FACE Fatality Assessment and Control Evaluation Program

NIOSH • 1095 Willowdale Road, Morgantown, West Virginia 26505 • 304-285-5916

REPORT#: 2015-01 **REPORT DATE: April 18, 2018**

Oil and Gas Delivery Driver Crushed Between a Dozer and a Semi-truck While Connecting Towline—West Virginia

INCIDENT HIGHLIGHTS

DATE:
July 3, 2013

TIME:
9:52 a.m.

VICTIM:
24-year old oil and gas delivery truck driver

INDUSTRY/NAICS CODE:
Oil and Gas/21

EMPLOYER:
Well servicing company; 70,000 employees in the U.S.

SAFETY & TRAINING:
Training on caught-between, not specific to dozer or other large equipment

SCENE:
Access road to a well site

LOCATION:
West Virginia

EVENT TYPE:
Struck by

SUMMARY

On July 3, 2013, a 24-year-old oil and gas delivery truck driver was fatally injured when he was crushed between a dozer and the front of his semi-truck. The driver was delivering concrete to the job site and, due to the hilly terrain, needed a tow to the well site. The towing dozer operator backed to the front of the driver's semi-truck. The driver exited his cab to connect to the dozer's towline... READ THE FULL REPORT> (p.3)

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- Lack of safety training or standard operating procedure for towing vehicles
- Lack of appropriate safeguards for equipment
- Lack of spotter or designated hookup personnel
- Steep terrain LEARN MORE> (p.9)

RECOMMENDATIONS

NIOSH investigators concluded that, to help prevent similar occurrences, employers should:

- Ensure employees follow safe operating procedures as written in the equipment's operations manual.
- Implement standard operating procedures for equipment operations such as parking and towing.
- Use a job hazard analysis (JHA) to identify and eliminate towing hazards. LEARN MORE> (p.9)

Fatality Assessment and Control Evaluation (FACE) Program

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Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

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SUMMARY

On July 3, 2013, a 24-year-old oil and gas delivery truck driver was fatally injured when he was crushed between a dozer and the front of his semi-truck. The driver was delivering concrete to the job site and, due to the hilly terrain, needed a tow to the well site. The towing dozer operator backed to the front of the driver's semi-truck. The driver exited his cab to connect to the dozer's towline. The driver was attempting to connect the towline to the front of his truck, but he needed a D-ring to complete the connection. The dozer operator got up from his seat and was exiting the dozer to hand the driver a D-ring. When exiting the dozer, it is believed his foot hit the parking brake lever and the dozer rolled backward, crushing the driver between the two vehicles. Emergency medical services (EMS) was called, and CPR was administered by another dozer operator until EMS arrived on-scene. The EMS responders pronounced the delivery truck driver dead shortly after their arrival. The medical examiner determined the cause of death was thoracic injuries.

INTRODUCTION

On July 3, 2013, a 24-year-old oil and gas delivery truck driver was fatally injured when he was crushed between a dozer and the front of his semi-truck. On January 15, 2015, a safety and occupational health specialist from the NIOSH Division of Safety Research, and a guest researcher from the West Virginia University Occupational Medicine Residency Program met with the area director of the Charleston Area Office of the Occupational Safety and Health Administration (OSHA) and reviewed the circumstances of the incident. Photos from the incident site, witness statements, and the medical examiner's report were provided to NIOSH.

EMPLOYER

The driver was employed by a well servicing company with approximately 70,000 employees in the United States. Well servicing companies are contracted to provide a wide variety of support activities at oil and gas well sites. In this case, the company was hired to deliver material, such as concrete, to the well site; they had 12 employees at the well site on the day of the incident. OSHA had not conducted an inspection with the company in the 5 years prior to this incident.

A second well servicing company employed the dozer operators at the well site. The company was contracted to maintain the service roads and tow semi-trucks up to the well site using dozers due to the steep terrain at the jobsite. The company had seven employees and provided services in West Virginia, Ohio, and Pennsylvania.

