MODULE CONTENT

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| Unit of Competency | **DIAGNOSE AND REPAIR INTAKE AND EXHAUST SYSTEM** |
| --- | --- |
| Module Title | **DIAGNOSING AND REPAIRING INTAKE AND EXHAUST SYSTEM** |
| Module Descriptor | This unit describes the performance outcomes required  to diagnose and repair faults in the conventional intake  and exhaust systems of vehicles such as intake and  exhaust manifold, and throttle system, turbocharger and  intercooler system. It covers the knowledge, skills and  attitude required to prepare to diagnose and repair intake  and exhaust system, diagnose and repair intake and  exhaust system and complete work processes. |
| Nominal Duration | **hours** |
| Summary of the Learning Outcomes: | |
| Upon completion of this module the student must be able to: | |
| LO1. Prepare to diagnose and repair intake and exhaust system | |
| LO2. Diagnose intake and exhaust system | |
| LO3. Repair intake and exhaust system | |
| LO4. Complete work processes | |

**LEARNING EXPERIENCES**

**LEARNING OUTCOMES NO. 1**

**PREPARE TO DIAGNOSE AND REPAIR INTAKE AND EXHAUST SYSTEM**

| **Learning Activities** | **Special Instructions** |
| --- | --- |
| Read Information Sheet 3.1-1 Prepare to diagnose and repair intake and exhaust system | If you have some problem on the content of the information sheet don’t hesitate to approach your Trainer.  If you feel that you are now knowledgeable on the content of the information sheet, you can now answer self-check provided in the module. |
| Answer Self-Check 3.1-1 on Prepare to diagnose and repair intake and exhaust system | Try to answer the Self-check without looking at the Answer Key  Compare your answer to Answer Key 3.1-1 |
| Observe Trainer’s demonstration on Task Sheet 3.1-1 on Prepare to diagnose and repair intake and exhaust system | Listen carefully and attentively so that you may be able to perform a task correctly  Ask questions if are in doubt for clarification |
| Perform the Task Sheet 3.1-1 on Prepare to diagnose and repair intake and exhaust system | Remember the step-by-step procedure the Prepare to diagnose and repair intake and exhaust system |
| Evaluate the performance using the Performance Criteria Checklist 3.1-1 | Repeat the task in case fail to meet the criteria |

**INFORMATION SHEET 1.1-1**

**PREPARE TO DIAGNOSE AND REPAIR INTAKE AND EXHAUST SYSTEM**

**Learning Objectives:**

After reading this **Information Sheet**, you must be able to:

1. Determined job requirements
2. Sourced and interpreted diagnostic information.
3. Verified symptoms.
4. Identified hazards associated with the work and managed risks.
5. Selected and checked tools, equipment, and materials.
6. Reported defective and damaged tools and equipment.
7. Checked and reported availability of materials.

**INTAKE SYSTEM**

**DEFINITION:**

A system that keeps air cool and dry.

**Purpose:**

* The purpose of the engine’s cooling system is to removed excess heat from the engine.
* To keep the engine up to the correct temperature as soon as after starting.

Two kinds of Cooling System

1. Air cooling system
2. Water cooling system

**Air cooling system**

This is the standard method of cooling system used method to dissipate heat.

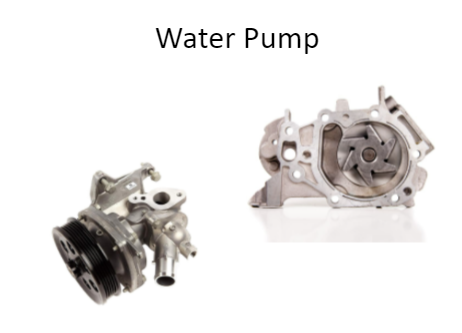
* The object being cooled will have a flow of air moving over its surface
* Usually a combination of fans and heat sinks.
* Contrast liquid/water cooling system.

**Water cooling system**

A water cooled engine blocks and cylinder head have interconnected coolant channels running through them.

