

MICHIGAN STATE UNIVERSITY EXTENSION

Shield Yourself From PTO Dangers¹

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One of the most hazardous areas on your tractor is the power takeoff shaft. Without proper guards, shields, and constant operator awareness of the risks involved with operating PTO-driven equipment, this spinning shaft can quickly grab and entangle an unsuspecting farmer or family member. Too often entanglement results in a severe injury or death. Records show that eight Michigan farmers were killed in PTO related accidents from 1985 to 1991.

There are two common types of accidents resulting from PTO shafts, entanglements and being struck by the shaft after it has separated during operation.

Getting caught by the shaft (entanglement) is the most common type of PTO accident, and generally causes the most severe injuries and deaths. Injuries resulting from shafts separating during operation frequently result from the shaft striking someone working or standing in the immediate area. Both of these types of accidents can be avoided if the operator properly maintains the equipment and limits access the PTO area when the equipment is running.

SHIELDS

Equipment manufacturers have made strides in reducing the risks of PTO mishaps, but it is up to the operator to make sure that all guards and shields are properly maintained. Removing a shield or guard increases operator risk.

SHIELDING THE TRACTOR

Master Shield

The first shield in the PTO driveline is the master shield on the rear of the tractor (Fig 1). This shield prevents the operator from accidentally coming into contact with the tractor stub shaft and the front universal joint of the equipment's driveline. Operators should make it a practice to replace the tractor PTO shaft guard, which completely covers the tractor stub shaft, when the PTO is not in use.

SHIELDING PTO-OPERATED EQUIPMENT

Fully Shielded Driveline

Most PTO-driven implements produced since the early 1970s were equipped with a fully shielded PTO driveline to protect the operator from accidental entanglement. This type of driveline shielding encases the shaft in a plastic or metal casing supported by bearings at each end of the shaft. The bearings allow the shield to stop spinning if someone or something comes into contact with the driveline, while the shaft inside continues to spin.

The ends of the driveline shield are bell-shaped to cover the universal joints of the shaft. Because universal joints are irregularly shaped and prone to grab objects, operators should never modify the bell-shaped shield to make maintenance, greasing parts or connecting the shaft easier.

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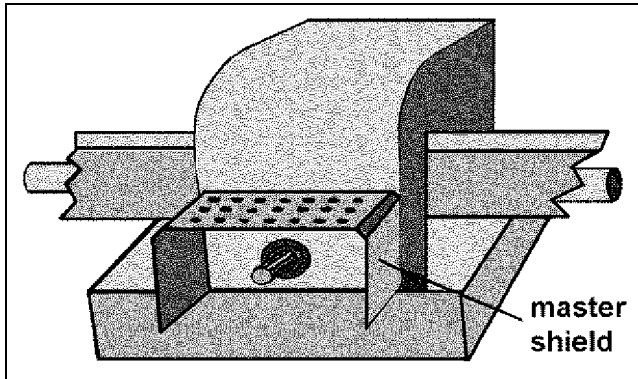


Figure 1.

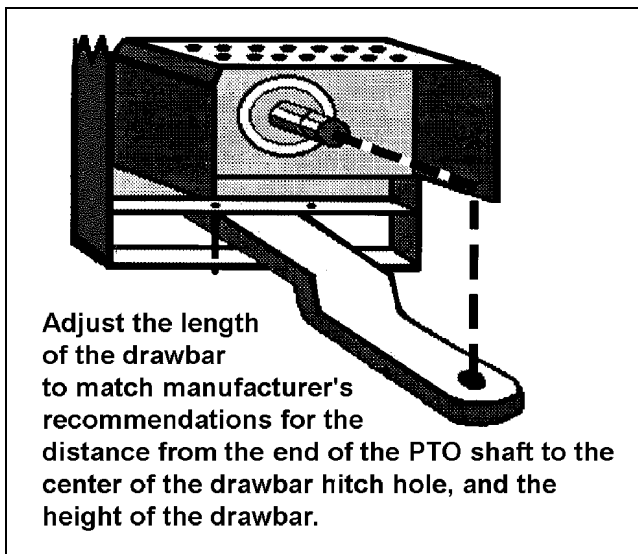


Figure 2.

