a six-cylinder, turbocharged and aftercooled, Komatsu SAA6D114E-6, 8.85-liter diesel engine.

## • Service Brake and Parking Brake Design

The dozer was equipped with wet, multiple-disc, spring-actuated and hydraulically-released service and parking brakes. A brake pedal located to the left of the decelerator pedal applied both the left side and right side service brakes when it was depressed. Parking Brake Lever and Work Equipment Lock Lever Design The dozer was equipped with a parking brake lever located on the operator's left side and a work equipment lock lever located on the operator's right side. The parking brake lever has a LOCK position for the application of the parking brake and a FREE position indicating the parking brake is released. The work equipment lock lever also has a LOCK position to block the blade tilt, raise, lower, and float operations and a FREE position to allow the blade to operate via commands from the blade control joystick.

During normal operation, the parking brake lever and work equipment lock lever are placed in the FREE position. These two levers are completely separate and they partially block egress from the machine when in the FREE position. The figures below show the parking brake lever on the operator's left side and the work equipment lock lever located on the operator's right.



Figure 1 – Parking Brake Lever



Figure 2 – Work Equipment Lock Lever

When the parking brake lever is not in the LOCK position, a limit switch will prevent the engine from starting. Similarly, if the work equipment lock lever is not in the LOCK position, a limit switch is actuated and the engine will not start.

The "Operation & Maintenance Manual" instructs the operator to set both levers to the LOCK position when leaving the machine.

## Directional Movement Joystick Design

The dozer was equipped with a joystick lever on the left side console that controlled all directional movements. Pushing the lever forward resulted in forward machine travel and pulling it rearward caused reverse travel. There was also a center neutral position. Each position was detented so the control remained in the selected position when released. The hydrostatic steering was operated by tilting the joystick to the left for a left turn and to the right for a right turn. When released from the tilted left or right position the joystick control spring-returned to the center straight travel position. The electronically controlled transmission had an automatic shift mode and a manual shift mode. Upshift and downshift buttons were located on the top of the joystick. The rated travel speeds in forward 1<sup>st,</sup> 2<sup>nd,</sup> 3<sup>rd</sup>L, and 3<sup>rd</sup> gears were 2.2 mph, 3.5 mph, 4.5 mph, and 7.0 mph respectively. In reverse, the rated travel speeds were 2.8 mph, 4.2 mph, 5.4 mph, and 8.5 mph for the four gear speed positions.

#### Blade Control Joystick Design

The blade control joystick lever was located on the right side console to control the blade tilt, raise, lower, and float operations.

#### • Fuel Control Dial and Decelerator Pedal Design

The governed engine speed was set with a fuel control dial located on the left side console. The dial could be rotated to achieve the desired engine speed from the MIN position (low idle) to the MAX position (high idle). The "Operation & Maintenance Manual" instructs the operator to start the engine in the MIN position and then to rotate the dial to the MAX position when moving the machine. The manual also recommends rotating the dial to the MIN position before stopping the engine. The decelerator pedal was located in front of the operator on the right side and was designed to reduce the engine speed when it was pushed down.

#### As Found Condition

After the accident, the left side door was found in the open and locked position. The work equipment lock lever was found in the LOCK position, the fuel control dial was found in the MIN position, and the transmission was in neutral. These control positions are consistent with the recommended control positions for an operator about to leave the machine. The parking brake lever, however, was found in the FREE position, which is not consistent with the recommended control positions for an operator about to leave the machine. In the FREE position, the parking brake lever partially blocked egress and forced the operator to go around it in order to exit through the left side door. In addition, testing showed that the dozer would immediately begin coasting where the accident occurred if the parking brake lever was placed in the FREE position and the service brake was released. Witnesses reported that the dozer blade was found in a raised position, approximately 6 to 8 inches off the ground, and the engine was running. The "Operation & Maintenance Manual" recommends lowering the blade and stopping the engine when parking the dozer and to park the dozer on level ground if at all possible.

#### Service and Parking Brake Testing

The service brake system had the capability to stop and hold the dozer at the accident location, which was on a grade of 11.5%. The service brake pedal moved freely and no obstructions were found that interfered with pedal movement. A service braking performance test described in the "Operation & Maintenance Manual" was performed on a level area. This test showed that the

service brake had the capability to hold the dozer stationary when the engine RPM was slowly increased to full throttle while the transmission was set in 2<sup>nd</sup> gear forward, indicating acceptable brake performance.

The parking brake had the capability to hold the dozer on the 11.5% grade with the dozer blade raised and facing uphill with the transmission in neutral, duplicating the conditions at the time of the accident. At this location, when the parking brake was released, the dozer immediately drifted backward toward the bottom of the slope.

The parking brake lever and the work equipment lock lever functioned as designed to respectively apply the parking brake and lock the blade functions when placed in the LOCK position.