**Components of a water engine cooling system**

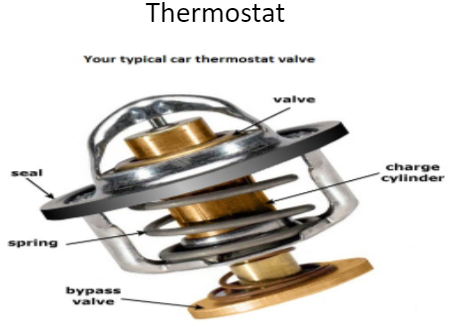
* Water Pump
* Freeze Plugs
* Thermostat
* Radiator
* Cooling Fan
* Heater Core
* Pressure Cap
* Over Flow Tank
* Hoses
* Antifreeze



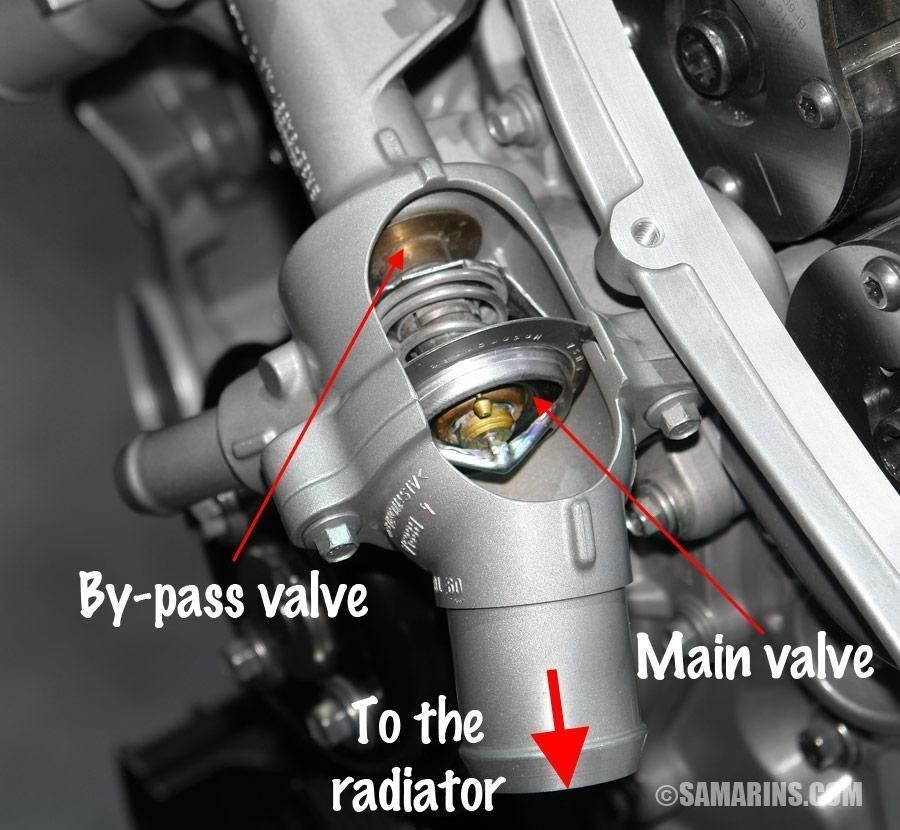
A water pump is vital to a car engine's operation because it ensures the coolant keeps moving through the engine block, hoses and **radiator**, and maintains an optimum operating temperature. It is driven by a serpentine belt (aka accessory belt or auxiliary belt) from the **crankshaft pulley**.

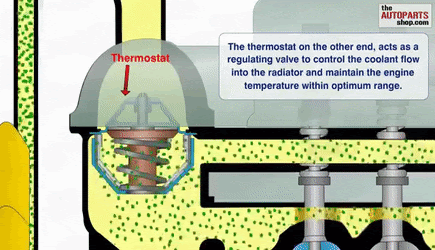


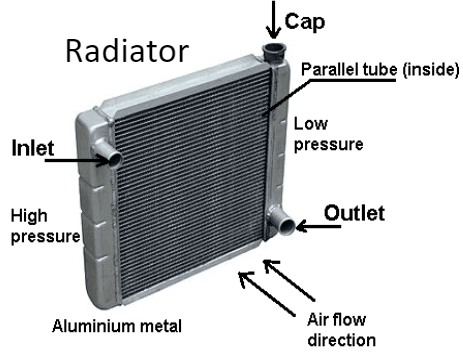
**Freeze plugs** are usually aluminum or brass **plugs** pressed into holes in the water jacked of your engine block. In some cases, as the water freezes and expands in your block, the **freeze plugs** will push out relieving the pressure of the freezing water and partially draining your cooling system.



