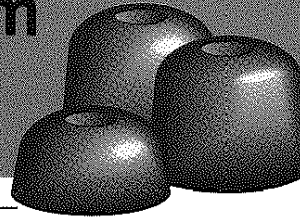


For Quality And Profits

# CHECK THE FACTS

## Valve Stem Seals



The valve stem seal is a critical element in the efficient operation of an engine. It controls the lubrication of the valve stem as it slides in the valve guide. A lack of oil causes premature valve stem and valve guide wear. Too much oil entering the valve guide results in excessive oil consumption, which is sometimes blamed on worn rings or other metallic parts. Tests indicate that replacing seals on an engine in good mechanical condition can reduce oil consumption as much as 70%.

Fel-Pro's level of quality for valve stem seals is always at least that of original equipment. Service life, not cost, dictates the materials required. Although seals made of premium materials, such as Viton or polyacrylate, are much more expensive than seals made of nitrile, they represent but a small fraction of the total repair cost. Therefore, it just doesn't make good economic sense to sacrifice a long-lasting, successful repair to save on the cost of the valve stem seals. With Fel-Pro valve stem seals, you'll do the job once, and do it right the first time.

### ✓ The Function of the Valve Stem Seal

Unlike other gaskets and seals where the goal is zero leakage, the valve stem seal is flow regulated . . . a controlled leak. It is much more difficult to achieve controlled leakage than zero leakage because the margin for error is so small.

Every time a valve opens and closes (as often as 100,000 times per hour at highway speeds), the valve stem slides in the guide. Without the lubricating benefits of lead, which is not used in fuels for today's engines, it is more important than ever for a thin film of oil to remain between the valve stem and guide. The amount of oil used to form this film, however, must be strictly metered. Seals that over-

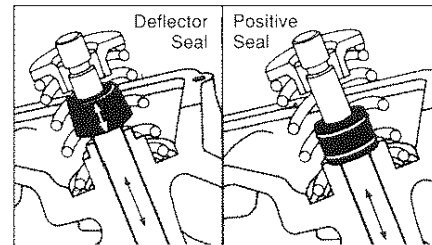
restrict oil will cause premature wear, and too much oil entering the valve guide can cause too much oil to enter the combustion chamber. This leads to:

- Excessive oil consumption
- Faster build up of combustion chamber carbon deposits
- Higher emissions
- Faster spark plug fouling
- Faster build up of carbon deposits on the valves

The valve stem seal regulates the amount of oil entering the valve guide. The proper fit of the valve stem and guide further limits the amount of oil which reaches the combustion chamber. The seals and hard parts must work hand-in-hand, and must all be in good condition for the engine to work efficiently.

### ✓ Valve Stem Seal Design

There are dozens of valve stem seal designs, but they all fall into two general categories — **Deflector Seals** and **Positive Guide Seals**.



Deflector seals grasp the valve stem, moving up and down with the valve, shielding the valve guide like an umbrella. Positive guide seals remain in a fixed position on the valve guide boss, acting as a squeegee on the valve stem to control lubrication.

*(continued on other side)*

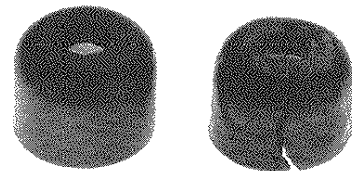


## Tech Tip

### Problems from the Use of Low Grade Valve Stem Seals

Unfortunately, the failure of valve stem seals can be a slow process and tends to be blamed on other causes. In the long run, however, using low-grade seals costs the car owner money and creates bad will toward you and your suppliers. By using low-grade seals, you can end up with premature wear or hardening of the seals, allowing large quantities of oil to enter the valve guide. This leads to:

- Substantially increased oil consumption
- Quicker spark plug fouling
- Carbon deposits accumulating in the combustion chambers at a faster than normal rate — possibly aggravating a pinging and run-on problem
- Seals breaking into pieces, entering the oiling system and getting trapped in the oil pick-up screen — possibly hindering oil flow and increasing the risk of bearing damage
- Diesel engines drawing excessive amounts of motor oil into the combustion chamber, which burn the oil as fuel, causing run-on
- The need to replace the bad seals with premium quality seals, which costs you valuable time, effort . . . and often money



Premium Material Low Grade Material



Valve stem seal designs are numerous. Once the engine hard parts are designed, the auto manufacturer conducts extensive engine testing to find the best seal design. Factors include:

- Lubrication requirements
- Cost
- Operating temperatures and speeds
- Type of fuel being used (gasoline, diesel, propane)

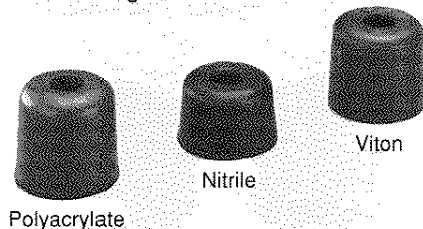
Deviating from the OEM design can allow too much or too little lubrication of the valve guide. That's why Fel-Pro always closely follows the original design in engineering and manufacturing valve stem seals to assure that they always meet or exceed OE specifications.

