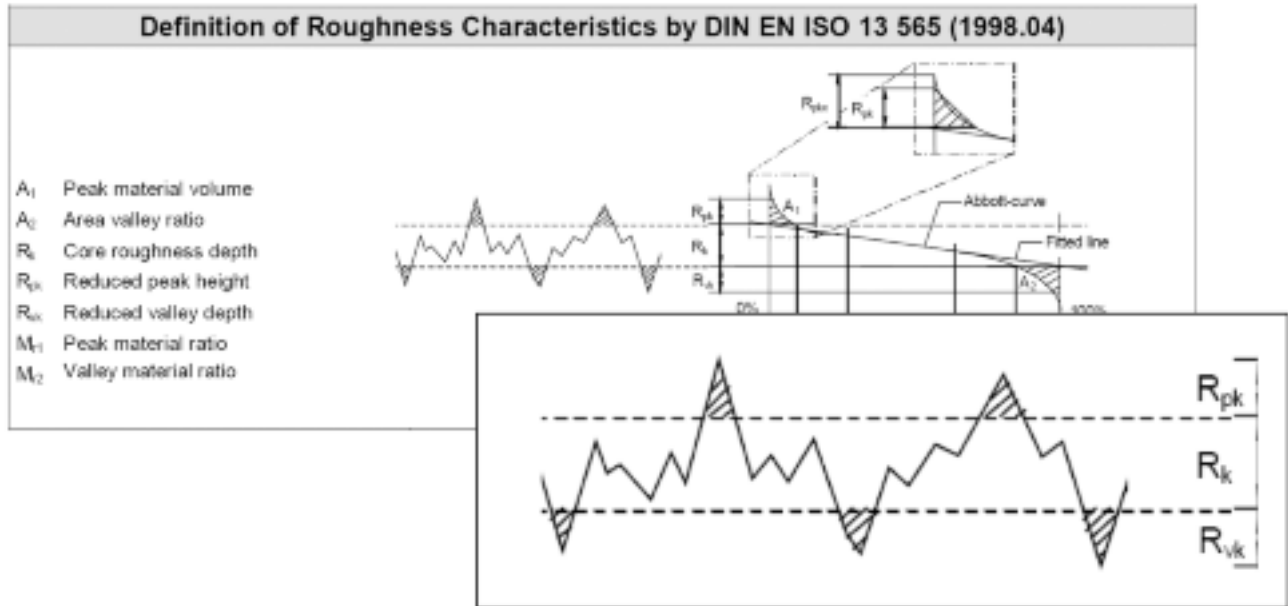


BORE FINISH

Rpk, Rk and Rvk have replaced Ra as the most important baselines of measuring bore finish. These present a much more defined description of the actual bore finish surface.

Bearing Ratio Curve (% of material contact of cylinder wall to ring)



Reduced Peak Height (Rpk)

The top portion of the surface which will quickly be worn away when the engines begins to run

Core Roughness Depth (Rk)

The long term running surface which will influence the performance and life of the cylinder

Reduced Valley Depth (Rvk)

The oil retaining capability of the deep troughs which have been machined into the surface

Industry Recommendations

General Applications:

Good Performance with Good Life

Rpk: 8-12 micro-inch (<12 optimum)

Rk: 25-35 micro-inch (25 optimum)

Rvk: 40-50 micro-inch (40 optimum)

Ra: 15-20 micro-inch and 12-23 allowable

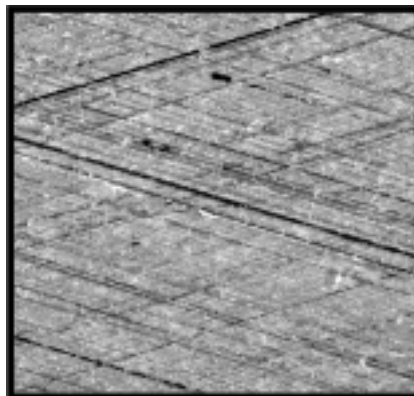
Pro-Stock & NASCAR:

**Much smoother finish,
much less life, but less friction**

Rpk: 3-5 micro-inch

Rk: 12-18 micro-inch

Rvk: 20-25 micro-inch



(April 2011 Engine Builder)

BORE FINISH (Cont.)

