

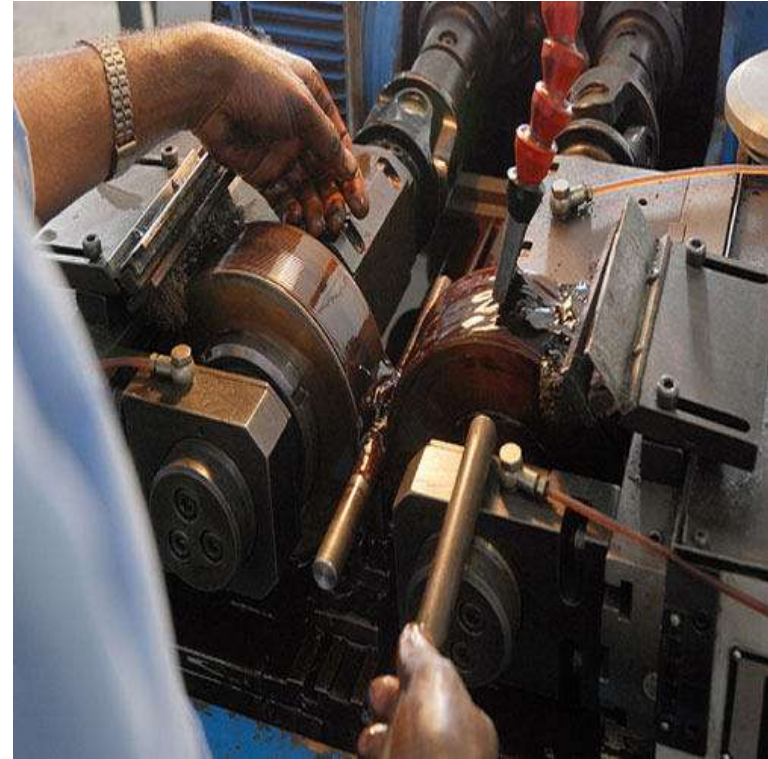
MAINTENANCE OF FARM MACHINERY & EQUIPMENT (Level 3)

Topic	Training & information Content
13.1	Farm tools & equipment
13.2	SOP of farm machinery
13.3	Maintainance of farm machinery & equipment



1. You will learn about (learning objectives):

- Identify the importance of maintenance.
- Identify the various types of maintenance for machinery and equipment's.
- Describe maintenance of common equipment's and machinery in a farm.



2. Introduction

- Machinery & equipment maintenance/repair helps farm tools, equipment and machinery work better and also contribute to a farm activities doing well.
- Performing checks on tools, equipment and machinery identifies broken parts, defects and where replacement should be done.
- Maintenance keeps tools, equipment and machinery in good condition and keeps animals (cows) and farmer safe.



3. When to do maintenance?

- Maintenance is done almost everyday in farm, before workers use a tool, equipment or machinery one has to inspect to confirm if the working condition is okay.
- Inspections are done since in most farms worker handle different tools on a daily basis and assumptions on condition cannot be done.
- Inspections are done in the work station, for some machinery certain condition should be met.
- For example when inspecting machinery it has to be switched off, area should be free and spacious plus certain tools have to be there for inspection to be carried out.



4. Maintenance in a dairy farm

- Machinery & equipment maintenance/repair needs staff to do it, this will require training and following of standard operational procedure.
- Other forms of maintenance may require experts from the manufacturing company.
- Through training and repetitive maintenance some maintenance can be carried out by staff reducing the cost of hiring experts to do maintenance.



