

UNDERTAKE OPERATIONAL MAINTENANCE OF MACHINERY



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PUBLICATION NOTES

BHP Billiton Iron Ore is proud to support Greening Australia to provide valuable conservation and land management training to communities throughout the Pilbara through the Indigenous Training Program.

This Learning Guide series has been developed as part of our partnership of the program.

Gavin Price, Head of Environment, BHP Billiton Iron Ore

Greening Australia is proud to produce and provide the comprehensive suite of new ALEP Learning Guides. The guides are compatible with the new horticulture and conservation industries training package and suited to developing skills in Indigenous communities within remote areas of the country where employment opportunities are limited. We would like to thank BHPBIO for their generous support in the development of the guides.

Brendan Foran, National CEO Greening Australia

The second series of ALEP Guides is aligned with a number of units of competence from the *Training Package AHC10 – Agriculture, Horticulture and Conservation and Land Management* (Release 8.0). The units selected are frequently used within Certificates I to III in Horticulture and Conservation and Land Management. As such they cover, where possible, the elements, performance criteria and required skills and knowledge of each unit.

The principal goal of these resources is to support the learning process; the learning activities may complement a trainer's assessment plan. The intent is that they will be used in an interactive manner with learners rather than as self-paced study guides. The structure and sequence have been designed to follow the logical steps of the practical tasks wherever possible. Concepts are introduced and then consolidated with discussion and/or practical activities.

The writers consider that these guides can provide a sound technical foundation but also strongly encourage trainers to complement the guides with additional, authentic resources from relevant industry texts and websites. The guides can be used in part or in their entirety but should always be linked to practical activities to strengthen the teaching and learning.

Genuine consideration was given to the level of language used in the guides. The goal has been to find a balance between simplifying the language to an accessible level and ensuring that the vocational concepts are addressed. The writers contend that with appropriate support these texts can provide an opportunity for students to strengthen their language, literacy and numeracy skills, which may be required for pathway progression.

A number of Aboriginal people have been involved in developing this ALEP Guide, which is considered suitable for use within a program based on Aboriginal pedagogies.

INTRODUCTION

Welcome to *Undertake operational maintenance of machinery*. This learning guide covers information about maintaining and servicing a range of machinery commonly used in conservation and land management (CLM) and horticulture. It is intended that students will learn about the machinery they use in their workplace. This may include spray equipment, small tractors, ride-on mowers, rotary hoes, chainsaws, hedge trimmers, vehicles and/or quad bikes.

This guide provides some information about operational maintenance of machinery, but much of the learning for this unit will be done practically by servicing and maintaining machinery alongside a trainer and/or workplace supervisor.

EQUIPMENT REQUIRED

To complete this training you will need the following:

1. Appropriate Personal Protective Equipment (PPE)
2. Machinery used in your workplace
3. Tools used for basic servicing
4. Supplies for basic servicing
5. Manufacturer's instructions for each piece of equipment

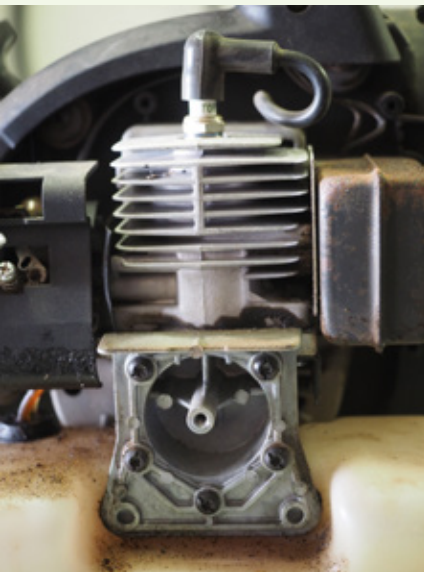


Much of the training for this unit should be completed on the job.

LEARNING ACTIVITIES

There are four kinds of activities to complete. These activities may go toward your final assessment.

SECTION	ACTIVITY	SATISFACTORY (Y/N)	DATE
RESEARCH ACTIVITIES			
1.2	Learn about engines		
2.5	Environmental Codes of Practice		
DISCUSSION ACTIVITIES			
2.1	Maintenance schedules		
3.2	Applying out-of-service tags		
4.2	Disposal of environmentally damaging waste		
WORKBOOK ACTIVITIES			
2.4	Safety signs		
2.4	Hazards and controls		
PROJECT			
5	Work with your team to service the machinery at your workplace		

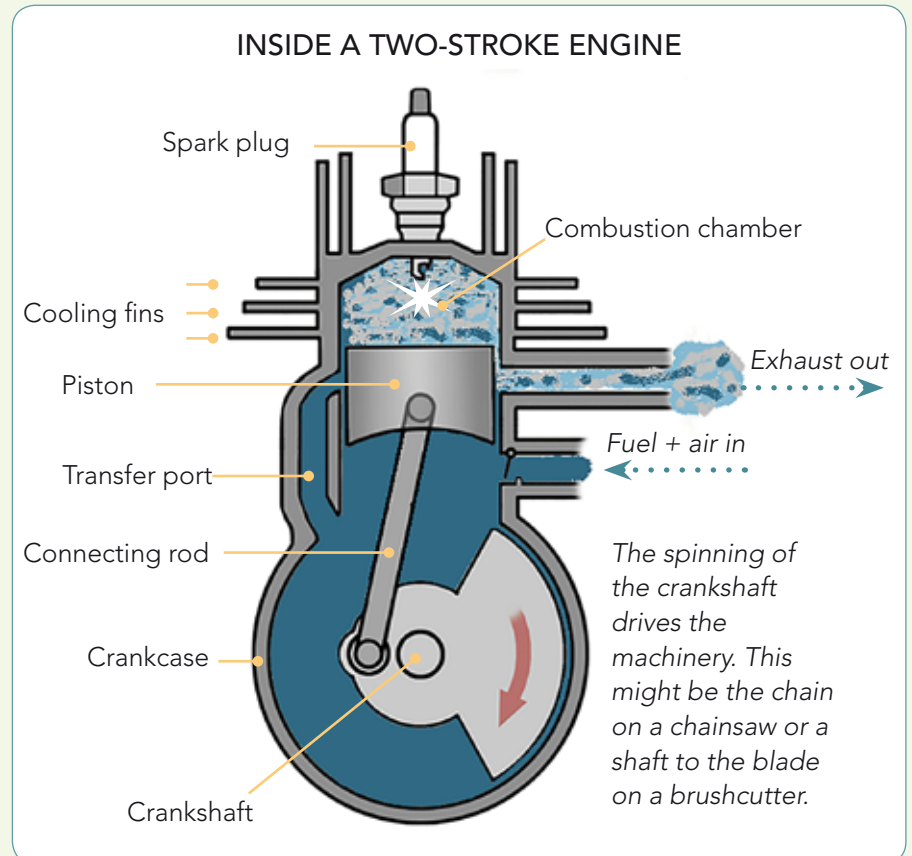


This is a photo of a two-stroke engine from the outside. Can you see how the parts in the diagram relate to this?