WRITTEN SAFETY PROGRAMS and TRAINING

The truck driver's employer provided training on caught-between, pinch-point, and struck-by hazards specific to workers on foot, hooking up a trailer, and being caught between the truck and another vehicle. This training occurred at least yearly, but the training was not specific to dozers or other large equipment. Employees received on-the-job training for hooking up to dozers for towing operations. The company used mentors to perform on-the-job training. The experience level of the driver's mentor was unknown. Employees did not receive training on the operations manual specific to their vehicle. The driver's vehicle operations manual included an illustration showing a minimum distance of 6 feet between the semi-truck and the towing vehicle as an acceptable distance for vehicle rigging [Kenworth, no date]. Recommended towing procedures were not addressed on the Driver Qualification Road Test/Certification or on the company's driver-mentoring checklist.

The company conducted and documented a job safety analysis (JSA) for jobs performed by concrete delivery/service personnel. The task of driving on leased roads was briefly mentioned but did not go into detail about being towed by

other vehicles. A JSA for hooking up bulk or cement trucks addressed spotting the truck with the specific hazard being caught between a bulk truck and another object. The JSA also recommended using two spotters when available to minimize the possibility of trucks running into each other, equipment, or property and that spotters stand beside the equipment, not behind or in front of it, to avoid being caught between the bulk truck and other equipment and/or property.

The dozer operator's employer operated out of the owner's residence. The employer had a written safety and health program. Training records were provided and indicated that 3 months prior to the incident, a toolbox talk had been administered that addressed personnel at the worksite and instructed employees to pay attention to their surroundings to be aware of any potential hazards. According to interviews conducted by OSHA, the owner said they performed daily JSAs covering what they were going to do for the day, potential hazards, and hazard prevention. He also stated that it was not recommended practice to keep the blade up when putting the dozer in park and he had previously disciplined employees for leaving the blade up while in park. The owner also mentioned that it was common practice for the dozer operators to back close to the front of the vehicle being towed due to the length and weight of the tow hook and tail chain (Photo 1). The exact weight is unknown; however, according to worker interviews, the hook and tail chain weighed 30–40 lbs. The dozer operators do not hook up the equipment due to liability reasons. The employer recommended that dozer operators remain in the dozer, but they were not prohibited by the employer from exiting during hookup.

Photo 1. Tow hook and tail chain, showing length of towline at time of incident.
(*Photo courtesy of WV OSHA*.)

WORKER INFORMATION

The delivery truck driver was a 24-year-old male who had worked as a driver for the current employer for over 1 year before the incident occurred. He had no other previous commercial driving experience and had a commercial driver's license.

According to an interview with OSHA, the dozer operator had 5 years prior operating experience before working for the current employer. He started with the employer in March of 2013, approximately 4 months prior to the incident, and had to demonstrate dozer operation before being hired.

INCIDENT SCENE

The incident occurred on an access road to a well site while the delivery truck driver was hooking up his semi-truck to a dozer. The section of access road was graded dirt and gravel surface with an approximately 10 percent grade (Photo 2). The dozer operator backed his dozer to within 3 feet of the driver's truck for hookup.

Photo 2. Incident scene, showing terrain and hill accessing the well site.
(*Photo courtesy of WV OSHA.*)

EQUIPMENT

The delivery driver was driving a Kenworth model 660 semi-truck and bulk cement trailer. He was struck by a Komatsu dozer that rolled backward and made contact with the Kenworth truck. The truck was equipped with a pin-type tow hitch on the front bumper that required the use of a D-ring to connect the hitch pin with the dozer's winch line hook (Photos 3 and 4). The truck did not have a D-ring (Photo 4) connected to the hitch prior to the truck pulling onto the access road. However, D-rings were kept on the dozers for trucks that came on-site without them.