* A **car thermostat** is a small device that sits between the radiator and the engine of a liquid-cooled **car**.
* Its principal function is to regulate the flow of engine coolant from the engine to the radiator. When closed, engine coolant cannot flow into the radiator which can lead to a rapid increase in engine temperature.







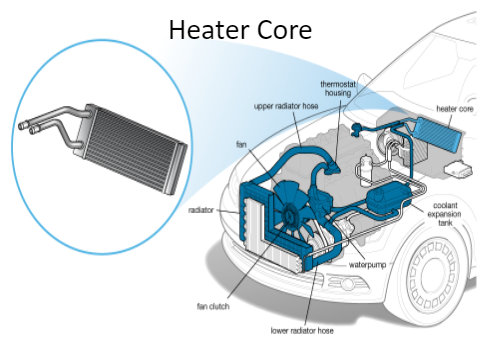
A **radiator** is a type of heat exchanger. It is designed to transfer heat from the hot coolant that flows through it to the air blown through it by the fan. Most modern **cars** use aluminum **radiators**. These **radiators** are made by brazing thin aluminum fins to flattened aluminum tubes.



The radiator pressure cap prevents coolant loss and increases the cooling systems boiling point. It contains a spring that holds pressure in the system until it reaches a specified pressure. The radiator cap also allows the engine's coolant to expand and contract without allowing air to enter the cooling system.



The engine **cooling fan** is designed to move air through the **radiator** when the vehicle is at slower speeds or stopped. This air flow removes heat from the coolant created by the engine using the **radiator** as a conductor. An engine **cooling fan** is temperature controlled to only run when needed.



A **heater core** is a small radiator located under the dashboard of the vehicle, and it consists of conductive aluminum or brass tubing with cooling fins to increase surface area. Hot coolant passing through the **heater core** gives off heat before returning to the engine cooling circuit.



The **overflow tank** typically has one or sometimes two ports. The hot **coolant** is transferred back and forth between the **tank** depending on the pressure emitted from the hot **coolant**.

An **overflow tank** can also be referred to as a recovery **tank** and is the simpler system of the two.



**Coolant** is the fluid that absorbs heat from the engine and then dissipates it through the radiator.



**INFORMATION SHEET 3.1-1**

**PREPARE TO DIAGNOSE AND REPAIR ENGINE LUBRICATING SYSTEM**

**LUBRICATING SYSTEM**

**DEFINITION:**

is a means whereby a material is placed between two rubbing surfaces to alleviate friction and therefore wear

**Components of Lubricating system:**

* Oil pump
* Oil filter
* Oil strainer/pump
* Oil pan
* Oil cooler
* Oil pressure relief valve

**Oil pump**

The oil pump in an internal combustion engine circulates engine oil under pressure to the rotating bearings, the sliding pistons and the camshaft of the engine.

As well as its primary purpose for lubrication, pressurized oil is increasingly used as a hydraulic fluid to power small actuators.



**Oil filter**

An oil filter is a filter designed to remove contaminants from engine oil



**Oil strainer**

The function of an Oil Strainer is to remove system debris from the refrigerant oil. Their purpose is to protect compressors and oil level regulators from damage.



**Oil pan**

The oil pan is attached to the bottom of the engine with bolts and is the reservoir for oil that gets pumped throughout the engine to lubricate, clean and cool moving parts.