4.1 Maintenance in a dairy farm Cont'd...

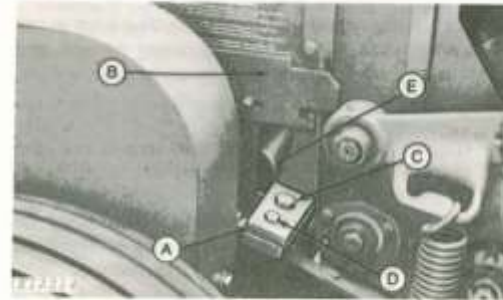
- Maintenance should not be reactive that is, maintenance is only at the point of equipment/machinery maintenance.
- Farmers should adhere to factory recommended maintenance intervals and document machine service history.
- Daily machine operators have a 'feel' for the machine and as such they can sense something is amiss, their information is also critical in identifying and planning for maintenance.



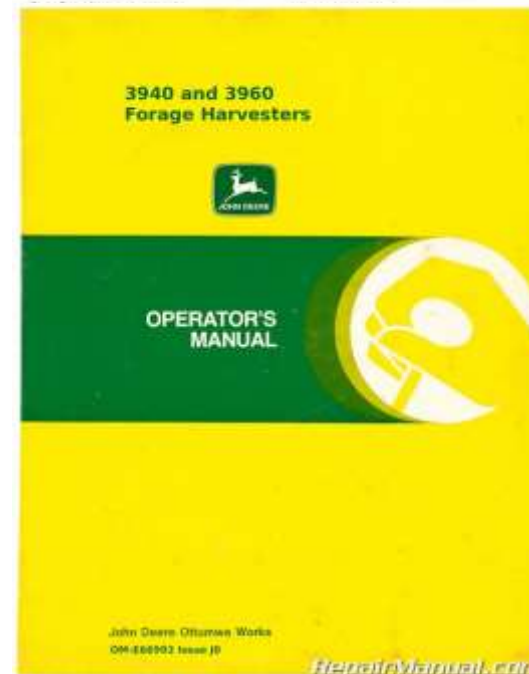
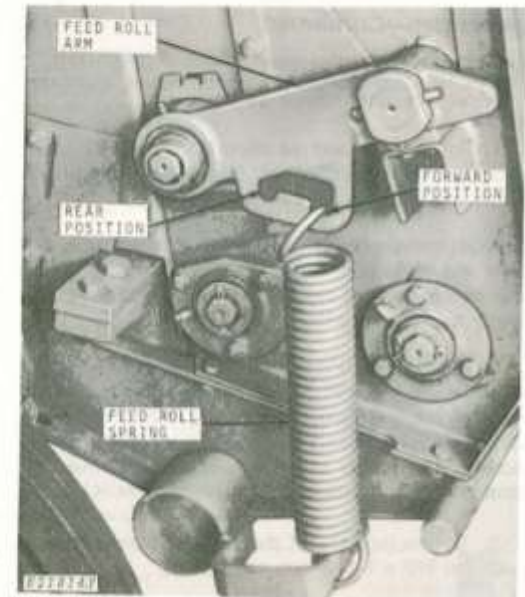
5. User manual guide

- It is a document that comes with a product, it helps customers know more about a product that one has.
- A user manual guide is also known as an instructional manual.
- It explains the parts of a product, how to attach a product, how to operate, what to do and not to do as well as how to maintain and intervals for doing repair plus how to go about it.
- Workers and owners should be acquainted with the user manual and keep in good storage for instances that help will be needed.

Adjusting Stationary Knife



Adjusting Feed Roll Springs



6. Importance of maintenance

- Helps keep the value of the machinery.
- Reduces the general cost of maintaining a machinery.
- Increases the lifespan of an equipment/machinery, ensuring that it can be used for a longer period of time.
- A well maintained equipment/machinery is generally more effective at a task.
- Well maintained equipment/machinery tends to fetch a better price in case of reselling in the future.



7. Recording maintenance in a farm

- Farms should keep a record of any information regarding any repair/maintenance that an equipment/machine undergoes.
- Keeping a maintenance record helps to keep workers safe and increases safety within the farm.
- Information of maintenance helps management to manage each equipment in a farm.
- It also helps track down when to do repairs in advance as well as help determine value of a machinery/equipment.



