

SB046

Use of Torque Plates when Boring and Honing Engine Blocks

With the O.E.M. quest for ever improving engine fuel economy, parasitical friction losses are a major focus of engine designers and the piston ring to cylinder bore interface is continually in their sights. Manufacturers reduce piston ring widths and tensions in an attempt to reduce friction but still have the rings seal compression and control oil. Keeping cylinder bores round over the full compression and combustion strokes is critical to the rings doing their job. With engine blocks also becoming lighter in construction, cylinder bore roundness can be compromised by main caps and cylinder heads when fitted and the bolts tensioned. Angle torque head bolts help to more accurately predict and design for their effect on the bores. For these reasons, it is good practice when boring and honing cylinder blocks to have the main caps and a torque plate fitted and tensioned. It goes some way to applying the major static stresses and distortions experienced by the bores when the engine is fully assembled and in operation. Diesel cylinder blocks have been found to have over 0.15 mm (0.006") bore distortion when bored and honed with a torque plate and main caps fitted and tensioned and then removed.

Fitted torque plates are used to simulate the distorting forces acting on the block when the cylinder head is fitted. They are typically made from a slab of aluminium if the head is aluminium, or steel or cast iron if the head is cast iron. The profile is rectangular, 75 to 100 mm thick and covers the deck of the block. All the head bolt holes are drilled in location, as are the dowel location holes. There are holes for each of the bores, usually about 2 mm larger than the standard bore diameter, to allow for boring and honing up to 1.5 mm oversize. The upper and lower faces of the torque plate are surface ground to the same finish of cylinder heads and block faces. The torque plates are fitted to the block with a head gasket and head bolts or studs, lubricated as per instructions, and tensioned to specification and sequence. 45 degree tapered (if room permits), hardened spacers need to be machined up to the correct length for each bolt, so that the bolt/stud thread engaged in the block is the same length as when the cylinder head is installed. This will help to achieve truer bores for the piston rings to run and seal in, which should mean longer engine life and better performance.