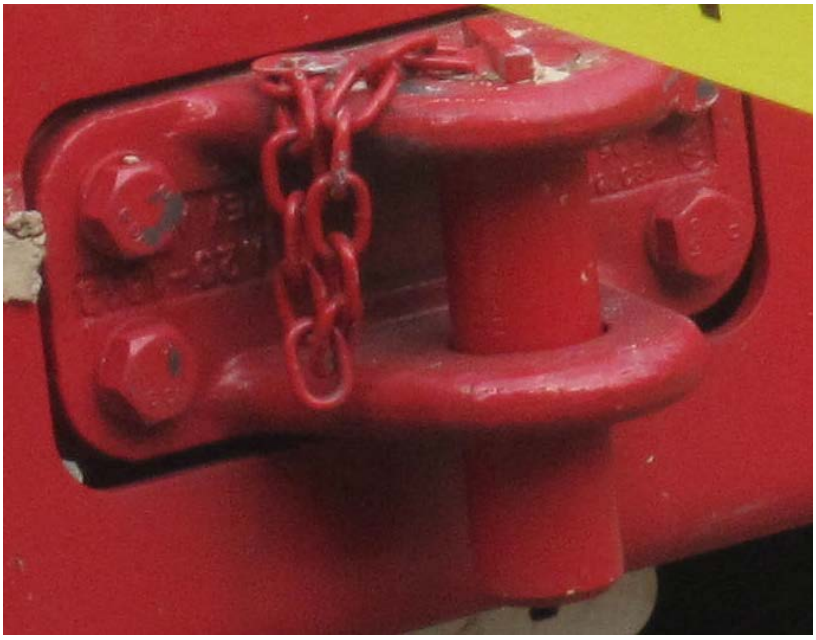

Photo 3. Pin-type tow hitch on front of the truck involved in this incident.
(*Photo courtesy of WV OSHA.*)

Photo 4. D-ring needed for connection between hook and hitch pin.
(Photo courtesy of WV OHSA.)

The Komatsu dozer model D65PX-15 weighed approximately 47,000 lbs (Photo 5). The dozer was equipped with a winch for towing. Specifications on the winch are unknown. Two levers lock different parts of the machine. The safety lock lever is a device that locks the work equipment, such as the blade, from being used. The parking lever stops the tram control from being used and the machine from moving. In this incident, it is believed that the operator inadvertently kicked the parking brake lever while exiting the machine, releasing it and causing the dozer to roll backward (Photo 6).

Photo 5. Dozer involved in the incident.
Note: The tow hook and tail chain have been removed.

