

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

REPORT OF INVESTIGATION

**Surface Nonmetal Mine
(Limestone)**

**Fatal Machinery Accident
May 24, 2010**

**US Lime Company - St. Clair
US Lime Company - St. Clair
Marble City, Sequoyah County, Oklahoma
Mine ID No. 34-00282**

Investigators

**Michael R. Van Dorn
Supervisory Mine Safety and Health Inspector**

**Maxwell A. Clark
Electrical Engineer**

**Michael A. Hockenberry
Fire Protection Engineer**

**Ronald M. Mesa
Mine Safety and Health Specialist**

**Dennis E. Robinson
Mine Safety and Health Inspector**

**Originating Office
Mine Safety and Health Administration
South Central District
1100 Commerce Street Room 462
Dallas, TX 75242-0499
Edward E. Lopez, District Manager**



OVERVIEW

On May 24, 2010, Wilbur A. Farris, maintenance manager, age 61, was fatally injured while in a roller mill when it started. Electrical power to the roller mill had not been locked out.

The accident occurred because management failed to ensure that safe work procedures were followed while performing maintenance and mechanical work in the roller mill. Farris asked another person to lock out the roller mill for him then entered it without ensuring that the electrical circuits had been de-energized and locked out. The roller mill started while Farris was inside it.

GENERAL INFORMATION

U. S. Lime Company - St. Clair (U. S. Lime) was an underground limestone mine and surface plant, owned and operated by U. S. Lime Company - St. Clair. The mine was located near Marble City, Sequoyah County, Oklahoma. The principal operating official was Aaron K. Farris, vice president and plant manager. The underground mine operated one 8-hour shift per day, seven days per week. The surface plant operated two 12-hour shifts per day, seven days per week. Total employment was 57 persons.

Limestone was drilled and blasted in the underground mine. A front-end loader placed broken rock into trucks which hauled it to the surface plant. At the plant, broken rock was crushed and screened. Larger sizes were conveyed to kilns and smaller sizes were conveyed to a roller mill. Finished products were shipped to a variety of customers by rail and truck.

The last regular inspection at this operation was completed on February 25, 2010.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Wilbur A. Farris (victim) arrived at the mine at 6:45 a.m., his usual arrival time. At 7:10 a.m., he conducted a safety meeting with the maintenance and quarry crews and discussed a variety of topics. At 7:30 a.m., Farris distributed several work orders then went into the maintenance office.

Sometime during the morning, Richard Calhoun, operations manager, told Joseph Ziemba, maintenance man, that the roller mill was making an unusual noise.

At 11:30 a.m., Ziemba went to the second level of the Fines Building and asked Richard Livers, mill operator, to shut down the roller mill so he could check the rollers to determine if they needed oil. Livers shut down the roller then followed Ziemba to the first floor and observed him place a lock on the breaker box that controlled the rollers in the lower part of the mill. Neither of them attempted to lock out the second floor power switch for the whizzer blades located in the upper part of the mill.

The power to the mill rollers was not actually turned off when Ziemba moved the breaker box handle to the "OFF" position because the linkage inside the breaker box door was missing. When Ziemba pulled the handle to the "OFF" position, the circuit breaker was actually still in the "ON" position. The breaker box defect was not visible with the breaker box door closed.

At 1:45 p.m., Farris and Johnny Drain, maintenance man, arrived at the roller mill to help troubleshoot it. Ziemba had opened an observation door and an access door. He identified that some bolts inside the mill needed to be tightened. Farris had Livers remove Ziemba's lock from the breaker box and start the roller mill to hear the noise.

About 3:00 p.m., Calhoun arrived at the roller mill while Drain, Farris, and Ziembra were filling the lower oil reservoirs through the open observation door. He wanted to hear the noise so Livers started the roller mill again.

After Livers stopped the roller mill, Farris told him to lock it out and started through the open access door. At that time, Drain was standing on the walkway overlooking the roller mill observation door, Calhoun was standing nearby, and Ziembra was heading toward his truck parked outside the Fines Building to get wrenches to tighten the loose bolts inside the roller mill.

