

Fatality Assessment and Control Evaluation Project

Public Health

KY FACE #97KY044

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SUBJECT: Tractor/Baler Operator Killed in Entanglement

Summary

An 80-year-old full-time farmer died after being caught under a baler. The victim worked closely with his son on the 300-acre farm. He was working alone, driving a tractor with a baler attached, in an 8-acre field during a midafternoon in May. Having completed a portion of the field in the morning, the victim returned to the field after lunch to complete the task. Rain was forecast and the remainder of the field would take 4-5 hours to complete. The victim's son went to a nearby town to pick up parts for the round baler while the victim used a square baler to bale the previously cut alfalfa. About 5:00 pm the victim dismounted the tractor to clear a bale from underneath the baler; he had inadvertently run over it. He depressed the clutch, took the tractor out of gear, set the parking brake, left the engine running, and dismounted the tractor. He walked to the side of the baler, bent over and reached with his left hand under the baler in front of the baler wheel. The tractor and baler were parked on a gradual downward slope. Because the PTO was still running, the baler was jerking forward as the flywheel continued to rotate. The pulsating movement of the baler caused the tractor to inch forward as the victim was reaching underneath. The victim's right arm, being used to support his weight as he reached with his left, was run over by the baler wheel, trapping him. His clothing then became entangled in a rotating pulley adjacent to the baler wheel. The victim was strangled by his shirt as it wound up tight. He was discovered by his son a few hours later. Emergency medical responders came to the scene, the

coroner was called, and the victim was pronounced dead at 7:10 pm. In order to prevent similar occurrences, FACE investigators recommend that:

- machinery should be turned off by disengaging the PTO before approaching the equipment;
- machines should be examined to ensure that all moving components are properly guarded; if better shielding is needed an authorized equipment dealer should be contacted to determine if safety modifications have been engineered or made available;
- brakes should be set in unison to minimize the possibility of rolling;
- operators should not wear loose fitting clothing when operating farm machinery. As well, clothing manufacturers should consider developing work clothes that will tear away in the event of entanglement and should label clothing which is tear resistant;
- whenever possible, operators should not work alone.

Introduction

On 23 May 1997, an 80-year-old farmer died of traumatic asphyxia after becoming entangled in a pulley on the side of a square baler. On 24 May, KY FACE was notified by a Community Partners for Healthy Farming (CPHF) nurse of the farm fatality the previous day. On 16 June a FACE investigator, accompanied by the CPHF nurse, traveled to the scene. Interviews were conducted with the deputy coroner who handled the case, the victim's son, and an equipment dealer. The case was later discussed by phone with the EMS paramedic who responded to the call. Photographs were taken of the tractor and the baler. Photographs taken by the deputy coroner were viewed. The manufacturer's safety department was called and an agricultural engineer was also consulted.

Investigation

The victim in this case had farmed all his life in the same south-central Kentucky region. He helped his son, who had been the primary farm operator for several years. They grew alfalfa hay, wheat, corn and soybeans, and had several head of beef cattle. The farm is bifurcated by an interstate highway so that 175 acres are on one side of the highway and 125 on the other. Visual contact between the two portions is not possible. On the day of the incident the victim was dressed in long pants, heavy duty long sleeved shirt, T-shirt and work gloves. It was warm and sunny. He had complained of knee pain although this was not unusual and no significant medical history was reported. He was taking no prescription medications.

The 1973 Ford 3000 diesel tractor (38 hp) was not equipped with a ROPS, a seatbelt, or a PTO guard. The victim had purchased the tractor new. It was one of three Fords he owned and was in fair condition for its age. At the time of the site visit the tractor wheels were spread to the

maximum width to facilitate the plowing of corn. The brakes and parking brake were functioning properly. This model tractor has a two-stage clutch where partial depression disengages the drive gear and complete depression disengages the PTO drive.

The baler being used in this case was a 1970 Ford Model 530 square baler. It was purchased by the victim new from a dealer who had used it as a demonstration model. A pulley guard had been included in the sale with the baler; however, it was never installed and so was not on at the time of the incident nor at the time of the site visit. According to an equipment dealer, the tractor and the baler were compatible with respect to horsepower and weight of the baler. Although the farmer had a round baler, he still used the square baler two or three times a year. At the time of the incident, the round baler was being repaired. On the left side of the baler (see Figure 1) were two exposed pulleys, one above the other, just forward of the rubber tire. A belt between the pulleys drove the pick-up tines and the feeder teeth. The lower pulley measured 13" across; its lowest part was 9" from the ground. The distance between the rubber wheel and the pulley was 2".

For this operation the tractor was usually operated in second gear with the engine running about 1800 RPMs. This allowed the PTO to rotate at 540 RPMs. With this speed, the plunger in the baler compressed once each second.