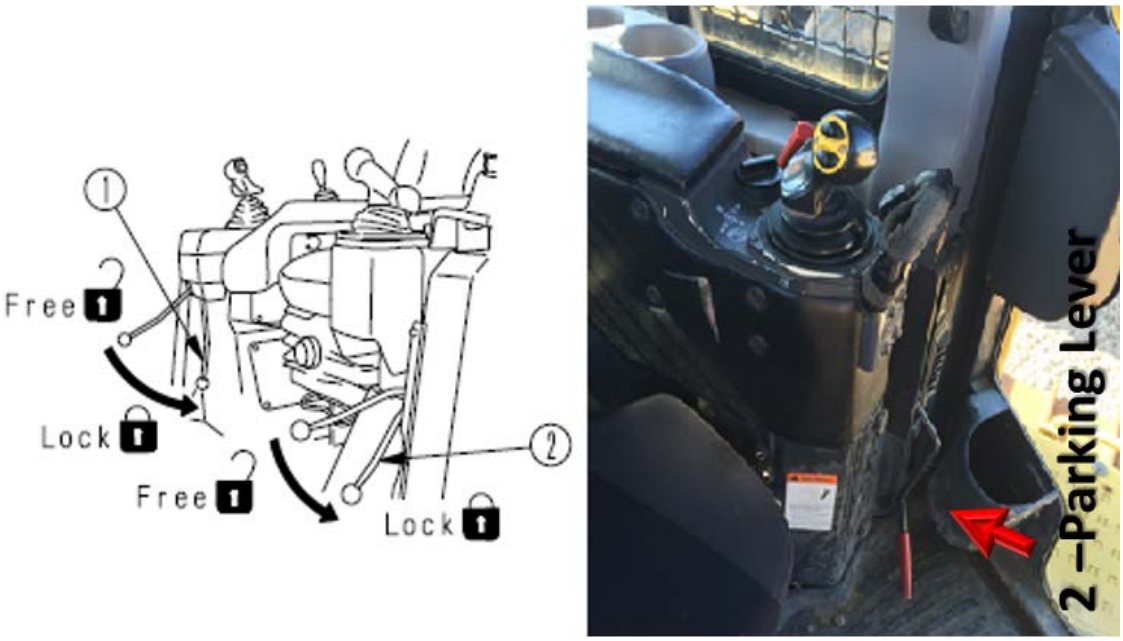

Photo 6. Safety lock lever (1) and parking lever (2).
(*Illustration adapted from Komatsu [2004]*.)

WEATHER

The incident occurred at 9:52 in the morning. The temperature was 74 degrees Fahrenheit; the visibility was 10 miles, with a wind speed of 2 mph SSW [Weather Underground 2013]. Weather is not believed to have been a factor in this incident.

INVESTIGATION

On July 3, at approximately 9:52 a.m., the delivery truck driver arrived at the well site access road. Due to the hilly terrain, the truck needed to be towed up hill to the worksite. The towing dozer operator backed his Komatsu dozer to within 3 feet from the front of the Kenworth semi-truck. According to OSHA interviews, the owner of the dozer company said that this distance was common practice for their dozer operators. The driver exited his truck and was attempting to connect the winch line to the hitch on the front of his truck, but was unable to because a D-ring was not attached to the hitch. A second dozer operator was operating his dozer nearby and noticed that the driver was having difficulty and radioed the towing dozer operator to give the driver a D-ring. The towing dozer operator engaged the parking lever and lowered the blade to approximately 6 inches above the ground. He then got up from his seat and turned to exit the dozer. As he did so, it is believed that the back of his heel caught the parking lever, releasing the parking brake. This allowed the dozer to roll backward, pinning the driver between the dozer and the semi-truck. The dozer operator drove the dozer forward, and the delivery driver fell to the ground. Emergency medical services (EMS) was called. Both dozer operators checked on the delivery truck driver and found he had a pulse but was not responsive. When he lost a pulse, CPR was initiated by the second dozer operator and continued until EMS arrived. EMS personnel arrived on-scene and pronounced the delivery truck driver deceased; he was transported to the state medical examiner's office.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. NIOSH investigators identified the following unrecognized hazards as key contributing factors in this incident:

- *Lack of safety training or standard operating procedure for towing vehicles*
- *Lack of appropriate safeguards for equipment*
- *Lack of spotter or designated hookup personnel*
- *Steep terrain*
- *Short length of chain being used; winch cable and chain not spooled out*
- *Truck not properly equipped ahead of time for towing (i.e., no D-ring pre-mounted on hitch pin)*

CAUSE OF DEATH

The medical examiner listed the cause of death as thoracic injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure employees follow safe operating procedures as written in the equipment's operations manual.

In this incident, the towing dozer operator was operating a Komatsu dozer model D65PX-15. The following procedures were listed in the manufacturer's operations manual.

- Always apply the lock when leaving the operator's seat (Figure 1). Before standing up from the operator's seat (such as when adjusting the operator's seat), lower the work equipment completely to the ground, set the safety lock lever (1) and parking lever (2) securely to the LOCK position, then stop the engine. If you accidentally touch the levers when they are not locked, the machine may suddenly move and cause serious injury or property damage [Komatsu 2004].

