

## SB018

# Valve Face Wear or Guttering and Valve Head Tuliping/Cupping

### ***Exhaust Valve Face Wear in Diesel, Petrol or LPG Engines***

This is usually not a problem with modern engines, as its occurrence will usually have been identified and corrected during development by the engine manufacturer. The problem is corrected by the appropriate choice of valve seat and valve face materials (e.g. stellite) and improved valve geometry. On earlier engines without hard faced seats, high engine temperatures, coupled with slack tappets or weak valve springs can result in valve face pounding and wear. Misaligned valve seats and valve stems can also cause this sort of wear. Normally, the exhaust valve is adequately lubricated by the products of combustion. However, lead free and LPG fuels result in drier and lubrication free exhaust gases, which causes increased valve face wear as a result of micro-welding between the valve face and seat. The typical appearance of valve face wear or guttering can be seen in Photo 1.

### ***Inlet Valve Face Wear in Turbocharged Diesel Engines***

This is a problem that is peculiar to the turbocharged diesel engine (but not turbocharged petrol engines) and typically in engines on constant or continuous duty cycles (e.g. marine engines, power generator engines, stationary engines etc.). Turbocharging increases the pressure developed during the induction stroke and air pressure in the inlet port above atmospheric pressure. This prevents any lubricating oil being taken into the air stream from the valve guide. Consequently, the valve face and seat run dry and wear can occur on either, although in practice, mainly on the valve face. Although similar conditions occur in turbocharged petrol engines, inlet valve and seat lubrication is provided by the wet fuel. Engine manufacturers spend considerable time researching and ensuring this type of valve wear does not occur. Again, the problem is corrected by the appropriate choice of valve seat and valve face materials (e.g. stellite) and improved valve geometry.



Photo 1. Valve face wear or guttering.

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### **Valve Head Cupping or Tuliping**

If the valve face wear results in the valve head edge being excessively thin and/or the valve head has been exposed to excessive engine temperatures resulting in loss of yield strength, the valve head may 'cup' or 'tulip'. The typical appearance of valve head cupping/tuliping can be seen in Photo 2. Cupping can also be the result of extreme mechanical stresses typical of excess spring loads from over revving or incorrect installed valve spring heights. Undetected, this condition can result in chordal cracking or burning of the valve head and contact between the valve and piston - particularly in diesel engines where the valve head to piston crown clearance is minimal.



Photo 2. Valve head cupping or tuliping.