8. Importance of data driven maintenance

- Farmer gets to replace parts only when necessary.
- Reduces risk of safety incidents caused by poor maintenance of equipment/machinery.
- Enables a farmer to easily predict maintenance schedule which helps guides in budgeting, scheduling and production expectations.
- Extends equipment lifespan.
- Reduces time lost/downtime as a result of unforeseen breakdowns and failures.



9. What is needed to do maintenance?

- Worker/mechanic/expert
- Protective clothing (overall, gumboots, mask, gloves)
- Manual guide
- Sharpening and grinding tools (file, sharpening stone)
- Cleaning agents (water, brush, detergent/soap, cloth)
- Lubricating agents (oil, Grease)
- Paint and brush
- Measuring tools (tape measure)
- Metal cutting tools (drills, welding machine)
- Holding tools (pliers, clamps)
- Striking tools (hammer and sledge)
- Screw driver
- Spanners/wrench



10. Maintenance activities in a farm

- Cleaning of manual tools
- Sharpening blades
- Oiling hinges, bearings etc.
- Checking on leakages and spillage
- Painting structures and buildings
- Self propelled equipment and machinery maintenance
- Tractor maintenance
- Milking machine maintenance
- Tractor driven farm equipment
- Forage chopper maintenance



11. Steps to follow when preparing for a maintenance

- Inspect equipment/machinery that needs maintenance.
- Where a specialist has to be called for repair, contact and make appointment.
- Prepare materials and tools needed for doing a maintenance for example; rag, water, oil and tool box.
- Identify and prepare location for doing the service.



12. Maintenance of farm tools and equipment's

- Hand tools are the simplest tools that are used in a farm, maintenance farm tools can be used even much longer periods and they become more efficient to use.
- Tools should be properly stored to avoid rusting of metallic parts and better accessible.
- Tools with wheels like wheelbarrows should be greased around rolling area.



13. Steps to follow when cleaning farm tools and equipment's

- Remove soil first while at the shamba.
- Scrub away stubborn soil using sharp pointed wood or object
- After tool has been sharpened and clean spray or apply petroleum-based lubricant to protect against rusting.
- Wipe tools with a rag and hang tools in the designated area in a store.



14. Steps to follow when sharpening farm tools & equipment's

- For sharpening edges of garden tools you will need a file or sharpening stone.
- Hold the file or sharpening stone at a slanting angle against the edge of the tool that needs to be sharpened.
- Push the file in a motion from one side to the other against the cutting edge to be sharpened .
- Once one side has been sharpened turn the blade to the other side and repeat the sharpening procedure.
- Once finished apply petroleum-based lubricant to protect against rust and store in designated area in the store.



15. Steps to follow when lubricating farm tools & equipment's

- Sharpen tools before and after use in the farm.
- Oil and grease metal parts using tool available like a grease gun.
- Also pay attention to wooden handles and ensure they are fastened if loose.
- Store tools in the store where it is designated.



Grease gun



16. Types of lubricants

- 1) Oil
 - 2) Grease
 - 3) Penetrating lubricant
 - 4) Dry lubricant
- Oil - is a thin liquid at room temperature that is found in plants. It is used after sharpening blades, on hinges, bearings and tool maintenance.
 - Grease - grease are oils that have been added a thickener, making grease thicker, grease are solid at room temperature. It is used on bearings, gears, chains and linkages.



16.1 Types of lubricants Cont'd...

- Penetrating lubricant - Used when you have rusty bolts, when infiltrating tiny cracks, when adding lubrication loosening stuck nuts & bolts and removing chewing gum.
- Dry lubricant - Usually found as a spray form that one sprays on an object. It is used on threaded rods, hinges and locks.



17. Importance of lubricating farm tools & equipment's

- Reduces wear and tear of moving parts.
- Reduces rusting/corrosion of metal surfaces.
- Reduces friction between rotating parts and stationary parts.
- Reduces heat created when surfaces rub one another and acts as a seal between them.
- Acts as a cleaning, sealing and protection agent by keeping contaminants out of the system, for example: it washes off dust, dirt, soot and metal chippings from the oil paths to the sump in tractors.