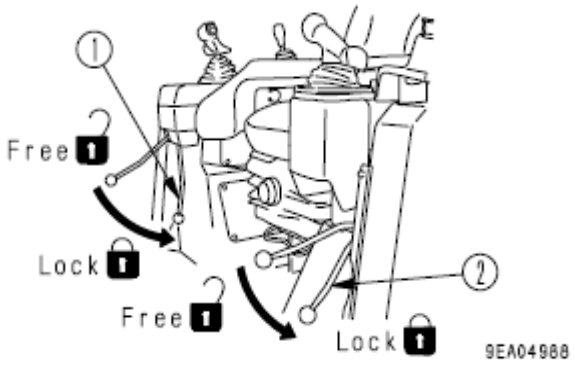

Figure 1. Safety lock lever (1) and parking lever (2).
(*Adapted from Komatsu [2004].*)

- When leaving the machine, always lower the work equipment completely to the ground, set the safety lock lever (1) and parking lever (2) securely to the LOCK position, then stop the engine. Use the key to lock all the equipment. Always remove the key, take it with you, and keep it in a specified place [Komatsu 2004].

- Park the machine on firm, level ground. Select a place where there is no hazard of falling rocks or landslides, or of flooding if the land is low. Lower the work equipment completely to the ground. When leaving the machine, set the steering, directional, and gearshift levers in the NEUTRAL position and set the blade lever in the HOLD position; then apply the safety lock lever (1) and the parking lever (2) and stop the engine. Always close the operator's cab door and use the key to lock all the equipment in order to prevent any unauthorized person from moving the machine. Always remove the key, take it with you, and leave it in a specified place (Figure 2) [Komatsu 2004].

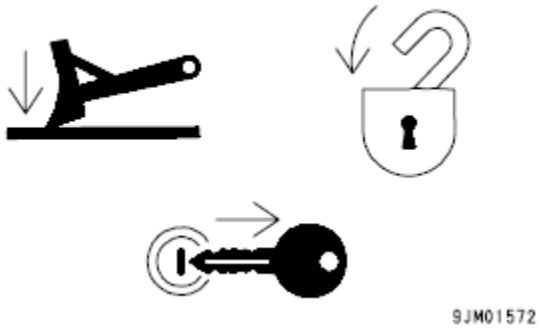

Figure 2. Warning label from the Komatsu operations manual.
(*Adapted from Komatsu [2004]*.)

Recommendation #2: Employers should implement standard operating procedures for equipment operations such as parking and towing.

OSHA regulations require employers to train workers to recognize and avoid unsafe conditions that may be present in their work environments and to provide training on the regulations applicable to their work [Safety and health regulations for construction, 1998].

Employers should ensure that drivers and equipment operators receive adequate safety training. In this case, consideration should be made for special hazards present during towline connection and disconnection, particularly when performed on a slope.

Employees need a set of standard procedures that they will always follow. Operators of tow vehicles should place the transmission in neutral, provide at least 6 feet of distance between the equipment, lower the blade, engage the parking brake and any brake system backups, and ensure that the vehicle is stable and secure before exiting or signaling for another individual to enter the hazard zone between the vehicles. Some procedures for consideration during connection or disconnection may include the following:

- *Make towing connections on level ground, such as a designated hookup location. If level ground isn't available, offset or stagger the machine from the unit being pulled so that even if the machine rolls, it will not roll into the unit.*
- *Identify hazardous zones and functions between or near vehicles that could result in crushing injuries during the connection process.*
- *During the connection process, the dozer operator remains in the equipment operator's seat.*

- *The worker connecting the tow cable/chain makes confirmed visual contact with the vehicle operator(s) prior to entering the area between the two vehicles.*
- *The worker connecting the tow cable/chain maintains visual contact with the towing vehicle during the connection process.*
- *After the towing vehicle is connected, the operator makes positive eye contact with the individual connecting the towing vehicle to ensure the person is clear of crushing hazards or other identified hazards, such as being struck by the towing chain or cable, prior to disengaging the braking system.*
- *Use a spotter [Montgomery and Krieger 1997].*

Recommendation #3: Employers should use a job hazard analysis (JHA) to identify and eliminate towing hazards.