Guards

Manufacturer installed guards must be replaced when removed for maintenance. These guards are designed to protect the operator and equipment. Guards not only reduce the risk of an injury, they also keep dust and other foreign objects from damaging gears and other moving parts.

Maintenance

Like any moving part, the driveline shield must be maintained to ensure proper operation. PTO equipment is frequently operated in inclement weather and exposed to dust, chaff and other foreign materials which can quickly damage the bearings that allow the shaft to spin freely inside the shield. Rust, dirt and crop debris must be cleaned frequently to allow the bearings to spin freely. Replace any damaged or worn shields with the manufacturer's recommended parts. Storing equipment

inside will also help extend the lifetime of the equipment and reduce maintenance costs.

Positioning the Drawbar to the PTO shaft

The length and height of a tractor's drawbar may need to be adjusted to match the implement manufacturer's specifications. It is important to make these adjustments to ensure that the PTO driveline does not compress or separate during operation. To make this adjustment, check the implement manufacturer's recommendations and adjust the height of the drawbar and the distance from the PTO stub shaft to the center of the drawbar hitch hole (see Figure 2).

Failure to match the drawbar to the implement can result in the driveline being compressed or separated when the tractor makes a sharp turn or comes to the top or bottom of a hill. Separation or compression frequently damages the protective shield to the point where it no longer slides together or allows the shaft to spin freely inside the shield.

Farmers in a hurry to complete planting or harvesting operations may be tempted to simply remove a damaged shield so they can continue working. This places the operator or anyone near the equipment at an unnecessary risk. Take time to make the necessary adjustments to the tractor drawbar before using the equipment or be prepared to stop and replace any damaged shields.

Shear Pins and Bolts

Most PTO-driven equipment has some form of a shear pin to prevent damage to the shaft or gearbox. Always follow the manufacturer's recommendations for size and hardness when replacing a damaged shear pin or bolt. Using a pin or bolt that is longer than necessary creates a potential catch point that may snag the operator's boot lace or clothing, resulting in a possible entanglement (Figure 3).

KEYS TO PTO SAFETY

1. *Always disengage the PTO, shut off the engine and remove the key before getting off the tractor.* This protects you from accidental entanglement while servicing the equipment and ensures that no one else can start the tractor during maintenance procedures.
2. *Keep the master shield in place at all times.* The master shield should be removed only when required for hooking up special equipment with equivalent

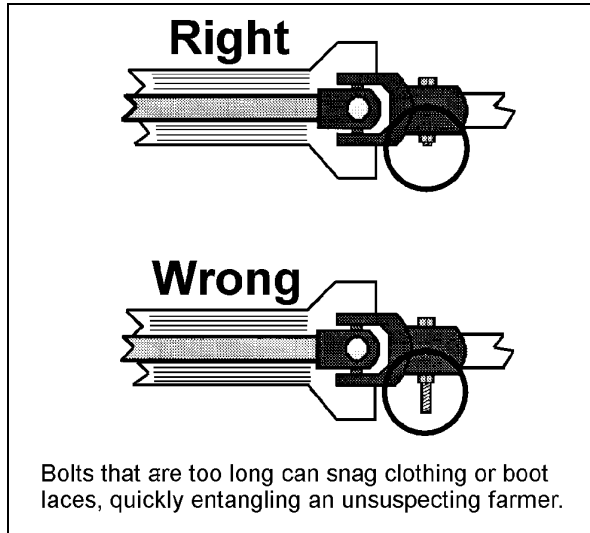


Figure 3.

shielding. Replace the PTO tractor stub shaft guard whenever PTO driven equipment is not being used.

3. *Check that the PTO driveline shields are in good condition.* With the PTO stopped, the shield should rotate freely by hand. Make any necessary repairs to damaged bearings or shields (See Figure 4).

