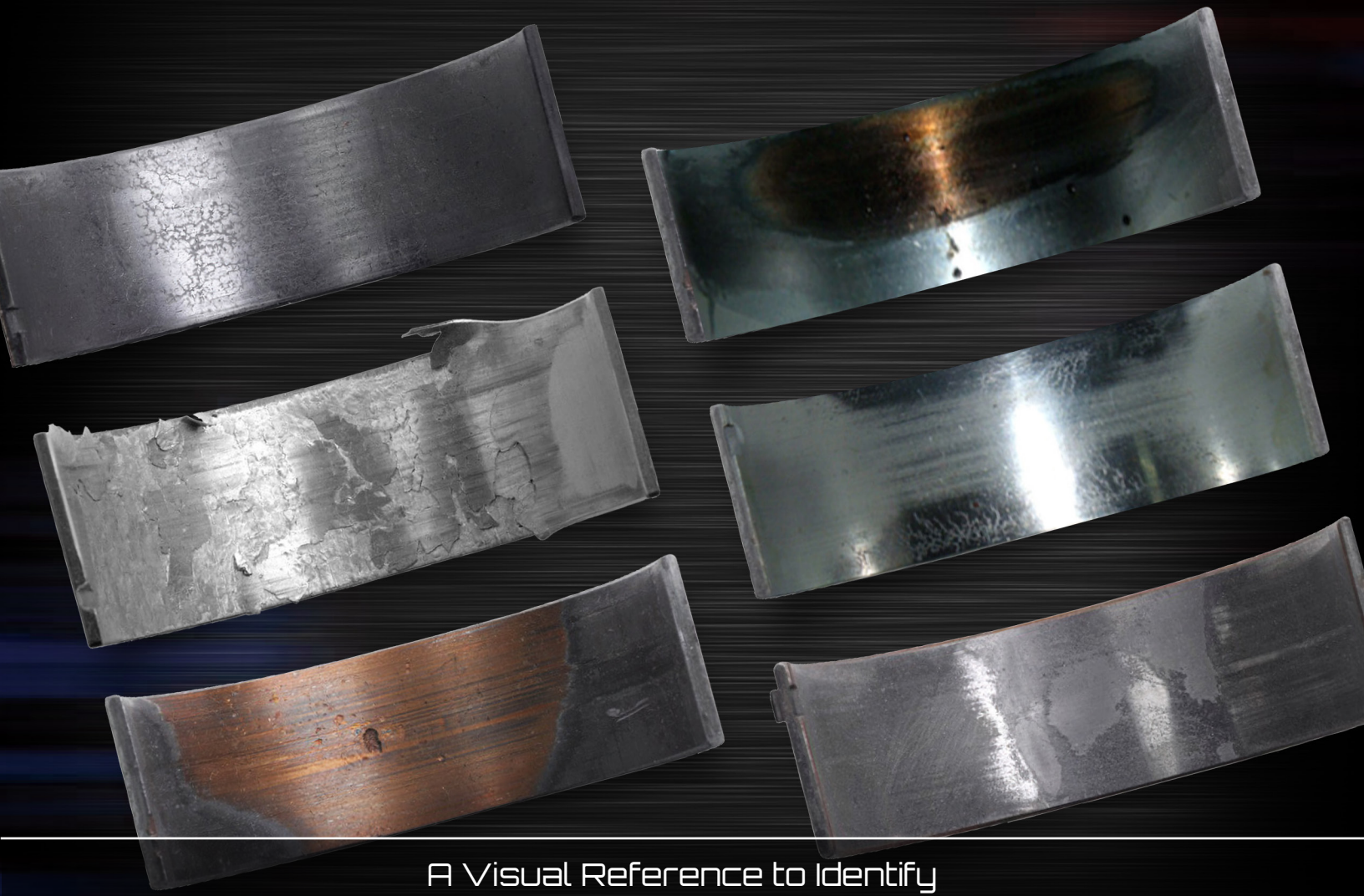
ENGINE BEARING FAILURE
ANALYSIS GUIDE



A Visual Reference to Identify
Common Engine Bearing Failures

KING
ENGINE BEARING SPECIALISTS

KNOW THE SIGNS

Explore the causes, symptoms, and solutions for the most common engine bearing failures, so you can build with confidence and avoid costly setbacks.

Why Bearing Failures Matter

Engine bearing failure is one of the most common, and costly, causes of engine damage. Spun bearings, wear, oil starvation, and contamination can quickly lead to major teardown work and expensive rebuilds. Knowing how to spot these issues early is key to keeping your engine alive.