18. Storing and organizing farm tools

- Ensure you have a designated area to store all tools, if possible store tools near point of use and an accessible area i.e tool box or cupboard.
- Storage cabinets should be placed and labelled correctly.
- Before storing, wash and dry tools correctly
- Sharp tools should be sharpened before storage.
- Metal equipment should be placed on one another after drying.
- Electrical cords should be gathered and secured to avoid causing accidents.



19. Treating wood and tightening wires

- Wood should be treated to prevent being damaged by insects like termite or decay.
- Groundline treatment (using preservative paste or grease) of poles over 5 years and any pole installed for replacement should be done to increase lifespan.
- Barbed wire used in fencing should also be inspected and tightened, this guards the security of the farm.
- Inspecting barbed wires help identify broken wires that need replacement and where sagging line should be tightened as well as removing plants that could interfere with the fence aim of being secure.

Untreated post vs treated post



20. Painting structure's and buildings

- Both interior and exterior paint last for 5 years if they are of standard quality.
- However factors like heavy rainfall or if region is of high salinity tends to cause paint to wear off faster.
- Repainting protects against moulds, exterior paint on building and structures like cow house and water storage tanks are purposeful since the paint has additives to protect against harsh environmental condition.
- Periodic inspection and proper painting every 2-3 years ensures that storage tanks last many years. Black storage tanks are preferred over light-coloured tanks since it blocks exposure to sunlight, which creates good environment for algae growth.



21. Managing leakages and spillage

- Detecting leakage goes a long way in controlling losses by preventing unnecessary withdrawals.
- Sealing holes and repairing cracks protects against leaks.
- For metal storage tanks welding should be done correct this while plastic tanks are pasted with a two-part adhesive like epoxy or putty to stop leakage.
- Small pipes can either be wrapped with rubber band/tape in the short run as you plan to replace the pipe.



22. Maintaining electrical wires & cables

- Sources like bulbs, circuits, switches for equipment and machinery should be inspected and maintained.
- Ensure that insulation is maintained and wires are not naked for electrical safety just in case objects come in contact with live electricity.
- Where checks on electric cables are done ensure protective clothes and equipment's are used 'torch and proper foot ware.
- All connections in an electric box has to be covered.
- Warning all electrical related issues should be consulted to a certified electrician and caution should be taken always.



23. Types of machinery & equipment maintenance

- Preventive maintenance
- Corrective maintenance
- Breakdown maintenance
- Turn around maintenance
- Periodic maintenance



24. Preventive maintenance

- Preventive maintenance refers to regular maintenance done to machinery & equipment so as to keep them in good condition and reduce chances of breakdown.
- The regular maintenance with anticipation of reducing machinery failures. The repairs are easily done by oneself.
- Preventive maintenance have shown to reduce the cost of general maintenance by 25%.



25. Example of Preventive maintenance

- Some of the maintenance are;
 - Cleaning equipment after use and storing
 - Checking oil & grease on rolling parts of equipment & machines.
 - Checking air pressure of vehicles
 - Checking radiator water level
 - Checking engine oil level
 - Checking fuel level
 - Checking brake linings for wear & tear



26. Doing preventive maintenance of vehicle

Ensure you start maintenance check from outside a machine/vehicle.

- **Body** - Inspect the body of the equipment/machinery for damage, rust, or missing parts if any.
- **Steps and handrails** - Ensure all stepping and grabbing points are secure, rusted or damaged.
- **Wheels** – Check tires and make sure tire pressure, tire tread and valve stem are in good condition.
 - Inspect that lug nuts are in place and tight and rims should be free from damage. Also check axle and drive shafts are free from rust and damage.
- **Fuel tank** - Inspect that the fuel tank has no dents that may cause leakage and the fuel cap should be fitting and in place.