4. *Never modify driveline shields to make servicing or connections easier.* Cutting or drilling a hole in the shield allows dirt, chaff or other foreign materials access to shaft bearings. This reduces the life of the shield and also increases the risk of the operator getting clothing caught in the spinning shaft.
5. *Never step across a rotating PTO driveline.* Always take the time to walk around a rotating shaft. Although the shaft may be enclosed in safety shields and guards, there is a chance that clothing could be caught in the spinning shafts.
6. *Wear snug fitting clothing.* Bulky, loose fitting clothing can quickly be caught in a spinning shaft, entangling an unsuspecting operator. Boots or shoes without laces are preferred because laces may become entangled in the shaft. A study of reaction time shows that a shoe lace would have to be 30-foot long for the farmer to have time to react to a lace entangled in a PTO shaft spinning at 500 RPMs. Nylon jackets can flap in the wind and catch on a PTO shaft; likewise, hooded sweat shirts with drawstrings can catch on moving equipment, entangling the operator.

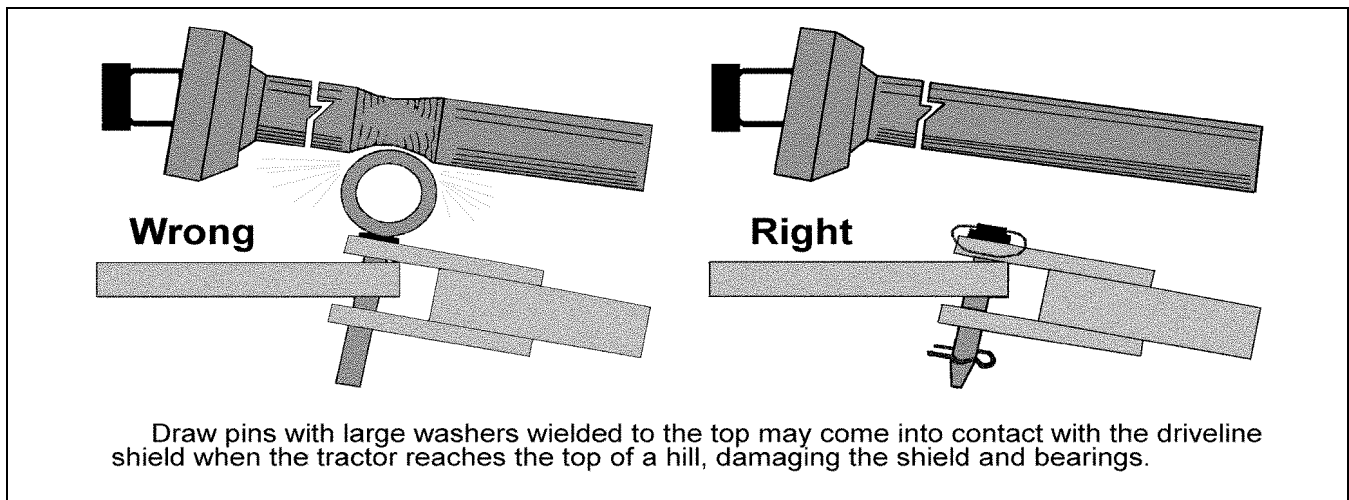


Figure 4.

CHECKLIST FOR SAFE PTO OPERATION

Figure 5 is a checklist for safe PTO operation.

Figure 5.

	Yes	No
Is the tractor master shield in place?	—	—
Is the drawbar height and length set to the implement manufacturer's specifications?	—	—
Does the driveline shield float freely (with the engine off) by hand?	—	—
Is the driveline shield free of dents and other damage?	—	—
Are all guards and shields in place?	—	—
Are shear bolts/pins of proper length and hardness?	—	—
Are you wearing snug fitting clothing with no hanging drawstrings or frayed cuffs?	—	—
Are you wearing slip-on boots instead of shoes or boots with dangling shoe laces?	—	—
Will you take the time to walk around the tractor instead of stepping over the spinning PTO shaft?	—	—
Did you answer "Yes" to all of these questions? If not, take time to repair the equipment or make changes in your operating practices to protect yourself from a PTO shaft entanglement.	—	—