Because of the plunger action to compress the hay, the baler had a tendency to creep forward, pulsate rhythmically, and push slowly, forcing the tractor forward. It pulsated once per second. The baler was in fair condition for this age equipment.

The 8-acre irregular and contoured field of hay had been cut a few days prior to the incident. It was a gently rolling field adjacent to an interstate highway. Wind rows curved with the contour of the land. A fence separated the highway easement and the hay field. The field was dry on the morning of the incident, so the farmer and his father (the victim) decided to bale the hay using the square baler, since the round one was being repaired. Rain was forecast for the evening. After lunch, the son went to town for a round baler part and the father returned to the 8-acre field to finish the baling that had begun earlier in the day.

At about 5:00 pm the victim was nearly finished with the task. As he began to turn downhill and to the right, evidence at the scene suggests he ran over a bale or partial bale that became lodged under the baler. He then depressed the clutch part way, taking the tractor out of gear. Next he set the parking brake on the left wheel. He dismounted the tractor and walked to the side of the baler with the exposed pulleys. He knelt down just forward of the wheel and with his left hand reached under the baler to clear it out. In doing so, part of his clothing became entangled in the exposed pulley, drawing him in tight against the wheel and the pulley. His clothing wrapped so tight it cut off his airway.

At 6:20 pm the victim's son and grandson went to the field to help complete the job. As they approached the field they noticed something was wrong because the tractor and baler were still running and no one was on the tractor. Seeing that his father was entangled in the pulley with his hand under the wheel, the son got on the tractor, disengaged the PTO, and backed up slightly to free him. He then phoned 911 to summon emergency medical assistance.

EMS was called at 6:32 pm and arrived at the scene at 6:46. Two paramedics and one EMT responded. The coroner was called at 7:00 pm and arrived at the scene at 7:19.

Cause of Death

The death certificate listed the cause of death as traumatic asphyxia. Toxicology was negative. No autopsy was done.

Recommendations/Discussion

Recommendation #1: Machinery should be turned off by disengaging the PTO before approaching the equipment.

Discussion #1: In this case the tractor engine was running, the drive was disengaged but the PTO power shaft to the baler was rotating. This caused the pulleys to continue rotating and the plunger to continue to operate. The tractor therefore inched forward and ran over the victim's hand, trapping him under the wheel. Had the PTO been shut off, the pulleys would have stopped and the forward movement of the tractor would have ceased.

Recommendation #2: Machines should be examined to ensure that all moving components are properly guarded. If better shielding is needed an authorized equipment dealer should be contacted to determine if safety modifications have been engineered or made available.

Discussion #2: The guard for the baler came with the unit when it was sold. However, it was never attached to the baler. The shield would have prevented the clothing from being caught. The distance between the wheel and the lower pulley was 2", leaving little room for a guard; however, the guard would have prevented any clothing from being "taken up" the pulley. Safety guards should not be removed or modified. Guards should not interfere with the tasks nor create additional sharp edges or protruding parts.

Recommendation #3: Parking brakes should be set in unison to minimize the possibility of rolling.

Discussion #3: Like most tractors, brakes on this tractor operate independently to facilitate turning. They can be set such that they can be applied one at a time or together. In this case the brakes were set to operate independently. The victim applied the left brake only, allowing the right brake to move freely. With the lurching motion of the tractor caused by the plunger, the tractor moved forward even though the left brake was engaged. If the intent is to stabilize the position of the tractor, both brakes should be applied equally.

Recommendation #4: Operators should not wear loose fitting clothing when operating farm machinery. As well, clothing manufacturers should consider developing work clothing that will tear away in the event of entanglement, and label tear-resistant clothing as a machine entanglement hazard.

Discussion #4: To minimize possible entanglement in rotating parts clothing should be well fitting. Frayed clothes, jackets, sweatshirts with drawstrings, and boots or shoes with long shoelaces should be avoided. A shoelace, loose string, thread, flap of cloth, or the corner of a jacket, as well as loose fitting garments, can become entangled very easily. If an entanglement occurs, then clothing should be made such that an excessive amount of force would cause the clothing to tear off. This should be considered by clothing manufacturers. As well, manufacturers of work garments should consider labeling sturdy work clothes as a possible hazard for entanglement.

Recommendation #5: Whenever possible, operators should not work alone.

Discussion #5: The large proportion of occupational fatalities that are attributable to machines such as the hay baler in this case indicates the need for another person to be present when such machines are operated. In many cases, immediate notification of emergency medical personnel could make the crucial difference.

Rererences

NIOSH *Update*, "Farm Safety - Danger of Hair Entanglement in Hay Baler Drive Shafts," July 1992. DHHS (NIOSH) Publication No. 93-126.

NIOSH *Alert*, "Preventing Scalping and Other Severe Injuries From Farm Machinery," June 1994. DHHS (NIOSH) Publication No. 94-105.

Figure 1.

