SURFACE FINISH OF CYLINDER HEADS

HEAD SURFACE FINISHES

Head surfacing is just one of the jobs usually performed when rebuilding an engine or reconditioning a cylinder head. It is important that the correct surface finish is achieved because not only will it affect the gaskets' ability to cold seal fluids and combustion gases, but also the long term durability. As head gasket design and materials have changed over the years and castings have become lighter and less rigid, the need for smoother, flatter surfaces have become more important.

CAST IRON CYLINDER HEADS

ACL recommends surface finish with a roughness average (Ra) of anywhere from 40 to 100 micro-inches for composite and graphite head gaskets. As long as the surface finish on the cylinder head and block is somewhere between the minimum smoothness and maximum roughness, there should not be any cold sealing or durability problems with the head gasket as long as factory torque specifications are adhered to.

ALUMINIUM CYLINDER HEADS

For aluminium cylinder heads the surface finish becomes more critical as there are different thermal expansion rates in bi-metal engines. The thermal expansion rates between a cast iron block and an aluminium cylinder head creates a tremendous amount of shearing force on the head gasket. If the surface finish is too rough the metal will bite into the gasket and pull it sideways as the cylinder expends and contracts. The cumulative effect over time can cause a de-laminating effect in the gasket, literally tearing it apart. Surface finish recommendations are from 40 to 100 micro-inches Ra.

MULTI-LAYER STEEL (MLS) HEAD GASKETS

This type of laminated steel gasket is extremely durable because the multiple layers of metal prevent the gasket from losing torque due to gasket relaxation. This design also reduces the amount of torque required on the head bolts to seal the gasket, which in turn reduces cylinder bore distortion and blowby. The recommended surface finish for ACL MLS gaskets is 8 to 22 micro-inches Ra.

CYLINDER HEAD/BLOCK DISTORTION

Flatness is an aspect of surface finish that needs to be mentioned, because a cylinder head that is not flat won't seal no matter how smooth it is. Near perfection is required on many of today's engines for a good cold seal. Measure the cylinder head and block faces with a straight edge and a feeler gauge. If the gap exceeds 0.051mm (.002") at any point then have the surface machined.

Hardness of aluminium cylinder heads is one more factor that could affect gasket-sealing performance. Cylinder heads are made in a variety of aluminium alloys and may be either gravity or low pressure die cast. Different heat treatments achieve between 80 & 120 Brinell from factory. As a guide, any used aluminium head which has a hardness lower than 65 Brinell is likely to have been permanently softened by overheating.