

Today's head and block surface finishes

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With the introduction of various gasket materials such as composite graphite and multilayer steel gaskets, the required surface finish of the block and head has also changed. The other piece of the puzzle is more and more bimetal engines are becoming a larger part of current production.

When using a composite graphite gasket, the rule of thumb is the smoother the better. The graphite material is very good for heat transfer. By having the ability to transfer heat, graphite eliminates localized hot spots on the gasket, which extends the life of the gasket.

Graphite is a fragile material and must have a smooth surface. Due to the difference of the expansion rate between aluminum and cast iron, the RA measurement must be less than 60. If the RA is too rough, then the side to side expansion motion will shear the gasket material and failure is likely. The same is true for the multilayered steel gaskets (MLS), such as the type used in the 4.6L Ford engine.

The MLS gaskets are different layers of steel that are coated with rubber. The surface finish recommendation for this engine is 7-15 RA. MLS gaskets aid in head bolt torque loss. This design has the ability to help reduce cylinder distortion due to lower head bolt torque values needed to seal coolant and compression. The fear has been that lowering the RA surface finish value, a problem may occur with cold sealability. This has not been a factor with the graphite or multilayered steel gaskets.

The surface finish for Kevlar gaskets can be somewhat higher- 60 to 125 RA. The rougher finish will grab and hold the gasket. However, Jasper is averaging 37-50 RA for both head and block surfaces and has not had a problem using graphite, multilayered steel or Kevlar.

Jasper uses a PCD (Polycrystalline Diamond) cutter to resurface aluminum heads. To resurface cast iron heads, Jasper uses CBN (Cubic Boron Nitride) cutters. It is important that the head surface be free of any nicks or scratches, especially those that lead into the combustion chambers or coolant holes. Nicks or scratches in these areas may allow leakage (see photos above). Over a period of time, the coolant or combustion leakage will erode the gaskets and cause premature gasket failure.

Surface finish is not the only concern though. The head bolt torque value and torquing the bolts properly in proper sequence is also very important. Torque requirements must be followed as listed by the O.E. specifications. Today's torque is not only listed as ft. lbs. but many specifications are specified as degrees of torque. By following the recommended torque sequence and the listed procedures, you will ensure the best possible clamp load without putting extra stress on the cylinders. Who would have thought that by over-torquing a cylinder head a block could become distorted and cause main bearings to fail. On some blocks this is a possibility.

Block and head surface flatness is also an issue. As a rule, a V-8 head should have

0.004" or less warpage. A V-6 head should have 0.003" or less warpage and an in-line 6-cylinder should have 0.006" or less warpage from end to end.

Looking at today's requirements, anyone assembling an engine or machining parts needs to be aware of the recommended specifications. Also, be aware of the parts that are to be used in order to insure the product will give the customer the reliability they are paying for.

Editor's note: Jasper Engines and Transmissions, Jasper, IN is one of the largest and most respected engine remanufacturers in the world and winner of the 1996 PERA Engine Remanufacturer of the year, Enginetech is proud of its long time relationship as an engine component supplier to Jasper.