DATE: June 10, 1996

FROM: Minnesota Fatality Assessment and Control Evaluation (MN FACE) Program Minnesota Department of Health

SUBJECT: MN FACE Investigation 96MN00401
Farmer Dies After Becoming Entangled in The Unloading Beaters of a Silage Feed Wagon

SUMMARY

A 30-year-old male farmer (victim) died from injuries sustained when he became entangled in the unloading beaters of a silage feed wagon. The wagon was equipped with a power-take-off drive mechanism that operated three unloading beaters mounted across the front of the wagon. The beaters broke apart the load of silage as two apron chains on the wagon floor moved the load to the front of the wagon. While using the wagon to feed cattle on the day of the incident, one of the apron chains broke. Since the wagon was nearly empty when the chain broke, the victim parked the wagon and continued with other farm activities. Later that day, the victim decided to completely empty the wagon to prevent the silage from freezing to the wagon floor. He drove the tractor and wagon into a cattle lot and entered the wagon with a shovel. While he shoveled the silage from the wagon, he apparently stepped backward into the rotating unloading beaters. The tines of the top beater caught the victim's coveralls and pulled him backward over the top of it and against the front wall of the silage wagon.

Approximately forty-five minutes after the victim began to empty the remaining silage from the wagon, his father entered the cattle lot and discovered him entangled in the unloading beaters. He ran to a farm building and notified a neighbor who had been helping at the farm that day. A call was immediately made to emergency medical personnel. They arrived shortly after being notified and completed the removal of the victim which had already been started. The victim was transported to a local hospital where he was pronounced dead by the county coroner. MN FACE investigators concluded that, in order to reduce the likelihood of similar occurrences, the following guidelines should be followed:

- operators should turn off the engine and remove the key before dismounting from a tractor;
- operators should disengage the power-take-off before dismounting from a tractor; and
- operators should not wear loose-fitting clothing near or while operating machines.

INTRODUCTION

On January 30, 1996, MN FACE investigators were notified of a farm work-related fatality which occurred on January 22, 1996. The county sheriff's department was contacted and releasable information obtained. Information obtained included a copy of their report and copies of photos of the incident site. A site investigation was conducted by MN FACE investigators on March 23, 1996. During the site investigation, the tractor that operated the silage feed wagon was inspected but the wagon was no longer available at the farm. During MN FACE investigations, incident information is obtained from a variety of sources such as law enforcement agencies, county coroners and medical examiners, employers, coworkers and family members.

INVESTIGATION

On the day of the incident, the victim used a tractor and a feed wagon to feed silage to a herd of cattle. The self-unloading wagon (Figure 1) was equipped with a power-take-off drive mechanism that operated three unloading beaters mounted across the front of the wagon. The unloading beaters were positioned in a vertical configuration (i.e., one above another) and broke apart the load of silage as two apron chains moved it to the front of the wagon. The apron chains moved across the floor of the wagon from the back to the front when the power-take-off was engaged. The chains divided the wagon floor in half along a line extending along the middle of the wagon floor from the front to the back. Each chain consisted of two parallel chains connected by cross bars that were approximately 18 to 20 inches apart. A third apron chain was located across the front of the wagon and beneath the unloading beaters. It transferred the silage from the wagon as it fell from the unloading beaters. The wagon was also equipped with a mechanical gear box to independently engage or disengage the unloading beaters. This enabled the power-take-off to operate only the apron chains to remove the last small amounts of silage from the wagon.