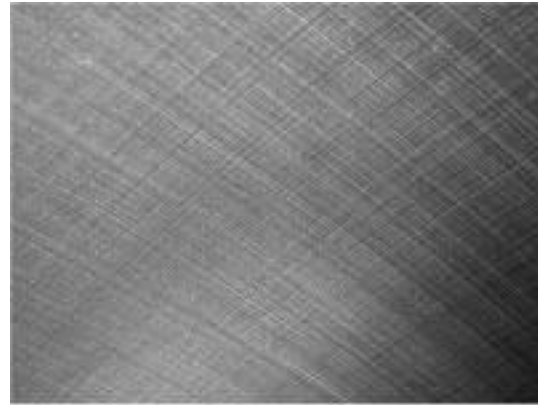
Oil Retention & Cross – Cross Hatch Angle

Oil Retention (valleys in bore surface)

- Rvk has very strong correlation to oil consumption
- Excessive Rvk leads to high oil consumption and excessive ring rotation
- Insufficient Rvk can lead to excessive ring and bore wear

Cross Hatch Angle

- Typical automotive application: 45° to each other (or 22° to 32° to the horizontal deck surface)
- Crosshatch angle should be the same throughout the length of the cylinder and not flatten out at either end
- Performance racing low tension rings: 20°-30°
- Nikasil – Thermal Spray Bores – Hypereutectic Bores: 10°-15°



(Cross Hatch Angle data provided by Sunnen Products Company)

Honing (General Applications)

Industry Standard Honing Practices

- **Stock Removal**
 - .0030" with 80-100 grit stone
 - Bulk Stock Removal; Produces Deep Valleys
 - .0015" with 280-320 grit stone
 - Prepares Core Roughness; Regulates Valley Depth
 - .0005" with 400-600 grit stone
 - Prepares Plateau Attributes
- **Finish**
 - 320 grit abrasive filled nylon filament brush
 - **OR** 800 grit cork bond stone
 - Removes Surface Defects Left Behind from Honing

Honing (Racing engines)

Common Honing Practice

- **Stock Removal**
 - **EHU412** 150 grit stone
 - Bulk Stock Removal; Produces Deep Valleys
 - .0020" with **JHU623** 280 grit stone
 - Prepares Core Roughness; Regulates Valley Depth
 - .0003" with C30J95 500 grit stone
 - These stones need to be cut down to 2.750" long
 - Prepares Plateau Attributes



Rpk: < 10 micro-inch
Rvk: 18-25 micro-inch

(Data provided by Sunnen Products Company)

BORE FINISH (Cont.)

Common deviations from a good bore finish

Cross hatch grooves irregularly spaced

- Causes: Varying reciprocation rates, poor stone breakdown with alternate loading and breakdown, stone grade too hard and/or grit too coarse
- Effect: Poor oil distribution, erratic break-in oil economy

Wide, deep cross hatch grooves

- Causes: Stone grit too coarse, excessive stone pressure, poor stone break-down, insufficient lubricant
- Effect: Causes abnormal wear, excessive oil consumption, poor and variable break-in period

One directional cut

- Causes: Excessive play in hone components
- Effect: Causes rapid wear, poor seating, excessive ring rotation, lowers oil control

Low cross hatch angle

- Causes: Low reciprocation rate compared to RPM used
- Effects: High impact forces causing excessive wear, poor oil distribution, slower break-in of rings

Cross hatch groove folded and fragmented

- Causes: Stone grit too coarse and/or grade too soft, insufficient lubricant
- Effect: Causes scratching, high wear, raises ring temperatures, high & erratic oil consumption

Too little plateau

- Causes: Stone grit too coarse, insufficient stock removal per cut
- Effect: Excessive ring wear, high temperatures

Glazed plateau

- Causes: Excessive stone pressures, loaded stones (too hard a grade), insufficient lubricant
- Effect: Slows down seating-in and increase oil consumption

Excessive voids in cylinder wall

- Causes: Excessive stone pressures, loaded stones (too hard a grade), insufficient lubricant
- Effect: Increase oil consumption, rapid wear, reduces uniformity from engine to engine