

# Oil & grease - lubrication - tutor notes

## What students will learn

When they have finished the lubrication module, students should:

- Know why engines need oil
- Know about types of engine oil
- Choose the right oil for their engine
- Choose the right oil filter for their engine
- Change their engine oil and filter
- Know how to lubricate the controls.

## Things you need before you start

### Information

You will need ideas and information on:

What type of oil and filters are available locally – and where from

What oil and filters are used for the engines your students will work on

How engine controls are lubricated – and with what lubricant

## **Materials**

Examples to show students:

4-stroke engines – eg mowers, outboard motors

Engine oil

Oil filter (if needed)

Cleaning cloths

CRC Marine, WD40 or similar lubricant

grease

## **Tools or equipment**

If students don't have their own engines, you may need to provide suitable engines to work on

Students will need tools and equipment to check and change oil and filters:

Spanner for fill and drain plugs

Filter wrench

Screwdrivers

Container to catch old oil

## **Oil and grease - Activity**

The activities in this module require the students to collect oil and grease information about the engines they are working on.

The students then carry out the regular maintenance checks and complete an oil and filter change on the engine.

Ideally, students should use their own engines for this activity. It would be useful for them to carry out the maintenance tasks on other types of engine and equipment as well.

Students should work together in small groups to answer the questions and carry out the maintenance tasks.

# The module

The workbook sections are:

- Introduction to engine lubrication
  - engine oil
  - oil filters
  - engine controls

- Maintenance
  - Checking oil level
  - Changing oil
  - Changing filter

- Lubricate engine controls

Copies of the workbook sections are included in your manual here as well as in the Student Workbook.

You need to work through each section with the students, talking about the oils, the parts and showing the students what to do - and what they should NOT do.

## Remember

The workbooks are **not** designed to be used by the students learning on their own.

## Important note

Make sure **your** students know where, and how, to get rid of waste oil and filters in a way that is safe for your local environment.

# General lubrication – introduction

Use these notes for an introduction at the beginning of the oil and grease module.

To start the module, talk to the students generally about the main things they will learn and what they will do in each section:

- Why engines need oil
- What they need for their engines
- Changing oil and filters
- Maintenance checks.

## Explain

Explain that the in module:

- You will talk about each of these things – and show them what and how to work on their engines.
- They will collect information about THEIR engine, and
- Finally, they will get to carry out checks, change oil and filters etc.

Explain that this module is about lubrication for the **engine** and its **controls** only. Lubrication for transmissions and other equipment attached to the engine are covered in separate non-engine worksheets.

Make sure students understand that they need expert assistance for any large or safety related work.

# Engine lubrication

Work with students through each part of the worksheets.

## Introduction

### Talk about

- 4-strokes have oil in the crankcase, 2 strokes have their oil mixed with the fuel.

So – this section is mainly about oil in 4 stroke motors.

There are some exceptions to this on new design outboard engines.

- 2-strokes with separate oil injection instead of pre-mixing with petrol
- 4-strokes with a 'dry-sump' that pump their oil to a separate tank on the engine.

This material does not cover these exceptions. Explain them to students if they have engines like that.

- Oil needs to be clean – and it needs to be changed.
- There needs to be the right amount of oil – so it is important to check oil level regularly.

## Engine oil

### Talk about

- Why engines need oil
- What oil does –
  - a cushion between engine parts
  - takes away heat
- Chemical additives in the oil help it work.
- Safety – getting rid of old oil properly.

## Talk about – Oil grades

- Oil gets thinner as it gets hotter

Thick oil is difficult to move round an engine. Oil that is too thin won't provide the 'cushion' between moving parts.

- It's important to have the right thickness of oil for the engine – when **hot and when cold**.

- Engine oil is measured by how thick it is. This is called its '*viscosity*'.

Oil is made in different thicknesses to meet standards set by the Society of Automotive Engineers (SAE).

SAE 10 oil is very thin, SAE 50 is quite thick, SAE120 gear oil is very thick

- There are 'multigrade' oils with a grade such as SAE 10W-30. This means it changes with temperature – it works like an SAE10 when its cold (W = winter!) and as an SAE 30 oil when its hot.

- Oil is also has a 'quality' specification or standard about how it performs – and what chemical additives it has in it.