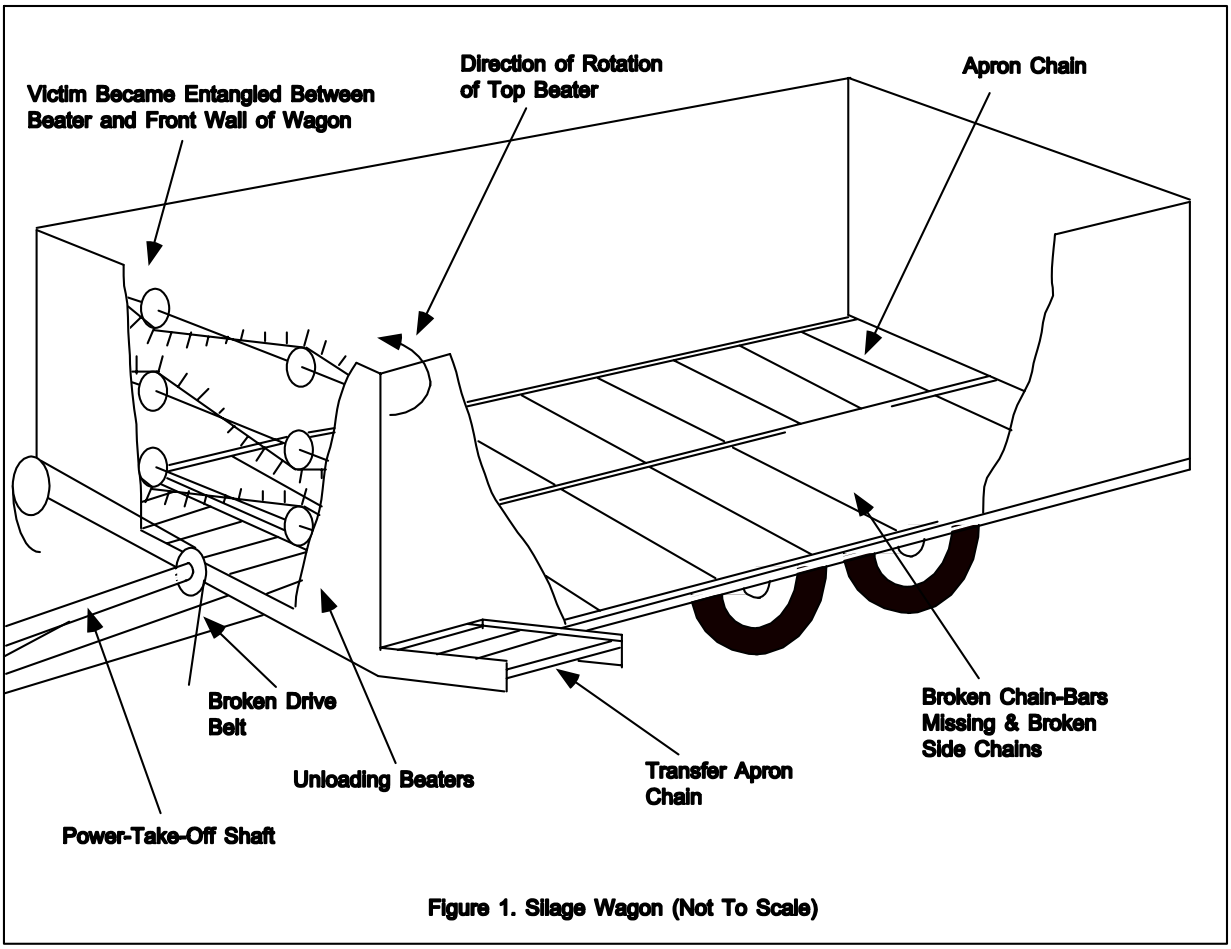

Figure 1. Silage Wagon (Not To Scale)

When the wagon was nearly empty, the apron chain on the left side of the wagon, (when facing forward) broke. The victim drove the tractor and wagon from the cattle yard and left it with a small amount of silage in it until later that day. Early during the evening, the victim decided to completely empty the wagon to prevent the silage from freezing during the night to the wagon floor and the apron chains. He drove the tractor and wagon back into the cattle yard and parked them in a slightly uphill direction. The victim entered the wagon with a shovel and began shoveling the remaining silage from the wagon. A small amount of silage was found behind the wagon which indicted that the victim had shoveled it over the back end of the wagon.

While the victim shoveled the silage from the wagon, he apparently stepped backward into the rotating beaters. The tines of the top beater caught the victims coveralls and pulled him backward over the top beater. The rotation of the top beater caused him to become partially wedged between the beater and the front wall of the wagon. The entanglement of the victim caused a drive belt for the unloading mechanism to break as the power-take-off from the tractor

continued to operate.

Approximately 45 minutes after the victim began to empty the remaining silage from the wagon, his father entered the cattle lot and discovered him entangled in the unloading beaters. He ran to a farm building and notified a neighbor who had been helping at the farm that day. A call was immediately made to emergency medical personnel. They arrived shortly after being notified and completed the removal of the victim which had already been started. The victim was transported to a local hospital where he was pronounced dead by the county coroner.

Since the victim was working alone, it could not be determined why the power-take-off was operating while the victim was inside the wagon. Several possibilities were identified based on information obtained during the investigation. One possibility was that the power-take-off engaged itself after the victim entered the wagon. On a previous occasion during cold weather, the power-take-off of the tractor involved in this incident inadvertently engaged itself. On the day of the site investigation, the tractor was started and the power-take-off lever was shifted between it's engaged and disengaged positions several times. It operated properly, however, the temperature was 40-45 degrees warmer on the day of the investigation than it was on the day of the incident. Another possible scenario is that the victim disengaged the gearbox on the wagon for the unloading beaters and engaged the power-take-off to operate only the apron chains. This would have allowed the unbroken apron chain to scrape the remaining silage from half of the wagon floor. While the victim was in the wagon, the gearbox lever may have inadvertently shifted to the engaged position. Due to darkness and the noise of the tractor, the victim may have thought that the beaters were not operating when he stepped backward toward them. Another possibility was that the victim engaged the power-take-off to operate the entire unloading mechanism before he entered the wagon.

CAUSE OF DEATH

The cause of death listed on the death certificate was crush injuries to chest.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Operators should turn off the engine and remove the key before dismounting from a tractor

Discussion: The risk of injury or death, due to entanglement, can be eliminated by stopping the engine and removing the ignition key before operators dismount from tractors. Stopping the engine and removing the key provides protection: from power-take-off shaft entanglement; entanglement in moving machine parts; and from unexpected engagement of power by another person while the operator is cleaning, lubricating, adjusting, or repairing a machine. In this case, if the tractor engine had been stopped and the ignition key removed before the operator dismounted from the tractor, this fatality would have been prevented.

Recommendation #2: Operators should disengage the power-take-off before dismounting from a tractor.

Discussion: Entanglements in power-take-off shafts and machinery components can be prevented by disengaging the tractor's power-take-off before operators dismount from the tractor. Although this may not be possible in certain cases where a tractor is used to power a stationary machine, it should always be done when the operator is using portable machines, such as the silage wagon in this incident. Although it could not be determined exactly why the power-take-off was engaged while the victim was in the silage feed wagon, a general safe work practice that operators should follow is to always disengage the power-take-off before dismounting from a tractor.

Recommendation #3: Operators should not wear loose-fitting clothing near or while operating machines.

Discussion: The risk of entanglement in rotating shafts and machine components can be reduced if operators do not wear loose fitting clothing. Work clothing should be well-fitting and zippered or buttoned, not open. Frayed or loose fitting clothes, jackets and sweatshirts with drawstrings, and boots or shoes with long shoelaces should not be worn. Although it did not appear that the victim in this incident was wearing loose fitting clothing, this recommendation is a general safe work practice that should always be followed by operators of machines whenever the risk of entanglement exists.

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