

What students will learn

When they have finished the Cooling module, students should:

- Know the different ways to keep engines cool
- Know how their engine is cooled
- Be able to check and maintain the cooling system on their engine

Things you need before you start

Information

You will need ideas and information on:

- What types of cooling system are used locally – and for what types of small engine –
 - Air cooled
 - Water cooled – sealed systems like automobile engines
 - Water cooled – outboard motors
- How to check, clean and maintain each one

Materials

Examples to show students:

- Water cooled engines – outboard motors
 - Flushing connectors and/or tank mounting for outboards
- Air cooled engines – mowers, chain saw, scrub cutter or similar

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 clean and maintain their cooling systems such as:

- Flushing connectors or tank mounts for outboards

- Brushes to clean fins and tools to remove covers on air cooled engines.

Cooling - Activity

The activity in this module requires the students to collect cooling information about the engines they are working on.

The students then carry out the regular maintenance and checks on the cooling of the engine. Flushing for outboards is particularly important.

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 for this module are:

- Ways of cooling an engine

 - Air cooling, Water cooling – auto engines, Water cooling – outboards

- Maintenance

 - Cleaning and maintaining

 - Outboards

 - Air cooled engines

- Regular checks

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 cooling and what parts for students to check. Show 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.

General Cooling introduction -Tutor notes

Use these notes for an **introduction** at the beginning of the Cooling module.

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

- Types of cooling system – and what their own engines use
- special things they should know about cooling
- safety and 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 the engines.
- They will collect information about THEIR engine, and
- Finally, they will get to carry out checks, clean, flush engines etc.

Then move into *Ways of cooling engines*.

In addition:

Talk about - The need for advice and assistance

- It is **very** important that students understand the limits of what they learn on this course. Here they learn only about simple, small – scale checks and maintenance jobs such as checks and cleaning.
- Bigger jobs, such as replacing water pumps, **need expert knowledge and skill and equipment** to dismantle, repair and adjust.

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

Ways of cooling engines

Work with students through each part of the workbook notes.

Talk about - cooling

- Why engines get hot – and why we need to keep them cool.
- Talk about the best types of cooling for the students' engines.

Talk about - Safety

- Reinforce the importance of safety when working on cooling parts:
They are hot!
Students may need to work on engines that are running – be careful of moving parts

Talk about - Air cooling

- Air cooling is simple!
- Air cooling parts
Fins, casing/covers, fans – and what they do

Show

- Air cooling parts on different types of engine; mowers, concrete mixers, chainsaws or similar. Include an air-cooled outboard if you have one.
- Any parts you have that were damaged by over heating.
- How to
remove any covers/casings
clean any grass/dirt/dust from the fins, covers and fan with a brush

Get them to show you that they can clean an air cooled motor correctly.

Talk about – water cooling on cars and trucks

- Explain that working on these systems is not part of this course – but it's good to know about the sealed cooling systems in cars.
- **Show them** the water cooling parts on a car or truck:
Radiator, radiator pressure cap, hoses, fan, water – and thermostat if possible.
Simply explain what each one does.
Include a warning not to open the radiator cap when the engine is hot – easy to get scolded by steam.

Talk about – Water cooled outboard motors

Talk about the

- Outboard motor cooling parts
Inlet and outlet ports (or tell-tales), water passages inside the engine, water pumps and impellers. Use the pictures on the worksheets.
- Explain what they do

Show

Where the parts are located on one or two different engines.

Talk about

- Checks to make sure of water flow
- How inlets can get blocked with weed and other debris
- How to check the 'tell-tale' or other water indicator

Show

How to clear a blocked intake

Talk about – corrosion

- How sea water can attack the aluminium engine passages and water pump.
- The need to flush engines with clean water
- When – and how – to flush enginesin your own local situation.

Note

All outboard makers recommend flushing engines with clean, fresh water after **every** trip.

Show

How to flush the students' engines. Use flushing connectors to a hose, and/or a fixed mounting to run the engine in a tank/drum of fresh water.

Flushing can be done by:

- (1) Run the engine in a **Fresh**-water stream before shutdown
- (2) Fit the flushing adapter or “ear-muff” type connectors in the correct place. Refer Manufacturer’s manual.

Turn on water supply.

Start the engine and run it for a few minutes at operating temperature. Stop engine and turn off/disconnect the water supply.

- (3) Set up a 200ltr. drum partly filled with about 175ltrs of **Fresh**-water.

Mount the outboard with the drive end in the water and run as in (2) above. You do not have to have the propeller driving to do this but it can help a lazy water pump.

Important operating note

Remind students to never carry or store an outboard motor with the **Propeller end** higher than the **Engine end**. If they do that, cooling water can run back up the Exhaust into the engine cylinders where it will damage the engine.

Student activity

Help students as they check, clean and flush the cooling systems on their own engine and other examples.