SUBJECT: A farmer was killed while bypass-starting his tractor.

SUMMARY

A 67-year-old farmer died on February 23, 2005 from crushing injuries after being run over by a tractor that he was attempting to bypass-start. The decedent was using a tractor to transport a large bale of hay to a field when the tractor died and would not restart. The victim walked to a barn where his wife was working, and they drove a pickup truck to the area where the tractor was located. While standing between the tractor and truck, the victim connected jumper cables to both vehicles and touched a metal wrench to the starter to bypass the ignition. When the engine started, the tractor moved forward and ran over the farmer. He was transported to the hospital and pronounced dead later that same day.

Agriculture requires a lot of work, and shortcuts may be tempting, but they are often dangerous. Bypass-starting is one of the more hazardous shortcuts.

Oklahoma Fatality Assessment and Control Evaluation (OKFACE) investigators concluded that to help prevent similar occurrences, farmers should:

- Ensure that tractor engines are started from the operator's seat with the transmission and power take-off in neutral and the parking brake engaged.
- Follow safe start-up procedures included in the operator's manual and designated by decals on the tractor.
- Ensure that tractors are properly shut down after each use.
- Periodically check the working condition of safety start switches and arrange to have any malfunctions repaired promptly.

Additionally,

- Rural emergency medical services should have the ability to quickly locate trauma victims and transport them to the appropriate level of care.

Figure 1. Tractor involved in the incident

INTRODUCTION

On February 23, 2005, a 67-year-old farmer died from crushing injuries after being run over by a tractor that he was attempting to bypass-start. OKFACE investigators were notified of the incident and conducted interviews with the investigating officer and the victim's wife on August 17, 2005. OKFACE investigators reviewed the death certificate, pictures of the incident site, and reports from the Medical Examiner, local media, and the investigating law enforcement officer.

Victim: The victim was a self-employed owner/operator of a cattle and crop farm. He had worked all of his adult life on the same farm where he was born and raised. The victim was operating a 23-year-old tractor that he had purchased new (Figure 1). The victim was familiar with jump-start procedures and had performed an ignition bypass-start many times before. According to his wife, the decedent had been ill for the past few days and seemed to be feeling very cold and weak on the day of the incident.

Figure 2. Positions of truck and tractor after the incident occurred

Training: On this privately owned and operated farm, there were no written safety procedures. It is unknown if the victim received any formal safety training on the use of the machinery he operated.

Incident Scene: The incident occurred on a private dirt road located on a farm owned by the victim. The ground conditions were dry.

Weather: The weather on the day of the incident was dry and cold.

INVESTIGATION

On the day of the incident, the decedent was operating his tractor to transport a large round bale of hay to his cattle located in a field. As he was driving to the field, the tractor died and would not restart. The victim walked to a barn where his wife was working and she drove him in their pickup truck to the area where the tractor was located. The truck was parked near the tractor so the victim could attach jumper cables to the tractor and truck's batteries.
The ignition switch of the tractor had not been functioning properly and three previous attempts to repair the faulty ignition had been unsuccessful. It was not uncommon for the decedent to use a metal wrench to perform a bypass-start while standing on the ground next to the engine compartment of the tractor. On the day of the incident, while standing between the tractor and truck with the jumper cables in place, the victim used a 15-inch metal wrench

on the unguarded starter to complete a circuit and start the tractor. When the engine started, the tractor was in gear and the brake was not set, which caused the tractor to move forward and strike the victim, throwing him back against the side of the truck. The decedent fell to the ground where he was run over by the dual rear tractor tires. The tractor came to rest and died when the rear wheel hit the truck (Figure 2). The victim's wife was sitting in the truck the entire time and witnessed the incident.

The victim's wife immediately called for emergency response from her cell phone. Emergency medical services (EMS) and other responders experienced difficulty locating the incident site and arrived approximately 50 minutes later. The victim was transported to a medical facility and pronounced dead 4½ hours after the incident occurred.

CAUSE OF DEATH

The Medical Examiner's report listed the cause of death as crushing injury of the pelvis.

RECOMMENDATIONS

Recommendation #1: Farmers should ensure that tractor engines are started from the operator's seat with the transmission and power take-off in neutral and the parking brake engaged.

Discussion: Farmers should start the engine of a tractor with a key from the operator's seat, which is the safest place to be during machine operation. Bypass-starting is often viewed as a timesaving shortcut to addressing a malfunction. The term "bypass-starting" points to its danger. It bypasses all the safety start and neutral start switches engineered in the tractor's electrical and hydraulic systems. If the tractor is left in gear and a bypass-start is performed, the starter will engage and the engine will start as soon as the circuit is complete. The operator does not have enough time to jump away and may be pulled down by the drive wheel, run over, crushed, or otherwise injured. The running tractor also has the potential to injure others and destroy property. Tractors should be started with the transmission and power take-off (PTO) in neutral and the parking brake set. Operators should be seated with the seat belt securely fastened. If the tractor is not equipped with a rollover protective structure (ROPS), then a seat belt should not be worn. Operators should be careful not to position themselves or others in or near a tractor's point of operation. Agriculture requires a lot of work, and shortcuts may be tempting, but they are often dangerous. Bypass-starting is one of the more hazardous shortcuts.

Recommendation #2: Farmers should follow safe start-up procedures included in the operator's manual and designated by decals on the tractor.