26.1 Doing preventive maintenance of a vehicle Cont'd...

- **Lights** - Check that lights (headlights, brake lights, warning lights) are working correctly and any burned out bulbs are replaced.
- **Brakes** - Check the parking plugs also inspect filters, fluid levels, lines and fittings and repair immediately if they are damaged.
- **Check for leaks** - look at the grease lines and check for spillage.
- **Electrical lines** - Inspect electric lines to ensure insulation is okay also check exposed wires and confirm insulation while repaired naked wires.
- **Hydraulic oil and lines** - Inspect hydraulic lines for leakage and look at the oil level, hoses, cylinders and fittings that are linked



27. Corrective maintenance

- Corrective maintenance refers to repairs that are done to identify, separate and repair faulty parts or functions in a machine or equipment.
- This maintenance are done to ensure machinery are restored to operational condition.
- For example; Changing fuel & air filters before scheduled maintenance time to correct a problem with a machine/equipment, Changing battery that are not working or solar modules in a solar panel for continued working.



28. Breakdown maintenance

- When machinery & equipment breakdown and fails to function the repaired done during this period are known as breakdown maintenance.
- Breakdown maintenance is an unplanned type of maintenance and mostly gets one unaware and not scheduled.
- This type of maintenance affects farm operations and always delays operations.



29. Turnaround maintenance

- Turnaround maintenance is a periodic and scheduled maintenance activity for a running machinery by completely shutting down the machine to carry out maintenance.
- Shutting down the running machinery is done to enable replacement, testing and inspection of processes for an effective performance.
- This type of maintenance is especially done on large machines.
- It is planned one/two years in advance due to the high cost involved in doing the repair/maintenance.



30. Periodic maintenance

- This type of maintenance especially is done regularly in most cases guided by manufacturers predetermined schedule.
- Periodic maintenance keeps machine/equipment in good working condition.
- Periodic maintenance especially is most likely done for specific parts of an equipment/machine over time to ensure longevity.
- For example; changing oil , replacing filters, replacing/adjusting belts for farm operated equipment's.



31. Maintenance activities of farm implements: disc plough

- Loose nuts and bolts should be tightened.
- Blunt discs should be hammered.
- Broken discs should be repaired.
- Lubrication should be done on wheel bearings and the hub as recommended.
- During long storage oiling should be done on all unpainted surfaces of the plough using engine oil



31.1 Maintenance activities of farm implements Cont'd: **Planter or seeder**

- Fertilizer containers and seed hoppers should be cleaned after use
- Loose nuts and bolts should be tightened.
- Moving parts should be lubricated.
- Worn-out and broken parts should be repaired and replaced.
- Coulter tubes should be free from any blockage for efficient seed passage.



32. Maintenance checks on tractor

- Maintenance activities of tractor parts depends on tractor use and as directed by manufacturer.
 - Oil, fuel, radiator water level and battery check - everyday
 - Air filter, fluid levels, greasing and bolts checks - every 10 hours.
 - Coolant change – every 2 years
 - Tire change – Recommended after 6 years
 - Changing engine oil and oil filter- Change after 200 hours or annually.
 - Changing air and fuel filter – Change every 500 hours
 - Changing hydraulic fluid and oil – Change after 500 hours



33. How to do a tires change & maintenance

- Ensure that the machine is parked safely either in the garage or side of the road. Use warning signs if parked on the side of the road.
- For machines with wheel cover/hubcap take it off first and secure a wrench on top lug nuts and turn in counter clockwise to loosen it, do this with all the lug nuts until it is loose enough to turn by hand.
- Lift the machine off the ground using a jack, by placing the jack under the metal portion on the machine frame, when well placed use the jack to raise the tire you want to change.



