

Norton Valve Seal Tests

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Following my research into the temperature tolerance of motor oils, I received several reports of deteriorated engine seals. I had previously heard rumors of seal problems resulting from synthetic oils, so I started a testing project to see if there was any truth to these reports. I built a small test chamber, using a heating element from a solder pot, and chose the following three valve seal samples to test the most common materials used in these parts:

- 1) A nitrile (black rubber) seal, supplied by Fair Spares. This part is similar to the original stock seal.
- 2) A viton (blue rubber) seal, supplied by US Seal in Chicago
- 3) A teflon (white plastic) seal, supplied by Perfect Circle.

The test samples were first weighed and measured accurately then immersed in the heated oil bath for nearly 100 hours at each of 150C, 165C, 180C and 200C. The measurements were repeated after each test. The dimensional data is for the part of the seal that actually touches the valve stem, in inches \pm .002. The weight is in grams, measured to 1 mg accuracy with a pharmaceutical scale courtesy of Lauden Homeopathic Pharmacy in Capitola CA. The "duro." data is hardness in durometer type 0 units, \pm 2.

	seal#1	Viton			seal#2	Teflon			seal#3	Nitrile	
Hours/Temp.	dim.	wt.	duro.	dim.	wt.	duro.	dim.	wt.	duro.		
initial values	0.277	3.650	45	0.313	2.959	n/a	0.263	1.138	60		
92 @150 C	0.277	3.651	45	0.313	2.959	n/a	0.260	1.140	60		
95 @165 C	0.279	3.652	45	0.313	2.959	n/a	0.258	1.142	60		
98 @180 C	0.278	3.655	46	0.313	2.959	n/a	0.256	1.144	65		
95 @200 C	0.276	3.656	50	0.313	2.962	n/a	0.256	1.146	70		

After 400 hours, the Viton and Teflon seals showed less than 1% change in weight and dimension. The Nitrile (stock) seal shrunk by about 3%, and gained almost 1% in weight. The hardness of both the nitrile and the viton seals increased by about 10% during the final test at 200 C, indicating some aging of these materials. The Viton seal appears to be a superior part, but because of its height, will require machining of the valve guide to avoid interference with the valve spring retainer at full lift. The Teflon seal, which also requires machining of the guide, is made from a very stable and temperature-tolerant material. But because it is not very flexible, the seal will tend to be less efficient once there is any guide wear. Thus these seals are used primarily for competition engines which typically don't accumulate much mileage between rebuilds.

This testing program is roughly equivalent to 20K miles of hard riding in adverse conditions, at up to the highest oil temperature I previously measured in a Commando motor. I'm therefore confident that there is no adverse effect on valve seals from running synthetic oil such as the Red Line I recommend.