ALEP

18

Aboriginal Landcare Education Program

UNDERTAKE OPERATIONAL MAINTENANCE OF MACHINERY





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CONTENTS

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

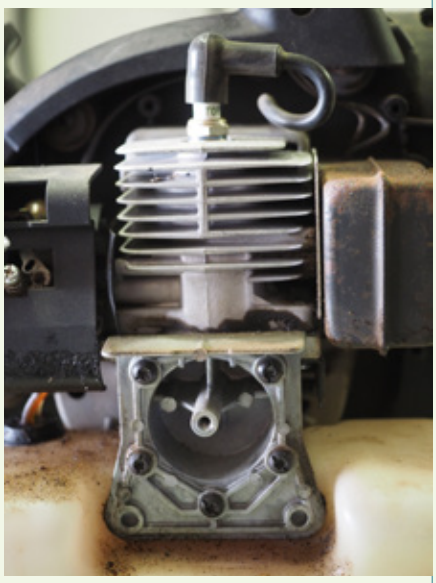
Much of the training for this unit should be completed on the job.

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		

1 BEFORE YOU START



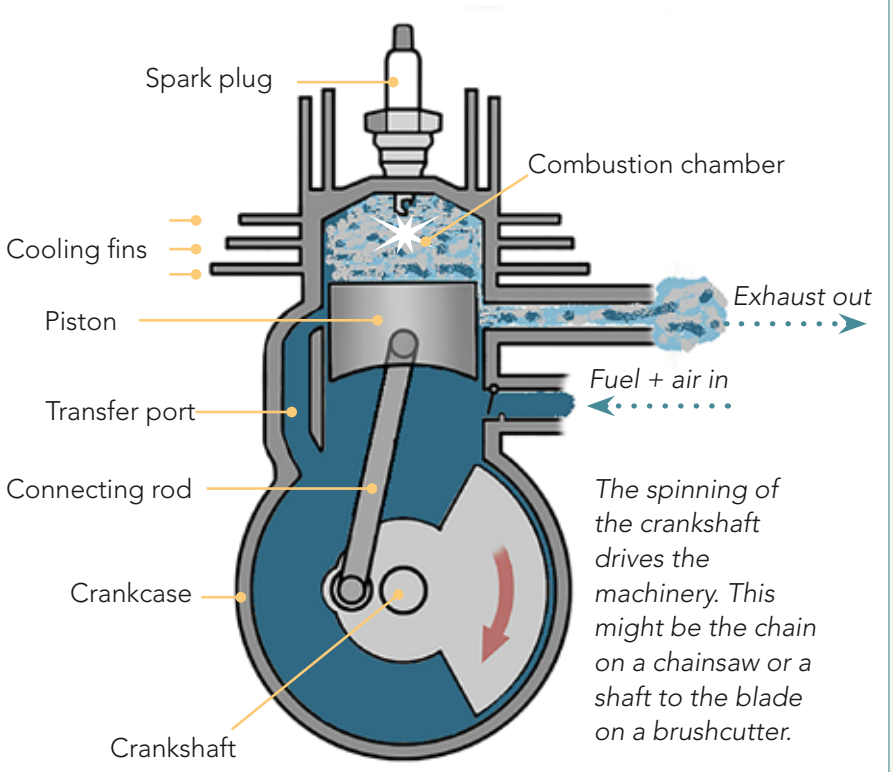
This is a photo of a two-stroke engine from the outside. Can you see how the parts in the diagram relate to this?

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.

INSIDE A TWO-STROKE ENGINE



The spinning of the crankshaft drives the machinery. This might be the chain on a chainsaw or a shaft to the blade on a brushcutter.

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

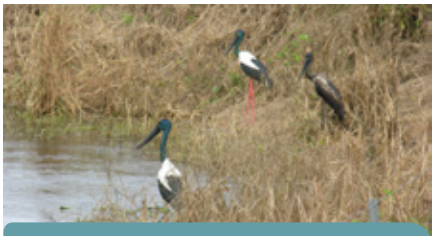
Fuel/Oil Ratio	ml oil per 1 L of fuel	ml oil per 5 L of fuel	ml oil per 10 L of fuel	ml oil per 20 L of fuel
25:1	40	200	400	800
50:1	20	100	200	400
100:1	10	50	100	200

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:

