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THE OHIO STATE UNIVERSITY EXTENSION

Extension FactSheet

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PTO Power

It was a cool October evening—a week before Halloween. A full, yellow, harvest moon hung on the horizon as Eric drove the tractor and corn-filled wagon into the barnyard from a nearby field. He was a senior in high school, looking forward to graduation and taking over the family farm. He felt tired and hungry from working all day, but he knew his father was counting on him. Besides, his father assured him he had only one more wagon to unload.

Eric aligned the wagon with the grain auger and jumped off the tractor. He started the tractor attached to the grain auger, engaged the power take-off or PTO, and opened the grain door on the wagon. Shelled corn poured into the auger, and Eric, in a daze, watched the grain flow.

Suddenly, he saw a problem—something had plugged the auger. Instinctively, Eric closed the door on the wagon and ran over to the tractor to disengage the PTO. Instead of taking the time to climb on the tractor, Eric reached for the PTO lever from the rear of the tractor. As he reached for the lever with his left hand, his torn right shirt sleeve became entangled in the power take-off shaft. Instantly, his arm became wrapped around the PTO and his body began to rotate with the shaft. He smashed against the ground and the tractor several times before his right arm was ripped completely from his body. Upon release the PTO slammed his body on the ground one final time.

Eric never finished that last load, nor did he finish his senior year of high school. His life was cut short when he made a tiny error with a very deadly farm equipment feature—the unshielded PTO.

Facts

Tractor power take-off shafts, or PTOs, are extremely powerful equipment features. PTO shafts transfer power from the tractor to various types of PTO-powered machinery including rotary mowers, feed grinders, balers, and grain bin augers.

In addition to providing power for many types of machinery, the PTO also creates a tremendous hazard. Power take-off drivelines are considered wrap points. Wrap points are just one of several hazard classifications found on farms. They are also one of the most deadly. Here's why.

Think about these facts for a moment. A PTO shaft can spin around 1,000 times every minute or 16 times every second. If you were to throw a 13-foot rope over a spinning PTO, the rope would wrap around the shaft in less than one second. Now instead of a rope, imagine that your shirt sleeve became entangled. One second is barely enough time for you to realize that you have been caught, let alone enough time for you to pull away. (Think about it—how many people do you know with 13-foot arms?)

PARENT ALERT

Roughly 40 percent of the injuries among farm workers ages 10-19 are associated with tractors or other farm machinery. Improperly shielded power take-off shafts on agricultural equipment are one of the primary causes of these serious and often fatal injuries. Teaching youth the hazards of PTOs, emphasizing the importance of dressing properly for the job, stressing the value in maintaining proper shielding, and encouraging the respect of all equipment are four concepts adult supervisors should enforce.

Rotating shafts are not to be taken for granted. A cuff, shirt sleeve, pant leg, or even a tiny thread can catch on a shaft and cause serious injury. Shoestrings and drawstrings on jackets and hooded sweat shirts can become entangled as well. Long hair is a hazard too, as several individuals have been scalped by PTO shafts.

When you become entangled in a wrap point any one of these scenarios can occur.

- Your clothes can be completely ripped off. You escape with a few minor injuries—burns, scrapes, sprains, and bruises. You are lucky!
- Your clothes can be completely ripped from your body, but the PTO catches your skin. You survive, but with severe bruises, lacerations, and possible amputations.
- Your clothing can be completely torn away, but part of your body wraps up in the shaft or wedges against the equipment. Two things can then happen. One, you can get lucky and escape with severe lacerations, broken bones, and the loss of limbs. Or two, the pressure from the shaft may be so intense that your body is crushed by the PTO, in which case you die of suffocation.
- This time you can be lucky enough to keep your clothes, but that's where your luck ends. Since your clothes are caught in the PTO, your body starts rotating with the shaft. With each rotation, your body is slammed against the ground and equipment. In a matter of seconds, the PTO shaft beats you to death!
- Your hair can become entangled, but you have no time to pull away. You are then either partially or completed scalped by the PTO.
- You carelessly bump into the PTO. You are not wrapped, but you are thrown off balance and fall into other moving machinery parts. Your injuries can be numerous and the outcome depends greatly on what equipment you fall into. You could be baled by a baler, ground by a mixer, or shredded by a rotary mower.

