

MAI-2018-04

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

REPORT OF INVESTIGATION

**Surface Facility
(Lime)**

**Fatal Ignition or Explosion of Gas or Dust Accident
May 9, 2018**

**Lhoist North America of Alabama, LLC, Alabaster Plant
Alabaster, Shelby County, Alabama
Mine I.D. 01-01264**

Investigators

**Darren Conn
Supervisory Mine Safety and Health Inspector**

**David Allen
Mine Safety and Health Specialist**

**Randall Dickerson
Mine Safety and Health Inspector**

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

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OVERVIEW

Benjamin Ballard, a 27-year old Kiln System Technician with 32 weeks of experience, received severe burn injuries while igniting natural gas to pre-heat a rotary kiln on May 9, 2018. Ballard used a standard road flare attached to the end of an angle iron rod to manually light the kiln while his supervisor adjusted the gas valve. The first attempt to light the kiln failed. During the second attempt, fire blew out of the kiln access door (blowback) injuring Ballard. Ballard was transported by helicopter to an emergency burn center. He died on May 28, 2018, as a result of his injuries.

The accident occurred because the mine operator:

- Did not ensure that the natural gas was purged after the initial lighting failure.
- Did not ensure the victim had been properly task trained in lighting kilns.
- Did not provide proper personal protective equipment and clothing for lighting kilns
- Did not have safe procedures in place for lighting the kiln.

GENERAL INFORMATION

Lhoist North America of Alabama, LLC (Lhoist) owns and operates the Alabaster Plant, a lime producing plant in Alabaster, Alabama. Duane Surman, Plant Manager; Jeremy Thompson, Regional Safety Manager-East; and George Vancourt, Site Manager, are in charge of health and safety at the mine.

The plant operates seven days per week with two, twelve-hour shifts per day and four work crews. The mine operator employs seventeen miners.

The operator uses two kilns at the plant. Limestone is transported to this plant from two nearby Lhoist quarries. The lime is shipped to customers by truck and by rail.

The Mine Safety and Health Administration (MSHA) completed its last regular inspection of the operation on April 19, 2018.

DESCRIPTION OF THE ACCIDENT

On May 9, 2018, Benjamin Ballard, victim, and Joshua Lowe, Kiln Supervisor - Crew C, reported to work at approximately 5:30 p.m. Ballard, who normally worked with Crew A, was filling in for a miner on Crew C. Lowe received the “pass down” sheet containing information related to 1st shift work progress and problems, and was informed that brick work maintenance on the #2 Kiln (K2) was completed and the 24-hour pre-heat process could start. Lowe discussed the plans for unlocking K2 and lighting the kiln with Ballard.

At approximately 6:00 p.m., Lowe and Ballard began the process of lighting K2. Lowe started unlocking equipment and went to the location where kilns are lit (burner floor) on the second level to start the pre-heat process. Ballard checked the control room system, which indicated the kiln was ready to run. He unlocked the K2 main drive, shut off the induced draft fan, and went to the burner floor.

Lowe verified the secondary gas valve for K2 was closed and then unlocked and opened the main gas valve. During this time, Ballard attached a flare to the end of a 153-inch long angle iron rod with duct tape to manually ignite the natural gas in the kiln. Lowe helped Ballard attach the flare to the angle iron rod after Lowe opened the main gas valve.

Ballard positioned himself approximately three feet in front of the open kiln access door. He inserted the angle iron rod, with the lit flare attached, into the chamber and positioned the flare at the end of the gas burner pipe. He signaled to Lowe to begin opening the secondary gas valve to feed gas to the burner pipe. Lowe, who was located approximately 26 feet from and to the side of the kiln door, began opening the valve. The gas initially lit for one to two seconds and went out as Ballard was pulling the rod out.

Lowe closed the secondary gas valve and started opening it while Ballard repositioned the rod with the lit flare. When Lowe opened the secondary gas valve approximately five to ten percent, fire blew out of the kiln access door engulfing Ballard. Based on information provided by the

operator, the total time from initially opening the secondary gas valve until the accident was estimated to be 20 to 25 seconds.

Lowe immediately closed the secondary gas valve and went to help Ballard. Lowe radioed Matt Doucet, Kiln Attendant, and Seth Britt, Bulk Loader, for help and called 911 at 6:33 p.m. Doucet and Britt arrived and, with Lowe, took Ballard to the lab room on the ground level.

Emergency Medical Services (EMS) called for a Lifesaver helicopter at 6:38 p.m. while on the way to the mine. EMS arrived at the mine at 6:41 p.m. and began assessing Ballard's condition. EMS took Ballard to a nearby helicopter landing zone at 6:57 p.m. The Lifesaver helicopter departed at 7:13 p.m. and flew Ballard to the University of Alabama-Birmingham Hospital. According to the helicopter response records, Ballard sustained 2nd and 3rd degree "flash burns to head, face, neck, chest, abdomen and upper extremities." He died as a result of his injuries on May 28, 2018.

