

Automotive Technology 5th Edition

Chapter 23 Lubrication System Operation & Diagnosis

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 5 th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and NATEF and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Real World Fixes, Videos, Animations, and NATEF Task Sheet references.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students as listed: <ol style="list-style-type: none"> 1. Explain the lubrication principles and discuss engine lubrication systems. 2. Describe the purpose and function of oil pumps. 3. Discuss the purpose and function of oil passages. 4. Discuss oil pans, oil coolers, and the dry sump system.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

NOTE: This lesson plan is based on the 5th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 23: [ATE5 Chapter Images](#)

ICONS



CH23 Lubrication System

1. SLIDE 1 CH23 LUBRICATION SYSTEM OPERATION & DIAGNOSIS

Check for **ADDITIONAL VIDEOS & ANIMATIONS**
@ <http://www.jameshalderman.com/>
WEB SITE IS CONSTANTLY UPDATED

LUBRICATION SYSTEM

Videos

When performing oil change it is recommended that engine be at operating temperature & that engine be run just before oil is drained. This is done in order to circulate and suspend heavy dirt particles so that they can drain out with oil.

DISCUSSION: Discuss with students that today's vehicles **USE** an engine oil life indicator, located in driver information center. The display shows percentage of engine oil life left or turns on a light alerting driver that the oil should be changed

With many oil pressure indicator lights, engine oil pressure must be very low (under 10 psi at idle) before warning light is triggered. Engine bearing knock or lifter noise may be evident before light is illuminated.

2. **SLIDE 2 EXPLAIN** Figure 23-1 Oil molecules cling to metal surfaces but easily slide against each other.
3. **SLIDE 3 EXPLAIN** Figure 23-2 Wedge-shaped oil film developed below a moving block.
4. **SLIDE 4 EXPLAIN** Figure 23-3 Wedge-shaped oil film curved around a bearing journal.
5. **SLIDE 5 EXPLAIN** Figure 23-4 Dash oil pressure gauge may be a good indicator of engine oil pressure. If there is any concern about the oil pressure, always use a mechanical gauge to be sure

DEMONSTRATION: Show students oil filter with decomposed oil and compare it to a new one. Explain why oil and oil filter must be changed at appropriate intervals to prevent dirty, broken down oil from causing serious damage to engine

ICONS



CH23 Lubrication System

A major cause of premature engine breakdown is failure to change oil and filter as recommended by OEM. Excessive heat and mechanical stress can cause oil to decompose and thicken.

ON-VEHICLE NATEF Task: Inspect, Test, and Replace Oil Temperature and Pressure Switches and Sensors. (P-2): Page 60

6. **SLIDE 6 EXPLAIN** Figure 23-5 oil pump driven by the camshaft.
7. **SLIDE 7 EXPLAIN** Figure 23-6 In an external gear-type oil pump, the oil flows through the pump around the outside of each gear. This is an example of a positive displacement pump, wherein everything entering the pump must leave the pump.
8. **SLIDE 8 EXPLAIN** Figure 23-7 typical internal/external oil pump mounted in the front cover of the engine that is driven by the crankshaft.
9. **SLIDE 9 EXPLAIN** Figure 23-8 operation of a rotor-type oil pump

HANDS-ON TASK: Have a group of students demonstrate to the class how gear type oil pump works and how it differs from a camshaft-driven oil pump.

[External Gear Oil Pump \(View\) \(Download\)](#)

[Gerotor Pump - Slow \(View\) \(Download\)](#)

[Gerotor - Type Oil Pump \(View\) \(Download\)](#)

[Internal-External Gear Pump with Crescent \(View\) \(Download\)](#)

[Rotor Oil Pump \(View\) \(Download\)](#)

[Vane Phaser \(View\) \(Download\)](#)

HANDS-ON TASK: Have students inspect a number of worn parts from an engine lubrication system and describe the evidence that indicates wear and how each part got to be way it is.

