



**Haynes**  
shows you how

BMW 3-Series (92-98) & Z3 (96-98) Haynes Online Manual

## Engine Bearing Analysis

### Debris

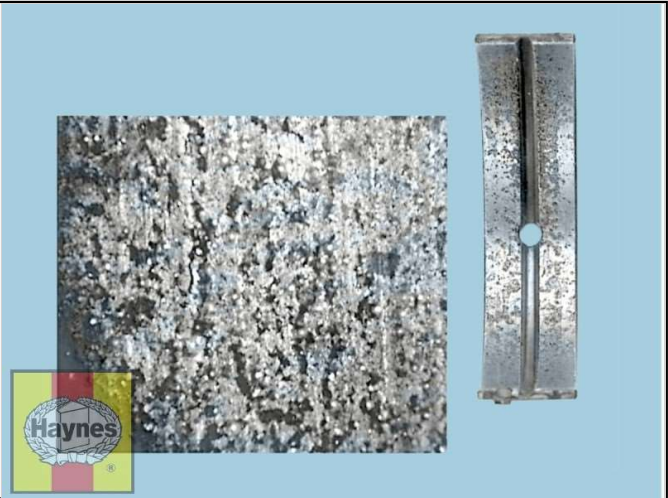
**Babbitt bearing embedded with debris from machinings. Microscopic detail of debris.**

 engine-bearing-debris-01.jpg

**Overplated copper alloy bearing gouged by cast iron debris. Microscopic detail of gouges.**

 engine-bearing-debris-02.jpg

**Aluminum bearing embedded with glass beads. Microscopic detail of glass beads.**



**Damaged lining caused by dirt left on the bearing back.**



## Misassembly

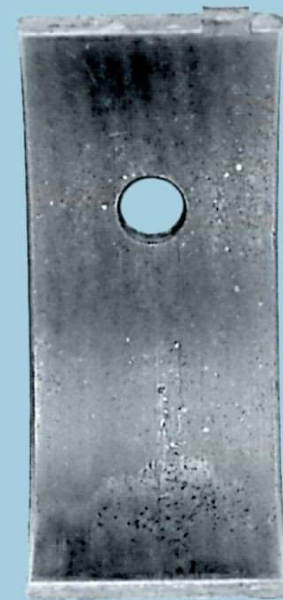
**Result of a lower half assembled as an upper - blocking the oil flow**

 engine-bearing-misassembly-01.jpg

**Excessive oil clearance is indicated by a short contact arc**

 engine-bearing-misassembly-02.jpg

**Result of a wrong, reversed, or shifted cap**



**Polished and oil-stained backs are a result of a poor fit in the housing bore**

 engine-bearing-misassembly-04.jpg

## Overloading

**Damage from excessive idling which resulted in an oil film unable to support the load imposed**

 engine-bearing-overload-01.jpg

**Damaged upper connecting rod bearings caused by engine lugging; the lower main bearings (not shown) were similarly affected**



**The damage shown in these upper and lower connecting rod bearings was caused by engine operation at a higher-than-rated speed under load**

 engine-bearing-overload-03.jpg

## Misalignment

**A warped crankshaft caused this pattern of severe wear in the center, diminishing toward the ends**

 engine-bearing-misalign-01.jpg

**A poorly finished crankshaft caused the equally spaced scoring shown**

 engine-bearing-misalign-02.jpg

**A tapered housing bore caused the damage along one edge of this pair**

 engine-bearing-misalign-03.jpg

**A bent connecting rod led to the damage in the "V" pattern**

 engine-bearing-misalign-04.jpg

## Corrosion

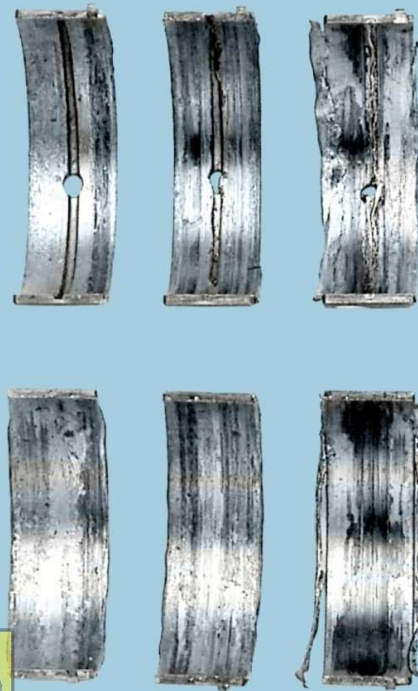
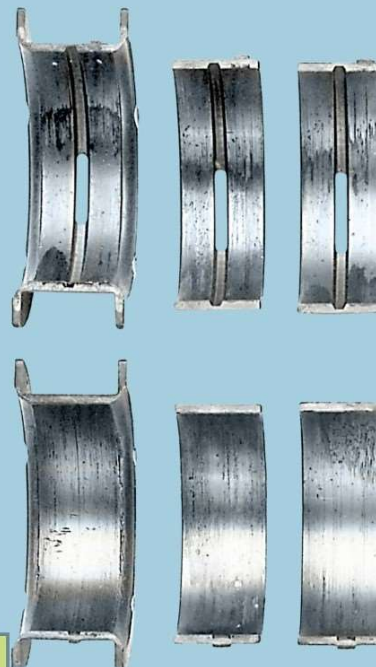
**Corrosion is an acid attack on the bearing lining generally caused by inadequate maintenance, extremely hot or cold operation, or inferior oil or fuels. Microscopic detail of corrosion**



## Lubrication

**Result of dry start: The bearings on the left, farthest from the oil pump, show more damage**

 engine-bearing-lubricate-01.jpg

**Result of a low oil supply or oil starvation****Severe wear as a result of inadequate oil clearance**

**Example of cavitation - a surface erosion caused by pressure changes in the oil film**



**Damage from excessive thrust or insufficient axial clearance**

 engine-bearing-lubricate-05.jpg

**Bearing affected by oil dilution caused by excessive blow-by or a rich mixture**

 engine-bearing-lubricate-06.jpg