33.1 How to do a tires change, cont'd...

- Turn the lug nuts counter clockwise with your hands until they are very loose. Remove and place lug nuts in a secure place. Pull the tire away from the body and place on the side.
- Replace the flat tire with the spare tire while lining up the holes where the lug nuts will go.
- Push the wheel as far as possible onto the wheelbase, using the jack slowly lower the machine until the tire touches the ground



33.2 How to do a tires change, cont'd...

- Tighten the lug nuts in rotation, if possible do it in a sequence for example; 1,3,5,2,4,1,3,5,2,4 then repeat to keep the wheel straight.
- If lug nuts are equally tight lower the machine completely to the ground. Continue your tightening in the same order until they no longer budge.



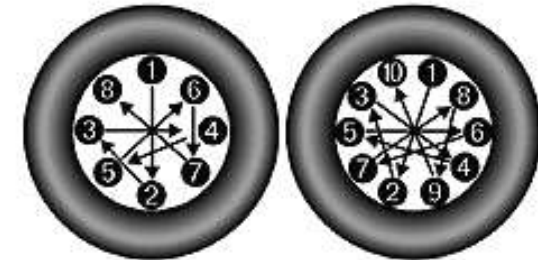
Wheel Lug Nut Torque



4-LUG NUT WHEEL

5-LUG NUT WHEEL

6-LUG NUT WHEEL



8-LUG NUT WHEEL

10-LUG NUT WHEEL

34. Oil and filter change in a tractor

What you need

Safety gloves

Empty draining pan to place the oil in the tractor

Wrench for removing the drain plug

O-ring or rubber gasket .

New oil for replacement

New oil filter

.....



Rubber gasket



Oil filter

34.1 Oil and filter change in a tractor, Cont'd:

Oil change

- Switch off the tractor before any oil change is done, if the engine is hot wait at least 30 minutes before changing oil.
- Place an oil drain under the drain plug and drain the oil by loosening the drain plug (usually located either at the side or underneath and near the crankshaft) using a wrench.
- Let the oil drain for 10-30 minutes and ensure to remove your hand to avoid being spilt by oil and then replace the oil drain plug.
- Remove an/or replace the O-rings/rubber gaskets present if the drain plug has it, this ensures a tight fit and seal.



34.2 Oil and filter change in a tractor

Cont'd: Oil filter change

- Locate the oil filter (usually labelled as a filter) near a metal cylinder attached to the outlet coming from the engine block.
- Note that the location of the filter is dependant on the model of the tractor.
- Loosen the oil filter by hand/filter wrench and crew it off by turning it counter clockwise until it comes off completely.
- Put the old filter facedown in the oil pan and let it drain for 24 hours before disposing the old filter.



34.3 Oil and filter change in a tractor Cont'd:

New filter and oil

- Lubricate the gasket of the new filter using the finger and cover the rubber ring around the base of the new filter.
- Screw on the filter by applying gentle pressure to avoid cross-threading the filter and causing damage to the threads until you make contact with the engine block.
- Tighten the new filter only do this by part hand as well until you notice is not leaking which occurs at a $\frac{1}{4}$ to $\frac{3}{4}$ of a turn.
- Remove the oil fill cap and place a funnel into the hole and pour fresh motor oil in the recommended amount then finally twist the oil fill cap back when done.



35. Battery maintenance practices

- Maintaining electrolyte in the correct level by topping up with distilled water.
- Cleaning and smearing grease on the terminals to prevent corrosion.
- Regular charging of the battery.
- Tightly fixing battery in a box to prevent spillage and damage.
- Fitting battery correctly on the tractor
- Emptying contents and turning it upside down for long storage.
- The generator fan belt should always be functional to ensure the battery is always charged.



36. Caution when handling battery

- Before doing any battery servicing one should take caution by ensuring that:
 - The negative battery terminal (-) is disconnected.
 - When handling battery be careful to avoid sparks, flames and cigarettes and keep them away from the battery.
 - During servicing/maintenance wear protective clothes (gloves, goggles) to protect against explosive gasses that battery can produce.
 - After maintenance first, connect the positive battery terminal (+).
 - Avoid placing any metal across the battery posts.