1.1 TWO-STROKE PETROL ENGINES

Two-stroke engines are widely used in small-engine machinery such as brushcutters, chainsaws and blowers.

These engines are internal combustion engines. They are called 'two stroke' because of the movement made by the piston in one combustion cycle. One stroke is called the compression stroke. The other stroke is called the combustion stroke.



1. During the compression stroke (upwards)
 - The crankshaft spins around
 - The piston is pushed up and compresses the fuel and air in the combustion chamber
 - This creates a vacuum in the crankcase, which draws fuel and air in from the carburettor
2. During the combustion stroke (downwards)
 - The spark plug sparks when the piston is at its highest point
 - The fuel in the combustion chamber is lit by the spark
 - An explosion forces the piston back down the cylinder
 - The piston, via the connecting rod, pushes the crankshaft around
 - Fuel is drawn into the combustion chamber via the transfer port, and the exhaust escapes from the muffler

The diagram opposite shows just one way that a two-stroke engine can be designed. There are many other designs, but they will all basically work in the same way.

MIXING FUEL AND OIL

The engine is made of metal, so moving parts must be lubricated. This stops the parts from wearing out quickly. In a petrol two-stroke engine the oil is mixed in with the fuel to lubricate the internal moving parts.

When you use or maintain machinery you must always look at the manufacturer's instructions. This will tell you how much oil you need to mix with the fuel. This is called the fuel/oil ratio.

When you know the ratio you can use the following table to work out how much oil you need, depending on the size of the fuel container you are using.

You need to use special two-stroke oil. This is made to burn more efficiently in this kind of engine. This means the engine will last longer and cause less pollution.



FUEL/OIL RATIO TABLE

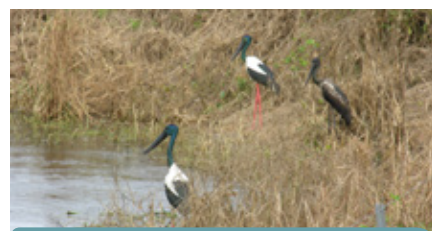
Fuel/Oil Ratio	ml oil per 1 L of fuel	ml oil per 5 L of fuel	ml oil per 10 L of fuel	ml oil per 20 L of fuel
25:1	40	200	400	800
50:1	20	100	200	400
100:1	10	50	100	200

Advantages of a two-stroke over a four-stroke engine

- Not so many moving parts, so cheaper to buy
- Powerful for their size
- Can be much lighter
- Can work at any angle (good for chainsaws)
- Cheap to maintain

Disadvantages of a two-stroke over a four-stroke engine

- Not as fuel efficient
- Polluting – a lot of unburnt fuel and oil escape from the exhaust
- Need to be careful with fuel/oil mix, or the engine can be ruined
- Might wear out quicker, as they usually operate at much higher revs



IMPORTANT

You always need to think about the environmental impact of what you do.

Consider your choices when:

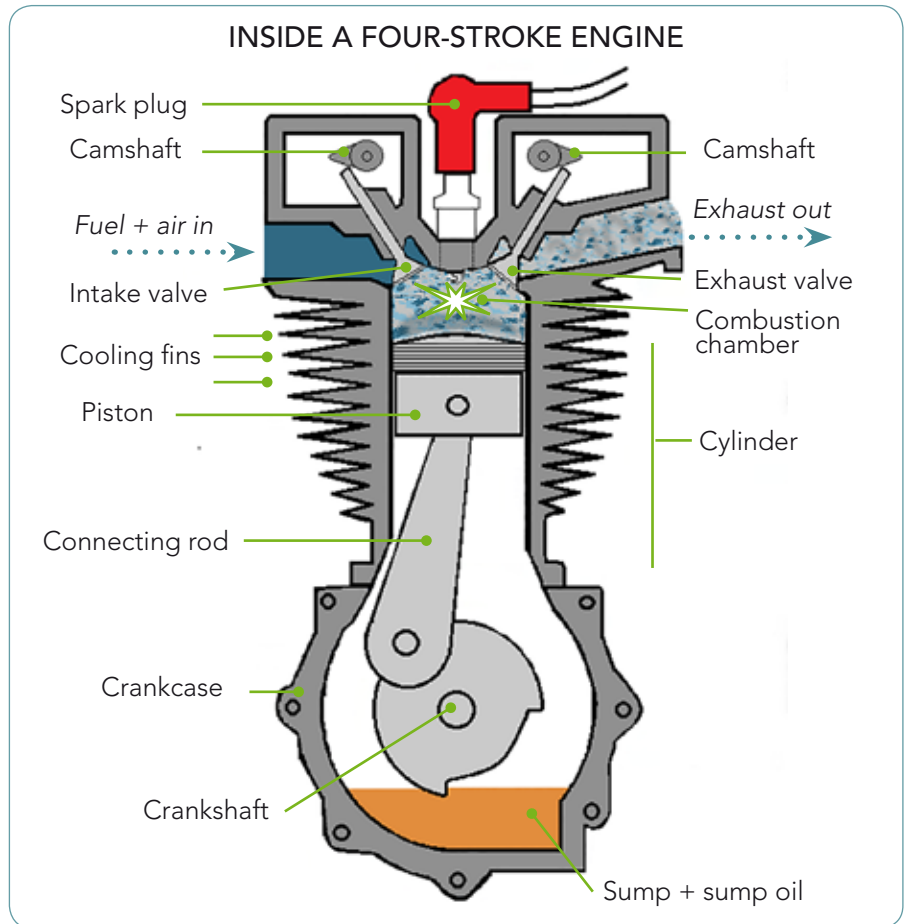
- Buying new machinery
- Disposing of old machinery
- Maintaining machinery



1.2 FOUR-STROKE PETROL ENGINES

While these engines are commonly used in large vehicles, they can also be found in smaller machinery such as mowers, rotary hoes and outboard motors.