INVESTIGATION OF THE ACCIDENT

Duane Surman called the Department of Labor's National Contact Center (DOLNCC) at 7:14 p.m. on May 9, 2018, and notified MSHA of the accident. DOLNCC contacted David Allen, Mine Safety and Health Specialist in MSHA's Southeastern District, at 7:23 p.m. Allen called Rory Smith, Supervisory Mine Safety and Health Inspector in MSHA's Birmingham, Alabama Field Office, who immediately sent Randall Dickerson, Mine Safety and Health Inspector, to conduct a non-fatal injury accident investigation. During this investigation, MSHA inspected the accident scene, reviewed training documentation and work procedures, and conducted interviews. As a result of this investigation, MSHA cited a violation of 30 CFR § 56.15006 because the mine operator did not provide miners special protective equipment and special protective clothing when exposed to hazards capable of causing injury or impairment.

Jeremy Thompson learned of Ballard's death on May 29, 2018, and notified MSHA by contacting Rory Smith. MSHA issued an order pursuant to Section 103(k) of the Federal Mine Safety & Health Act of 1977 to ensure the safety of the miners. MSHA sent Darren Conn, Supervisory Mine Safety and Health Inspector in MSHA's Lexington, Kentucky Field Office, and David Allen to re-inspect the accident scene, to conduct additional interviews, and to further review training documentation and work procedures for the fatal accident investigation.

DISCUSSION

Weather

The temperature was about 80° Fahrenheit with little wind at the time of the accident. Investigators did not consider weather to be a factor in the accident.

#2 Kiln (K2)

The kiln involved in the accident is an Allis-Chalmers unit installed in 1958. It is 8.5 feet in diameter and 250 feet long. K2 uses natural gas for fuel for the first six to twelve hours after lighting. After that, the fuel is switched over to coal.

The secondary gas valve, which is a ½-inch gate valve, is used to adjust natural gas flow to K2. The secondary gas valve is located approximately 26 feet from the kiln access door and is not in direct alignment with the door. The K2 access door is visible from the secondary gas valve location. The miner operating the gas valve and miner lighting the kiln use hand signals or verbal cues to communicate. The miner inserting the flare into the chamber stands approximately three feet from the access door opening, which measures approximately 24 inches wide by 21 inches high. Another miner slowly opens the secondary gas valve until the flare ignites the natural gas. The operator instructed miners lighting the kiln to stay to the side of the opening as much as possible. After the accident, the operator changed the gate valve to a needle valve for better gas flow control.

Personal Protective Equipment (PPE)

Prior to the accident, the PPE required to be worn and used while lighting a kiln were hard hat, steel-toed shoes, gloves, and safety glasses, goggles or face shield. The operator's new procedures require wearing and using an arc flash protective suit with hood and leg extensions, heat resistant gloves, safety glasses, and steel-toed boots.

National Fire Protection Association (NFPA) Requirements

NFPA 86, Standard for Ovens and Furnaces, 8.5.2.1 specifies that the trial-for-ignition period of any pilot or main gas burner should not exceed 15 seconds. According to NFPA 86 8.5.1.8, "prior to re-ignition of a burner after a burner shut-down or flame failure, a pre-ignition purge should be accomplished."

The investigation revealed that the time from initially opening the gas valve until the accident occurred was 20-25 seconds. A pre-ignition purge after flame failure was not completed prior to the second attempt to light the kiln.

Training

Training records indicated Ballard received required new miner training but there were no records indicating the victim was task trained in kiln lighting procedures. Task training records for lighting kilns were readily available for other employees at the plant.

The operator's kiln lighting procedures and training materials did not address the procedures or steps to take if the kiln failed to light or if the kiln did not remain lit, such as purging and maximum time for the gas valve to remain open, prior to making another attempt to light the kiln.

Blowback

The investigation found that the blowback most likely occurred due to an accumulation of natural gas within the kiln chamber that ignited as Ballard reinserted the flare after initial flame failure.

ROOT CAUSE ANALYSIS

Investigators conducted a root cause analysis and identified the following root causes.

- *Root Cause:* The operator's procedures for kiln lighting did not address purging after flame failure and did not specify a maximum time the secondary gas valve could remain open while attempting to light the kiln. This resulted in natural gas accumulating in the kiln chamber.

Corrective Action: The mine operator implemented new procedures that require purging after flame failure. The new procedures also specify the maximum time the secondary gas valve can remain open when attempting to light the kiln. The length of time the gas valve is open is not to exceed 15 seconds. All affected miners have been trained in these new procedures.