**Oil cooler**

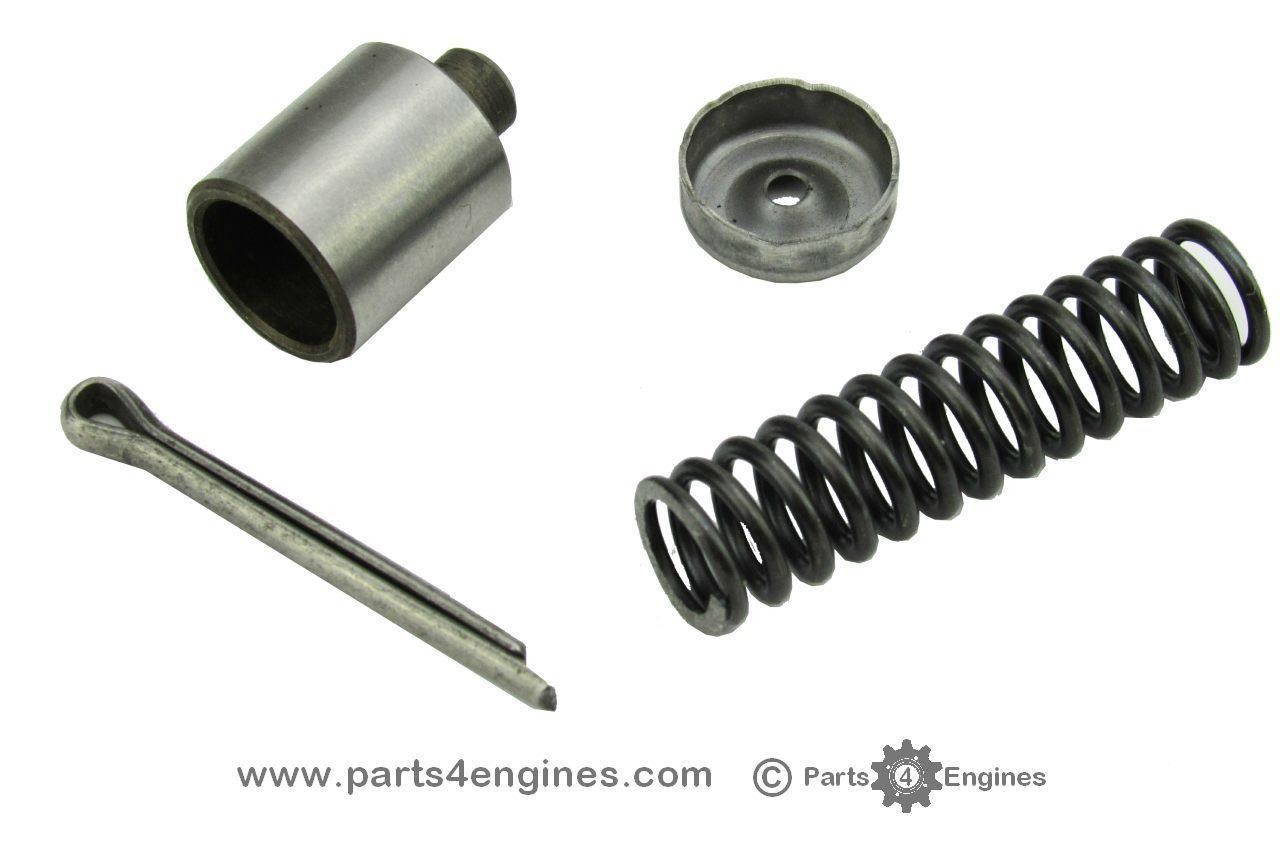
The purpose of the engine oil cooler is to allow the engine's cooling system to remove excess heat from the oil. These types of coolers are usually of the water-to-oil type of heat exchanger.

The oil then flows through the tubes of the cooler while the engine coolant flows around the tubes.

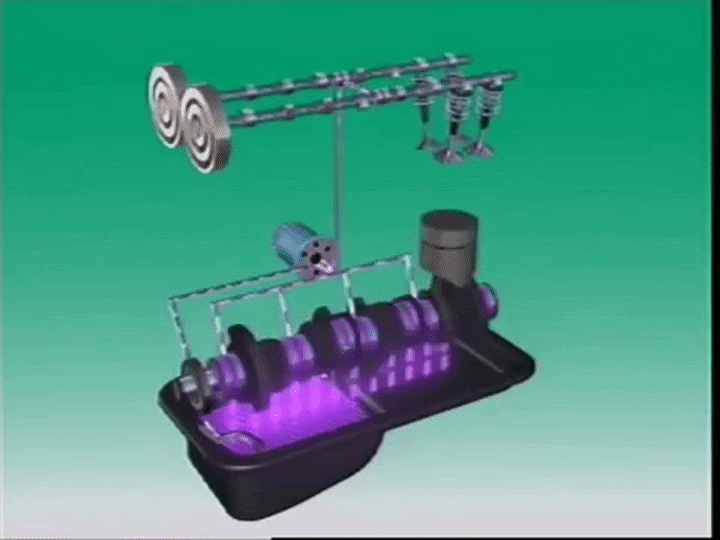


**Oil pressure relief valve**

The oil pressure relief valve is usually located at the pulley end of the engine, right around the oil pump. When the engine is cold, the oil becomes cold and thick. It is at this time that the oil pressure relief allows oil to flow directly to the bearings from the oil pump.