Shielding

Many of these accidents involving PTOs can be prevented with the installation and proper maintenance of shielding devices. Every component of the PTO should be shielded for maximum protection. For this reason, engineers have developed four different types of shields—master shields, stub shaft shields, shaft shields, and implement shields. Let's start with the power source—the tractor.

Master shields cover the tractor PTO stub shaft. This is the part of the tractor where you would attach the PTO driveline. Master shields cover the top and sides of the PTO stub. This shield protects operators from dangerous rotating connections.

Stub shaft shields cap exposed PTO stub shafts when not in use. It is recommended to guard stub shafts when an implement is not attached to the tractor.

Shaft shields are those guards used to cover PTO drivelines. Plastic or metal tubular shaft shields are recommended since they completely enclose the shaft. Older equipment is commonly equipped with U-shaped shields; however, they only protect individuals from the sides and top of the shaft. If possible, these shields should be replaced by tubular shaft shields.

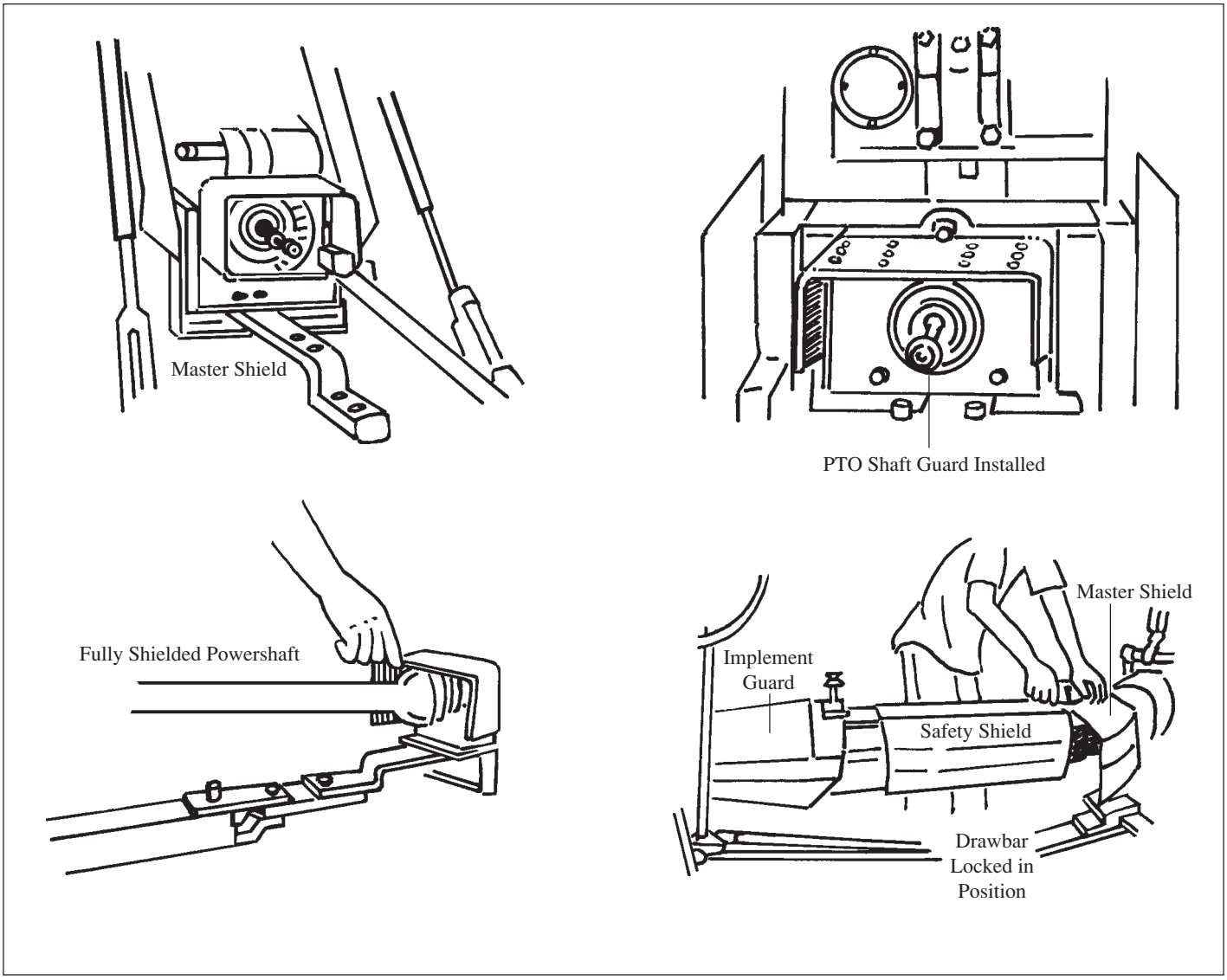
Implement shields are very similar in appearance to master shields. They are attached to the implement and enclose the area connecting the PTO shaft to the implement.

