Valve Stem Seal Failures

The AERA Technical Committee offers the following information regarding valve stem leakage. Valve stem seals are a metered leak designed to lubricate the valve stem while restricting excess oil from entering combustion. The design of the valve stem seal has changed over the years, but all have the same basic function. Here are some common designs used in internal combustion engines.

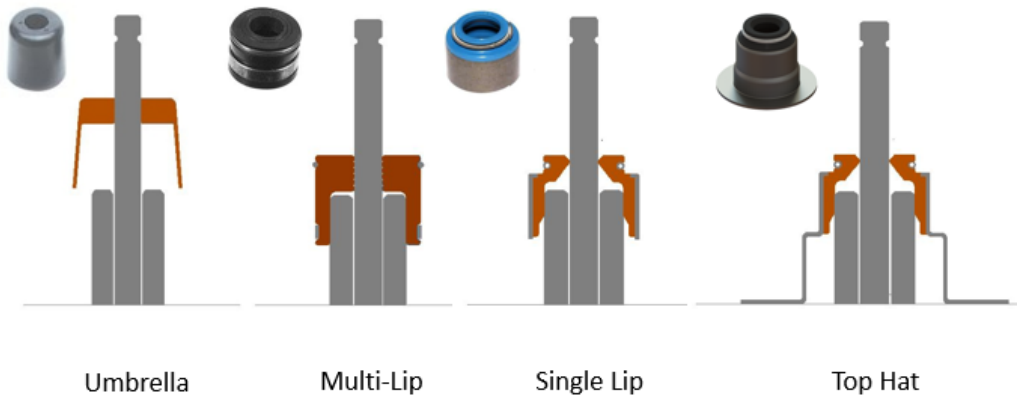

FIGURE 1: Valve Stem Seal Designs

Failures occur for a variety of reasons but the most common are listed here. Regardless of design, the installation and operational environment can contribute to failure.

1. Installation damage: Installing the stem seal over the keeper grooves without a protective sleeve can tear the sealing lip or lips and provide a small leak path that allows more oil to get past the lip and enter combustion. See Figure 2.

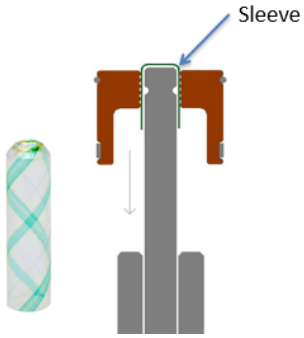

FIGURE 2: Installation Sleeve

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2. Using a lower grade rubber compound than the OE. Some aftermarket seals are made from a lower grade compound which has lower temperature range properties. These seals may not hold up to the operating temperatures for the given engine.
3. Some aftermarket seals also have no or inadequate chemical bonding of the rubber compound to the metal shell. This allows the rubber to separate from the shell and travel with the valve allowing excess oil to enter combustion.
4. Worn guides allow the valve stem to wobble in the guide stretching the ID of the seal to a point where a portion of the lip is no longer touching the stem and excess oil enters combustion.

Careful consideration to guide wear, installation practices and selection of seals from known reliable sources is critical to successful valve stem sealing.

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