- *Root Cause:* The mine operator did not ensure the victim was properly trained in the task of lighting kilns.

Corrective Action: All affected miners have been task trained in new kiln lighting procedures.

- *Root Cause:* Proper PPE and clothing were not required to be used while lighting the kiln.

Corrective Action: Proper PPE and clothing have been provided and are required to be worn when lighting the kiln. This PPE includes an arc flash protective suit with hood and leg extensions, heat resistant gloves, safety glasses, and steel-toed boots.

- *Root Cause:* The mine operator's procedures required miners to be positioned in front of an open kiln access door while lighting the kiln.

Corrective Action: The mine operator developed procedures that require the miner to insert a rod with lit flare through a tube that extends into the chamber. The rod is clamped in place and the miner moves to a safe location before gas is applied. The kiln access door remains closed. (See APPENDIX C – Kiln #2 Modification)

CONCLUSION

Benjamin Ballard received severe burn injuries while igniting natural gas to pre-heat a rotary kiln and died of his injuries several weeks later. The accident occurred because the mine operator:

- Did not ensure that the natural gas was purged after the initial lighting failure.
- Did not ensure the victim had been properly task trained in lighting kilns.
- Did not provide proper personal protective equipment and clothing for lighting kilns
- Did not have safe procedures in place for lighting the kiln.

ENFORCEMENT ACTIONS

Citation No. 9336623 – issued May 15, 2018, pursuant to Section 104(d)(1) of the Federal Mine Safety & Health Act of 1977 for a violation of 30 CFR § 56.15006 Protective Equipment and Clothing for Hazards and Irritants (issued during initial non-fatal injury accident investigation):

Special protective equipment and special protective clothing was not used where process hazards exist capable of causing injury or impairment. Kiln Technicians were not wearing flameproof suits when manually lighting the kiln burner. No other protective measures were in place to safeguard their health. This practice exposes miners to burn injuries from blowback or flashback during the lighting process. Miners are required to manually light the kiln by extending a lighted flare into the 24" by 21" opening of the burner hood while the kiln supervisor manipulates the gas valve. This procedure is necessary on a regular and frequent basis. This condition contributed to an accident resulting in serious (1st and 2nd degree) burn injuries to over 30% of the miner's body.

Management engaged in aggravated conduct constituting more than ordinary negligence by failing to have policies and procedures requiring the use of available flame retardant suits when manually lighting the kiln. This violation is an unwarrantable failure to comply with a mandatory health and safety standard.

Order No. 9331007 – issued May 29, 2018, pursuant to Section 103(k) of the Federal Mine Safety & Health Act of 1977:

A miner was seriously injured in an "ignition or explosion of gas or dust" accident that occurred at approximately 6:15 p.m. on May 9, 2018. Gas ignited and a blowback occurred as the miner was relighting a kiln. The accident was initially investigated as a "non-fatal injury" accident. The miner passed away on May 28, 2018, as a result of injuries sustained in the accident. This order is issued to ensure the safety and health of miners while additional investigation activities are conducted. At the time of this issuance there is no area affected because a contributory violation/condition observed during the initial investigation was addressed by the operator.

Citation No. 9331008 – issued pursuant to Section 104(d)(1) of the Federal Mine Safety & Health Act of 1977 for a violation of 30 CFR § 46.7(a) New Task Training:

An accident occurred on May 9, 2018, causing a miner to receive serious burns while relighting the #2 Kiln. The miner died on May 28, 2018, as a result of injuries sustained in the accident. The victim did not receive required new task training related to lighting and relighting a kiln before performing this task.

Management has engaged in conduct constituting more than ordinary negligence by not ensuring the miner received required training. This violation is an unwarrantable failure to comply with a mandatory standard.

Approved: _____
Samuel K. Pierce
Southeastern District Manager

Date: _____

APPENDIX A – Persons Participating in the Investigation
(Persons interviewed are indicated by a * next to their name)

Lhoist North America of Alabama, LLC

Duane Surman*	Plant Manager
Jeremy Thompson*	Regional Safety Manager-East
George Vancourt*	Site Manager
Charles Morgan	Attorney
Joshua Lowe*	Kiln Supervisor – Crew C
Seth Britt*	Bulk Loader/Miners’ Representative – Crew C
Ryan Northcutt*	Kiln System Technician – Crew C
Matt Doucet*	Kiln Attendant – Crew C
Ryan Toth*	Kiln System Technician – O’Neal Plant
David Yearber*	Kiln Supervisor – Crew D
Cooper Leibach*	Kiln System Technician – Crew D
Crimson Kromer*	Bulk Loader/Miners’ Representative – Crew D
Ryan Aufdenberg*	Kiln Supervisor – Crew A
Mickey Brown*	Kiln System Technician – Crew A

