



PREVENTATIVE MAINTENANCE AND PRE-OPERATION CHECKS

HOSTA Task Sheet 4.6

Core

NATIONAL SAFE TRACTOR AND MACHINERY OPERATION PROGRAM

Introduction

John is a part-time farmer. Two years ago he purchased a small utility tractor with backhoe and scraper blade for \$12,000. He wanted to push snow, clean the barn, and do odd jobs on his property. While driving his tractor down the road, the engine overheated, began to make noise, lost power, and shut down. A neighbor stopped by and John asked, "What could be the problem?" He was already pouring water in the radiator. "Could it be the hydrostatic transmission?" he asked as he checked that dipstick.

The neighbor suggested the engine oil, but John didn't know where to find that dipstick, which turned out to be hidden by the high-lift arms. The dipstick registered no oil at all.

Performing tractor maintenance is a critical task for every tractor operator. This task sheet discusses the proper way to maintain a tractor to avoid costly and unnecessary repairs.

Pre-Operation Checks

A good operator uses a daily checklist of items and systems to inspect before starting the tractor. This is often called a pre-operation checklist. Many drivers write down what needs to be inspected and then check off the list as they examine each item.

Things to check include:

- Fuel level
- Coolant level
- Engine oil level
- Hydraulic oil level
- Battery condition
- Lug nuts and wheels
- Tire condition
- Loose or defective parts
- SMV emblem
- Fluid leaks
- Operators platform/steps
- Seat/Adjustment
- Seat belt
- Fire extinguisher
- Lighting/Flashers
- Visibility from operator's seat

Some Practical Hints

Here are several things to look for as you perform a pre-operation check:

- Low tires and leakage from the valve stem
- Oil or hydraulic leaks on the ground beneath the tractor
- A frayed or worn fan belt
- Corroded battery terminals
- Loose bolts or lug nuts on wheels
- Dirty cab windows that obstruct your vision
- Headlights or warning lights

with broken bulbs or glass

- An SMV emblem that is faded or distorted in either color or shape
- A fire extinguisher with a pressure gauge in the "recharge" range
- Several tools or supplies on the operator platform

If you were to buy a new, expensive tractor, what would you want your friends to check before they started the engine?

Learning Goals

- To conduct pre-operation checks on a daily basis to reduce repair costs and downtime

Related Task Sheets:

Fuel, Oil, Coolant Levels	4.6.1
Lead Acid Batteries	4.6.2
Tire and Wheel Condition	4.6.5
The Operator Platform	4.6.6

Don't start the engine until you have completed the "walk-around" inspection and are sure all systems are ready to work for you.

Safe Starts

Some newer utility or lawn tractors may have safety start systems. If so, the owner should also have in good working order one or both of the following items:

Seat Switch/Safety Interlock that prevents starting the tractor if the operator is not in the seat

Neutral-Start Safety Switch that prevents the tractor from starting if the tractor is in gear

A good operator takes responsibility for the tractor he or she operates.

Safety Activities

1. Make a chart of maintenance items to be done on your tractor. Use the following format, or develop your own chart. If you have a computer, make a spreadsheet or database project to help with maintenance records.

Tractor Maintenance Log

<u>Date</u>	<u>Item Checked</u>	<u>Problem Found</u>	<u>Corrective Action</u>
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2. Help someone change the oil and oil filter on a tractor.
3. Help someone change an air filter on a tractor.
4. Call a tractor dealer/service center, and ask for any maintenance charts or record forms that they can send to you.
5. Memorize the "pre-op" checklist, and recite this list as you conduct a pre-operation inspection for your class or an interested adult.
6. Math Problem: You forgot to check the engine oil in the tractor before starting. When the oil light came on, you continued working. Now the engine must be rebuilt to the amount of \$5000. This is the only tractor that can pull the forage harvester and chop 40 acres per day for the next 5 days. An estimated nutrient loss value of \$10 per acre will occur due to the delay in harvest. Calculate the dollar loss to the producer.

References

1. Farm and Ranch Safety Management, John Deere Publishing, 1994.
2. Safe Operation of Agricultural Equipment, Student Manual, 1988, Silletto and Hull, Hobart Publications.
3. Owners' Manuals for specific tractors.

