

## Issue No.: 7/2012—Cylinder liners with cylinder liner ring (fire ring)—information about function and assembly

In engines subjected to heavy loads, many engine manufacturers install cylinder liners with a fire ring. This is located in the upper end of the liner and seals in the direction of the cylinder head gasket. The pressure emanating from the cylinder head fixes the ring in the cylinder liner retainer. The key feature: the inner diameter of the fire ring is slightly smaller than that of the cylinder liner. The piston circumference is dimensioned accordingly too: in contrast to conventional pistons, these also have a reduced circumference at the top land.

### RISK: OIL CARBON ON THE TOP LAND

Combustion occurs at very high temperatures and leads to the formation of hydrocarbon compounds. This, in turn, leads to oil carbon build-up. A minimal amount of oil carbon is harmless; however, its formation should be avoided if possible, and any existing build-up of oil

carbon should be removed. As the amount of oil carbon on the top land builds up, abrasive wear increases and raises the risk of the piston rings jamming. Since the circumference at the piston top land and inner diameter of the cylinder liner are reduced in size due to the fire ring, the oil carbon is scraped off, thus reducing the negative effects.

The formation of oil carbon is aggravated by operating engines in unfavourable operating conditions and harsh conditions, such as:

- Short distances and city traffic
- Low-grade fuel
- Inadequate cooling
- Frequently irregular maintenance intervals
- Longer periods of operation while idling



Figure 1: Non-destructive removal



Figure 2: Destructive removal



Figure 3: Cross section in lowered state

## REPAIR SHOP INFORMATION

### REMOVAL VARIANT 1: DESTRUCTIVE

The destructive approach to removal is most frequently used when fitting a new cylinder liner with new fire ring—either due to time constraints or because the fire ring is already damaged. The first step towards loosening the fire ring is to drive a chisel between the fire ring and liner. Once the fire ring has been detached, the other components can be removed in the usual manner.

### REMOVAL VARIANT 2: NON-DESTRUCTIVE

More effort is required if both the cylinder liner and the fire ring are to be reused. First, the piston must be moved to bottom dead centre by turning the crankshaft. Then, a used piston ring with a diameter matching the diameter of the cylinder liner is inserted below the fire ring. To prevent the piston ring sliding over the fire ring when being pushed together, the gap clearance between the ends of the piston ring must be bridged—ideally with a metal wedge or a feeler gauge. If the cylinder liner is not to be replaced, this must be pushed into position from above using a pressure pad. By turning the piston towards top dead centre, the piston becomes a removal tool that distributes pressure along the entire circumference of the fire ring.