Conducting a job hazard analysis alerts the employers and workers to the hazards associated with towing. A JHA looks at job tasks in order to identify their associated hazards and develop control strategies and techniques before injuries occur. In this case, the JHA might have identified the hazard of being crushed between the dozer and the semi-truck and prompted the development of a safe vehicle-towing procedure. Employers should always include workers in the JHA process to encourage workers to implement the identified control strategies [OSHA 2010].

Additionally, a JHA policy or program specifically related to tasks involving more than one contractor should be in place. Each company may have their own form of JHA or towing/hauling policies; an agreement on which to follow should be reached before work commences.

Recommendation #4: Ensure vehicles are properly equipped for towing prior to initiating the towing connection procedures (either have a D-ring pre-mounted on the truck's hitch pin or have a D-ring in the truck).

In this case, the dozer operator was exiting the dozer to give the truck driver a D-ring for connection. Vehicles being towed should be properly equipped for towing with all necessary hookup equipment prior to engaging in the hookup procedures. For example, the D-ring can either be equipped on the truck or placed on the truck before preparing to be towed. This is especially true where towing connection is an ongoing activity at the job site.

Recommendation #5: When possible, ensure a designated area is flat prior to making towing connections.

Towing connections should be conducted on level ground where possible. In this incident, an attempt to hook up was performed on a slope of approximately 10 degrees. Steep terrain increases the chance of machinery moving unintentionally during operations. Designating a level area for hookup operations may reduce the risk of involuntary movement. If level ground isn't available, the machines should be staggered/offset so that if the potential to roll backward exists, the machine would not roll into the unit being towed.

Training and standard operating procedures should be developed to ensure employees understand the hazards of towing on inclined terrain. During training, the truck drivers and dozer operators should be informed of designated towing hookup areas.

Recommendation #6: Dozer equipment manufacturers should consider providing an engineering control, such as an interlock or other safe guards, to prevent parking brake levers from disengaging.

Control guards are safety features designed to prevent the inadvertent operation of equipment. Larger controls, such as levers, may require bars or specifically designed guards to limit access to the levers. Alternatively, mechanical stops, such as removable pins or blocks, can be used to limit movement of the lever until the operator is ready to safely activate the control.

In this incident, the victim was pinned between the dozer and semi-truck. It is believed that the dozer operator bumped the parking brake lever while dismounting the dozer, which disengaged the parking brake and caused the dozer to roll back and onto the victim.

An interlock device prevents a vehicle from shifting into motion on its own. Many companies have developed several different types of interlock variations, including a brake transmission interlock, a brake shift interlock, and a starter ignition interlock.

A brake transmission interlock works by applying the brakes automatically if no one is in the operator's seat. If the safety restraints are not being used, the brakes are also automatically applied. A brake shift interlock does not allow the gear shift to move unless the brake is applied. A starter ignition interlock requires a key and the brake to be applied for a vehicle to start.

In this case, the dozer operator left the cab to give the delivery driver a D-ring, and the parking brake lever was inadvertently disengaged, which caused the dozer to roll back. A separate safety lock lever on the right side of the seat controls the work equipment attachments, such as the blade, from moving up and down. It is believed that this safety lock lever may not have been engaged. The operator's manual warns that if the control lever (parking brake lever) is touched by accident, the machine may suddenly move and cause serious personal injury.

The manual states: "When leaving the machine, always lower the work equipment to the ground, set work equipment lock lever and parking brake lever to lock position, and stop the engine. Always lock all parts, take the key with you, and leave the key in the specified place" [Komatsu 2004].

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INVESTIGATOR INFORMATION

This investigation was conducted by Nancy Romano, Safety and Occupational Health Specialist. The report was co-authored by Melanie Moore, Safety and Occupational Health Specialist, Fatality Investigations Team, Surveillance and Field Investigations Branch, Division of Safety Research, and Yusef Sayeed, MD, MPH, MEng, CPH, Guest Researcher, West Virginia University Occupational Medicine Residency Program.

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