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FUEL, OIL, AND COOLANT LEVELS

HOSTA Task Sheet 4.6.1

NATIONAL SAFE TRACTOR AND MACHINERY OPERATION PROGRAM

Introduction

A tractor is a huge investment to make farm work more efficient. Even a mid-size tractor may cost \$40,000 or more.

The tractor must be kept in top operating condition. Downtime for engine and tractor repairs are costly. An engine rebuild may cost over \$5000 in parts and labor. A crop in the field may be lost because of harvest delays. Crop losses can lead to increased costs to purchase replacement feeds or protein supplements.

Therefore, tractor and equipment pre-operation checks are an economic necessity. A damaged engine or an empty fuel tank at the farthest field from the barn is no excuse for the skilled operator.

This task sheet discusses the importance of checking the fluid levels of the

- fuel
- coolant, and
- oils

before you touch the tractor ignition switch. Developing this habit will help you to understand that the tractor engine is ready for field work.



Figure 4.6.1.a. Before driving the tractor to the field, check for the possibility of an empty fuel tank. If you run out of fuel during a workday, you are causing downtime losses.

What to Do



Fig. 4.6.1.b. Check the fuel level.



Fig. 4.6.1.c. Check the oil level.



Fig. 4.6.1.d. Check the coolant level with the engine cold.

Learning Goals

- To understand how to check fuel levels of common engines (alternative fuels excluded here)
- To safely check coolant levels of liquid cooled engines
- To correctly check oil levels of any engine

Related Task Sheets:

Tractor Instrument Panel

4.4

Save an engine from costly repairs; check the fuel, coolant, and oil levels before starting the engine.

Why You Should Check Fuel, Coolant and Oil Levels

Fuel

Check the fuel level before leaving the barnyard or shop area. You cannot assume that someone else has done this job. Failure to check the fuel level may result in lost field time. Or it may result in the need to mechanically bleed air from diesel fuel lines in some older tractors.

Be sure you do not fill diesel fuel tanks with gasoline and vice versa.

Oil

Oil bathes metal surfaces to prevent the heat of friction from damaging the moving parts. Low

engine oil allows engine parts to overheat, expands them, and “seizes” the engine. Overfilling the engine oil results in oil seal damage.

Use the oil dipstick daily to prevent engine damage.

Coolant

Coolant fluid (water and antifreeze) carries engine heat away from the engine. Air flowing across the radiator then reduces the coolant temperature. Lack of coolant causes overheating of the engine. Water used as a coolant by itself will cause rust in the water pump.

Check coolant levels while the engine is cold to prevent severe scalds.

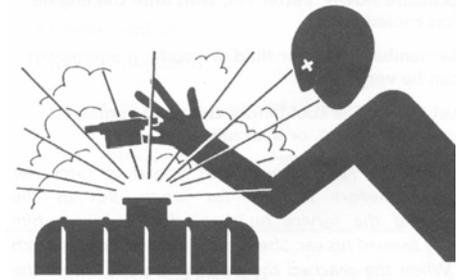


Figure 4.6.1.e. Never remove a radiator cap from a hot engine. Steam and hot water from the radiator can scald your skin. *Safety Management for Landscapers, Grounds-Care Businesses, and Golf Courses, John Deere Publishing, 2001. Illustrations reproduced by permission. All rights reserved.*

If the engine oil light comes on while you are operating the tractor, shut down immediately.

Safety Activities

1. Park the tractor at the farthest field from the barn, and time your walk back to the farm shop or fuel area. This is wasted time or downtime when cropping work could be completed.
2. Call a tractor dealer’s service department to ask about the cost to rebuild a tractor engine damaged from lack of oil. Provide this information to your class and instructor.
3. Using a hydrometer (device to measure specific gravity of coolant or antifreeze for level at which the liquid would freeze), test engine coolant for level of temperature protection that coolant would provide.
4. Explain the meaning of the term “oil viscosity.”
5. Describe the difference between diesel fuel and gasoline. How does the storage of these fuels differ?

