

Automotive Engines Theory and Servicing

Ninth Edition

Automotive Engines Theory and Servicing

Ninth Edition
James D. Halderman



Chapter 32 Gaskets and Sealants

ALWAYS LEARNING

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON

OBJECTIVES

- 32.1** Discuss the need for gaskets and sealants.
- 32.2** Describe head gaskets and the types of head gaskets.
- 32.3** Discuss cover gasket materials and gasket failures.
- 32.4** Discuss the purpose and function of oil seals.
- 32.5** Discuss the purpose and function of assembly sealants.

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON

INTRODUCTION (1 OF 2)

- Gaskets and sealants are used in engines to seal gaps and potential gaps between two or more parts.
- Gaskets and sealants must be able to withstand:
 - Temperatures to which the engine part may be exposed during normal operation

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON

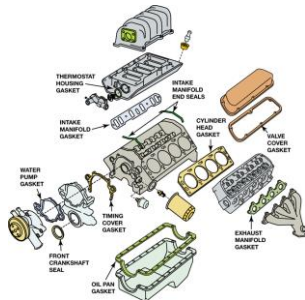
INTRODUCTION (2 OF 2)

- Vibrations produced in the engine and the accessories that are attached to the engine
- Acids and other chemicals that are found in and throughout an engine
- Expanding and contracting at different rates

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

FIGURE 32-1 Gaskets are used in many locations in the engine.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

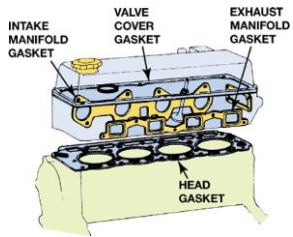
HEAD GASKETS (1 OF 2)

- The head gasket is under the highest clamping loads.
 - It must seal passages that carry coolant and often is required to seal a passage that carries hot engine oil.
 - The most demanding job of the head gasket is to seal the combustion chamber.

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

FIGURE 32-2 Gaskets help prevent leaks between two surfaces.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON

HEAD GASKETS (2 OF 2)

- As a rule of thumb, about 75% of the head bolt clamping force is used to seal the combustion chamber.
 - The remaining 25% seals the coolant and oil passages.
- Perforated steel core gaskets
- Multilayered steel gaskets

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON

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 the aluminum to expand without losing the sealing ability of the gasket.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON

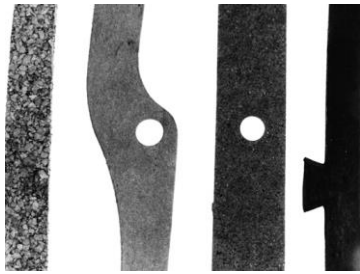
COVER GASKET MATERIALS

- Cover Gasket Requirements
- Cork Gaskets
- Fiber Gaskets
- Synthetic Rubber Gaskets
- Rubber-coated Metal Gaskets
- Formed In Place Gaskets
- Plastic/Rubber Gaskets

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

FIGURE 32-7 Left to right: Cork-rubber, paper, composite, and synthetic rubber (elastomer) gaskets.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

FIGURE 32-8 Rubber-coated steel gaskets have replaced many oil pan gaskets that once had separate side rail gaskets and end seals.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

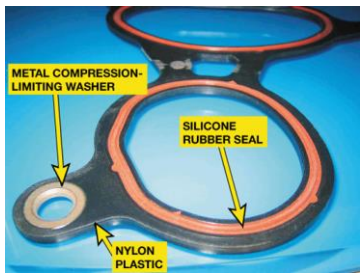
FIGURE 32-9 Formed in place gaskets often use silicone rubber and are applied at the factory using a robot. Check gasket manufacturers for the correct gasket replacement.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

FIGURE 32-10 A typical intake manifold gasket showing the metal washer at each fastener location which keeps the gasket from being compressed too much.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

GASKET FAILURES (1 OF 2)

- Detonation may cause extreme pressure to be exerted on the armor of the head gasket, causing it to deform.
- A plugged PCV system can increase crankcase pressure resulting in engine gasket failures such as oil pan, valve cover, timing cover, and main oil seals.

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

GASKET FAILURES (2 OF 2)

- Improper installation such as incorrect torquing sequence can cause gasket failure.
- Fretting is a condition that can destroy intake manifold gaskets, caused by the unequal expansion and contraction of two different engine materials.

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

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.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

OIL SEALS (1 OF 2)

- Oil seals allow the shaft to rotate and seal the area around the shaft to prevent oil or coolant from leaking.
- Seals come in varied sizes and styles.

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

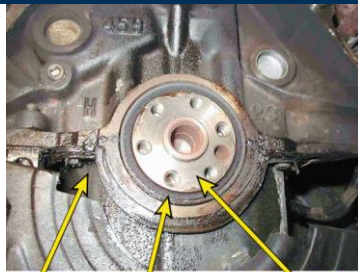
OIL SEALS (2 OF 2)

- Most seals use a steel backing for strength and a variety of sealing materials, including:
 - Buna-N
 - Viton® (fluorocarbon)
 - Teflon® (polytetrafluorethylene, also called PTFE)

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

FIGURE 32–12 A rear main seal has to be designed to seal oil from leaking around the crankshaft under all temperature conditions.



OIL PAN

REAR
MAIN SEAL

CRANKSHAFT

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

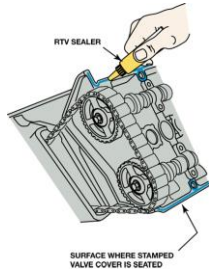
ASSEMBLY SEALANTS

- RTV Silicone
- Anaerobic Sealers
- Nonhardening Sealers
- Antiseize Compounds
- Sealant Summary

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

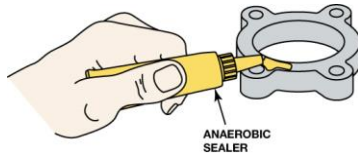
FIGURE 32-13 Room-temperature vulcanization (RTV) is designed to be a gasket substitute on nonmachined surfaces. Be sure to follow the instructions as printed on the tube for best results.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

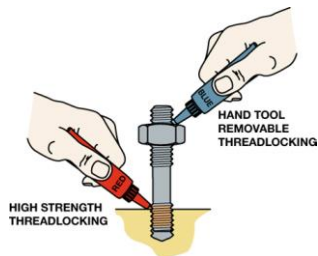
FIGURE 32-14 Anaerobic sealer is used to seal machined surfaces. Always follow the instructions on the tube for best results.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

FIGURE 32-15 The 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.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved.

PEARSON

FIGURE 32-16 Applying antiseize compound to the threads of a bolt helps prevent the threads from galling or rusting.



Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON

SUMMARY (1 OF 2)

- Gaskets are used to fill a space or gap between two objects to prevent leakage from occurring.
- There are many types of gaskets including cylinder head gaskets, valve cover gaskets, and timing cover gaskets.
- Rubber or contact cement is used to hold a gasket in place.

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON

SUMMARY (2 OF 2)

- RTV and anaerobic sealers are commonly used to seal engines.
- Sealers are used to help gaskets seal.

Copyright © 2018, 2015, 2011 Pearson Education, Inc. All Rights Reserved

PEARSON