These engines are also internal combustion engines. The piston moves four times in each combustion cycle.



NOTE

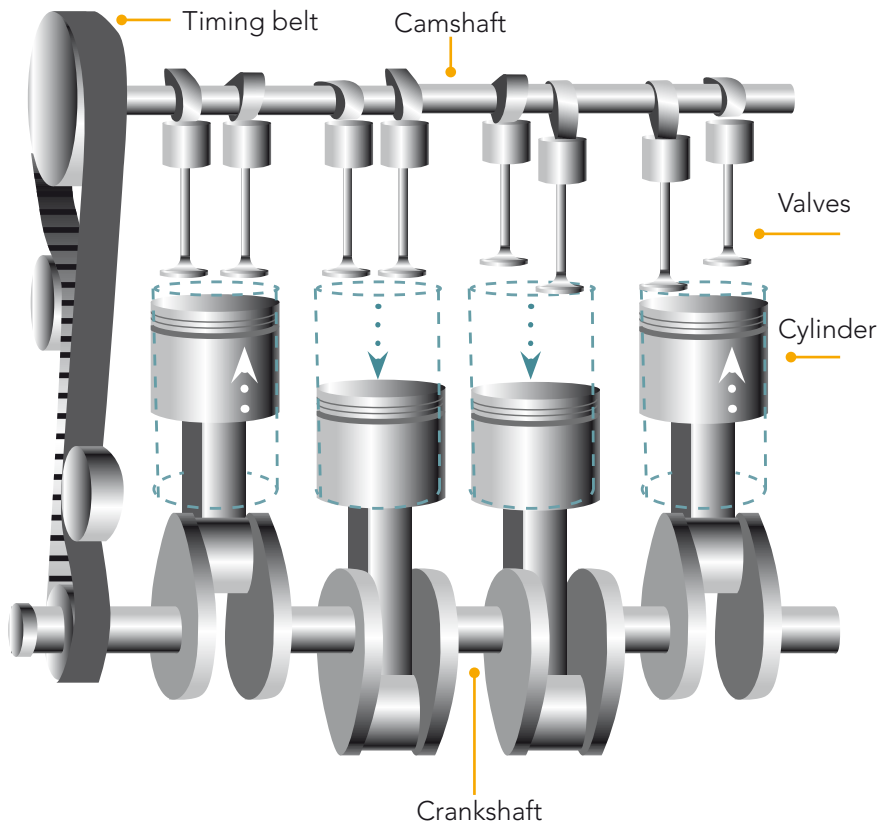
There are now many small four-stroke engines. These are more fuel efficient and create less pollution.

Many boat owners now use four-stroke motors. This prevents excess oil and fuel from the exhaust getting into the sea and waterways.

1. Intake (downward)
 - The piston is at the top of the cylinder and moves down
 - The intake valve is opened by the camshaft
 - The fuel and air enter the combustion chamber
2. Compression (upward)
 - The piston rises and compresses the fuel and air mix in the combustion chamber
3. Combustion (downward)
 - The spark plug sparks and ignites the fuel
 - The explosion pushes the piston back down
4. Exhaust (upward)
 - The exhaust valve is opened by the camshaft
 - The piston rises and pushes the exhaust out of the combustion chamber

Four-stroke engines come in many different designs but all work in a similar way.

This is a diagram of a four-cylinder, four-stroke engine. Can you see how it relates to the diagram on the previous page?



RESEARCH ACTIVITY

Look at the websites in the *Resources* section that give more information about engines. These sites have animations that make it easier to understand how each engine moves.



See Websites about engines
Resource R1, page 24

1.3 PETROL VS. DIESEL ENGINES

In motor vehicles, petrol and diesel engines are generally both four-stroke internal combustion engines. This is because they both work by igniting fuel inside the combustion chamber at the top of the cylinder.

The main difference is the way the fuel and air are mixed.

- Petrol engines mix the fuel and air before it is taken into the cylinder
- Diesel engines inject the fuel into the cylinder after the air is compressed, which causes the fuel to ignite.



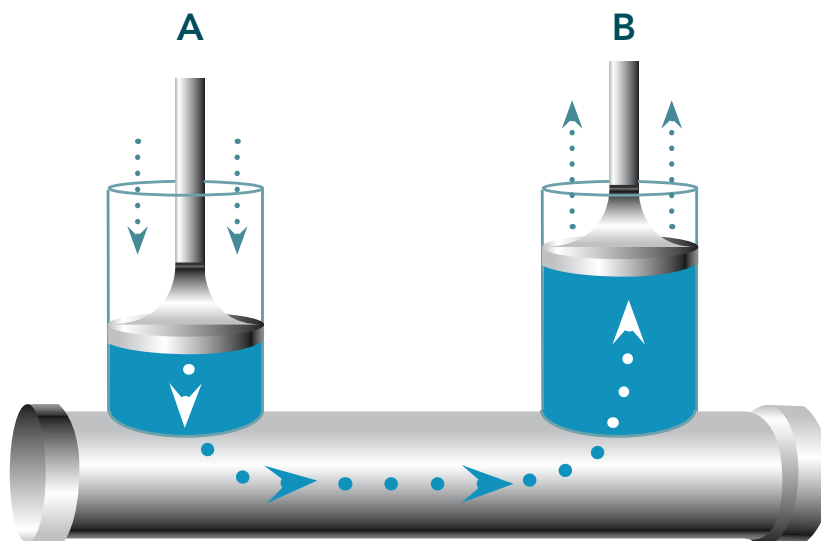
Extended hydraulic ram

1.4 HYDRAULIC SYSTEMS

Many kinds of machinery use hydraulic systems to operate. For example:

- Car brakes
- Car jacks
- Hoists
- Excavators

Hydraulics use liquid to transfer force.