**OIL CYCLE**



| Unit of Competency | **DIAGNOSE AND REPAIR ENGINE COOLING AND LUBRICATION SYSTEM** |
| --- | --- |
| Module Title | **DIAGNOSING AND REPAIRING ENGINE COOLING AND LUBRICATION SYSTEM** |
| Module Descriptor | This unit describes the performance outcomes required to diagnose and repair faults in the cooling systems of  vehicles such as radiator, water pump, and thermostat  and lubrication systems such as oil pump, oil cooler,  hoses and oil pressure switch. It covers the knowledge,  skills, and attitudes required to prepare to diagnose and  repair engine cooling and lubrication systems, diagnose  and repair engine cooling and lubrication system and  complete work processes. |
| Nominal Duration | **hours** |
| Summary of the Learning Outcomes: | |
| Upon completion of this module the student must be able to: | |
| LO1. Prepare to diagnose and repair engine cooling and lubrication systems | |
| LO2. Diagnose engine cooling and lubrication system | |
| LO3. Repair engine cooling and lubrication system | |
| LO4. Complete work processes | |

**LEARNING EXPERIENCES**

**LEARNING OUTCOMES NO. 1**

**PREPARE TO DIAGNOSE AND REPAIR ENGINE COOLING AND LUBRICATION SYSTEMS**

| **Learning Activities** | **Special Instructions** |
| --- | --- |
| Read Information Sheet 3.1-1 Prepare to diagnose and repair engine cooling and lubrication systems | If you have some problem on the content of the information sheet don’t hesitate to approach your Trainer.  If you feel that you are now knowledgeable on the content of the information sheet, you can now answer self-check provided in the module. |
| Answer Self-Check 3.1-1 on Prepare to diagnose and repair engine cooling and lubrication systems | Try to answer the Self-check without looking at the Answer Key  Compare your answer to Answer Key 3.1-1 |
| Observe Trainer’s demonstration on Task Sheet 3.1-1 on Prepare to diagnose and repair engine cooling and lubrication systems | Listen carefully and attentively so that you may be able to perform a task correctly  Ask questions if are in doubt for clarification |
| Perform the Task Sheet 3.1-1 on Prepare to diagnose and repair engine cooling and lubrication systems | Remember the step-by-step procedure the Prepare to diagnose and repair engine cooling and lubrication systems |
| Evaluate the performance using the Performance Criteria Checklist 3.1-1 | Repeat the task in case fail to meet the criteria |

**INFORMATION SHEET 1.1-1**

**PREPARE TO DIAGNOSE AND REPAIR ENGINE COOLING SYSTEM**

**Learning Objectives:**

After reading this **Information Sheet**, you must be able to:

1. Determined job requirements
2. Sourced and interpreted diagnostic information.
3. Verified symptoms.
4. Identified hazards associated with the work and managed risks.
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**ENGINE COOLING SYSTEM**

**DEFINITION:**

A system that keeps air cool and dry.

**Purpose:**

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Two kinds of Cooling System

1. Air cooling system
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**Air cooling system**

This is the standard method of cooling system used method to dissipate heat.

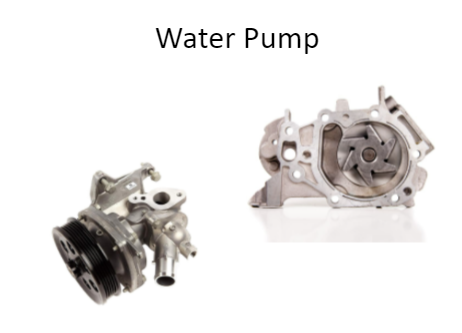
* The object being cooled will have a flow of air moving over its surface
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**Water cooling system**

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**Components of a water engine cooling system**

