Automotive Technology 6th Edition
Chapter 36 GASKETS & SEALANTS
Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASEEducation (NATEF) Task Sheets.
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: 1. Discuss the need for gaskets and sealants. 2. Describe head gaskets and the types of head gaskets. 3. Discuss cover gasket materials and gasket failures. 4. Discuss the purpose and function of oil seals. 5. Discuss the purpose and function of assembly sealants.
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.

NOTE: This lesson plan is based on the 6th Edition Chapter Images found on Jim's web site @
www.jameshalderman.com
DOWNLOAD Chapter 36 Chapter Images: From
http://www.jameshalderman.com/automotive_principles.html
NOTE: You can use Chapter Images or possibly Power Point files

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	**1. SLIDE 1 CH36 GASKETS & SEALANTS** 2. **SLIDE 2 EXPLAIN Figure 36-1** Gaskets are used in many locations in engine **Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED** **http://www.jameshalderman.com/automotive_principles.html** **DOWNLOAD** **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF** **GASKETS & SEALANTS** **DISCUSSION: Refer to Figure 36–1 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** 3. **SLIDE 3 EXPLAIN** Figure 36-2 Gaskets help prevent leaks between two surfaces. 4. **SLIDE 4 EXPLAIN Figure 36-3** typical perforated steel core head gasket with a graphite or composite facing material. 5. **SLIDE 5 EXPLAIN Figure 36-4** 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 and multilayered steel gaskets. Discuss materials used in each type of gasket and how their design enhances their function.** **EXPLAIN TECH TIP: *Wow! I Can't Believe a Cylinder Can Deform That Much!* An automotive instructor**
	

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used a dial bore gauge in a 4-cylinder, cast-iron engine block to show students how much a block can deform. Using just one hand, the instructor was able to grasp both sides of the block and then squeeze it. The dial bore gauge showed that the cylinder deflected about 0.0003 inch (3/10,000 of an inch) just by squeezing the block with one hand—and that was with a cast-iron block! After this demonstration, the students were more careful during engine assembly and always used a torque wrench on each and every fastener that was installed in or on the engine block.

6. **SLIDE 6 EXPLAIN Figure 36-5** armor ring can be made from steel or copper.
7. **SLIDE 7 EXPLAIN Figure 36-6** 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 the aluminum to expand without losing the sealing ability of the gasket.

DISCUSSION: Ask the students to talk about why different types of gasket sealers are needed and where and when they should be used.

8. **SLIDE 8 EXPLAIN Figure 36-7** Left to right: Cork-rubber, paper, composite, and synthetic rubber (elastomer) gaskets.
9. **SLIDE 9 EXPLAIN Figure 36-8** 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)

10. **SLIDE 10 EXPLAIN Figure 36-9** Formed in place gaskets often use silicone rubber and are applied at the factory using a robot. Check gasket manufacturers for the

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	correct gasket replacement. **11. SLIDE 11 EXPLAIN Figure 36-10** typical intake manifold gasket showing the metal washer at each fastener location which keeps the gasket from being compressed too much. **EXPLAIN TECH TIP: *Rubber and Contact Cement*** **One of the reasons why gaskets fail is due to their movement during installation. Some gaskets, such as cork or rubber valve cover gaskets or oil pan gaskets, can be held onto the cover using a rubber or contact cement. To use a rubber or contact cement, use the following steps.** • **STEP 1 Apply a thin layer to one side of the gasket and to the cover where the gasket will be placed.** • **STEP 2 Allow the surfaces to air dry until touch free.** • **STEP 3 Carefully place gaskets onto cover, being sure to align all of the holes.** **CAUTION: Do not attempt to remove the gasket and reposition it. The glue is strong and the gasket will be damaged if removed. If the gasket has been incorrectly installed, remove the entire gasket, clean the gasket surface, and repeat installation using a new gasket.** **DEMONSTRATION: Show the difference between formed in place gaskets and non-formed gaskets when used to seal between engine parts** **12. SLIDE 12 EXPLAIN Figure 36-11** This intake manifold gasket was damaged due to fretting. Newer designs allow for more movement between the intake manifold and the cylinder head. **EXPLAIN TECH TIP: Hints for Gasket Usage** 1. **Never reuse an old gasket. A used gasket or seal has already been compressed, has lost some of its resilience, and has taken a set. If a used gasket does reseal, it will not seal as well as a new gasket or seal.** 2. **A gasket should be checked to make sure it is the correct gasket. Also check the list on**

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	the outside of the gasket set to make sure that the set has all the gaskets that may be needed before the package is opened. 1. 3. Read the instruction sheet. An instruction sheet is included with most gaskets. It includes a review of the things the technician should do to prepare and install the gaskets, to give the best chance of a good seal. The instruction sheet also includes special tips on how to seal spots that are difficult to seal or that require special care to seal on a particular engine. **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. **EXPLAIN TECH TIP:** Always Check the VIN There are so many variations in engines that it is important that the correct gasket or seal be used. For example, a similar engine may be used in a front-wheel-drive or a rear-wheel-drive application, and this could affect the type or style of gasket or seal used. For best results, the wise technician should know the vehicle identification number (VIN) when ordering any engine part. **DISCUSSION**: Ask the students to discuss why gaskets should never be reused when assembling engine parts. 13. SLIDE 13 EXPLAIN **Figure 36-12** A rear main seal has to be designed to seal oil from leaking around the crankshaft under all temperature conditions. **HANDS-ON TASK:** With an assortment of seals, have students determine which side of the seal faces the engine.

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	DISCUSSION: **Ask the students to talk about what a bolt torque sequence is and why it is necessary** 14. **SLIDE 14 EXPLAIN Figure 36-13** Room-temperature vulcanization (RTV) is designed to be a gasket substitute on non-machined surfaces. Be sure to 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** 15. **SLIDE 15 EXPLAIN Figure 36-14** Anaerobic sealer is used to seal machined surfaces. Always follow the instructions on the tube for best results. 16. **SLIDE 16 EXPLAIN Figure 36-15** 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.** 17. **SLIDE 17 EXPLAIN Figure 36-16** Applying antiseize compound to the threads of a bolt helps prevent the threads from galling or rusting. **DISCUSS CHART 36-1 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**

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	purposes for each gasket. Report out the findings at the next class.