References

1. *Safety Management for Landscapers, Grounds-Care Businesses, and Golf Courses*, John Deere Publishing, 2001. Illustrations reproduced by permission. All rights reserved.
2. *Farm and Ranch Safety Management*, John Deere Publishing, 1994.
3. *Owners’ Manuals of Several Tractors*.

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TIRE AND WHEEL CONDITION

HOSTA Task Sheet 4.6.5

NATIONAL SAFE TRACTOR AND MACHINERY OPERATION PROGRAM

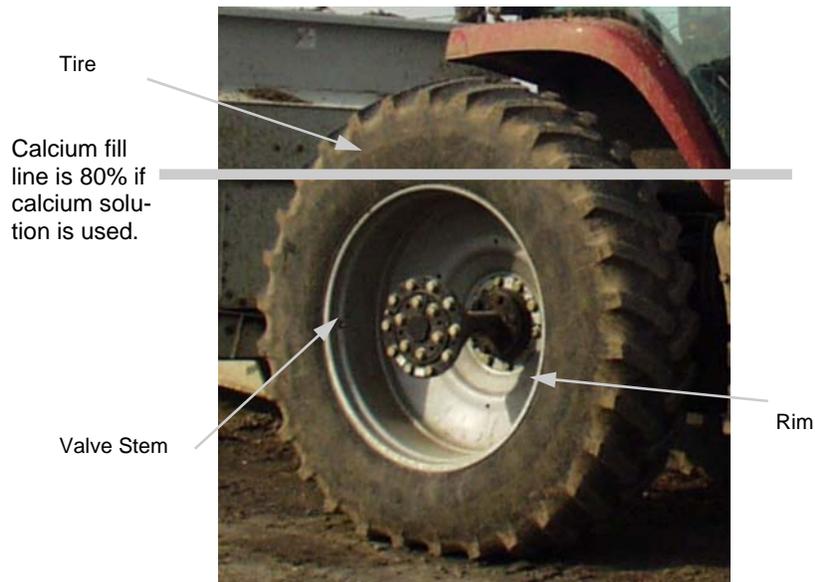
Introduction

Tractors are traction machines! Better traction comes from good tires.

Tractor tires can cost several hundred dollars each. Estimates show that tractor tire repair and replacement comprise nearly 30% of the total repair costs during a tractor's lifetime.

You are responsible for protecting this valuable traction component.

This task sheet discusses tractor tire and wheel conditions for safe tractor operation.



Tire Basics

These simple activities can extend the life of tractor tires:

- Check tire pressure regularly.
- Use wheel weights to reduce excess slippage, which can damage the tire.
- Drive carefully to avoid damaging objects.
- Make tire repairs promptly.

Tire and Wheel Hazards

Tractors are not built for high speed. *High speeds* on paved roads reduce tire life. Unpaved roads can do the same and also increase the chance for large stones to damage the tire as well.

Figure 4.6.5.a. Tractor tire components include the tire, the rim or wheel, an inner tube with valve, and, many times, a calcium solution filling about 80% of the inner tube.

Foreign objects can puncture tires. All farms have their share of sharp rocks, hidden field objects, and construction debris. Fields near rural roads may have glass bottles and metal cans which can cut tires. Be alert for those objects which can damage tires.

Improper use can ruin tires. Turning too tight and gouging the tire into towed equipment leads to cut tires. Most tractors have no shock absorbers; so the tire must absorb all ground shocks. Tire sidewall breaks can occur when objects are impacted.

Some rear tractor tires are filled with a calcium solution to add weight to the tractor to improve traction.

Learning Goals

- To identify faulty tire and wheel situations and take corrective action to remedy the problem

Related Task Sheets:

Preventative Maintenance and Pre-operation Checks 4.6

Tire and Wheel Defects



Fig. 4.6.5.b. Worn treads and dry rot make for poor traction and risk for downtime due to a blowout.



Fig. 4.6.5.c. Damaged rims from careless use may cause damaged tire beads and flat tires.



Fig. 4.6.5.d. A leaking valve stem released calcium solution which rusted the rim. A major expense will be incurred, as well as a severe safety hazard in using this tractor.

Tractor tires are expensive. They may cost hundreds of dollars to repair or replace.