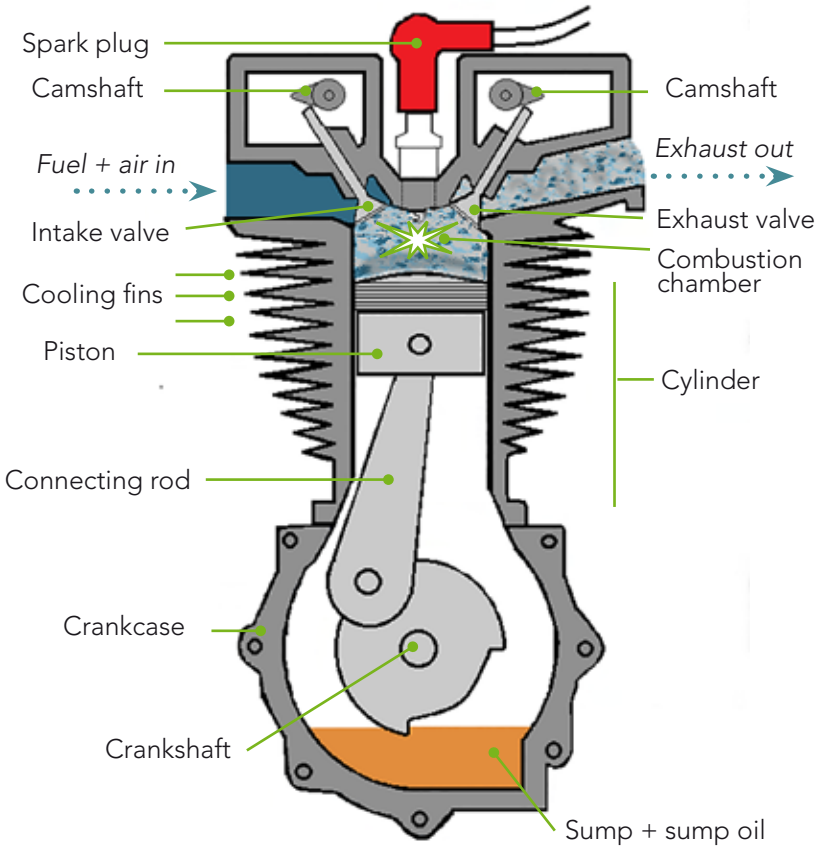
- Buying new machinery
- Disposing of old machinery
- Maintaining machinery

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.

INSIDE A FOUR-STROKE ENGINE



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

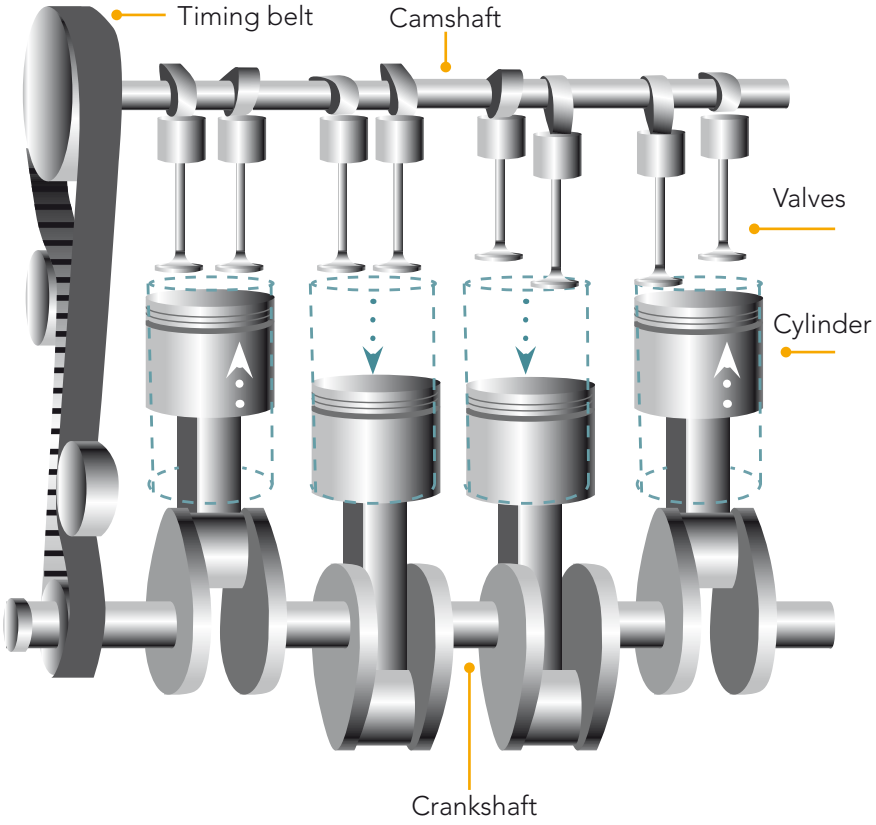
NOTE

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.

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.

R1

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.