MODULE CONTENT

| Unit of Competency | **DIAGNOSE AND REPAIR ENGINE COOLING AND LUBRICATION SYSTEM** |
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| 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. 2**

**DIAGNOSE ENGINE COOLING AND LUBRICATION SYSTEM**

| **Learning Activities** | **Special Instructions** |
| --- | --- |
| Read Information Sheet 3.1-1 Diagnose engine cooling and lubrication 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 Diagnose engine cooling and lubrication 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 Diagnose engine cooling and lubrication 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 Diagnose engine cooling and lubrication system | Remember the step-by-step procedure the Diagnose engine cooling and lubrication 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**

**DIAGNOSE ENGINE COOLING SYSTEM**

**Learning Objectives:**

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

1. Diagnosed engine cooling and lubrication system.
2. Performed diagnostic tests.
3. Carried out inspection.
4. Compared inspection results.
5. Identified faults and its causes.
6. Reported findings.
7. Applied safety practices.

**ENGINE COOLING SYSTEM**

**WATER PUMP**

The water pump is the heart of your car's cooling system. It transports water that was cooled in the radiator to the engine block. Once the cooled water has gone through the engine block, it goes back to the pump and back again to the radiator. The water pump is attached directly to the engine block, and operates through centrifugal force.

**Types of engine water pumps**

* Centrifugal
* Positive displacement

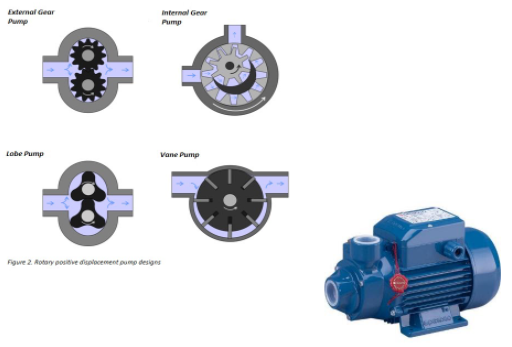
**CENTRIFUGAL**

The most common type among centrifugal pump is the radial flow pump. These centrifugal pumps use a rotating impeller to create a vacuum in order to move fluid.



**POSITIVE DISPLACEMENT**

A positive displacement pump makes water move by trapping a fixed amount and forcing (displacing) that trapped volume into the discharge piping. Some positive displacement pumps use an expanding cavity on the suction side and a decreasing cavity on the discharge side.



**Water pump specifications**

Pumps are commonly rated by horsepower, volumetric flow rate, outlet pressure in metres (or feet) of head, inlet suction in suction feet (or metres) of head. The head can be simplified as the number of feet or metres the pump can raise or lower a column of water at atmospheric pressure.

A typical water pump can move a maximum of about 7,500 gallons (28,000 liters) of coolant per hour, or recirculate the coolant in the engine over 20 times per minute. ... However, even at 35 mph (56 km/h), the typical water pump still moves about 2,000 gallons (7,500 liters) per hour or 0.5 gallon (2 liters) per second.

**INFORMATION SHEET 3.1-1**

**DIAGNOSE ENGINE LUBRICATING SYSTEM**

**LUBRICATING SYSTEM**

**Functions of oil in the engine parts**

* Reducing friction,
* Cooling,
* Sealing,
* Cleaning,
* Serving as protection for moving parts.

Lubricants provide a fluid barrier between moving parts to prevent friction and wear. As for cooling, oil provides up to 40 percent of an aircraft's air-cooled engine's cooling. Oil creates a seal between piston rings and cylinder walls. This helps to reduce wear, provide better compression, and keep contaminants out while improving fuel efficiency.

**Types and classifications of engine oil**

* **Full Synthetic motor Oil**
* **Synthetic Blend Motor Oil**
* **Conventional Motor Oil**
* **High Mileage Motor Oil**

**Full Synthetic oil** is a lubricant consisting of chemical compounds that are artificially made.



**Synthetic blend motor oils** are a third choice in between full synthetic motor oil and conventional oil. As the name suggests, it is a blend of full synthetic oil and conventional oil.



**Conventional motor oil** is a lubricant that is derived directly from crude oil. Some blends of synthetic oil are designed specifically to increase the performance and life of high-mileage cars. Others are meant specifically for high-performance engines.



**High**-**mileage oils** have ingredients to take care of older engines, like conditioners, seal swells, antioxidants, detergents and wear or friction additives. Typically they use a viscosity modifier that is durable and won't lose viscosity very easily. These oils need to stay thicker longer to protect engine parts.



**SAE viscosity grade**

**SAE – Society of Automotive Engineering**

Defines a numerical system for grading motor **oils** according to viscosity. The suffixes (0, 5, 10, 15 and 25) followed by the letter W designate the **engine oil's** "winter" grade.

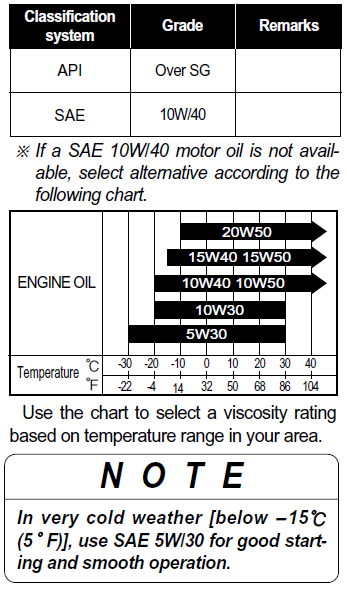
**VISCOSITY RATING CLASSIFICATIONS**

**OLD classification**

* **65 weight / SAE 30,**
* **80 weight / SAE 40,**
* **100 weight / SAE 50,**
* **120 weight / SAE 60**

**Multi-grade**

* **15W-50,**
* **20W-50,**
* **25W-60**

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**VISCOSITY**

Viscosity is the measure of the oil's resistance to shear or flow. High viscosity indicates a high resistance to flow while low indicates a low resistance. It varies with temperature and is affected by pressure. Increasing temperature causes viscosity to decrease; conversely reducing temperature causes viscosity to increase.

Higher pressure causes viscosity to increase which also increases the oil's film thickness. Viscosity is measured by shear and time. When measured by shear it is expressed in centipoise and is known as dynamic viscosity. Kinematic viscosity is expressed in centistokes and is usually given at two temperatures 40 C and 100 C.

**Kinematic viscosity**

is measured as the time required for an oil sample to flow through a viscosity tube at a standard temperature. This value is then converted to centistokes.

**Suggested Engine oil for Diesel Engine**

* **Castrol EDGE 5W-30 Full Synthetic Diesel Oil.**
* **Motul 007250 8100 X-cess 5W-40 Synthetic Gasoline and Diesel Engine Oil.**
* **Shell Rotella T6 5W-40 Diesel Engine Oil.**

**Suggested Engine oil for Gasoline Engine**

* **5W-20 SAE**
* **5W-30 SAE**