Safety Activities

1. Call a local tire dealer who specializes in tractor tires, and ask for the price of a tractor tire that fits your tractor. For comparison purposes, call several dealers.
2. Have an adult mentor, leader, or teacher show you how to check air pressure in a calcium-filled tractor tire.
3. Find out how much a rear tractor tire weighs when it is filled with a calcium solution. You can use the *Yellow Pages* of the phone book to find a tractor tire repair service or tire dealer.
4. Ask a local tractor tire dealer what the recommendations are for filling tractor tires with liquid ballast (or calcium solution).

References

1. Farm and Ranch Safety Management, John Deere Publishing, 1994.
2. Safe Operation of Agricultural Equipment, Student Manual, 1988, Silletto and Hull, Hobar Publications.

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THE OPERATOR PLATFORM

HOSTA Task Sheet 4.6.6

NATIONAL SAFE TRACTOR AND MACHINERY OPERATION PROGRAM

Introduction

If you compare the tractor operator platform to the cockpit of a jet fighter plane, both the tractor and jet fighter have:

- Steps to climb on board
- Adjustable operator seat with seat belt
- Multiple controls at hand and foot positions
- High visibility from the operator's seat

Keep these similar work areas free of obstructions for safe operation.

Could the pilot of the jet plane be able to fly to our defense in a moment's notice if:

- The steps were covered with mud and manure?
- The cockpit was filled with chains, grease guns, tools, and hitch pins?
- The windows were covered with pesticide spray drift or other materials?
- The pilot could not reach the controls because of a poorly adjusted seat?

This task sheet discusses the need for a clear tractor operator platform and an adjustable seat to safely reach the operating controls.



Figure 4.6.6.a. The operator's platform is not a tool box. You must have room to operate hand and foot controls. PTO levers, differential locks, foot throttles, and brake locks have to be engaged from the floor position. Soda cans and tobacco snuff containers can roll under control pedals and prevent correct, timely operation.

Operator Platform Workplace



Figure 4.6.6.b. Falls account for many farm injuries. Keep the steps and platform clean of mud, manure, and tools.



Figure 4.6.6.c. Tractors with ROPS come equipped with seat belts. Use them.



Figure 4.6.6.d. Keep windows and mirrors clean for good visibility.

The tractor platform serves as the cockpit of this farm tool.

Learning Goals

- To understand the need to keep steps and platform clear of tools and debris at all times
- To adjust the tractor seat and seat belt to safely reach all controls while your seat belt is buckled

Related Task Sheets:

Preventative Maintenance and 4.6
Pre-Operation Checks

Seat Adjustment

Each person who operates the tractor will be a different size and weight. Check and adjust the seat adjustment so that you can comfortably reach all controls.

Seat controls may be levers or knobs and will be black in color. They may:

1. Release the seat to tilt it away from rain if the tractor is sitting outside.
2. Position the seat higher, lower, closer, farther, or to a different tilt position from the steering wheel and foot pedals.
3. Adjust the seat for the weight of the operator.
4. Be sure the seat belt is also adjusted for the seat.



Figure 4.6.6.f. The steering wheel should be adjusted as soon as you are seated. In the correct position, your arms are bent at a 90-degree angle as you hold the steering wheel. Your legs should remain slightly angled while the foot pedals are fully depressed.



Figure 4.6.6.e. Locate seat adjustments and know how they work. You may need the Operator's Manual. *Farm and Ranch Safety Management*, John Deere Publishing, 1994. Illustrations reproduced by permission. All rights reserved.

Seat belts keep tractor drivers from being thrown out of the cab or off the seat during roll-overs.

Wear your seat belt!

Safety Activities

1. Select any tractor at the farm where you work, and clean the tractor steps and platform. List how many different objects you can find there.
2. Use the NIOSH website to locate data on injuries due to falls in agricultural work. Are falls from getting on or off tractors considered a problem? If so, describe how serious it is.
3. Conduct a farm survey in the area with the help of your club or class members to determine how many tractors have seats or seat belts that can be easily adjusted.

References

1. www.cdc.gov/niosh/injury/trauma
2. Owners' Manuals for Specific Tractors.
3. *Farm and Ranch Safety Management*, John Deere Publishing, 1994. Illustrations reproduced by permission. All rights reserved.

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