MECHANICAL HAZARDS

HOSTA Task Sheet 3.1 Core

NATIONAL SAFE TRACTOR AND MACHINERY OPERATON PROGRAM

Introduction

There are many hazards in agriculture associated with mechanical equipment. Knowing every hazard of every machine is very difficult. For this reason, agricultural safety and health professionals group them in ways that help the operator recognize the different types of hazards regardless of the machine.

Your ability to recognize these hazardous components is the first step in being safe.

This task sheet identifies groups of hazards, what the danger is, where the hazards may be found, and gives instruction for avoiding them.

Pinch, Wrap and Shear Points

A ***pinch point*** hazard is formed when two machine parts move together and at least one of the parts moves in a circle (Figure 3.1.a). These types of hazards are often found in power transmission systems such as belt drives, chain drives and gear drives. *Avoid pinch points by keeping machine guards in place.*

Any type of rotating machine component can be considered a ***wrap point.*** The rotating components are often shafts such as the PTO. Individuals can be caught in a wrap point by their loose clothing or long hair. *Guards can protect the operator from wrap points. Attention to dress and care of long hair is important as well.*

A ***shear point*** occurs when the edges of two machine parts move across or close enough to each other to cut a relatively soft material. One of the two objects can be stationary or moving while the second is moving. Hedge trimmers are a good example of a shear point.

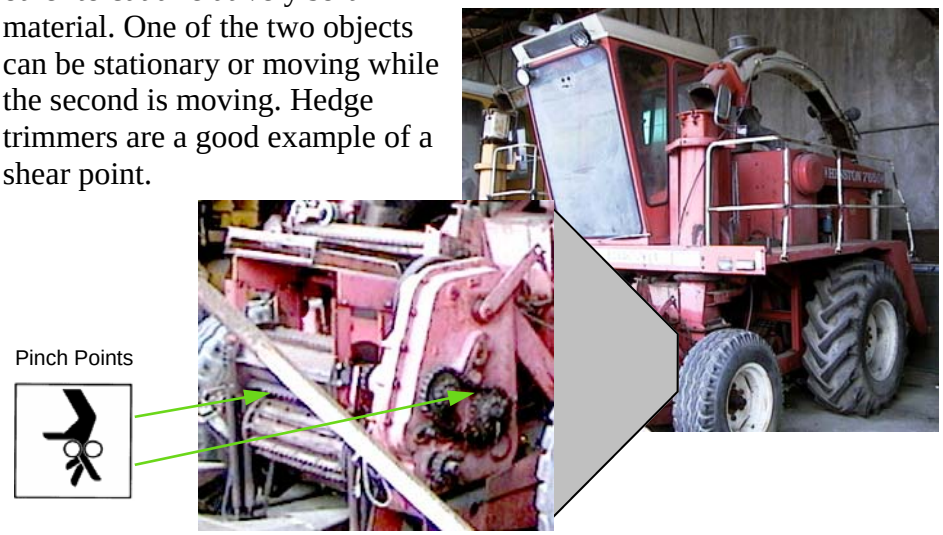

Figure 3.1.a. Pinch points can be found on most machines.

Shielding the worker from the shear point is difficult on many agricultural machines. *The best precaution to take for preventing injury is to shut off the machine before making repairs or adjustments.*

Learning Goals

- To identify the mechanical hazards associated with agricultural machinery
- To avoid mechanical hazards

Related Task Sheets:

Reaction Time	2.3
Hazard Warning Signs	2.8
Making PTO Connections	5.4
Using Power Take-Off (PTO) Implements	5.4.1

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PTO Stub

- Transfers power from the tractor to the machine
- Rotates at 540 rpm (9 times/sec.) or at 1,000 rpm (16.6 times/sec.)
- Some tractors have a stub shaft guard that screws onto the PTO stub.

Master Shield

- Protects the operator from the PTO stub
- Is often damaged or removed and never replaced.

Figure 3.1.b. A PTO stub and a master shield on a tractor. A PTO is a wrap point hazard that causes countless injuries and deaths each year.

Awareness is the best protection from hazards that cannot be eliminated or shielded.

