Sealing Solutions in Automotive Engines

Sealant Joints:
Addressing sealing solutions in vintage engines requires some judgment and the following criteria is meant as a guide to help insure a leak proof, flanged joint.

In many European engines, from Edwardian times to the present day, flanged joints were machined only to accept aviation sealant. Adding a gasket during an engine rebuild could change the geometry of the assembly and lead to unacceptable fits. Examples might include some Maserati grand prix machines like the Wilbur Shaw 8CTF where half the main bearings were cast into the sump and the other half, cast into the crankcase. Most Bugatti engines only relied on sealer and it would be quite difficult to incorporate a gasket even if there was an intention to do so. An indication of whether a gasket was intended is often surmised if there is a bore at the union that needs to remain round i.e.: a blower mount, cam drive casting, speedo mount, etc.. American engines that followed this same practice were Miller and Offenhauser.

Bugatti Cam Box

Alfa 2.9 Blower cases

There are a number of joint compounds to address these joints. The choice is based on:

1. Temperature: will the sealant become of reduced viscosity and flow from the joint and/or vaporize with excess heat?

2. Media: is the material miscible with the fluid it is meant to contain and therefore fail?

3. Pressure: will the sealant adhere to the mating surfaces sufficiently to withstand either vacuum or pressure?

My selection for a no pressure application where the machine flanges are flat is the old fashioned Aviation Sealant (now marketed by NAPA). In assembling magnesium and aluminum castings that will expand differentially with each other, I prefer Kawasaki Z1 crankcase sealant.

Gasket Joints:
Most automotive engines require gaskets to contain fluids of one sort or

another. Selection of what kind of gasket that is the most beneficial depends on the following:

1. Temperature: I first assess what temperature the gasket might experience because it is the most limiting factor.

2. Media: I next insure that the gasket material I choose is compatible with the material I'm trying to restrict.

3. Application: A less than prudent assessment of the compressive load on the gasket, the flange strength material, the number of bolts holding the flange and their relative separation, can lead to failure.

Some Thoughts:

1. Choose a gasket material that will perform within the temperature limits. If it is for exhaust, insure it is copper asbestos type or graphite. If the application is general purpose, i.e. oil pump, cams covers, blower, an aramid sheet gasket with nitrile binder will withstand up to 750 degrees F and 1200 psi. It also is favored with a wide range of fluids.(Note: comes in wide range of thickness 1/64, 1/32, 1/16, 3/32, 1/8)If the use is for a water pump, the Felpro blue might be of choice.

2. Choose a gasket that deforms enough to flow into imperfections in the flange castings, has resistance to creep, but is not so thick as to permit the flanges to deform when torqued on assembly. This is often overlooked and important.

a. Rule of thumb: A gasket material's performance decreases with an increase in gasket thickness. Thicker gaskets require an increase in compressive loads to resist blow out.

3. Choose a gasket that has sufficient strength to resist compression under an applied load if the application is to maintain a critical dimension. On vintage engines from early Cadillacs to Bentley and Bugatti, the blocks bolted to the crankcase. If a gasket is required, it must resist crush. Often in these circumstances, I fabricate gaskets of metal shim stock, spray with a

light coat of Copper Coat and assemble. The sealant resists oil weep and the use of copper or steel resists crush.

4. Choose a gasket that will conform to the geometry of the engine. If the shape is curved, I use cork impregnated with neoprene. You can also use cork/Buna N but it will not resist oil as well. I also use cork when the mating castings are subject to vibration and/or to be reused. That's why they are often found used on valve covers.

Note: Garlock and Felpro have a large variety of gaskets with technical sheets to aid in an appropriate selection.