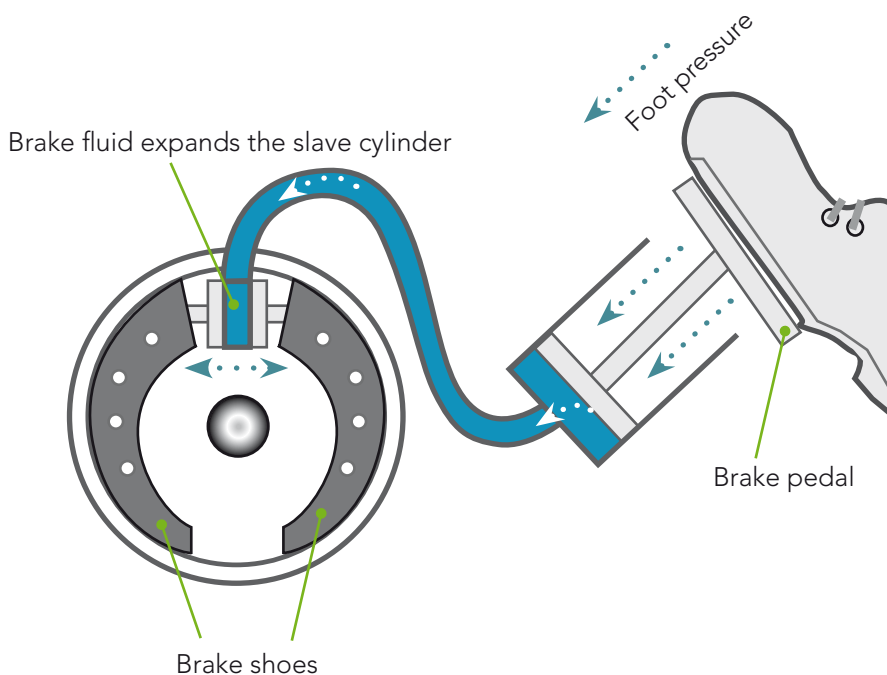


The blue liquid is a kind of oil. If you press on A, then B will rise.

Hydraulic hoses on a front-end loader



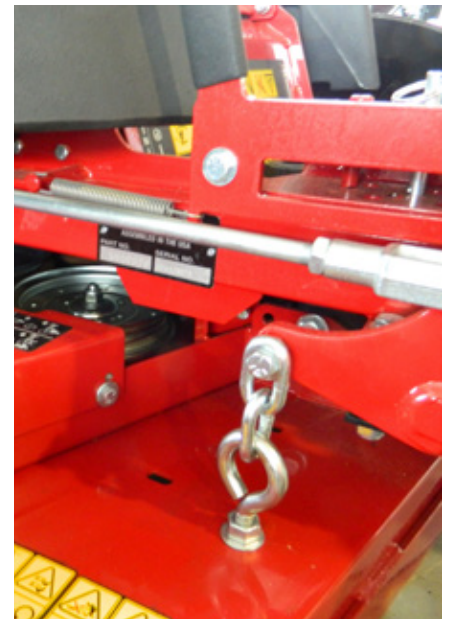
Similarly, when you press your foot on the brake pedal in a car, the force is transferred through the hydraulic liquid and forces the brake calipers against the inside of the wheel rim.



1.5 MECHANICAL LINKAGE SYSTEMS

Mechanical linkage systems use rods, springs, levers and linkages to lift or push machinery parts. You will find these systems used on a range of horticultural and other machinery, for example:

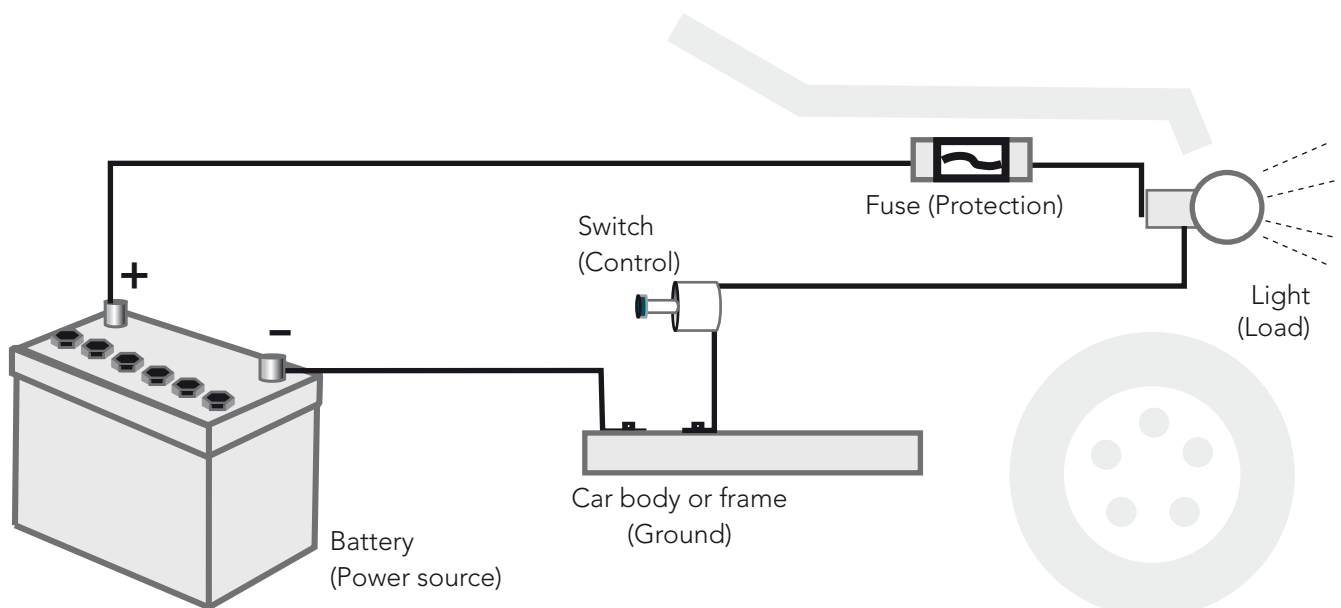
- To raise or lower mower decks
- For steering on some ride-on mowers
- To open the door on a grass catcher



1.6 ELECTRICAL SYSTEMS IN A VEHICLE

Electricity works by flowing around a circuit. If there is a break in the circuit, then it won't work.