10. **SLIDES 10 EXPLAIN** Figure 23-9 Gerotor-type oil pump driven by the crankshaft.
11. **SLIDE 11 EXPLAIN** Figure 23-10 variable displacement oil pump reduces the displacement during engine warm-up and high-speed conditions.
12. **SLIDE 12 EXPLAIN** Figure 23-11 Oil pressure relief valves are spring loaded. The stronger the spring tension,

ICONS



CH23 Lubrication System

the higher the oil pressure.

13. **SLIDE 13 EXPLAIN Figure 23-12** Typical engine design that uses both pressure and splash lubrication. Oil travels under pressure through galleries (passages) to reach top of engine. Other parts are lubricated as oil flows back down into oil pan or is splashed onto parts.
14. **SLIDE 14 EXPLAIN Figure 23-13 (a)** visual inspection indicated that this pump cover was worn.
15. **SLIDE 15 EXPLAIN Figure 23-13 (b)** embedded particle of something was found on one of the gears, making this pump worthless except for scrap metal.
16. **SLIDE 16 EXPLAIN Figure 23-14 (a)** oil pump is the only part in an engine that gets unfiltered engine oil. The oil is drawn up from the bottom of the oil pan and is pressurized before flowing to the oil filter.
17. **SLIDES 17 EXPLAIN Figure 23-14 (b)** If debris gets into oil pump, drive or distributor shaft can twist and/or break. When this occurs, engine will lose all oil pressure.

ON-VEHICLE NATEF Task: Inspect oil pump gears or rotors, housing, pressure relief devices, & pump drive; perform necessary action (P-2) Page 58

18. **SLIDE 18 EXPLAIN Figure 23-15** intermediate shaft drives the oil pump on this overhead camshaft engine. Note the main gallery and other drilled passages in the block and cylinder head.
19. **SLIDE 19 EXPLAIN Figure 23-16** Oil is sent to rocker arms on this Chevrolet V-8 engine through hollow pushrods. Oil returns to oil pan through oil drainback holes in cylinder head.

DISCUSSION: Discuss common locations of oil galleries in an engine block and how oil flows through hollow push rods to the rocker arms.

HANDS-ON TASK: Have students inspect a number of worn parts from an engine lubrication system and describe the evidence that indicates wear and how each part got to be the way it is. Check with OEM before using oil additives. Some OEMS will void the engine warranty if unapproved additives are found in oil.

ICONS



CH23 Lubrication System

ON-VEHICLE NATEF Task: (A1A3) Research applicable vehicle & service information, vehicle service history, service precautions, & TSBs. (P-1) Page 57

20. **SLIDE 20 EXPLAIN** Figure 23-17 typical oil pan with a built-in windage tray used to keep oil from being churned up by the rotating crankshaft.

DEMONSTRATION: Show students an oil pan with a built-in windage tray. Have students discuss the benefits of this configuration.

[Cylinder Wall Lubrication \(View\) \(Download\)](#)

[Dry Sump Oil System \(View\) \(Download\)](#)

[Vane Phaser \(View\) \(Download\)](#)

21. **SLIDE 21 EXPLAIN** Figure 23-18 dry sump system as used in a Chevrolet Corvette.

22. **SLIDE 22 EXPLAIN** Figure 23-19 Oil is cooled by the flow of coolant through the oil filter adapter.

ON-VEHICLE NATEF Task: Inspect Auxiliary Oil Coolers; Determine Necessary Action (P-3): Page 59

DEMONSTRATION: Show students oil cooler. Talk about the possible applications of oil coolers. Indicate that some oil coolers use engine coolant to transfer heat from oil to engine cooling system

HANDS-ON TASK: Have a group of students disassemble an engine oil cooler. Have a second group of students reassemble oil cooler.

SEARCH INTERNET: research American Petroleum Institute (API) and find all engine oil ratings. The first letter should start with "S", which stands for spark ignition (gasoline) engine. Also have them research the International Lubricant Standardization and Approval Committee (ILSAC) and find international lubricant standards. Ask students to report their findings to the class.

ICONS



CH23 Lubrication System

HOMEWORK

[CROSSWORD PUZZLE \(MICROSOFT WORD\) \(PDF\)](#)

[WORD SEARCH PUZZLE \(MICROSOFT WORD\) \(PDF\)](#)

Crossword