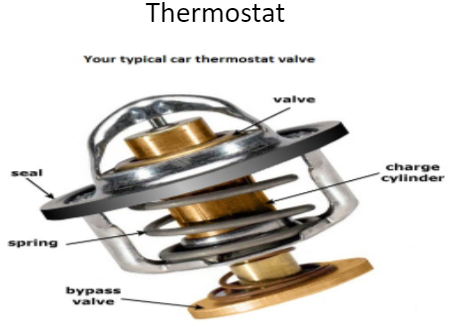
* Water Pump
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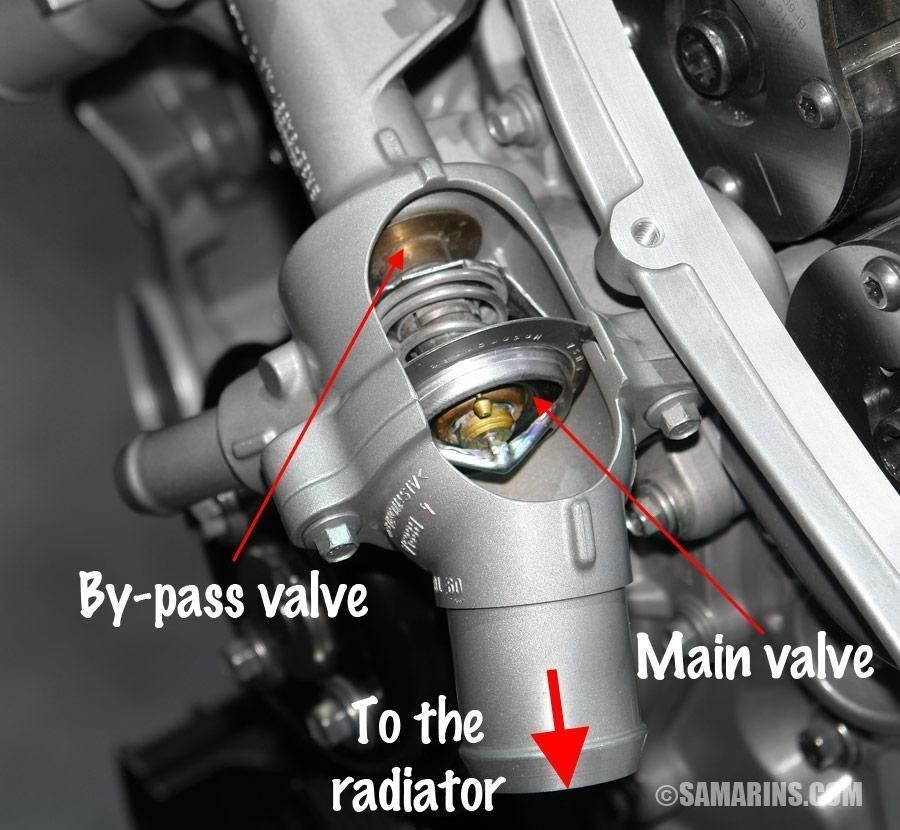
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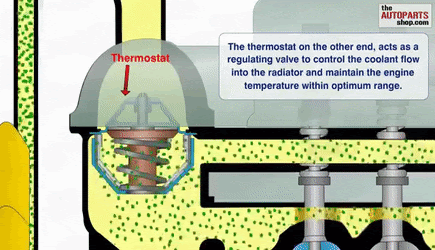


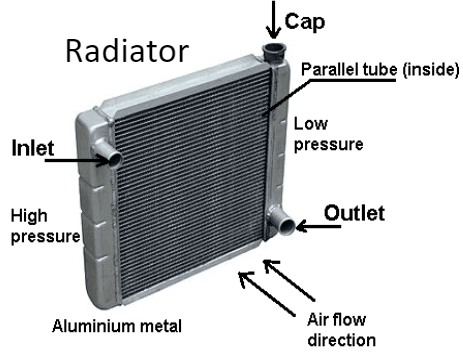
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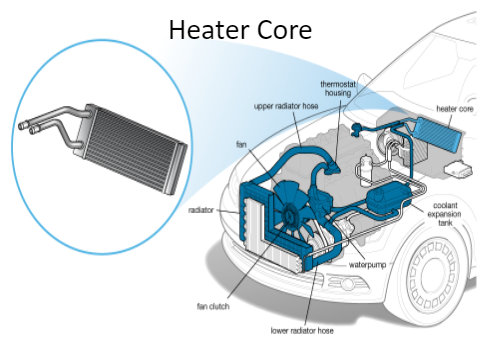
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**INFORMATION SHEET 3.1-1**