A fuse is used to protect the wiring and parts from damage. If there is an overload or short circuit, then the fuse will blow.



2

GETTING READY



IMPORTANT

WHS guidelines advise workplaces to keep a maintenance schedule and record all servicing that is done.

Before you begin work, you need to plan what you will be doing and what you will need.

Some workplaces have a written maintenance schedule. In other workplaces, this is arranged by the supervisor and discussed with the workers.

Most manufacturers provide a maintenance chart or servicing schedule in the instructions provided when you buy the machinery.

Following the manufacturer's instructions for servicing and maintenance will help to keep your machinery in good condition. The benefits of following this schedule can be:

- You avoid breakdowns
- Machinery is safer to use
- Machinery lasts longer so saves the workplace money
- The manufacturer's warranty is preserved
- Your workplace will be more environmentally friendly

2.1 THE MAINTENANCE PLAN

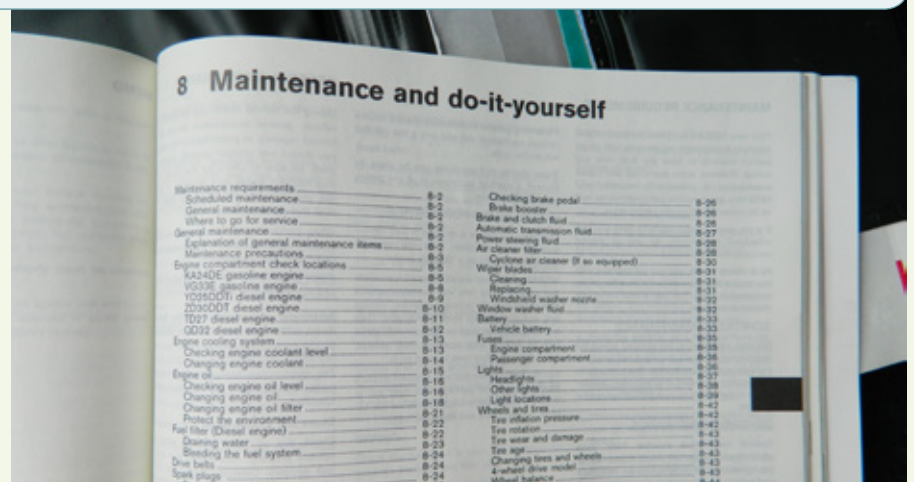
To get your supplies, tools and safety equipment organised, you need to know:

- Which machinery will you service?
- Which servicing tasks will you do?



DISCUSSION ACTIVITY

Find the maintenance schedule in the manufacturer's instructions for each piece of machinery in your workplace, and discuss what needs to be done.



2.2 SUPPLIES

Before you start, make sure you have the supplies you need to complete the job. You might have supplies on hand, or you might need to order them.

Supplies you might need:

- Fuel
- Oil
- Coolant
- Lubricant
- Filters
- Replacement parts: spark plugs, blades, bearings, globes, belts, nuts and bolts, fuses

You can find out what you need from the manufacturer's instructions for each piece of machinery. It is important to make sure that you use the right types of oil and parts. Ask your supervisor if you are not sure.



R2











See Pre-start checklist for power tools *Resource R2*, page 24

2.3 TOOLS

When you understand the maintenance plan, then you can choose the right tools for the job.

You need to make sure that all the tools you need are ready and safe to use. If using power tools, you need to do pre-start checks. You can find a checklist in the *Resources* section.

TOOLS		USED TO
	Open-ended and ring spanners	Remove and tighten nuts and bolts
	Adjustable spanner/shifter	Remove, tighten and hold items
	Screwdrivers	Remove and tighten screws
	Socket set	Remove and tighten nuts and bolts
	Pliers, side cutters, long-nosed pliers and circlip pliers	Hold or remove items
	Multigrips	Remove, tighten and hold items
	Allen keys	Remove and tighten screws
	Hammer	Hit items

TOOLS		USED TO
	Cordless drill	Drill, grind, remove or tighten screws
	Grease gun	Apply lubricant to parts
	Filter wrench	Remove filters
	Punches	Punch out locking pins, etc.
	Wire brush	Clean metal parts
	Rags	Clean grease, oil and dust
	12-volt test lamp	Test for power in wiring
	Funnel	Top up oil
	Specialised chainsaw tools	Sharpen and adjust chains
	Jack and car stand	Lift and hold up a vehicle securely



2.4 WORKPLACE HEALTH & SAFETY

It is important to think about Workplace Health and Safety (WHS) before you begin to maintain machinery.

To work safely you need to:







- Think about the hazards, assess risk and apply controls
- Learn how to use tools properly
- Look out for signs and/or hazard symbols
- Read the manufacturers' instructions and labels
- Understand the legislation



WORKBOOK ACTIVITY

DRAW THE SIGN / SYMBOL	WHAT DOES IT MEAN?

PPE USED WHEN MAINTAINING MACHINERY

Long cotton shirt and trousers		Hearing protection	
Steel-capped boots		Safety glasses	
Gloves		Dust mask	



WORKBOOK ACTIVITY

Different maintenance tasks will present different hazards. List some general hazards that are present when maintaining machinery. In the next column, list some controls you can apply.

REMEMBER: A hazard is something that can cause injury to or can damage the health of a person or animal.

HAZARD	CONTROLS TO REDUCE RISK OF INJURY

2.5 ENVIRONMENTAL CONSIDERATIONS

Maintaining and servicing machinery will involve the use of grease, oil, fuel, degreaser and spray lubricant. If these are not managed well, they can cause damage to the environment.

It is important to have absorbent materials ready to soak up small spills. The easiest thing to use is rags. For large spills you need to use materials from your spill kit or use sand if you have nothing else.

You also need to know how you will get rid of waste oil and fuel. We will discuss this in *Section 4*.