### ✓ The Need for Premium Materials in Valve Stem Seals

Today's smaller engines are expected to do more work per pound than their larger predecessors, which results in higher operating temperatures. Ordinary rubber compounds, such as nitrile, aren't able to withstand these temperatures, which often rise above 300°F. The most important differences among valve stem seals can't be seen or felt, however, so it is critical that you know what they are and what affect they have on the valve stem seal's performance.

Rubber valve stem seals composed of different compounds vary tremendously in physical properties. Two parts may look and feel identical when new, yet one will last many times longer than the other. This is because, in addition to the presence of high temperatures, the valve stem seal must survive the damaging effects of:

- Motor oil
- Oxidizing atmospheres
- Fuel vapors
- Oil additives
- Exhaust gas recirculation



If the rubber compound doesn't have the right properties for the particular application, it can wear, harden, split, crack or break into pieces.

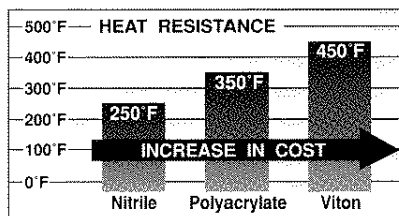
### ✓ Nylon Valve Stem Seals

One deviation from OE seals, found in Fel-Pro sets is nylon, deflector-type valve stem seals. These seals are hard and very unelastic. Therefore, in cases where the seal may have to fit on oversize valve stems used in the aftermarket, up to .003" over, Fel-Pro substitutes an appropriate rubber compound. This allows it to stretch over the larger diameter valves. The configuration and function of the seal is unchanged. Fel-Pro's SS 13364, the valve stem seal for most Ford V8's 1962 and up, is an example of a rubber seal being used for an OE nylon seal.

**Nitrile** works well in older engines, except certain high-performance applications. It is relatively inexpensive, but if used as a substitute when premium grade materials are specified, it can show signs of deterioration and failure in a matter of months.

**Polyacrylate** compounds have much higher temperature resistance, and present a good balance between heat and oil resistance and price.

**Viton** is currently the best material available for today's engine designs, particularly the smaller import and domestic models. While it costs more initially, this cost is fractional compared to the cost of the entire job, and is more than offset by its greater reliability (and therefore much less chance of contributing to a comeback).



The material specified by the engine manufacturer can be expected to give satisfactory service. Some parts suppliers do not always observe these standards. They supply look-alike, lower grade materials to reduce their costs and allow them a price advantage. The lower-grade seals get the car out the shop door, and while they function for awhile, it's a losing proposition.

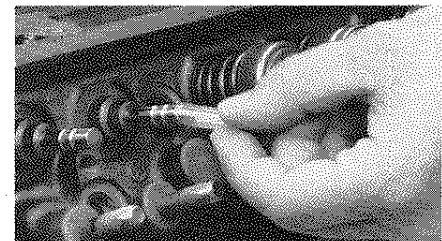
### ✓ A Word About Exhaust Valve Stem Seals

A common misconception is that exhaust valve stem seals aren't as important as those on the intake side because they don't operate under a vacuum. On the contrary, exhaust gases rushing past the valve create a low-pressure area near the lower end of the valve guide, which tends to draw oil into the combustion chamber.

And because exhaust valves get hotter than intake valves, it is even more important for them to be resistant to hardening under high temperatures. Fel-Pro includes premium material valve stem seals for both the intake and exhaust valves, to be sure you get the sealing power you need to avoid costly comebacks and keep your customers satisfied with your work.

### ✓ Installation Aid

Fel-Pro also helps the technician by including a thin plastic installation sleeve with positive-type valve stem seals. When placed over the tip of the valve stem during installation, this sleeve protects the inner lip of the seal from damage by the lock grooves. Just another reason to choose Fel-Pro.



*Demand the valve stem seals that are preferred by technicians — For greater profits, demand Fel-Pro quality and engineering expertise!*

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