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Power Take-Off Accident Victim Rescue[1]

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The power take-off (PTO) was developed in the late 1920s to transfer power from the tractor to trailing or other equipment (see Figure 1). The drives from the early power takeoffs were poorly shielded, and in many cases were not shielded at all. Within a short period some manufacturers added a protective device call the inverted "U" shield. These shields frequently got in the way of farmers and ranchers who operated the tractors and equipment. They bent or broke easily, and often were removed. Thus, the shields frequently were seen hanging from a shop rafter or laying in a junk pile. Years later, the totally-shielded shaft came into production. This new shield was less likely to be removed from the power take-off drives, and provided greater protection for tractor and implement operators. However, even with this improved shield, there continues to be a large number of unshielded drives-a hazardous situation likely to be with us for years to come.

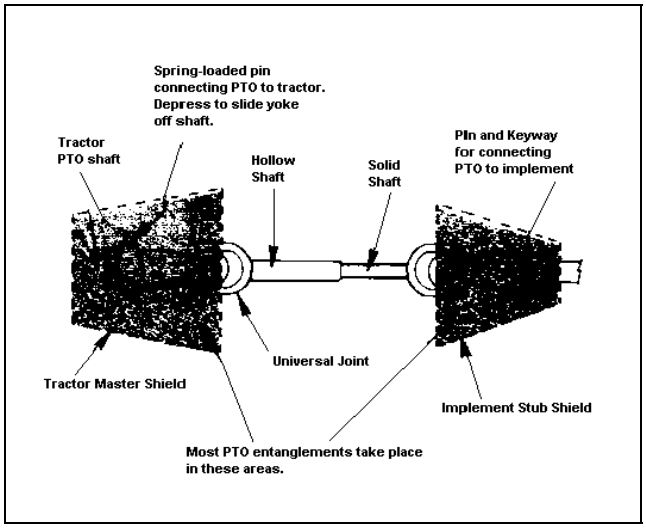

Figure 1.

Power take-off shafts generally vary with the size of the tractor. Those on larger tractors usually turn at 1,000 revolutions per minute (RPM), and those on smaller units run at 540 RPM. This means that a person caught in a PTO drive unit that turns at 540 revolutions per minute, conceivably could be whipped around the shaft nine times per second. If the power take-off drive unit turns at 1,000 RPM, a person caught in it could turn at a speed of 16 2/3 times per second. If the weight of the person caught in a PTO shaft did not cause a slow operating tractor engine to stall, the accident could be totally devastating. The power take-off shafts on most irrigation pump drive line systems turn at even higher rates than the 1,000-revolution PTO shaft on tractors.

Power take-off accidents still are fairly common. Open power-drive lines on augers, elevators and posthole diggers cause a major share of PTO accidents. Some operators remove the master shield on the power takeoff drive from the tractor. This easily could lead to a major accident. Power take-off accident injuries are similar to those of the past, even with newer equipment. The numbers of PTO accidents is partially a result of inexperienced operators who fail to observe many of the standards required for safe operation. PTO accidents probably will continue for years, because of the unshielded shafts on older equipment still found on many farmsteads and careless or untrained operators. It will take considerable time and effective educational

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programs to change all this equipment and the realization of the importance of safe procedures among operators. Both open drive lines or partially covered drive lines that use the "U" shaped shield should be replaced by totally-shielded shafts.

Typical injuries resulting from getting caught in an open power take-off shaft are amputations, severe lacerations, multiple fractures, spine and neck injuries or complete body destruction. Broken arms, broken legs and severe facial lacerations are common. Spine and neck injuries are common if a person is rotated around the shaft. All it may take for a person to become entangled in an open power take-off shaft is one single thread, string from a hooded parka or strand of loose hair. As these begin to wrap extremely fast around the power take-off shaft they pull the victim directly into the PTO unit.

Rescue procedures to remove a victim from the power take-off shaft should start by shutting off the tractor and making sure it will not re-start. Next, chock the tractor wheels so that the tractor cannot move. The critical time to remove a victim from the equipment may vary from only a few minutes to several hours. There are several methods that can be used to remove a victim from a PTO shaft:

1. Disconnect the PTO shaft from the rest of the tractor, and turn the shaft counterclockwise to unwrap the tightly wrapped cloth and tissue that may be around the shaft. This material will not slip off the shaft after the PTO shaft is disconnected, but must be unwrapped.

2. Place the power take-off drive unit in neutral and turn the PTO shaft counterclockwise to unwrap the person from the shaft. This may require using a large pipe wrench or putting a small shaft or bar into the yoke of the power take-off unit and turning with considerable pressure.

3. You may be able to disconnect the hitch pin that attaches the trailing equipment to the tractor and move the tractor forward to pull the PTO shaft apart. After the PTO shaft separates into two parts, you will have to turn the shaft counterclockwise to remove the victim. If the shaft is solid, the rescuers may have to cut it with a cutting device such as a portable power grinder, hacksaw or oxyacetylene torch.

If there are combustible materials in the area, rescuers should be extremely careful when using any type of flame-producing equipment, or even portable grinders that produce sparks. If such equipment must be used, adequate fire equipment must be readily available in case a fire starts. If explosive products such as gasoline may be have been spilled in the area, open flame must be ruled out. In this case, rescuers and observers should be alert and not smoke in the area.

While the victim is being removed from the power take-off shaft, other rescuers must provide life support to the victim and monitor his vital signs continuously Extrication is only the first step of saving the victim’s life. If an arm, foot, leg or other part of the body was amputated, it should be located and handled properly for possible reattachment. If possible, rinse the tissue in a saline solution, wrap the part in a clean, moistened towel and place it in a plastic bag. It should be transported with the victim, placed in a container so the part is not in direct contact with ice used to lower its temperature. Amputated tissue often can be reattached to the victim if it is properly cared for and is promptly available.