Livers walked down to the first floor, where the breaker box was located, and moved the outside handle to the "OFF" position. However, when he attempted to place Ziembra's lock, Livers was unable to get the handle aligned properly to accept the lock so he did not place it on the handle.

Livers went back to the second floor, saw that Farris was inside the mill, and yelled down to Ziembra that he needed help locking out the breaker box. Before Ziembra came back into the Fines Building, Livers went downstairs and made another attempt to lock the breaker box. He was again unsuccessful and started back to the second floor.

Livers met Ziembra at the top of the stairs inside the Fines Building, spoke to him briefly, and walked toward the roller mill controls. About 3:50 p.m., the roller mill started. At that time, Ziembra had descended the stairs, Drain was still standing near the roller mill, and Calhoun was standing nearby.

Drain ran toward the mill controls and saw that Livers had already turned it off. After running back to the front of the mill, Drain called the scale house and Katrenia Thirsty, scale operator, called for Emergency Medical Services (EMS), who arrived at the mine at 4:17 p.m. At 4:25 p.m., EMS looked into the roller mill and noted that Farris was deceased. The cause of death was attributed to blunt force trauma.

INVESTIGATION OF THE ACCIDENT

On the day of the accident, the Mine Safety and Health Administration (MSHA) was notified at 4:01 p.m. by a telephone call from Dennis Johnson, safety director, to MSHA's emergency hotline. Fred Gatewood, assistant district manager, was notified and an investigation was started the same day. In order to ensure the safety of all persons, an order was issued pursuant to section 103(j) of the Mine Act. This order was later modified to section 103(k) of the Mine Act when the first Authorized Representative arrived at the mine. A 104(a) citation was issued because management would not provide information regarding the accident.

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, employees, Baldor Electric Company, and Kelly Power Services. A 104(a) citation was issued to U. S. Lime because management hindered the investigation.

DISCUSSION

Location of the Accident

The accident occurred indoors on the second level of the Fines Building at the surface plant. The weather consisted of clear skies and 80-degree temperatures and was not considered a factor in the accident.

Fines Building

The Fines Building was a 2-story 30-foot by 39-foot steel structure that housed the roller mill. The second floor was accessible by one set of stairs inside the building and one set of stairs outside the building. Finished product from the roller mill was stored in two loading bins located just outside the Fines Building.

Roller Mill

The roller mill involved in the accident was a suspended six-roller air swept mill that was designed to dry, pulverize, and classify material. It was manufactured in 1930 and was about 66 inches in diameter and 9 feet 6 inches high. The roller mill rested on a concrete stand about four feet above the floor of the first level of the Fines Building and extended through the floor of the second level. The roller mill capacity was dependent upon the hardness of the material processed. At the time of the accident, the roller mill was grinding minus 3/8-inch rock to a product that was 85 percent 200 mesh or finer.

Material entered the side of the mill through two rotary feeders. Inside the mill, a vertical shaft rotated an assembly of spider arms. Free swinging journals and rollers were attached to the arms. The vertical shaft and roller assembly were indirectly driven at 89 rpm by a 300-HP motor located at the base of the mill. As the shaft rotated, centrifugal force swung the rollers against the inner surface of a grinding ring placed around the inside circumference of the mill. The force of the rollers against the grinding ring pulverized the material as it dropped into the mill from the feeders.

After material was pulverized to the desired size, heated air carried it up through a double whizzer separator located about 4 feet 8 inches above the mill rollers. Heated air was provided by a system fan located on the ground level of the Fines Building. The double whizzer separator had two sets of 72-inch diameter blades that rotated independently of the mill rollers. It was driven by a 20-HP motor located on the second level of the Fines Building. The separator had variable speeds up to 250 rpm. The separator picked up larger particles at lower speeds and smaller particles at higher speeds.

Pulverized material exited the roller mill through a 30-inch diameter circular duct to a classifying cyclone before being conveyed to storage bins located just outside the Fines Building.