Crush, Pull-in and Burn Points

Crush points are formed when two objects are moving toward each other, or when one object is moving toward a stationary object, and the gap between the two is decreasing. The most common example of a crush point is formed when an implement is attached to a tractor's drawbar. Most often the tractor is moving toward a stationary implement, and the gap between the tractor's drawbar and the implements hitch is decreasing. *Do not permit another person to stand between the tractor and implement while hitching.*

Pull-in points occur most often where crops are fed into harvesting machinery. Rotating parts that come in close contact with each other, such as feed chambers on square balers. *To avoid being pulled into a machine, shut down the engine and the PTO before making repairs or adjustments.*

Hot mufflers, engine blocks, pipes, and fluids (fuel, oils, chemicals) are all examples of possible ***burn points*** on tractors, self-propelled machinery, and pulled machinery. Machine inspection, servicing, and maintenance are the most common types of activities that may result in exposure to a burn point hazard. *To avoid being burned, do not touch the engine or machine parts you are inspecting. Place your hand near the surface of the part to determine if heating has occurred.*

Figure 3.1.c. Pull-in points are found on harvesting machinery.

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Freewheeling Parts

When parts of a machine continue to move after the power to the machine has been turned off, they are called *freewheeling parts.* These hazards exist because many machines require a large amount of rotational force to keep them running smoothly under irregular loading. Bringing this rotational force to a sudden stop is almost impossible. A baler is an example of the freewheeling hazard.
To avoid injury from freewheeling parts, stop the tractor engine, disengage the PTO, and wait for the machine to stop completely before making repairs or adjustments.

Figure 3.1.d. The flywheel on a small square baler is an example of a freewheeling part. The flywheel keeps the baler running smoothly if a large amount of hay is suddenly taken into the bale chamber. Notice that part of the PTO driveline is unguarded.

Figure 3.1.e. Mowers are a frequent source of thrown objects.

Thrown Objects

Thrown object hazards occur as normal machine operations discharge materials into the surrounding environment. These hazards are formed by rotating fan or knife blades that are used to cut, grind or chop materials. The blades can throw small or large objects, such as glass, metal, rocks, sticks or other vegetation. A common example of a thrown object hazard is the material that it discharged from a rotary mower.
To avoid injury from thrown objects, be sure the machine is at a complete stop before nearing the discharge area. Keep the work area clear of bystanders. Wear eye protection when working with this type of hazard.

The ability to identify hazards is the first step in avoiding them.

Stored Energy

Stored energy hazards occur when energy that is confined is released unexpectedly. This hazard is present in pressurized systems and their components. Example include springs, hydraulic, pneumatic, and electrical systems.
Avoid the hazard of stored energy by knowing which parts which may be spring loaded. Relieve hydraulic system pressure when the job is completed. Ask for a demonstration of where you might encounter this potential hazard.

Figure 3.1.f. Hydraulic systems often have stored energy.

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Safety Activities

1. Draw a line from the Mechanical Hazard to the correct definition.

Pinch Point ·	• Hot mufflers, engine blocks, pipes, and fluids (fuel, oils, chemicals) are all examples of this type of hazard on tractors, self-propelled machinery, and pulled machinery.
Freewheeling Part ·	• A hazard formed when two machine parts move together and at least one of the parts moves in a circle.
Pull-in Point ·	• This type of hazard occurs when machine parts continue to move after the power to the machine is turned off.
Shear Point ·	• Any type of rotating machine component can be considered this type of hazard.
Crush Point ·	• These types of hazards occur when a machine discharges materials into its surrounding environment.
Stored Energy ·	• A hazard formed when the edges of two objects move across or close enough to each other to cut a relatively soft material.
Burn Point ·	• These hazards are caused by energy that is confined and then released.
Wrap Point ·	• A hazard formed when two objects are moving toward each other or when one object is moving toward a stationary object, and the gap between the two is decreasing.
Thrown Objects ·	• Rotating parts that come in close contact with each other, such as feed rolls, often form these points. They can also be formed by moving components, such as feed chambers on square balers.

2. Find an old and a new machine on your farm or at a local dealership, and identify as many mechanical hazards as you can. Compare the two machines.

References

1. Farm and Ranch Safety Management, John Deere Publishing, 1994.
2. ASAE Standards, 45th Ed. 1998. ANSI/ASAE S318 Safety for agricultural equipment. St. Joseph, MI: ASAE.
3. Murphy, D.J. 1992. *Safety and Health for Production Agriculture.* St. Joseph, MI: ASAE.

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Credits

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