Orchard Safety: Farm Hazards and Risk Assessment

Most farm fatalities are associated with transportation incidents. These include overturns, runovers, power take-off (PTO) systems, and unintended contact with tractor attachments and/or implements.

In 2016, the Bureau of Labor Statistics documented 417 farmers or farm workers were fatality injured while working. Major hazards that increased the risk of a workplace fatality associated with tractor operation included:

1. Overturns
2. Runovers
3. Entanglements
4. Roadway collisions with other vehicles or objects

Overturns

Tractor overturns are the leading cause of fatal injuries on U.S. farms. Approximately one in ten operators overturn a tractor in his or her lifetime. Most of tractor fatalities come from tractors turning over either sideways or rearward. These incidents are preventable when safe procedures are followed during tractor operation.

Safe operating techniques reduce the risk of overturns. Some common examples of safe tractor procedures include:

- Maintaining a safe distance from the edges of an embankment or ditch. A rule of thumb is to keep a distance equivalent to the depth of the embankment or ditch. For example, if the ditch is 6 feet deep you must keep the tractor at least 6 feet from the edge of the ditch.
- Using slow speeds and low gears when operating on rough roads and lanes. Tractors lack the suspension of most automobiles and operators can lose control quickly by running or bouncing off the road or lane.
- Always hitching properly. Use the correct hitch pin and connection for the implement. Hitching to a location on the tractor other than the drawbar when pulling or towing objects may result in the tractor rearing backwards onto the operator.
- Not operating a tractor on unsafe slopes. Driving a tractor straight up a slope that is too steep will result in a tractor overturn.
- Keeping loader buckets such as front-end loaders as low as possible when moving materials. A front-end loader raised high raises the center of gravity of the tractor making it less stable and more likely to turn over.

A rollover protective structure (ROPS) with a seatbelt is a structural steel cage designed to provide a zone of protection around the operator. Many ROPS are integrated into an enclosed cab. These devices when used during operations can protect the operator from being killed when a tractor...

Tractor safety training during a commercial tree fruit school in Biglerville, PA. Photo: Tara Baugher

Tractor overturns can occur with high-speed sharp turns. Avoid sudden sharp movements in all tractor operations. Photo: Maria Gorgo
overturns.

If the tractor is equipped with a ROPS, the seatbelt must be fastened to keep the operator in the zone of protection. Remember, though, that a ROPS can protect you from injury but cannot keep the tractor from overturning in the first place. This explains the importance of operating a tractor safely even if the tractor has a ROPS.

Runovers

Typically, a tractor runover is associated with one of three unsafe practices. The first practice is when a passenger (extra rider) falls from the tractor because the operator will not have enough time to react before the tractor or implement crushes the victim. It is important to never allow extra riders. Remember one seat for one operator. There is only one safe place for a person to be on a tractor, and that is in the operator's seat. Some new, larger tractors have an extra seat for temporary instructional purposes. This seat should never be used to allow extra riders during operations.

Trying to start an older tractor from the ground while the tractor is in gear can also result in a fatal runover. Additionally, small children and pets are sometimes run over by a tractor as it is moved around the farmstead. Often, the tractor operator is unaware that the child or the pet is near the tractor, so it is important to be aware of the surroundings. Using a safe play area and keeping children out of the worksite is the best way to prevent children from being runover. The use of mirrors and backup cameras can also help operators reduce blind spots while operating equipment.

Entanglements

The power generated by a tractor engine is often transferred to attached equipment through a power take-off (PTO) shaft. These output shafts will rotate between 540 and 1,000 revolutions per minute. This is much faster than a human can safely react. If a piece of clothing comes into contact with the shaft, the person will be unable to react before being pulled into or around the PTO shaft. If equipped with a PTO shaft, tractors should have a PTO master shield as well as other guards to protect the tractor operator and helpers. Always shut down the equipment before making adjustments or unplugging clogs.

The second common cause of a tractor runover is being knocked from the seat by an object. The tractor operator may fall off the tractor as it is operating as a result of encountering a low-hanging tree branch or other object. Older tractors that do not have a ROPS or tractors with older seats may not have arm or back rests, which can cause a person to lose his or her balance and be knocked off or bounced out of the seat. A tractor equipped with a ROPS and safe seat with a seatbelt can significantly reduce the risk of an injury or fatality.

The third type of runover incident involves a person who is on the ground near a tractor. An example is when operators try to mount or dismount a moving tractor. This may happen during the hitching and unhitching of equipment. Before dismounting always place the tractor in park (follow procedures outlined in the tractor operators' manual) as well as set the parking brake. If the tractor will be unattended always shut off the engine and remove the key.
**Road Collisions**

During planting and harvesting operations, tractors and farm machinery are moved on public roads to reach fields, complete jobs or get repaired. Pennsylvania had 666 vehicles and 780 people involved in incidents from 2010 to 2013. Twenty percent of these incidents occurred when it was dark or during dusk/dawn, and typically in rural areas. In 88% of incidents the driver’s actions were the prime factors leading to the crashes. Careful lighting and marking of agricultural equipment could significantly reduce risk, along with other road safety procedures. For full details on lighting and marking requirements in Pennsylvania, review the Rx for SMV Highway Safety article by Penn State Ag Safety and Health.

The modern farm tractor is equipped with many safety features, but caution is a necessity when operating on public roads. Older tractors are often less safe to operate because they do not have modern safety features and because some parts of the older tractor may not have been maintained in good working condition.

A list of reasons why older tractors may be less safe to operate includes:

- Lack of ROPS and seat belt
- A seat without arm and back rests (pan seat)
- Seat does not adjust easily or at all
- Rear brakes and brake pedals do not operate properly
- Front wheels do not turn as quickly as the steering wheel turns
- Tractor may not have flashers, or the flashers are no longer working

In addition to properly lighting and marking equipment, be sure to equip your tractor and machinery with a Slow-Moving Vehicle (SMV) emblem on the rear. An SMV placard is an orange reflective triangle that lets drivers know the machine is travelling less than 25 mph. Its distinct triangle shape lets other drivers know that the implement is moving slower. The SMV should be placed on the rear of the machine between 2 to 10 feet off the ground, in the center or as near left center as possible and should not be obstructed by any parts of the implement.

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For information on obtaining a manual to use on your farm for hands-on tractor safety training, see A Guide for Safe Tractor Operation.

**References**