RESEARCH ACTIVITY

Some states have a Code of Practice that describes procedures for disposing of this kind of waste.

Go to your WorkSafe website and see what is recommended in your state.



See WorkSafe websites
Resource R3, page 24

3

DO MAINTENANCE



The job you are doing might be:

- Routine maintenance tasks, including minor repairs and adjustments
- Troubleshooting: diagnosing and fixing a problem

3.1 ROUTINE MAINTENANCE TASKS

There are some tasks that need to be done regularly to look after your machinery. As you carry out these tasks you should be looking for any problems and developing familiarity with the machine. The better you know the machine, the more likely you are to detect problems early on rather than when it is too late.

CLEAN

Clean away dirt, grass, sawdust and/or mud from the machinery. This prevents rust, allows you to see if anything is missing or damaged and keeps the engine cooler. You can do this with a water-pressure cleaner or a compressed air hose (you must wear your safety glasses for this). Cleaning should be done in a wash-down area to prevent the spread of weed seeds or diseases.

If you notice any damage to the body of the machine you should report it to your supervisor. You may be asked to apply an out-of-service tag.

CHECK WHEELS & TYRES

Doing the following checks and follow-up actions can reduce wear so your wheels and tyres will last longer and keep you safe.

Things you can check for:

- Damage to sidewalls, such as cuts, embedded objects, splits, etc.
- The tread – see diagram to the left
- The pressure for each tyre – inflate if necessary
- Loose wheel bearings – you can check by wobbling each wheel sideways
- Wheel nuts – check that they're there and tighten if necessary

Fix anything you can, and refer any serious problems to your supervisor so repairs or replacements can be scheduled.

CHECKING TYRE TREAD

On the side of the tyre you will see one of these marks.



These line up with raised areas between the tread.



When the tread is level with the raised areas, you need to replace the tyre.



These markers help to show if the wheel nuts have come loose.

In this case, if a marker is not pointing outwards you need to check the wheel nut

APPLY GREASE

Grease lubricates bearings and internal moving parts of machinery. You can apply grease to all grease nipples.

The manufacturer's instructions for each machine will tell you:

- The kind of grease to use
- How often this needs to be done

CHECK & TOP UP FLUID LEVELS

Begin by looking at the fluid reservoirs (bottles) under the bonnet.

It is important when checking fluid levels that you keep the fluid completely clean. This is especially true for fuel. Use a rag to remove dust and grease before removing a cap to refill. Check all of the following that are relevant:

1. Brake fluid
2. Power-steering fluid
3. Hydraulic fluid
4. Clutch fluid
5. Engine oil
6. Coolant
7. Radiator and/or overflow bottle
8. Windscreen water
9. Fuel

If you find that you have to top up fluids too often, then there might be a leak or something is damaged. Look around the engine bay, underneath the vehicle and around the inner wheels to see if you can spot where something is wrong.

TIGHTEN NUTS, BOLTS & SCREWS

Nuts, bolts and screws hold the body of the machinery together. These will often become loose because machinery vibrates a lot. This is easier to check on small machinery, such as chainsaws. On larger machinery you will need to listen for rattles or other sounds. If nuts, bolts and screws become loose, the following problems can occur:

- Bolts can snap
- Parts can be damaged
- Dirt can get inside the machinery

You need to use the appropriate tools for the job to avoid damage to the nuts, bolts and screws.



Grease nipple on a whipper snipper



IMPORTANT

Always wait until the engine is cool before removing the radiator cap.





CHANGE THE OIL

Oil is used in the engine, gear box, transfer case and differential to lubricate moving parts in machinery. Over time, the heat in the motor breaks down the oil so that it is not effective anymore. You need to change the oil so that moving parts in the motor are protected from wear. If you do this, they will perform better and last longer.

You should also change the oil filter when you change the engine oil.

You need to follow the manufacturer's instructions to find out:

- The type of oil to use
- How often you need to change it

Remember you must follow your workplace procedures when disposing of waste oil. These procedures should aim to minimise impact on the environment.



LIGHTS

Checking the lights is important for registered vehicles and machinery that will travel on roads. Check:

- Reverse lights
- Brake lights
- Indicators
- Headlights
- Side clearance lights
- Rooftop flashing warning lights

If a light is not working, you might need to replace a globe or a fuse. In general terms, if a fuse has blown then there is possibly a problem in the wiring circuit. This could be caused by vibrations wearing through the insulation on wiring. It could also be caused by a faulty part or by moisture. You might need to refer this to an auto-electrician.



Muffler on a mower



MUFFLER & EXHAUST SYSTEM

The muffler takes the exhaust away from the engine. Exhaust is hot and polluting, so it is important that the muffler is attached properly and not leaking. This ensures the exhaust will be blown away from the operator.

You need to check that:

- The muffler and guard are in place and screws are tight enough to hold them there
- The muffler has no rusty holes
- The spark-arrester screen is in place on two-stroke machinery

If any of these things are not okay, then you should apply an out-of-service tag and follow your workplace procedures to report this.

CHECK BATTERY

Check the battery is seated firmly in its holder and bolted down. You might need to tighten the bolts on the frame.

If there is corrosion around the terminals you need to remove it. When the terminals are clean, apply an anti-corrosion product to keep them clean.

Check that the terminals and any wiring for accessories are secured to the battery and tighten if necessary.

If the battery is not sealed, then you can also top up the cells with distilled water as needed.



This battery is not sealed. You can remove the caps.

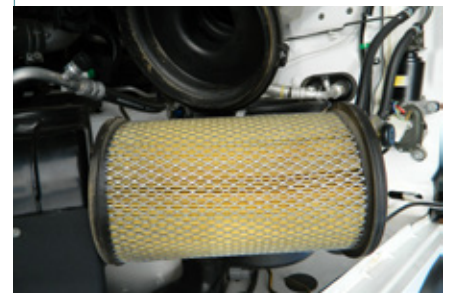
CHECK/REPLACE PARTS

Machinery has many parts that wear out or become damaged. You need to check these and replace when necessary. This is part of keeping the machine operating effectively and safely.

It is best to keep a supply of parts in your store so they are available when you need them.