Older or low power engines are OK to use an "SG" spec oil. Newer high speed engines usually need a higher specification oil such as 'SJ" or higher. The higher specification oils usually cost more.

An oil spec starting with 'C' (for example CC or CF) is for using the oil in Diesel engines.

## Show

- Examples of engine oils you have locally
- Explain the SAE rating and specification code for each

## Talk about

- The most suitable oil grades for the students' engines.

The worksheet has a general guide to suitable oils but help students find out:

- what their engine manufacturers recommend in your local conditions.
  - how much oil their engine needs
  - how often they should change the oil
- 
- Where to buy oil from

## Oil filters

### Talk about - filters

- 2-stroke engines don't need them – they don't have engine oil
  
- Purpose of the filter –  
To remove small pieces of metal, chemicals and carbon that the oil takes away from the moving parts of the engine. The metal is in very tiny pieces that come from wearing parts of the engine, the chemicals and carbon come from the burned fuel. They are very small, but they will wear the engine if they move about in the oil.

All the oil in the engine goes through the filter – usually it is pumped around

- Not all small engines have filters. Many small mower and generators motors rely on regular oil changes to remove dirt, carbon and metal pieces.
  
- Change the filter when you change the engine oil

## Show

Examples of can-type oil filters you use on engines locally.

## Help

students find out:

What filter (part number) they need for their engine (if needed at all)

Where to buy filters from

## Grease

### Talk about

The types of grease and what they are used for.

- A general purpose grease is good for most small lightly-loaded jobs – but make sure students understand the need for the right grease on important jobs.

For example:

- marine grease to stop corrosion and water entry on outboards
- high melting point grease on cars and wheels

## Show

- Types of grease students should use locally
- Typical jobs – shafts, steering gear
- Grease nipples and grease guns
  
- How to load and use a grease gun.

## Engine controls

### Talk about

- Controls on the students' engines such as cables and levers and the need to lubricate and protect them from dirt and corrosion.
- Help them check engine makers recommendations on what parts to lubricate.



# Oil and grease – Maintenance

Work with students through the worksheet.

**Note**

Stress the fact that waste oil can damage and make a mess of the environment. Make sure **your** students know the right way to dispose of them properly.

## Check oil levels

### Talk about

- Need to check oil level every time they use engine – or at least every 5 hrs.
- Dipsticks, level plugs and sight glasses.
- Engines in good condition will not ‘use up’ oil – but check anyway

### Show

There are pictures on the worksheet, but show examples of engines with each type you have available

- Show how to check oil level with each type.
- Show how to add more oil if needed.

## Student activity

Help students with the activity

They check the oil level on their engine and top up if needed.

## Changing oil and filter

**Work with students through the worksheet.**

### Talk about

- Engine oil needs to be changed, because

Oil gets dirty in use and stops lubricating and cooling as well as it should, so the engine will wear more.

Also, many small engines have no oil filter to catch all the dirt, metal particles, and other nasty stuff that end up in the oil and the moving parts. Changing the oil is the only way to stop the oil in those engines getting too bad.

Larger engines *will* have an oil filter to clean the oil – and that needs to be changed as well.

The worksheet gives a general guide to oil change periods – but this may be different in you local conditions.

### Help

Students to find out the makers recommended oil change periods for their operating conditions.

## Show

- Examples of clean – and used, dirty engine oils. Get students to see, smell and feel the difference.
- Show – how to change oil and filter
- Show how to drain and replace the oil and change the filter on two or three different types of engine.
  - The worksheet describes the steps to change oil on a typical outboard and a simple mower engine.
  - The worksheet also describes the steps to change the can-type oil filter.
- **Talk** about each step – and **show** how to do it on an actual engine.
- **Show** how to use a filter or strap wrench. Advise only to use the screwdriver punched through the filter as a last resort to get the filter off – it works well, but makes a big mess!
- Oil the face of the new filter. **DO NOT** do the filter up too tight and hand-tight only, as you will damage the filter/seal and make it very hard to get off again!

## Talk about – safety

- The oil may be very hot – be careful
- Dirty engine oil is not good for the skin or the environment.
  - Avoid getting it on your hand – if possible. Dispose of the old oil in an environmentally safe way according to local regulations.

## Student activity

Help students to complete the Activity where they change the oil and filter on their own – and other engines.