The roller mill had six (13 inches by 15 inches) observation doors spaced evenly around the circumference about two feet above the bottom of the mill housing. These doors provided access for oiling the bottoms of the six mill rollers. The roller mill had one hinged (27 inches by 41 inches) access door located on the west side. This door provided access to the inside of the mill between the rollers and the two sets of whizzer blades.

Electrical Components

Two separate circuits provided electrical power to the moving parts inside the roller mill. The double whizzer separator was driven by a 20-HP motor located on the second level of the Fines Building. The vertical shaft and roller assembly were indirectly driven at 89 rpm by a 300-HP motor located at the base of the mill.

Since the double whizzer separator did not start before or during the accident, investigators concentrated only on the electrical circuitry and components for the shaft and roller assembly which did start at the time of the accident.

The 300-HP motor for the shaft and roller assembly received 460-volts of electrical power through a soft start system that included power cells, a bypass contactor, and soft start control. The soft start system, along with the associated circuit breaker, was located inside a NEMA 12 enclosure (breaker box) located on the ground level of the Fines Building. The soft start system controlled the amperage to the 300-HP motor during startup and was remotely activated by a 3-position start/stop switch located on the second level of the Fines Building.

The breaker box containing the circuit breaker and soft start system for the roller mill shaft and roller assembly had a 27-inch wide by 42.5-inch high door that opened from the right side. The breaker box had an ON/OFF handle on the outside of the door that was installed with mechanical linkage that opened and closed the circuit breaker inside the box when the handle was moved down or up, respectively. However, at the time of the accident, the linkage from the handle to the breaker was missing. Therefore, movement of the breaker box handle did not affect the position of the circuit breaker. The breaker box defect was not visible with the breaker box door closed.

The breaker box handle was designed that, when it was in the “OFF” position, a person could install a padlock on it to ensure that the handle could not be moved to the “ON” position. This was the location where persons would go to lock out the power to the shaft and roller assembly inside the roller mill. However, when the plant employees placed a padlock on the breaker box handle prior to the accident, the power to the roller mill was still energized.

The start/stop switch for the shaft and roller assembly inside the roller mill was a 3-position type that had to be pulled out to energize the moving parts. After being pulled out and released, the switch would self-center and remain until it either lost electrical power or was depressed. Either of these events would result in stoppage of the shaft and roller assembly inside the roller mill.

Electrical Testing

The electrical circuit for the shaft and roller assembly was tested and investigators verified that it was isolated from all other circuits. The integrity of the wiring insulation from the start/stop switch to the soft start system was tested to determine if an electrical short occurred that could inadvertently start the roller mill. The wiring was removed at the controller inputs and the insulation was tested from line to ground for each phase and line to line for each combination. No defects were found.

The bypass contactor in the soft start system was tested for an electrical short. No defects were found. An external button that could have been used to close the contactor was extremely hard to close and had evidently not been used. The start/stop switch was inspected and found to be difficult to pull to the “ON” position because limestone dust had accumulated on it. However, the switch functioned correctly otherwise and moved easily to the “OFF” position when it was depressed.

The soft start system was disconnected from the start/stop switch and tested with only 120 volts by manufacturer’s representatives in the presence of investigators to determine if it was functioning correctly. No defects were found. The start/stop switch was reconnected and the soft start system was tested with only 120 volts to determine if it was functioning properly. No defects were found.

The electrical circuit was provided with 460 volts and the soft start system and start/stop switch were tested again for proper functioning. No defects were found.

Training and Experience

Wilbur A. Farris had 37 total years of mining experience, including 6 years as maintenance manager, all at this mine. He had received all training as required by 30 CFR Part 48.

Richard D. Calhoun, Jr. had 8 years of mining experience, all at this operation. He had received all training as required by 30 CFR Part 48.

Johnny R. Drain had 5 years of mining experience, all at this mine. He had received all training as required by 30 CFR Part 48.

Richard Livers had 9 years of mining experience, all at this mine. He had received all training as required by 30 CFR Part 48.

Joseph D. Ziemba had 1 year of mining experience, all at this mine. He had received all training as required by 30 CFR Part 48.

Root Cause Analysis

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

Root Cause: Safe operating procedures were not followed during maintenance and mechanical work on the roller mill. Farris entered the roller mill without ensuring that it had been de-energized and locked out.

