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3 Piston crown

3.3 Deformation of the piston crown

3.3.1 Impacts on the valve or cylinder head

Symptoms

Figure 1 shows a piston crown bearing the impact mark of a valve head. It can clearly be seen that the displaced piston material is raised up around the edge of the point of impact.

In Figure 2, the piston crown is deformed by approx. 5 mm, and has conformed to the shape of the combustion chamber of the cylinder head.

Figure 3 shows the case of a Diesel engine where the crown edge is deformed and the top land had hard cylinder contact.

Cause and Effect

In the case of the valve-head impact, it is clearly not the piston which is at fault. Damage of this kind is caused by incorrect valve timing (camshaft installation), broken valve springs, the build-up of oil carbon on the valve stem and incorrect valve clearance.

In the second case, it is probable that, because of a connecting rod bolt which has become loose, the piston stroke has become larger, and the piston has hit the cylinder head. Firstly, the piston material has been displaced into the combustion chamber, and secondly, in the quenched area,the ring belt is jolted down to the piston skirt. Breakage of the piston in thiscase was prevented only by the toughness of the forged piston material.

Hard cylinder contact of the top land as shown in Figure 3 occurs particularly with pistons on Diesel engines with direct injection. A build-up of oil carbon on the piston crown, which is thicker than the top clearance, causes the piston to hit the cylinder head. Thereby the edge of the top land will be deformed and bear hard on the cylinder wall. The most serious results of this heard bearing are seizure and even fracture of the piston. Liquids (oil or fuel) which, for example with V-engines or horizontal engines, collect in the bottom "corner" of the combustion chamber after switching off a failing engine, may also cause displacements of material of this kind.

Remedy

When assembling an engine, check that the control components are fitted correctly. Check the top clearance between the cylinder head and the piston crown, also the piston projection or recess distance for all cylinders.In cases where an engine produces harsh noise while running, check it before serious damage occurs.