Damaged guards can be as hazardous as no guards. If guards are bent or nicked they can prevent the shield from rotating properly on the PTO shaft. Bent or damaged guards should be replaced immediately.

Prevention

Accidents never "just happen." People get careless, take short cuts, or try to do things too quickly. Fortunately, many accidents can be prevented by using a little common sense and following these safety strategies.

- Never remove PTO shields. Although the presence of master shields can make attaching implements more difficult, master shields should be left in place. If the removal of a guard is absolutely necessary for maintenance or repair, replace the guard immediately when finished.
- Shield all PTOs completely by installing shaft shields, master shields, and implement shields. Replace U-shaped shields on older equipment with tubular shields for maximum protection.
- Always replace bent or damaged guards.



- Install PTO warning labels on equipment.
- Disengage the PTO and shut down the tractor engine when dismounting.
- Never attempt to engage or disengage a PTO shaft from the rear of the tractor. Only attempt this from the tractor seat.
- Do not perform maintenance on any equipment until the engine is shut off and the PTO and other machinery parts have completely stopped moving.
- Never wear baggy shirts, shirts with extra long sleeves, or oversized pants. As an added precaution, always tuck in shirts.
- Always remove drawstrings from jackets, hooded sweat shirts, and pants before wearing them while operating farm machinery.
- Avoid wearing frayed clothing when operating farm equipment.
- Never wear jewelry when operating farm equipment.
- Tie and secure long hair, but be aware that even short hair or hair that has been tied back can become entangled.
- Read the safety section of the operator's manual of all equipment.
- Be extra careful when operating stationary PTO-powered equipment. This includes equipment that requires the operator to be out of the tractor seat when the equipment is in operation. Examples include grain augers and feed grinders/mixers.
- Never step over, lean across, or crawl under an engaged PTO shaft.
- Never stand upon master shields or implement shields. Shoestrings can become entangled at these universal joints.

Things to do: SAFETY CHECK

Perform a safety inspection on the equipment you use on the farm. Check for damaged or missing guards. Use the following chart to help you keep track of your findings.

Type of Equipment	*Master Shield*	*Stub Shield*	*Shaft Shield*	*Implement Shield*	*Action to be Taken*
Loading tractor	Damaged	Missing	Not applicable	Not applicable	Alert owner/ operator
Rotary mower	Not applicable	Not applicable	Cracked on end	Good condition	Replace plastic implement shield

Reviewed by:

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Sources:

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4) *NIOSH ALERT—Request for Assistance in Preventing Scalping and Other Severe Injuries from Farm Machinery*. DHHS (NIOSH) Publication No. 94-105. June 1994. U.S. Department of Health and Human Services.

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