Corrective Action: Automatic startup alarms were installed on the roller mill. All persons working in the plant were retrained regarding lock-out procedures.

Root Cause: The defective breaker box was not removed from service before it became a hazard to persons. The breaker box handle was moved to the “OFF” position but did not disconnect the power to the mill rollers.

Corrective Action: The defective breaker box was repaired. All electrical boxes at the plant were examined to ensure they were in functional condition.

CONCLUSION

The accident occurred because management failed to ensure that safe work procedures were followed while performing maintenance and mechanical work in the roller mill. Farris asked another person to lock out the roller mill for him then entered it without ensuring that the electrical circuits had been de-energized and locked out. The roller mill started while Farris was inside it.

ENFORCEMENT ACTIONS

Order No. 6573670 was issued on May 24, 2010, under the provisions of section 103(j) of the Mine Act. This order was modified to section 103(k) of the Mine Act when the first Authorized Representative arrived at the mine site:

A fatal accident occurred at this operation on May 24, 2010. This order is issued to assure the safety of all persons at this operation. It prohibits all activity at the roller mill area until MSHA has determined that it is safe to resume normal operations. 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 June 11, 2010, when the conditions that contributed to the accident no longer existed.

Order No. 6242475 was issued on June 10, 2010, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 57.12016:

A fatal accident occurred at this operation on May 24, 2010. Electrical power to the vertical roller mill was not locked out and tagged prior to maintenance and mechanical work being performed inside the mill. Management engaged in aggravated conduct

constituting more than ordinary negligence in that one supervisor entered the roller mill knowing that it was not locked out while another supervisor observed the activities. This is an unwarrantable failure to comply with a mandatory safety standard.

This order was terminated on June 11, 2010 after all persons working at the plant were retrained regarding lock out procedures.

Order No. 6242476 was issued on June 10, 2010, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 57.14100(c):

A fatal accident occurred at this operation on May 24, 2010. The linkage from the breaker box handle to the electrical circuit breaker for the lower portion of the vertical roller mill was missing. Moving the handle to the "OFF" position did not de-energize the lower portion of the roller mill as it was designed to do. Management engaged in aggravated conduct constituting more than ordinary negligence in that two supervisors were present when the mill operator said that he could not get the breaker box locked out. They did not take the breaker box out of service. This was an unwarrantable failure to comply with a mandatory safety standard.

This order was terminated on June 11, 2010, after the breaker box was repaired.

Approved: _____

Edward E. Lopez
District Manager

Date: _____

LIST OF APPENDICES

- APPENDIX A Persons Participating in the Investigation
- APPENDIX B Floor Plan – Fines Building Second Level
- APPENDIX C Accident Investigation Data – Victim Information Form

APPENDIX A

PERSONS PARTICIPATING IN THE INVESTIGATION

U. S. Lime Company - St. Clair

Dennis D. Johnson	Safety Director
Russell W. Riggs	Vice-President Production

Baldor Electric Company

Stan Komander	Applications Engineer
Bryan Swafford	National Sales Manager

Kelly Power Services

Fred Kelly	President
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Law Office of Adele Abrams PC