**PREPARE TO DIAGNOSE AND REPAIR ENGINE LUBRICATING SYSTEM**

**LUBRICATING SYSTEM**

**DEFINITION:**

is a means whereby a material is placed between two rubbing surfaces to alleviate friction and therefore wear

**Components of Lubricating system:**

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* Oil filter
* Oil strainer/pump
* Oil pan
* Oil cooler
* Oil pressure relief valve

**Oil pump**

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**Oil cooler**

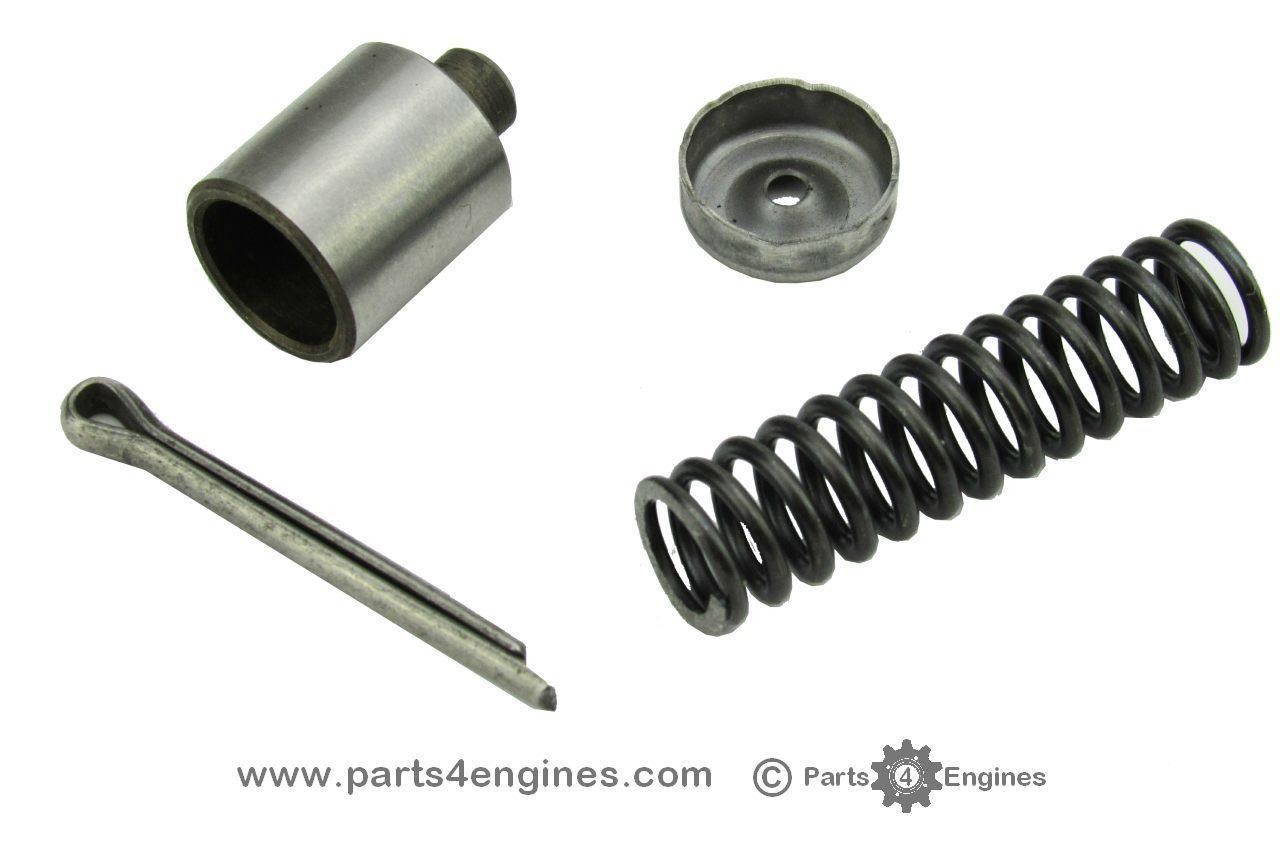
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**OIL CYCLE**