Examples are:

- Mower/slasher blades, retaining nuts, bolts, washers
- Chainsaw chains
- Drive belts
- Fuel filter
- Oil filter
- Air-filter element
- Chain-drive sprockets





3.2 BASIC TROUBLESHOOTING

Troubleshooting means diagnosing a problem and finding out what is causing the symptoms.

Symptoms are things you notice that don't seem right. Pay attention to these and think about what could be the cause. The more you work with engines, fuel and electrical systems the better you will become at linking the symptoms with the cause. Doing training, asking questions and reading the manufacturer's instructions will always be useful.

The table on the opposite page is designed to encourage you to observe and think about problems and how to solve them. It is not meant to be an all-encompassing guide to troubleshooting.

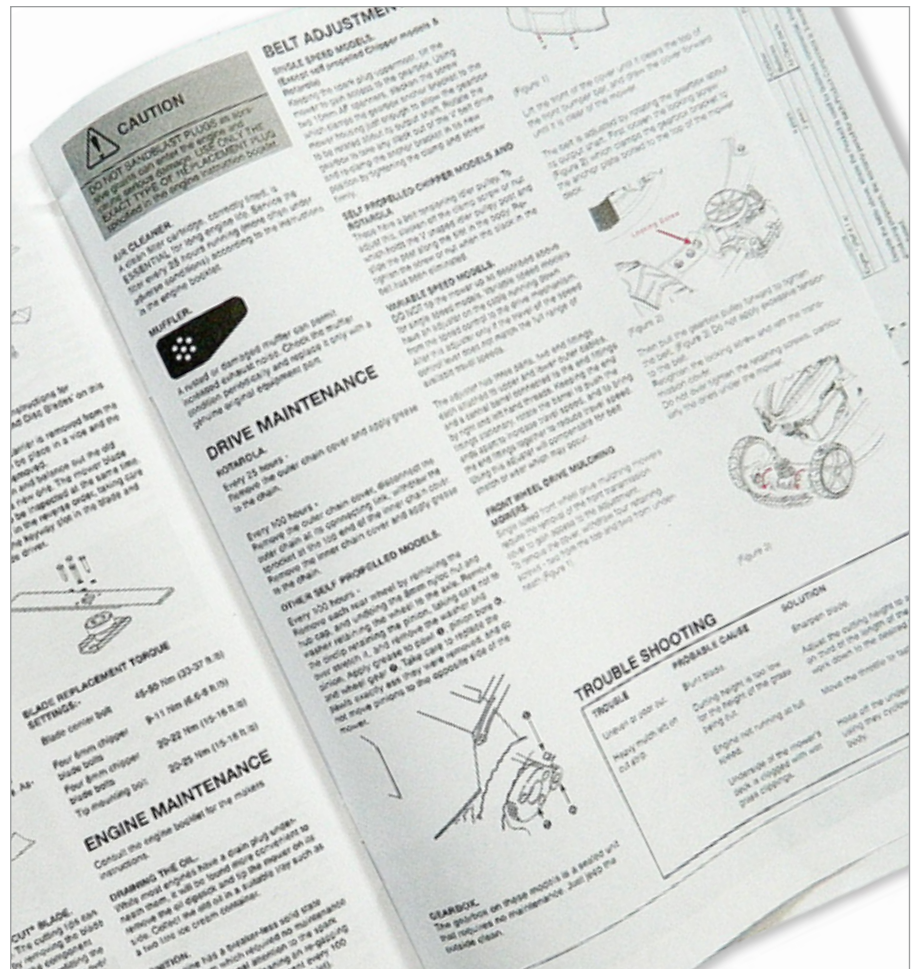
You should always refer problems to your supervisor or mechanic if:

- You can't get a machine to start and you don't know what is wrong
- If something seems wrong and you don't know what to do



DISCUSSION ACTIVITY

What is your workplace procedure for applying an out-of-service tag and reporting faulty equipment?



TROUBLESHOOTING TABLE

SYMPTOMS	POSSIBLE CAUSE	POSSIBLE ACTIONS
THINGS YOU SEE		
Broken, bent or missing parts		Remove broken and bent parts and replace with new parts
Smoke	Oil leak onto hot engine part	Replace gasket and/or leaking part
	Electrical wires short-circuiting	Replace wiring if you can see the cause or ask an auto-electrician
	Overheating engine	Check cooling system Clean cooling fins
Excessive blue exhaust smoke	Incorrect fuel mix	Drain and replace with correct mix
	Worn piston rings	Ask a mechanic
NOISES YOU HEAR		
Extra loud	Muffler damaged or loose	Replace or tighten
Banging, rattling clunks, ticking	A part has come loose	Replace or tighten
STRANGE SMELLS		
Burning oil	Oil leak onto hot engine part	Replace gasket and/or leaking part
Rubber or plastic insulation smells	Electrical wires short-circuiting	Replace wiring if you can see the cause or ask an auto-electrician
	Overheating engine	Check cooling system Clean cooling fins
THE FEEL OF THE MACHINERY		
More vibrations than usual	Bolts, belts are loose, worn or damaged	Replace or tighten
Hard to handle, steer or control	Loose parts, damaged or bent components	Tighten or replace if possible or ask a mechanic

4

FINISH UP



When you have finished doing the maintenance on machinery, you need to spend some time finishing up.

4.1 PUT TOOLS AWAY

Clean your tools with a rag to remove grease and oil. Then put the tools away in a toolbox or designated place. It is important you have a place to store and secure your tools.

This helps to:

- Keep your workspace tidy so you can find things when you need them
- Protect tools from damage
- Keep untrained people from accessing your tools
- Prevent injury from people tripping over or using tools unsafely

4.2 DISPOSE OF WASTE

There are laws to protect the environment from damage caused by waste from machinery. Fuel, oil and grease are hazardous to the environment. They present a serious risk to waterways, affecting native flora and fauna.

You must always dispose of these things appropriately:

- Used oil and contaminated fuel
- Used filters and other parts
- Oily rags
- Machine parts
- Tyres

You must never dump used oil or fuel:

- In garbage bins
- Down a sink or stormwater drain
- Into sewers
- Into rivers
- On the ground

You must always follow your workplace procedures when disposing of waste.