The engine start/interlock feature functioned as designed. When the parking brake lever was not in the LOCK position, the engine could not be started. Similarly, if the work equipment lock lever was not in the LOCK position, the engine would not start.

When the parking brake lever was moved fully down into the LOCK position to engage the parking brake, the tip of the lever was 3.5 inches above the floorboard. When the lever was pulled upward into the FREE position to release the parking brake the tip of the lever was 19 inches above the floorboard.

With the engine running and the dozer on the 11.5% grade, investigators slowly raised the parking brake lever from the LOCK position to test functionality. The dozer started to coast when the lever was raised approximately half way through its range of travel, indicating the point where the parking brake was released. This amount of lever travel was also approximately the point at which the parking brake lever will continue, by spring force, to the full "up" position when released. To duplicate the conditions found after the accident, the transmission lever was in neutral and the dozer blade was in the raised position during this test.

#### Fuel Control Dial and Decelerator Testing

The fuel control dial functioned to vary the engine speed as described in the "Operation & Maintenance Manual," and the decelerator pedal operated to reduce engine speed when it was engaged. As designed, the decelerator pedal returned to the "up" position when released. It moved freely, and no obstructions were found that interfered with pedal movement.

• Directional Movement Joystick and Blade Control Joystick Testing

To test functionality, investigators operated the dozer in the forward and reverse directions, through numerous left and right-hand turns, and numerous starts and stops. The directional movement and blade control joysticks functioned as described in the "Operation & Maintenance Manual."

### • Seat Belt

The seat belt latched and unlatched when tested.

### Weather

The weather conditions around the time of the accident were partly cloudy with an average temperature of 76 degrees Fahrenheit and light winds. Weather was not considered to be a factor in the accident.

## Training and Experience

James Henderson had 18 years mining experience, all at this mine. Brown and Root was responsible for conducting their own task training. A representative of MSHA's Educational Field Services staff conducted an in-depth review of the contractor's training records. The training records indicated that task training had been conducted. Henderson also received Part 48 Annual Refresher Training in January of 2016.

## **Contractor Management Presence**

The investigation revealed that contractor management presence at the mine was not consistent. Consistent management presence is important for ensuring safe work practices and procedures are being followed.

## Accident Summary

Henderson was performing haul road maintenance when, for an unknown reason, he stopped the dozer at or near the top of the slope and, apparently, was attempting to exit the cab through the left door. The dozer was found at the bottom of the slope with left door locked open, the engine running with the transmission in neutral, the fuel control dial in the MIN position, and the blade locked 6 to 8 inches above the ground. The parking brake was in the released (FREE) position.

Evidence found during the investigation indicates that Henderson either stepped or fell onto the left dozer track as the dozer started moving backwards down the slope. The dozer movement caused the victim to be pulled between the dozer track and the cab frame. Testing conducted at the accident site revealed that dozer movement would not have occurred had proper parking procedures been followed. It was also determined that contractor management did not provide consistent oversight to ensure proper and safe work procedures were being observed.

## ROOT CAUSE ANALYSIS

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

• *Root Cause:* Proper parking procedures were not followed.

*Corrective Action:* Employees were retrained in proper parking procedures.

• <u>*Root Cause*</u>: Contractor management did not provide consistent oversight to ensure proper and safe work procedures were being observed.

<u>*Corrective Action*</u>: Contractor management established procedures and controls to assure the work processes and the operation of heavy equipment in the pit area are observed on a consistent basis.

#### CONCLUSION

The accident occurred because proper parking procedures were not followed and contractor management did not provide consistent oversight to ensure proper and safe work procedures were being observed.

## **ENFORCEMENT ACTIONS**

#### Issued to The Chemours Company TT LLC (Mine Operator)

<u>Order No. 8638739</u>-- issued on April 11, 2016, pursuant to Section 103(k) of the Federal Mine Safety & Health Act of 1977:

An accident occurred at this operation on 4/11/2016 at approximately 1335. This order is being issued under Section 103 (k) of the Federal Mine Safety and Health Act of 1977. The 103(k) 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 MU (Mobile Unit) Pit where the accident happened. This 103(k) order is intended to protect the safety of all persons on-site, including those involved in rescue and recovery operation or investigation of the accident. The mine operator shall obtain prior approval from an Authorized Representative of the Secretary for all actions to recover or restore operations in the affected area. This order was initially issued orally to Chris Thomas at 1440 and now is in writing.

The order was terminated on April 11, 2016, after conditions that contributed to the accident no longer existed.

