Automotive Engines
Chapter 32 GASKETS & SEALANTS
Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This engine systems course or class provides complete coverage of the 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 on the NEXT SLIDE. 1. Prepare for ASE Engine Repair (A1) certification test content area "C" (Engine Block Diagnosis and Repair). 2. Describe the various types of gaskets. 3. Explain why the surface finish is important for head gaskets. 4. List the types of sealers and their applications. 5. Explain the use and precautions associated with cover gaskets.
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 CH32 GASKETS & SEALANTS 2. **SLIDES 2-3 EXPLAIN Objectives & KEY TERMS**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS UPDATED REGULARLY**
	4. **SLIDE 4 EXPLAIN** Introduction 5. **SLIDE 5 EXPLAIN FIGURE 32-1** Gaskets are used in many locations in engine
	**Show ANIMATION: GASKETS & SEALING AREAS www.myautomotivelab.com** http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/A1_Animation/Chapter32_Fig_32_1/index.htm
	**DISCUSSION: Refer to Figure 32–1 and have students talk about all the different types of gaskets that are used to seal different engine parts**
	**DEMONSTRATION: Show different types of gaskets that are used to seal the engine. Stress differences between gaskets that are used for extreme heat and pressure and those used for low pressure and low heat**
	6. **SLIDE 6 EXPLAIN Head Gaskets** 7. **SLIDE 7 EXPLAIN FIGURE 32-2** Gaskets help prevent leaks between two surfaces. 8. **SLIDE 8 EXPLAIN** Head Gaskets & **EXPLAIN FIGURE 32-3** typical perforated steel core head gasket with a graphite or composite facing material. 9. **SLIDE 9 EXPLAIN FIGURE 32-4** solid steel core head gasket with a nonstick coating, which allows some movement between the block and the head, and is especially important on engines that use cast-iron blocks with aluminum cylinder heads.
	**DEMONSTRATION: Show examples of perforated steel core & multilayered steel gaskets. Discuss materials used in each type of gasket and how their design enhances their function.**
	10. **SLIDE 10 EXPLAIN FIGURE 32-5** armor ring can be made from steel or copper.

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	11. **SLIDE 11** EXPLAIN **FIGURE 32-6** Multilayer steel (MLS) gaskets are used on many newer all-aluminum engines as well as on engines that use a cast block with aluminum cylinder heads. This type of gasket allows aluminum to expand without losing the sealing ability of the gasket.
	12. **SLIDE 12** EXPLAIN TECH TIP
	**DISCUSSION: Ask the students to talk about why different types of gasket sealers are needed and where and when they should be used.**
	13. **SLIDE 13** EXPLAIN Cover Gasket Materials
	14. **SLIDE 14** EXPLAIN **FIGURE 32-7** Left to right: Cork-rubber, paper, composite, and synthetic rubber (elastomer) gaskets.
	15. **SLIDE 15** EXPLAIN **FIGURE 32-8** Rubber-coated steel gaskets have replaced many oil pan gaskets that once had separate side rail gaskets and end seals
	**DEMONSTRATION: Show the difference between formed in place gaskets and non-formed gaskets when used to seal between engine parts**
	**DEMONSTRATION: Show examples of different types of gaskets & materials each gasket uses to perform its sealing job. (Examples: Cork gaskets, fiber gaskets, synthetic gaskets, rubber-coated metal gaskets, formed in place gaskets, and plastic/rubber gaskets)**
	16. **SLIDE 16** EXPLAIN **FIGURE 32-9** Formed in place gaskets often use silicone rubber and are applied at the factory using a robot. Check gasket manufacturers for the correct gasket replacement.
	17. **SLIDE 17** EXPLAIN TECH TIP
	18. **SLIDE 18** EXPLAIN **FIGURE 32-10** typical intake manifold gasket showing the metal washer at each fastener location which keeps the gasket from being compressed too much.

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	**DEMONSTRATION: Show the difference between formed in place gaskets and non-formed gaskets when used to seal between engine parts**
	**19. SLIDE 19** EXPLAIN Gasket Failures **20. SLIDE 20** EXPLAIN **FRETTING & FIGURE 32-11** This intake manifold gasket was damaged due to fretting. Newer designs allow for more movement between the intake manifold and the cylinder head.
	**DEMONSTRATION: Show examples of different head gasket failures. Show them different places that can fail on the gaskets and why they fail. Discuss what causes the gasket to fail in each area of the head gasket.**
	**DEMONSTRATION: Show intake manifold gasket failures caused by the different expansion rates of cast iron and aluminum and movement of the parts when heated & cooled.**
	**DISCUSSION: Ask the students to discuss why gaskets should never be reused when assembling engine parts.**
	**21. SLIDES 21-22** EXPLAIN Oil Seals **23. SLIDE 23** EXPLAIN **FIGURE 32-12** A rear main seal has to be designed to seal oil from leaking around the crankshaft under all temperature conditions.
	**24. SLIDE 24** EXPLAIN TECH TIP
	**25. SLIDE 25** EXPLAIN TECH TIP
	**HANDS-ON NATEF TASK: Install engine covers using gaskets, seals, and sealers as required PAGES 160 & 183**
	**DISCUSSION: Ask the students to talk about what a bolt torque sequence is and why it is necessary**
	**26. SLIDE 26** EXPLAIN Assembly Sealants **27. SLIDE 27** EXPLAIN **FIGURE 32-13** Room-temperature vulcanization (RTV) is designed to be a gasket substitute on non-machined surfaces. Be sure to

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	follow the instructions as printed on the tube for best results
	**DEMONSTRATION: Show students where RTV gasket sealers are applied on engine parts. Show where anaerobic gasket sealers are applied to certain engine parts and surfaces**
	**28. SLIDE 28 EXPLAIN FIGURE 32-14** Anaerobic sealer is used to seal machined surfaces. Always follow the instructions on the tube for best results.
	29. SLIDE 29 EXPLAIN FIGURE 32-15 strength of the thread locker depends on whether the fastener is to be removed by hand (blue). High-strength thread locker (red) can only be removed if heated
	**DEMONSTRATION: Show students how to use (blue) thread locking sealer and where to use (red) thread locking sealer. Demonstrate differences in usage by trying to loosen each part on which blue & red thread locker were used. Discuss results.**
	**30. SLIDE 30 EXPLAIN FIGURE 32-16** Applying antiseize compound to the threads of a bolt helps prevent the threads from galling or rusting.
	31. SLIDE 31 EXPLAIN Chart 32-1 Summary chart showing where sealants are used and their common trade names
	**DEMONSTRATION: Show the difference between blind tapped threaded hole and a tapped threaded hole that goes into an open chamber like a coolant passage in a block.**
	**DISCUSSION: Ask students to discuss why sealers are used on bolts that are threaded into coolant passages but not on blind bolt holes.**
	**SEARCH INTERNET: Have students use Internet to research an engine gasket company of their choice. Collect all the information available on how gaskets are made, what materials are used, and the purposes for each gasket. Report out the findings at the next class.**
	**Talk through SUMMARY and questions**

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	**HOMEWORK:** complete Ch32 crossword puzzle: http://www.jameshalderman.com/links/book_engine_theory_serv_7/cw/crossword_ch_32.pdf