NOTE

There are recycling services available in most towns. This means that oil can be cleaned and reused.



DISCUSSION ACTIVITY

What are your workplace procedures to manage the disposal of environmentally damaging waste?

4.3 RECORD YOUR WORK

When you have finished, you need to record what you did. This will help to track each piece of machinery and see if it has a problem that keeps happening. This might be a symptom of a more serious problem.

It also means anyone can see what has been done on the maintenance schedule from the manufacturer's instructions. Then they can work out what needs to be done next time.

It is important to write as much information as you can about what you did and what you observed. If you need help to write this out, then talk with your supervisor.

Service logs should be filed in the office at your workplace. Having a folder for each piece of machinery is a good way to organise the service logs.

Below is a sample of a completed log sheet.

You will find a blank of this in the *Resources* section. Use this if your workplace does not have a form to use.



See Service and Maintenance Log Sheet Resource R4, page 25

SERVICE AND MAINTENANCE LOG SHEET	
Service person	Joe Bloggs
Date	26 th Oct 2014
Model and/or registration	Ride-on John Deere 445 Front Deck
<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Clean machine	Comments: Washed down
<input checked="" type="checkbox"/> Check wheels and tyres	Comments: Some air needed in right re
<input checked="" type="checkbox"/> Apply grease	Comments: Greased all points
<input checked="" type="checkbox"/> Check and top up fluid levels	Comments: all OK
<input checked="" type="checkbox"/> Change oil	Comments: not required yet
<input checked="" type="checkbox"/> Check lights, replace globes, fuses	Comments: all OK
<input checked="" type="checkbox"/> Check battery	Comments: all OK
<input checked="" type="checkbox"/> Check/replace parts e.g. filters, belts, blades, spark plug	Comments: Cleaned out air filter and pre-clean
<input checked="" type="checkbox"/> Check nuts, bolts and screws	Comments:
<input checked="" type="checkbox"/> Check muffler	Comments: OK
<input type="checkbox"/> Other	Comments:

SERVICE AND MAINTENANCE LOG SHEET	
Service person	Joe Bloggs
Date	26 th Oct 2014
Model and/or registration	Stihl M3250 Chainsaw
<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Clean machine	Comments: Removed side covers, bar & chain and cleaned. Blew out air filter with compressor
<input type="checkbox"/> Check wheels and tyres	Comments: NA
<input type="checkbox"/> Apply grease	Comments: NA
<input checked="" type="checkbox"/> Check and top up fluid levels	Comments: Fill with 2 stroke and bar oil
<input type="checkbox"/> Change oil	Comments: NA
<input type="checkbox"/> Check lights, replace globes, fuses	Comments: NA
<input type="checkbox"/> Check battery	Comments: NA
<input checked="" type="checkbox"/> Check/replace parts e.g. filters, belts, blades, spark plug	Comments: Replaced anti-vibration rubber
<input checked="" type="checkbox"/> Check nuts, bolts and screws	Comments: all OK
<input checked="" type="checkbox"/> Check muffler	Comments: Cleaned and all OK.
<input type="checkbox"/> Other	Comments:

UNDERTAKE OPERATIONAL MAINTENANCE OF MACHINERY GREENING AUSTRALIA



PROJECT

With your work team and supervisor, you will perform basic maintenance on the machinery in your workplace.

For each piece of machinery:

- Do the relevant routine maintenance tasks
- Carry out basic troubleshooting if there is a fault. If you can fix it then do so. If you can't fix it, then apply an out-of-service tag and report it to your supervisor or follow your workplace procedure to refer to the appropriate person
- Complete a service log
- Clean up the worksite and dispose of waste appropriately

You need to show that you can:

- Work safely
- Communicate effectively with your work team and supervisor
- Prepare to do the work
- Use the right tools for the job
- Clean up your workspace
- Dispose of environmentally damaging waste appropriately





RESOURCES

R1

WEBSITES ABOUT ENGINES

Animated image of a two-stroke engine

<http://science.howstuffworks.com/transport/engines-equipment/two-stroke1.htm>

Animated image of a four-stroke engine

<http://auto.howstuffworks.com/engine.htm>

R2

PRE-START CHECKLIST FOR POWER TOOLS

	<input checked="" type="checkbox"/>
No obvious faults or damage	
Electrical cords are not damaged	
Nuts and bolts are tight	
Safety guards are in place and in good condition	

R3

WORKSAFE WEBSITES

National	www.safeworkaustralia.gov.au
Western Australia	www.worksafe.wa.gov.au
Victoria	www.worksafe.vic.gov.au
Northern Territory	www.worksafe.nt.gov.au
Tasmania	www.worksafe.tas.gov.au
Queensland	www.worksafe.qld.gov.au
New South Wales	www.workcover.nsw.gov.au
South Australia	www.safework.sa.gov.au

SERVICE & MAINTENANCE LOG SHEET

R4

Service person

Date

Model and/or registration



Clean machine

Comments



Check wheels and tyres

Comments



Apply grease

Comments



Check and top up fluid levels

Comments



Change oil

Comments



Check lights, replace globes, fuses

Comments



Check battery

Comments



Check/replace parts, e.g. filters, belts, blades, spark plug

Comments



Check nuts, bolts and screws

Comments



Check muffler

Comments



Other

Comments

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UNDERTAKE OPERATIONAL MAINTENANCE OF MACHINERY

This learning guide covers information about maintaining and servicing a range of machinery commonly used in conservation and land management (CLM) and horticulture. This may include spray equipment, small tractors, ride-on mowers, rotary hoes, chainsaws, hedge trimmers, vehicles and/or quad bikes.

Topics include:

- GENERAL INFORMATION
 - TWO-STROKE PETROL ENGINES
 - FOUR-STROKE PETROL ENGINES
 - PETROL VS. DIESEL ENGINES
 - HYDRAULIC SYSTEMS
 - MECHANICAL LINKAGE SYSTEMS
 - ELECTRICAL SYSTEMS IN A VEHICLE
- WORKPLACE HEALTH & SAFETY
- GETTING READY TO DO MAINTENANCE
- DOING ROUTINE MAINTENANCE TASKS
- BASIC TROUBLESHOOTING
- FINISHING UP



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