

Introduction to Automotive Service

Chapter 19 Lube, Oil, and Filter Service

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class serves as an introduction to the world of automotive service. It correlates material to task lists specified by ASE and NATEF.
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. <ol style="list-style-type: none">1. Prepare for ASE Engine Repair (A1) certification test content area "D" (Lubrication and Cooling Systems Diagnosis and Repair).2. Describe chassis system lubrication and under-vehicle inspection.
Establish the Mood or Climate	Provide a WELCOME , 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.

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1. SLIDE 1 CH19 CHAPTER 19 LUBE, OIL, AND FILTER SERVICE

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2. SLIDE 2 **EXPLAIN** Properties of Engine Oil
3. SLIDE 3 **EXPLAIN FIGURE 19-1** Clean engine oil is the life blood of any engine
4. SLIDE 4 **EXPLAIN FIGURE 19-2** SAE viscosity rating required is often printed on the engine oil filler cap

DEMONSTRATION: Put quart of 10W-30 & a quart of 30W oil in freezer to demonstrate flow characteristics of multigrade vs. single-grade oil in freezing temperatures.

DISCUSSION: Discuss why OEMs do not recommend single-viscosity oil. Ask students why it was OK for single-viscosity oil to be used in older engines & engines designed for high performance. Why is oil viscosity important?

Internal Combustion Engine (ICE) lubrication system absorbs 1/3 of heat produced by engine.

5. SLIDE 5 **EXPLAIN FIGURE 19-3** API doughnut for a SAE 5W-30, SN engine oil. When compared to a reference oil, the “energy conserving” designation indicates a 1.1% better fuel economy for SAE 10W-30 oils and 0.5% better fuel economy for SAE 5W-30 oils.
6. SLIDE 6 **EXPLAIN** ILSAC Oil Rating
7. SLIDE 7 **EXPLAIN FIGURE 19-4** International Lubricant Standardization and Approval Committee (ILSAC) starburst symbol. If this symbol is on the front of the container of oil, then it is acceptable for use in almost any gasoline engine.

DISCUSSION: Ask students to discuss differences between SAE & API ratings. Then have them identify those ratings on different brands and

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viscosities of oils. Then ask them to compare API, ILSAC, & European oil ratings standards.

Oil ratings are constantly updated & newer oil is backward compatible, meaning THEY can be used in older vehicles

8. SLIDE 8 **EXPLAIN** European Oil Rating System

9. SLIDE 9 **EXPLAIN** FIGURE 19-5 ACEA ratings are included on the back of the oil container if it meets any of the standards. ACEA ratings apply to European vehicles only such as BMW, Mercedes, Audi, and VW

10. SLIDE 10 **EXPLAIN** Engine Oil Additives

11. SLIDE 11 **EXPLAIN** FIGURE 19-6 Viscosity index (VI) improver is a polymer and feels like finely ground foam rubber. When dissolved in the oil, it expands when hot to keep the oil from thinning.

12. SLIDE 12 **EXPLAIN** Engine Oil Additives

DEMONSTRATION: Using saved oil show students the difference between new oil and oil that is dirty. Have students use latex gloves to feel difference between new & contaminated oil

DISCUSSION: Have students discuss reason why oil additives are important. Ask them whether all OEMS use same additives

13. SLIDE 13 **EXPLAIN** Synthetic Oil

14. SLIDE 14 **EXPLAIN** FIGURE 19-7 Mobil 1 synthetic engine oil is used by several vehicle manufacturers in new engines.

Synthetic oils 1st developed for Army Air Forces (WWII) to keep their high-perf. turbo radial aircraft engines alive, which could not be done with conventional oils.

DISCUSSION: Ask students to compare advantages & disadvantages of synthetic and conventional oils included in service intervals

15. SLIDE 15 **EXPLAIN** Vehicle-Specific Specifications

16. SLIDE 16 **EXPLAIN** FIGURE 19-8 Dexos is the oil specified for use in all General Motors engines starting

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with the 2011 model year.

17. **SLIDE 17 EXPLAIN FIGURE 19-9** European vehicle manufacturers usually specify engine oil with a broad viscosity range, such as SAE 5W-40, and their own unique standards, such as the Mercedes specification 229.51. Always use the oil specified by the vehicle manufacturer
18. **SLIDE 18 EXPLAIN** Examples of Correct Oil to Use
19. **SLIDE 19 EXPLAIN** High Mileage Oils
20. **SLIDE 20 EXPLAIN FIGURE 19-10** Using a zinc additive is important when using SM or SN rated oil in an engine equipped with a flat-bottom lifter, especially during the break-in period

DISCUSSION: Ask the students to discuss any advantages & disadvantages that high mileage oils have compared to conventional and synthetic oils

HANDS-ON TASK: Have students use owner's manual or electronic service information to look up and find OEM specific oil specifications for at least 2 different vehicles including their own.

21. **SLIDE 21 EXPLAIN** Oil Filters
22. **SLIDE 125 EXPLAIN FIGURE 19-11** cutaway of a typical spin-on oil filter. Engine oil enters the filter through the small holes around the center of the filter and flows through the pleated paper filtering media and out the large hole in the center of the filter. The center metal cylinder with holes is designed to keep the paper filter from collapsing under the pressure. The bypass valve can be built into the center on the oil filter or is part of the oil filter housing and located in the engine.
23. **SLIDE 23 EXPLAIN FIGURE 19-12** rubber diaphragm acts as an antidrainback valve to keep the oil in filter when engine is stopped and oil pressure drops to zero.
24. **SLIDE 24 EXPLAIN FIGURE 19-13** typical filter crusher. Hydraulic ram forces out most of oil from filter. The oil is trapped underneath the crusher and is recycled.