#### Issued to Brown and Root (Independent Contractor - B3167)

<u>Citation No. 8903501</u> -- issued pursuant to Section 104(a) of the Federal Mine Safety & Health Act of 1977 for a violation of 30 CFR § 56.14206(b):

A fatal accident occurred at this operation at 13:25 on April 11, 2016. The operator (victim) of a Komatsu D65PX dozer stopped the dozer near the top of the MU-39 pit slope and left the engine running. The victim either fell, or stepped onto the left-side dozer track indicating the dozer was not in use, and was not properly attended at the time of the accident. The dozer started moving backwards down the pit slope. Movement of the dozer caused the victim to be caught between the cab frame and the track as he was pulled backwards, and subsequently crushed by the weight of the dozer. The investigation revealed that the dozer blade had not been properly lowered to the ground.

<u>Citation No. 8903502</u> -- issued pursuant to Section 104(a) of the Federal Mine Safety & Health Act of 1977 for a violation of 30 CFR § 56.14207:

A fatal accident occurred at this operation at 13:25 on April 11, 2016. The operator of a Komatsu D65PX dozer (victim) had stopped the dozer near the top of the MU-39 pit slope and left the engine running. The victim either fell, or stepped onto the left-side dozer track indicating the dozer was not in use, and was not properly attended at the time of the accident. The dozer started moving backwards down the pit slope. Movement of the dozer caused the victim to be caught between the cab frame and the track as he was pulled backwards, and subsequently crushed by the weight of the dozer. The parking brake had not been properly set, and the dozer had not been turned into a bank. The investigation revealed that the dozer would not have moved if the parking brake had been properly set.

<u>Citation No. 8903503</u> -- issued pursuant to Section 104(a) of the Federal Mine Safety & Health Act of 1977 for a violation of 30 CFR § 56.9101:

A fatal accident occurred at this operation at approximately 13:25 on April 11, 2016, when the Komatsu D65PX dozer operator (victim) attempted to either exit, or enter the machine stepping onto the left track and was caught between the cab frame and the track. The MU-39 pit slope measured 8.6 to 1 (11.5 percent grade). The dozer operator failed to maintain control of the dozer while it was in motion. The dozer park brake was not engaged and the blade was not secured against the ground. The machine was free to travel down the ramp and was not under the control of the equipment operator.

Approved: 🛹

Date: 8/24/16

Samuel K. Pierce Southeast District Manager

# APPENDIX A

#### PERSONS PARTICIPATING IN THE INVESTIGATION

#### The Chemours Company TT LLC

Clement Hilton	Plant Manager
Travis Jolley	Area Manager
Chris Thomas	Safety and Health Manager
Wendy S. Smith	Global EHS Manager

#### **Brown and Root**

Kevin Byrd	Sr. HSE Manager
Ricky Lee	Safety Manager
Tim Murrhee	Supervisor
Joe Baxter	Leadman
Erik Scoggins	Equipment Operator

## **Clay County Sheriff's Office**

	M.J.	Calhoun	Lead	Detective
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## <u>EMS</u>

Clay County Fire Rescue

#### **Duval Co. Medical Examiner**

Aurelian Nicolaescu Associate Medical Examiner

## Mine Safety and Health Administration

Darren A. ConnSupervisory Mine Safety and Health InspectorThomas G. GalbreathMine Safety and Health InspectorRonald MedinaMechanical Engineer, Technical SupportNorberto OrtizMine Safety and Health Specialist (Training)

## **APPENDIX B**

# **Victim Information**

Victim Information: 1														
1. Name of Injured/III Employee	là.	2. Sex	3. Victim's	Age	4 Degree	of Injury	1							
James Henderson		M	61		01 Fai	tal								
5 Date(MM/DD/YY) and Time	(24 Hr.) O	f Death:				6. Dat	e and Tim	e Started:						
a Date: 04/11/2016	b.Time: 1	3:35					a. Date:	04/11/201	6 b.Time.	6:00				
7. Regular Job Title:				8. Work A	ctivity when	Injured				9. Was	this work ac	tivity part o	f regular jol	0?
168 Bulldozer 04				047 Ope	047 Operating bull/dozer					Yes X No				
10. Experience Years W a This	eeks	Days	b Regular	Years	Weeks	Days	c: This	Years	Weeks	Days	d Total	Years	Weeks	Days
Work Activity: 18	0	0	Job Title:	18	0	0	Mine:	18	0	0	Mining:	18	0	0
11. What Directly Inflicted Injun	y or Illness	?					12. Natur	e of Injury	or Illness					
081 Dozer track							370	Multiple in	iuries					
13. Training Deficiencies: Hazard	New/New	ly-Employ	ved Experien	ced Miner:				Annual:		Task:				
14. Company of Employment: ( Brown and Root	lf different	from proc	luction opera	ator)				a transmission of the second se	ndependent	Contractor	D: (if applic	able) B	3167	
15. On-site Emergency Medica	Treatmen	nt:												
Not Applicable:	First-Ai	d:	C	PR:	EMT	X	Med	cal Profes	sional.	None:				