Mine Safety and Health Administration

Darren Conn	Supervisory Mine Safety and Health Inspector
David Allen	Mine Safety and Health Specialist
Randall Dickerson	Mine Safety and Health Inspector

APPENDIX B – Victim Information

Accident Investigation Data - Victim Information

U.S. Department of Labor
Mine Safety and Health Administration



Event Number:

6	7	9	4	4	4	1
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Victim Information: 1

1. Name of Injured/Ill Employee: <i>Benjamin Ballard</i>		2. Sex <i>M</i>	3. Victim's Age <i>27</i>	4. Degree of Injury: <i>01 Fatal</i>																											
5. Date(MMDD/YY) and Time(24 Hr.) Of Death: <i>a. Date: 05/28/2018 b. Time: 15:32</i>				6. Date and Time Started: <i>a. Date: 05/09/2018 b. Time: 18:00</i>																											
7. Regular Job Title: <i>179 Kiln System Technician</i>		8. Work Activity when Injured: <i>098 Lighting kiln</i>		9. Was this work activity part of regular job? <table style="width: 100%;"><tr><td style="text-align: center;">Yes</td><td style="text-align: center;"><input checked="" type="checkbox"/></td><td style="text-align: center;">No</td><td style="text-align: center;"><input type="checkbox"/></td></tr></table>		Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>																						
Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>																												
10. Experience a. This Work Activity: <table style="display: inline-table;"><tr><td style="text-align: center;">Years</td><td style="text-align: center;">Weeks</td><td style="text-align: center;">Days</td></tr><tr><td style="text-align: center;"><i>0</i></td><td style="text-align: center;"><i>32</i></td><td style="text-align: center;"><i>0</i></td></tr></table>		Years	Weeks	Days	<i>0</i>	<i>32</i>	<i>0</i>	b. Regular Job Title: <table style="display: inline-table;"><tr><td style="text-align: center;">Years</td><td style="text-align: center;">Weeks</td><td style="text-align: center;">Days</td></tr><tr><td style="text-align: center;"><i>0</i></td><td style="text-align: center;"><i>32</i></td><td style="text-align: center;"><i>0</i></td></tr></table>		Years	Weeks	Days	<i>0</i>	<i>32</i>	<i>0</i>	c. This Mine: <table style="display: inline-table;"><tr><td style="text-align: center;">Years</td><td style="text-align: center;">Weeks</td><td style="text-align: center;">Days</td></tr><tr><td style="text-align: center;"><i>0</i></td><td style="text-align: center;"><i>32</i></td><td style="text-align: center;"><i>0</i></td></tr></table>		Years	Weeks	Days	<i>0</i>	<i>32</i>	<i>0</i>	d. Total Mining: <table style="display: inline-table;"><tr><td style="text-align: center;">Years</td><td style="text-align: center;">Weeks</td><td style="text-align: center;">Days</td></tr><tr><td style="text-align: center;"><i>0</i></td><td style="text-align: center;"><i>32</i></td><td style="text-align: center;"><i>0</i></td></tr></table>		Years	Weeks	Days	<i>0</i>	<i>32</i>	<i>0</i>
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Years	Weeks	Days																													
<i>0</i>	<i>32</i>	<i>0</i>																													
11. What Directly Inflicted Injury or Illness? <i>059 Gas ignition blowback</i>				12. Nature of Injury or Illness: <i>120 Burns</i>																											
13. Training Deficiencies: Hazard: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"></td><td style="width: 20px;"></td></tr></table> <i>New/Newly-Employed Experienced Miner.</i> Annual: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"></td></tr></table> Task: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"><input checked="" type="checkbox"/></td></tr></table>												<input checked="" type="checkbox"/>																			
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14. Company of Employment: (If different from production operator) <i>Operator</i>			Independent Contractor ID: (if applicable)																												
15. On-site Emergency Medical Treatment: Not Applicable: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"></td><td style="width: 20px;"></td></tr></table> First-Aid: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"></td><td style="width: 20px;"></td></tr></table> CPR: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"></td><td style="width: 20px;"></td></tr></table> EMT: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"><input checked="" type="checkbox"/></td></tr></table> Medical Professional: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"></td><td style="width: 20px;"></td></tr></table> None: <table style="display: inline-table;"><tr><td style="width: 20px;"></td><td style="width: 20px;"></td><td style="width: 20px;"></td></tr></table>																<input checked="" type="checkbox"/>															
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16. Part 50 Document Control Number: (form 7000-1)			17. Union Affiliation of Victim: <i>2647 AFL-CIO</i>																												

APPENDIX C – #2 Kiln Modification

