Reconditioning of Aluminium Engine Blocks

ALUSIL® & LOKASIL® Cylinder Surfaces

What are ALUSIL® und LOKASIL®?

ALUSIL® and LOKASIL® are processes for manufacturing aluminium engine blocks with silicon reinforced cylinder sliding surfaces.

Objectives of these processes are to produce hard and consequently wear-resistant cylinder surfaces by using suitable casting and finishing processes for the cylinder bores.

The two processes differ considerably in the casting technologies used. The finished cylinder surfaces, however, these differences are insignificant. For this reason, the cylinder finishing processes used are identical for both methods.

To avoid any direct contact between the aluminium and the pistons and piston rings, it is essential that the adjacent aluminium matrix is only exposed a few 1/1000 mm during the cylinder finishing process. This procedure is called silicon exposure. The resulting cavities between the silicon crystals are intended as oil-retaining cavities in this process.

Principle of the Sliding Surface

The high wear resistance of the cylinder surface is achieved by silicon crystals embedded in the aluminium matrix. The silicon crystals are introduced in the aluminium matrix during the casting of the engine block. The silicon crystals are individually called silicon exposure. The resulting cavities between the silicon crystals are intended as oil-retaining cavities in this process.

The aluminium matrix is relatively soft compared to the silicon crystals. It is not involved in the wear process and in this regard only ensures the function of a carrier material.

Machining Steps

Finish-drilling of the Cylinder Bores

Objectives and Requirements:
- Preparing the cylinder bore for the honing process
- Establishing the desired cylinder bore dimension
- Elimination of geometrical faults inside the bore
- It is common that the machining parameters (speed, advance, material removal) are observed during the drilling process as well as during honing to achieve the desired bore diameter.
- Diamond tipped drilling tools (PCD) must be used to minimise the damage zone of the Si crystals.

Attention
Exposing silicon crystals caused by inappropriate cutting tools and incorrect machining parameters cannot be removed by a subsequent honing process. Increased contact pressure at the joint end counteracts the tendency to flutter.

Honing the Cylinder Bore

Objectives and Requirements:
- Fine machining the cylinder surface
- Establishing the nominal diameter of the cylinder
- Removing the silicon crystal damage zone caused as a result of the drilling process
- Elimination of geometrical faults inside the bore
- The required surface qualities can only be achieved by using KS diamond honing tools.

Attention
Ceramic honing stones made of silicon carbide, boron nitride or silicon nitride result in the destruction of the crystals and should not be used.

Exposing Silicon Crystals - Mechanical Exposure Process

Objectives and Requirements:
- Exposing silicon crystals from the adjacent aluminium matrix to a certain exposure depth
-Reviving the sharp edges of the silicon crystal edges
- Generation of an oil-retaining volume for lubricating the interacting sliding parts - cylinder bore and piston rings
- Using the highly porous KS exposing stones.
- Removal of the direction of rotation during machining to achieve exposure on all sides
- Use of normal honing oil

Attention
Thanks to the new, much simpler mechanical exposure process, not only has the tapping exposure process used to date been completely replaced but exposure has also been improved to a significant extent.

Tools

KS Diamond Honing Stones:
- Abrasive grains of synthetic diamonds
- Soft wax-based metal carrier
- Favouring by clamping or gluing
- High endurance
- Optimal machining results
- Cooling lubricant: Conventional honing oil

KS Exposing Stones:
- Specially adapted to ALUSIL® und LOKASIL® surfaces
- Highly porous resin-based material
- Ceramic abrasive grains of pure red quartz
- Optimal exposing results
- Long tool service
- Cooling lubricant: Conventional honing oil

Quantum Leap in Engine Reconditioning

With the new machining techniques, the new tools and the know-how provided in the “Reconditioning of Aluminium Blocks” brochure, the professional engine reconditioner now has all means at his disposal for carrying out the reconditioning of state-of-the-art cylinder surfaces in highest quality. These new techniques have not only improved the reliability of the process, but have also simplified it considerably.

The manufacture of a perfectly, extremely wear resistant and piston already run-in cylinder surface has consequently achieved a state-of-the-art series production level in the reconditioning sector.

Details on this subject can be found in our brochure "Reconditioning of Aluminium Blocks".

Further information can be obtained directly from your local Motor Service partner or at www.ms-motor-service.com

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