

AGRICULTURAL MACHINERY SAFETY

David W. Smith, Extension Safety Program

Modern farmers use a variety of machines to do farm work that used to require back-breaking labor. Today's machinery is extremely specialized and designed to perform many different tasks. However, these mechanical systems share many of the same hazards that seriously injury and kill hundreds of farm workers each year.

Agriculture remains among the most dangerous industries in the United States, although the threat of liability, litigation, and severe monetary penalties is causing agricultural employers to give safety an added emphasis. Occupational Safety and Health Administration (OSHA) regulations and worker protection standards now exist to promote safe workplaces and protect agricultural workers. Equipment manufacturers design machinery with safety in mind. They install guards, shields, warning decals, and color-coded parts to warn of potential hazards.

Despite these advances, working with and around farm machinery remains dangerous. Aged and homemade machinery with missing and damaged guards and shields is common. Formal training on use of farm equipment is practically non-existent.

This fact sheet will discuss the common causes of agricultural machinery injuries and deaths. All machinery operators should be able to identify these hazards, provide safeguards and barriers to their exposure, and train all workers accordingly. Actual case descriptions are provided that illustrate the dangers and consequences of operating unsafe machines, and failing to recognize machinery hazards.

SHEAR AND CUTTING POINTS

Shear points exist when the edges of two objects move toward or next to each other closely enough to cut relatively soft material. Cutting points happen when a single object moves forcefully or rapidly enough to cut. They are found with many types of

crop cutting equipment, such as forage harvester heads, sickle bars, and grain augers. Shear and cutting points are hazardous because of their cutting force. They often move so rapidly that they may not be noticeable when in motion.

February 24, 1995. A 27-year-old agricultural maintenance worker was killed while repairing a silo bottom unloading auger. The victim was working inside a cement silo filled with corn silage, repairing a sweep auger that was damaged due to frozen feed inside the silo. The victim was lying inside on the floor of the silo behind the auger safety shield when he shouted that he was clear of the auger. A workmate outside at the electric control panel turned on the auger for approximately 15 seconds to dislodge frozen corn silage in the auger. During that time the victim apparently reached to move a trouble-light hanging near the auger, and got caught in the moving auger knives, severing his arm and shoulder, and causing severe chest injury. *Source: Iowa FACE Report.*

PINCH POINTS

Pinch points exist when two objects move together, with at least one of them moving in a circle. They are common in power transmission devices, such as belt and chain drives, feed rolls, and gear drives. Fingers, hands, and feet can be caught directly in pinch points or they may be drawn into pinch points by loose clothing that becomes entangled.

Contact may be made by brushing against unshielded parts or by falling against them. Machine manufacturers will cover pinch points with guards and shields that are removable for maintenance purposes. Unfortunately, many workers take off these guards for maintenance, but do not replace the shield when finished.

Once someone is caught in a pinch point, machines generally move too fast for him or her to get out. Be aware of pinch point hazards and don't wear loose clothing that can become caught. Never reach over or work near rotating parts. Turn off machinery before performing maintenance and replace all missing shields.

September 30, 1996. A 61-year-old dairy farmer was killed when his head was caught in a cattle feeding machine. The incident occurred at the family farm in the cattle feeding pen. The victim was operating a center drive feeding machine, which directed corn from a nearby silo and transferred it to a conveyor belt that evenly distributed the feed into a 100-foot-long feeding trough. It is suspected that the farmer was trying to service the machine when his head was caught between the moving conveyor and a wooden support beam. *Source: New Jersey FACE Report.*

WRAP POINTS

Any exposed, rotating machine component is a potential wrap point. Protruding shaft ends can also become a wrap point. A cuff, sleeve, pant leg, or hair can catch on a rotating part and result in serious injury and death. Entanglement with a wrap point can pull a person into a machine or wrap their clothing so tightly the person is suffocated. Contact with a wrap point may cause the person to lose balance and fall into other parts of the machine.

Power take-offs (PTOs) and drive shafts are involved in the majority of serious wrap point injuries. Injuries occur when PTO guards and drive shaft shields become damaged or removed. To prevent wrap point injuries, wear tight-fitted clothing, put up hair, and look out for protruding bolts or U-joints that could snag clothing. Never attempt to reach over or climb under these rotating parts.

November 16, 1995. A 32-year-old male was killed when he was caught in a rotating PTO shaft. The farm worker was helping one of the owners of the farm load corn from the silage wagon into the feeding trough. The PTO connecting the tractor to the silage wagon was not covered by a safety guard. Recent heavy rains had made the area slick and muddy. The owner was nearby when he heard the victim yell. He found the victim wrapped around the rotating PTO. The farm worker suffered severe damage to the spinal cord, skull, and left leg. *Source: Kentucky FACE Report.*

CRUSH POINTS

Crush points exist when two or more objects move toward one another, or when one object moves toward a stationary object. Hitching tractors to implements may create a potential crush point. Failure to block equipment safely can result in a fatal crushing injury.

Crushing injuries commonly happen to fingers and hands at the hitching point. If you are hitching equipment on the ground, while the tractor operator is backing the tractor, make sure to communicate clearly. Never put yourself or any part of your body between the tractor drawbar and implements.

Never crawl underneath a machine or implement without first chocking and blocking equipment. Never rely solely upon the tractor's hydraulic system to keep raised equipment suspended.