DEMONSTRATION: Taking a name brand filter and a cheap oil filter that have been cut open, show the students difference between the two

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DISCUSSION: Ask students to discuss difference between name brand filter and cheaper filter and what it could mean to them as consumers

25. **SLIDE 25 EXPLAIN** Oil Change Interval
26. **SLIDE 26 EXPLAIN FIGURE 19-14** Many vehicle manufacturers can display the percentage of oil life remaining, whereas others simply turn on a warning lamp when it has been determined that an oil change is required.

DEMONSTRATION: Show the students how to rest the oil life service monitor

DISCUSSION: Ask students to find out if their vehicles have a service monitor and at what intervals that light comes on. Have them write down procedure to reset light

HANDS-ON TASK: Have the students research the OEM procedure for resetting the oil life service monitor and to rest one if a vehicle is available.

27. **SLIDE 27 EXPLAIN** Oil Change Procedure
28. **SLIDE 28 EXPLAIN FIGURE 19-15** Always check to make sure that the oil drain plug is the plug being removed as some vehicles also have transmission or transfer cases that also have drain plugs. This oil pan has a label and an arrow pointing to the engine oil drain plug
29. **SLIDE 29 EXPLAIN** Oil Change Procedure
30. **SLIDE 30 EXPLAIN** Chassis Lubrication

31. **SLIDE 31 EXPLAIN FIGURE 19-16** Greasing a tie rod end. Some joints do not have a hole for excessive grease to escape, and excessive grease can destroy seal
32. **SLIDE 32 EXPLAIN FIGURE 19-17** Part of steering linkage lubrication is applying grease to the steering stops. If these stops are not lubricated, a grinding sound may be heard when the vehicle hits a bump when the wheels are turned all the way one direction or the other. This often occurs when driving into or out of a driveway that has a curb

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DEMO



DEMO



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DEMONSTRATION: Show the students how to lubricate the steering stops

33. **SLIDE 33 EXPLAIN FIGURE 19.18** To check an idler arm, most vehicle manufacturers specify that 25 lb force be applied by hand up and down to the idler arm. The idler arm should be replaced if the total movement (up and down) exceeds 1/4 in. (6mm)

DEMONSTRATION: Show the students how to perform a steering linkage inspection

34. **SLIDE 34 EXPLAIN** Chassis Lubrication

HANDS-ON TASK: Have the students research steering & suspension grease (Zerk) fittings and what if any vehicles still use them. Have them check their own vehicles or a LAB vehicle for fittings and tag them for inspection.

35. **SLIDE 35 EXPLAIN FIGURE 19-19** Steering system component (s) should be replaced if any noticeable looseness is detected when moved by hand

HANDS-ON TASK: Have the students do a steering linkage inspection on their own vehicles or a LAB vehicle.

36. **SLIDE 36 EXPLAIN FIGURE 19-20** All joints should be checked by hand for any lateral or vertical play.
37. **SLIDE 37 EXPLAIN** Differential Fluid Check
38. **SLIDE 38 EXPLAIN FIGURE 19-21** This differential assembly has been leaking fluid. The root cause should be determined and the unit filled to the proper level using the specified lubricant, to help prevent early failure and an expensive repair later
39. **SLIDE 39 EXPLAIN** Differential Fluid Check

HANDS-ON TASK: Have the students do a steering linkage inspection on their own vehicles or a LAB vehicle.

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40. **SLIDE 40 EXPLAIN** Manual Transmission/ Transaxle Lubricant Check
41. **SLIDE 41 EXPLAIN FIGURE 19-22** Always ensure that the fill plug can be accessed and removed before draining the fluid from a manual transmission

DEMONSTRATION: Show the students how to perform to check fluid levels on final drives and manual transmissions

HANDS-ON TASK: Have students check fluid levels on final drives and manual transmissions

42. **SLIDE 42 EXPLAIN** Under Vehicle Inspection
43. **SLIDE 43 EXPLAIN FIGURE 19-23** broken coil spring was found during an under-vehicle inspection. The owner was not aware of the problem and it did not make any noise, but the vehicle stability was affected
44. **SLIDE 44 EXPLAIN FIGURE 19-24** This corroded muffler was found during a visual inspection, but was not detected by the driver because it was relatively quiet
45. **SLIDE 45 EXPLAIN FIGURE 19-25** A drive axle shaft equipped with 2 flexible rubber grease boots at each of the axles. Look for signs of grease leaking from these boots

HANDS-ON TASK: Have students do a chassis inspection on their own or a lab vehicle and tag what they found.

46. **SLIDES 46-63: EXPLAIN OIL CHANGE PROCESS: WORDS & GRAPHICS. OPTIONAL COVERAGE.** You will be doing an ON-VEHICLE Task Sheet on this NATEF Task

ON-VEHICLE NATEF TASK (A1D13)
Perform oil and filter change (P-1)

SAFETY: Make sure students are aware that hot oil causes burns and is carcinogenic, and use of latex gloves is highly recommended

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HOMEWORK: Have students use Internet to research difference high mileage & synthetic oils & what makes high mileage oil different from regular motor oil. Ask them to answer question "Are high mileage oils worth the extra cost?" & "Do high mileage oils really work?" and report their findings at the beginning of the next class in a discussion

Homework: complete Ch19 crossword puzzle:
http://www.jameshalderman.com/links/book_intro/cw/crossword_ch_19.pdf