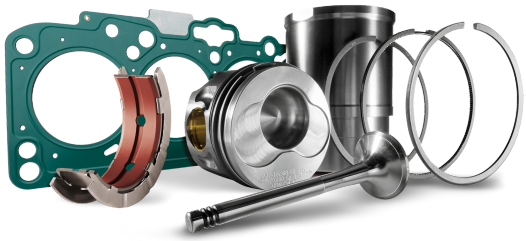

Engine Valves - a guide to trouble free service life

The design and manufacture of engine valves contains a high degree of technology. They not only have very fine limits of machining, but the design engineers specify a material that will cope with the most arduous conditions.

In use, a valve:

- Typically opens and closes around 50 times a second.
- It also has to withstand pressures of more than 1000 psi
- Corrosive attack from chemicals within the fuel
- High temperatures, typically 800°c for the exhaust.

Given these extreme operating conditions, it is remarkable that a valve can last 16km/10 miles, let alone 160,000 km/100,000 miles service. However, considerable metallurgical advances now make it easily possible for a valve to give 160,000 km/100,000 miles service.

The fitting and service of any component affects its overall working life. When servicing/replacing engine valves take the following principal precautions:

1. Engine valves are precision products, machined to very fine limits of accuracy. Take extreme care when handling and storing.

2. When stripping a cylinder head prior to overhaul, use chalk, labels or other similar non-injurious means to identify the valves. Never stamp marks on the valve head as this will almost certainly cause distortion and consequently, ineffective seating upon re-assembly.

3. During de-carbonising operations, take care to clean the carbon and oxide deposits.Do this from not only the head of the valve, but also the neck, the top of the valve stem and the top of the guide. A build-up of deposits in these additional areas will result in the likelihood of the valve sticking during service.

4. For the efficient functioning of a valve, it is essential that the clearance between the valve stem and the guide bore be in accordance with the engine manufacturer's instructions. In addition, that the guide bore and port seat is concentric to within a tolerance of 0.038mm/0.0015". Heavy lapping will not cure a port seat with any sign of distortion or burning. Re-cut the seat to the tolerance as stated above, ensuring that the spigot of the cutter is a close fit in the valve guide. Fit new guides, as it is pointless to attempt this work with old, worn-out guides.

5. Only the lightest lapping-in with fine paste is necessary. The valve head seat is ground to very close limits of concentricity and to a high finish – excessive lapping can cause serious damage, particularly if a coarse paste is used.

6. When closed, the valves must completely seal the combustion space. Should they fail to do so, there is an immediate loss of power and the possibility of an early failure. It is, therefore, essential that when carefully installing new valves to check the rockers, tappets, springs, guides and the whole valve train geometry thoroughly. Otherwise, excessive side thrust may be exerted on the valve leading to distortion of its head and incorrect seating. No valve, regardless of its material, or however accurate the machining, can give satisfactory service under such conditions. This ultimately leads to burnt-out, or worse, fatigue breakage.