1

2

3

4

3 Piston crown

3.2.2 Melting of the piston crown and top land, Diesel engine

Symptoms

The top land in Figure 1 is locally molten above the ring insert.
Figure 2 shows the progression of the melting over the entire top land width to the piston crown. In both cases, the ring insert broke out.
The piston crown in Figure 3 shows melting which has begun at the rim of the combustion cavity and at the edge of the crown, while in Figure 4 the crown and top land are completely destroyed.

Cause and Effect

Unburnt fuel because of ignition delays and spark failures is deposited in the clearance between top land and cylinder. On the one hand the consequence of this is increased ring wear (2.1.7) and on the other hand the collected fuel ignites without any control. In places, high temperatures exceeding the melting point of the piston material being 577~C are produced.Subsequently, the meltings in Figures 1 and 2 can even result in the total destruction of the piston shown in Figure 4.The causes for this faulty combustion are too low compression pressure (caused by wear, too large clearance or incorrect ignition timing), as well as faults in the injection equipment (such as carbonized or bad-locking nozzles or excessive injected quantities of fuel). The meltings at the rim of the combustion cavity and the edge of the crown in Figure 3 are to be attributed to increased injection quantities. Damaged injection nozzles or incorrect injection pump timing (for performance increase) lead to excessive temperatures.

Remedy

Check that injection quantity and injection timing are adjusted as recommended by the engine manufacturer. Check injection nozzles for correct injection pressure and sealing. Ensure that the recommended clearance is met after cylinder head or block machining, if necessary assemble pistons with reduced compression height.