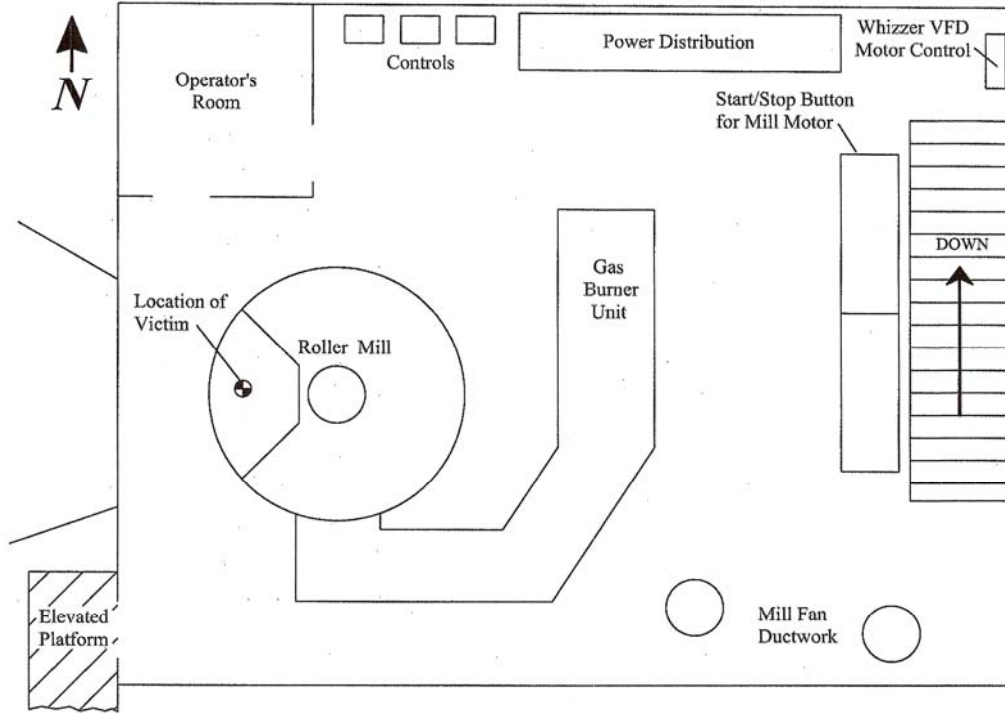
Adele L. Abrams	Attorney
Joshua E. Schultz	Attorney

Mine Safety and Health Administration

Maxwell A. Clark	Electrical Engineer
Michael A. Hockenberry	Fire Protection Engineer
Ronald M. Mesa	Mine Safety and Health Specialist
Dennis E. Robinson	Mine Safety and Health Inspector
Michael R. Van Dorn	Supervisory Mine Safety and Health Inspector

APPENDIX B

FLOOR PLAN – FINES BUILDING SECOND LEVEL



APPENDIX C

Accident Investigation Data - Victim Information										U.S. Department of Labor					
Event Number: 6 5 4 3 2 6 3										Mine Safety and Health Administration					
Victim Information: 1															
1. Name of Injured/Ill Employee: <i>Wilbur A. Farris</i>			2. Sex: <i>M</i>	3. Victim's Age: <i>61</i>		4. Degree of Injury: <i>01 Fatal</i>									
5. Date(MM/DD/YY) and Time(24 Hr.) Of Death: <i>a. Date: 05/24/2010 b. Time: 15:50</i>						6. Date and Time Started: <i>a. Date: 05/24/2010 b. Time: 15:50</i>									
7. Regular Job Title: <i>049 Maintenance Foreman</i>				8. Work Activity when Injured: <i>039 Trying to stop rumbling on mill</i>				9. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>							
10. Experience	Years	Weeks	Days	b. Regular	Years	Weeks	Days	c. This	Years	Weeks	Days	d. Total	Years	Weeks	Days
Work Activity:	<i>6</i>	<i>25</i>	<i>1</i>	Job Title:	<i>6</i>	<i>25</i>	<i>1</i>	Mine:	<i>37</i>	<i>41</i>	<i>1</i>	Mining:	<i>37</i>	<i>41</i>	<i>1</i>
11. What Directly Inflicted Injury or Illness? <i>075 victim was inside mill when it started</i>								12. Nature of Injury or Illness: <i>170 Victim was crushed inside mill</i>							
13. Training Deficiencies: Hazard: <input type="checkbox"/> New/Newly-Employed Experienced Miner: <input type="checkbox"/> Annual: <input type="checkbox"/> Task: <input type="checkbox"/>															
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: <input type="checkbox"/> First-Aid: <input type="checkbox"/> CPR: <input type="checkbox"/> EMT: <input checked="" type="checkbox"/> Medical Professional: <input checked="" type="checkbox"/> None: <input type="checkbox"/>															
16. Part 50 Document Control Number: (form 7000-1)										17. Union Affiliation of Victim: <i>9999</i>		<i>None (No Union Affiliation)</i>			