Discussion: The operator's manual should be used for guidance on safe start-up procedures and operators should pay attention to all decals and safety labels placed on their equipment. Labels with the words DANGER, WARNING, and CAUTION and safety alert symbols contain important information on serious safety hazards; additional details can be found in the operator's manual. Equipment dealers and manufacturers can provide new or additional safety decals for farm machinery. Decals should be kept clean and readily visible, acting as a frequent reminder to operators. Furthermore, the operator's manual should be consulted when the tractor's battery is dead so that safe procedures for recharging or using jumper

cables are followed. Shorting across starter terminals and bypassing the safety start switches should not be considered safe start-up procedures. Bypass starter covers installed by the manufacturer should not be removed and other safety devices should not be circumvented. By following the manufacturer's recommendations when using jumper cables, the operator reduces the chances of injury from explosions, acid burns, or other causes.

Recommendation #3: Farmers should ensure that tractors are properly shut down after each use.

Discussion: Farmers should ensure that their tractors are properly shut down after each use by placing PTO and drive levers in neutral, lowering attachments to the ground, shutting off the engine, setting the parking brake, and removing the key. Whenever possible, tractors should be parked on level ground. If that is not feasible, then the tractor should be parked at a right angle to the slope and the wheels should be chocked. Safe shut down procedures should be used each time the tractor is no longer needed, in order to reduce the chances that it is started while unintentionally left in gear. Prior to performing any maintenance, farmers should ensure that the parking brake is engaged and the wheels are chocked to reduce the chances of any unintentional movement of the tractor. Operators should not dismount a tractor with the engine running unless they are following a manufacturer recommended operating procedure.

Recommendation #4: Farmers should periodically check the working condition of safety start switches and arrange to have any malfunctions repaired promptly.

Discussion: Tractor operators should periodically take a few seconds and ensure that all safety start switches are in proper working order. If malfunctions are identified, the farmer should arrange to have the problem repaired as soon as possible. This check should only be done when there are no people, animals, or other obstructions around the tractor. Operators should follow these steps when performing this quick safety check:

- √ Depress the clutch and brake pedals and attempt to start the engine with the gears disengaged and the PTO in neutral. The starter should engage.
- √ Depress the clutch and brake pedals and attempt to start the engine with the gears engaged and the PTO in neutral. The starter should not engage.
- √ Depress the clutch and brake pedals and attempt to start the engine with the gears in neutral and the PTO engaged. The starter should not engage.
- √ For tractors with clutch-mounted start switches, depress only the brake pedal and attempt to start the engine with the transmission and PTO in neutral. The starter should not engage.

Recommendation #5: Rural emergency medical services should have the ability to quickly locate trauma victims and transport them to the appropriate level of care.

Discussion: In this incident, emergency responders had difficulty locating the site. While the reasons for the delay are unknown, there are things that both responders and those seeking assistance can do to help minimize response times. Incidents that occur in rural settings, particularly agricultural areas, are especially prone to delayed emergency assistance. Using addresses in isolated and remote locations may present additional difficulties because they can be confusing and impractical due to poorly marked roads, changing road names, or

construction of new roads. Global positioning systems (GPS) could be used to provide precise locations of victims and this technology could be incorporated into cell phones, radios, and other electronic devices. Enhanced 911 (E911) allows dispatch operators to provide location information on calls from a wireless telephone. Utilization of this technology requires development and upgrades to local 911 Public Safety Answering Points, as well as coordination among public safety agencies, wireless carriers, technology vendors, equipment manufacturers, and local wireline carriers. State and local agencies should work together to encourage the development and deployment of E911.

Rural employers and independent farmers should develop an emergency response plan and take into consideration the response time of EMS and distances to medical facilities. As part of an emergency response plan, contact should be made with local fire departments and EMS providers to discuss locations, response times, and changes to local roadways. First aid and cardiopulmonary resuscitation (CPR) capabilities may be necessary when response times are greater than 3-5 minutes. All employees and family members should be capable of accurately directing responders to the work site.

REFERENCES

- Occupational Safety and Health Administration, 29 CFR 1928.57 *Guarding of Farm Field Equipment, Farmstead Equipment, and Cotton Gins*.
- National Ag Safety Database, AgSafe, *Safely Working With and Around Tractors,* NASD Review, April 2002.
- National Ag Safety Database, The Ohio State University Extension, Agricultural Tailgate Safety Training, *Training Module*: *Safely Starting and Stopping a Tractor,* NASA Review, July 2004.
- Kubota Tractor Corporation, *The Ten Commandments of Tractor Safety*, 2005.
- National Institute for Occupational Safety and Health. *Traumatic Occupational Injuries: Agricultural Safety*, www.cdc.gov/niosh/injury/traumaagric.html.
- Injury Prevention Service, Oklahoma State Department of Health, *Jump-Start/Bypass-Start-Related Fatalities in Oklahoma, July 1997-February 2005*, August, 5, 2005.

The Oklahoma Fatality Assessment and Control Evaluation (OKFACE) is an occupational fatality surveillance project to determine the epidemiology of all fatal work-related injuries and identify and recommend prevention strategies. FACE is a research program of the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research.

These fatality investigations serve to prevent fatal work-related injuries in the future by studying the work environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in injury, and the role of management in controlling how these factors interact.

For more information on fatal work-related injuries, please contact:

Oklahoma State Department of Health
Injury Prevention Service
1000 NE 10th Street
Oklahoma City, OK 73117-1299
nancyk@health.ok.gov
1-800-522-0204 or 405-271-3430
www.health.ok.gov/program/injury