

SB022

Plateau Honing

While traditionally a bore finishing process used in preparing performance petrol engines, plateau honing is now recommended for nearly all engines, including diesel engines. Diesel ring and bore design trends are following those of petrol engines, with narrower ring widths, lower ring tensions, pre-lapped rings, a range of ring coatings and treatments, smoother bore finishes and lighter engine blocks. Final stage bore honing with #220 or #280 grit stones will give a bore finish in the range of $0.75 - 0.91 \mu\text{mRa}$ ($30 - 36 \mu\text{Ra}$) and $0.50 - 0.63 \mu\text{mRa}$ ($20 - 25 \mu\text{Ra}$) respectively. However, the finish consists of sharp peaks (Figure 1.), folded metal and trapped debris. When the rebuilt engine first runs, the rings do the final finishing of the bore. The high ring pressures on these sharp peaks causes them to fracture and break off and the folded metal and trapped debris are loosened. These particles damage the ring faces and coatings, extending break-in time and shortening ring life and may actually mean the engine experiences oil consumption and blow-by from start-up and never seals properly.



Figure 1. Final hone and plateau hone profile.

Plateau honing attempts to duplicate a run-in bore (Figure 1.) and when matched with pre-lapped rings, should mean minimum break-in time, longer ring life, lower oil consumption and higher cylinder compression pressures - which all mean lower emissions, better engines and satisfied customers. Plateau honing gives all the benefits of a smooth surface, but the oil holding benefits of the rough and deep valleys underneath (Figure 2.).

Normal bore finishes can be specified with Ra, Rz and Rt values. Figure 3 depicts three very similar bore Ra finishes, which have very different profiles. When finishing bores with a plateau hone, other parameters of the bore finish are considered - eg. specific details of the valleys and peaks and the relationship between them. The extra parameters usually specified for plateau hone finishes are:

Rk - Core roughness depth - body of material between the tops of the peaks and the bottoms of the valleys

Rpk - Reduced peak height - average height of protruding peaks above the roughness core profile

Rvk - Reduced valley depth - average depth of valleys protruding through the roughness core profile

BAC - Bearing Area Curve or Abbott Firestone curve - Material ratio curve - establishes the relationship between the Rk values

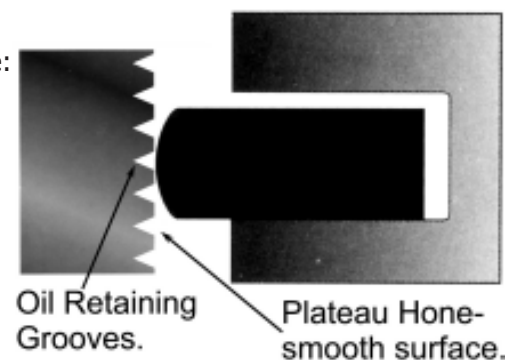


Figure 2. Smooth surface and oil holding valleys.

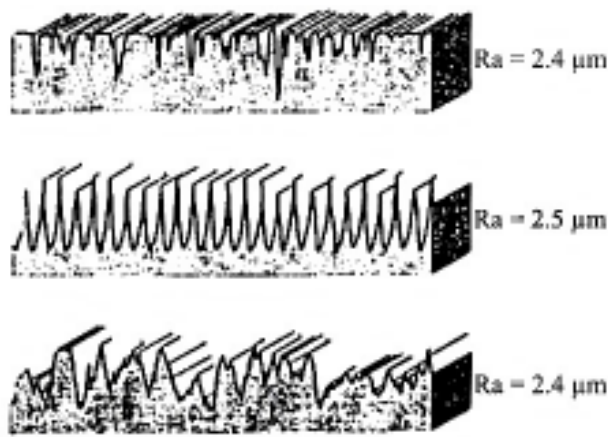


Figure 3. Similar Ra bore finishes with significantly different profiles.

The desired plateau bore finish is one with sufficiently deep oil holding valleys, plateaus with a surface area about 2/3 of the base profile to support the rings and overall, relatively smooth. Following the final stage honing with #220 or #280 grit stones (Refer SB016 Cylinder Bore Finish), the plateau honing is achieved with either #400 grit stones or a dedicated Plateau Honing Tool (PHT). PHT's are specially designed abrasive nylon brushes that fit in the standard hone stone holders. Plateau honed bores will typically have a finish of 0.30 - 0.60 μmRa (12 - 24 μRa).

Bore surface finish can only be accurately measured with a surface texture analyser/roughness tester and all workshops should regularly check the cylinder bore finishes they are producing to ensure they are achieving the required specifications.

While bore finish is critical, narrower ring widths, lower ring tensions and thinner engine blocks also require highly controlled bore geometry. Less than 0.012 mm variation in bore roundness and taper is recommended. Cleaning of the finished bores with hot soapy water and a stiff nylon brush, followed by rinsing and wiping dry with a clean white cloth is still the recommended cleaning procedure.