March 16, 1999. A 71-year-old farmer was killed when a stock shredder he was working on fell and crushed him. He had raised it hydraulically and was working underneath it. The shredder was not blocked up and the hydraulic shutoff valves to the tractor (to which the shredder was attached) were not shut off. It appears the hydraulics on the tractor leaked at the connection which allowed the shredder to slowly fall on the victim. *Source: Nebraska FACE Report.*

FREE-WHEELING POINTS

The heavier a revolving part, the longer it will continue to rotate after power is shut off. Rotary mower blades, baler flywheels, and various other farm machinery components will continue to move after power stops. Workers must allow time for these wheels or blades to stop before approaching them. This may take as long as two minutes on some machinery.

June 26, 1995. A 56-year-old farm worker died after being struck by a flywheel of a hay baler. He was lying on his side under the baler, oiling a chain, while the baler was operating. A flywheel for the bale tosser cycled and struck the victim on the top of the head, instantly killing the farm worker. *Source: Wisconsin FACE Report.*

PULL-IN POINTS

Pull-in points usually occur when someone tries to remove or force in plant material or other objects that have become stuck in feed rolls or other machinery parts. Many pull-in injuries involve round balers.

The feed rollers on round balers occasionally clog when the hay is too wet, when the baler is pulled too fast, or when too much hay is being fed into the baler at one time. Rather than shutting down the baler by disengaging the PTO, some operators try to dislodge the clog by trying to pull the hay out by hand or by kicking the clog with the feet. Unfortunately, when jammed hay becomes dislodged, hands and feet are pulled in so fast that the worker cannot let go in time, and is pulled into the rollers.

June 17, 1998. A 17-year-old male died when he became trapped in a round baler that caught fire. The farm worker was alone, baling dried wheat straw for hay. Evidence suggests that the round hay baler became jammed, and the clutch temporarily shut down the power take-off device. The worker apparently climbed on top of the baler to clear the jammed wheat straw by using his feet. The jam cleared, and the clutch put the PTO back into motion. The baler rollers suddenly started moving and trapped the worker's leg inside the baler. The rollers and belts spinning around the hay started a fire. The worker died on the scene from smoke inhalation and burns. *Source: Oklahoma FACE Report.*

SPRINGS AND CHAINS

Springs are commonly used to lift equipment, to provide cushion and resistance on heavy machinery operating in rough terrain, and to keep belts tight on pulleys. Springs harbor potential energy that, when released, can be potentially dangerous to bystanders.

Spring injuries usually occur during machine maintenance. Be sure to read the operator's manual carefully before performing maintenance. Know what direction a spring will move when pressure is released, and know how other machine parts will be affected.

Chains are frequently used to secure two or more objects together, or to pull heavy objects such as tree stumps, machinery, and portable buildings.

When pulled tightly, the chain contains stored energy that is suddenly released when a link breaks, or if it becomes detached from either end.

Before using a chain, make sure it is sturdy enough to do the job. If you detect any deformation in the links, stop immediately and get a larger chain. Never allow anyone to be near the chain when it is under stress. Also, make sure to provide a protective barrier on either end in case the chain breaks and springs backward.

June 4, 1996. A 45-year-old farmer died from injuries he sustained when he was struck by a chain that was being used to pull a cultivator stuck in the mud. Attempting to free the cultivator, he hooked one end of the chain to the cultivator and hooked one end of a stretchable "snap strap" to the chain and the other end of the strap to the tractor. On one attempt to pull the cultivator free, the chain slipped from where it was hooked to the cultivator. The chain was propelled toward the tractor and the victim seated in the enclosed cab. It shattered the rear and front windows of the tractor cab, and struck the victim. He lost control of the tractor, hit a ditch, fell from the tractor, and was run over by the left dual wheels. *Source: Minnesota FACE Report.*

HYDRAULIC SYSTEMS

Hydraulic hoses and cylinders provide power to lift implements such as plows and loader arms, change the position of implement components such as combine headers and scraper blades, and operate hydraulic motors on tractor steering and brake systems. Hydraulic systems also harbor considerable energy that can cause serious injury and death.

Be careful when servicing, adjusting or replacing hydraulic parts. Refer to the operator's manual for instructions. Check hydraulic hoses, motors, and fittings regularly for leaks by using a piece of cardboard. High-pressure blasts of hydraulic fluid can injure eyes and break the skin.

Be sure to lower equipment before servicing hydraulic systems, so that equipment does not fall unexpectedly.

Treat hydraulic fluid as a flammable liquid.

March 22, 1995. A 34-year-old farm worker died from injuries sustained when a stalk chopper fell on him. The chopper was hooked to a farm tractor and parked in a farm yard. A removable hydraulic cylinder had been improperly installed in the chopper and was used to raise the front of the chopper. The victim crawled underneath the raised chopper to lubricate several bearings. A concrete block had been placed on the ground below each end of the chopper frame but not in contact with it. The chopper was not equipped with a mechanical transport link to securely lock it in a raised position. While the victim was underneath the chopper, a damaged hydraulic cylinder ruptured and the chopper fell on him.
Source: Minnesota FACE Report.

As these case studies show, you cannot be passive when it comes to agricultural machine safety. You must recognize the hazards as they exist, eliminate unsafe habits and risky behavior around machinery, and read and follow the machine operator's manual carefully.

Educational programs and information of Texas Cooperative Extension are available without regard to race, color, religion, sex, age, handicap or national origin.