Learn to Read the Clues

Each damaged bearing tells a story. Surface scoring, heat discoloration, embedded debris, uneven wear — these visual indicators all point to specific problems that can often be corrected. With the right knowledge, these failures become preventable, not inevitable.

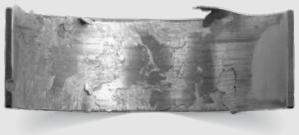
Knowledge You Can Build On

At King Engine Bearings, we've spent decades developing high-performance bearings and studying failure patterns across thousands of engines. We created this guide to help you understand why bearings fail, and what you can do to prevent it.

Your Build Deserves Better

Use this guide to enhance the reliability and performance of your engines. When you understand how bearings fail, and how to prevent failures, every engine you build runs stronger, lasts longer, and performs the way it was meant to.

Fatigue of Aluminum Lining



APPEARANCE

Cracks, cratered & distressed bearing surface due to loss of aluminum lining material.

POSSIBLE CAUSES

- Wrong selection of engine bearing material
- Engine power increased beyond original design
- Excessive clearance
- Fuel detonation/advanced ignition
- Geometry defects causing localized bearing overloading

CORRECTIVE ACTIONS

- Select a bearing material with higher load capacity
- Check: clearances and component geometry
- Retard ignition or use fuel with higher octane number
- Repair/replace distorted parts

Fatigue of Babbitt Overlay

APPEARANCE

Irregular spider web-like cracks and craters in the overlay. Fatigue may lead to partial flaking of the overlay, followed by fatigue of the copper-lead intermediate layer.

POSSIBLE CAUSES

- Wrong selection of engine bearing material
- Engine power increased beyond original design
- Excessive clearance
- Fuel detonation/advanced ignition
- Geometry defects causing localized bearing overloading

CORRECTIVE ACTIONS

- Select a bearing material with higher load capacity
- Check: clearances and component geometry
- Retard ignition or use fuel with higher octane number
- Repair/replace distorted parts

Bronze Intermediate Layer Fatigue

APPEARANCE

Babbitt surface missing and intermediate layer cracked and cratered. Fragments are detached from the steel back causing imminent bearing failure.

POSSIBLE CAUSES

- Wrong selection of engine bearing material
- Engine power increased beyond original design
- Excessive clearance
- Fuel detonation/advanced ignition
- Geometry defects causing localized bearing overloading

CORRECTIVE ACTIONS

- Select a bearing material with higher load capacity
- Check: clearances and component geometry
- Retard ignition or use fuel with higher octane number
- Repair/replace distorted parts

Surface Wear

APPEARANCE

Accelerated Wear: Shiny surface
Heavy Wear: Signs of overheating (blackening), partial melting/ removal of overlay (top shell)
Severe Wear: Torn surface, heavy overheating, melted/missing overlay & lining material (bottom shell)

POSSIBLE CAUSES

- Insufficient oil supply (starvation)
- Non-uniform/unstable oil film (due to bearing fatigue)
- Geometrical irregularities or poor journal surface finish
- Grinding chatter marks and lobing
- Contaminated oil

CORRECTIVE ACTIONS

- Check oil supply system, prevent dilution/contamination
- Change bearing material
- Verify proper grinding/polishing procedures
- Improve cleaning process, replace oil & filter more often

Edge Wear Due to Distorted Rod

APPEARANCE

Localized excessive wear of the bearing surface along the bearing edge. Possibility of fatigue cracks in the affected area.

POSSIBLE CAUSES

- Rod distortion caused by Overloading / Detonation
- Excessive torque
- Distorted rod produces non-parallel orientation of the bearing and journal surfaces
- Metal-to-metal contact occurs along the bearing edge

CORRECTIVE ACTIONS

- Replace the distorted parts
- Prevent engine detonation and pre-ignition (check cooling system, air-fuel ratio, ignition timing, knock sensor, octane number of fuel)
- Choose higher strength connecting rods

Imperfect Journal Geometry

APPEARANCE

Localized wear in parts of the bearing surface. Fatigue cracks may occur in these areas.

POSSIBLE CAUSES

- Inconsistent journal diameter. Areas of greater diameter produce metal-to-metal contact with the bearing surface, causing local wear
- Use of worn or improperly dressed grinding wheel when resizing the crankshaft. Journals may result as tapered, hourglass shape or barrel shape

CORRECTIVE ACTIONS

- Replace/redress grinding wheel
- Re-grind the crankshaft

Cavitation Erosion

APPEARANCE

Erosion damaged areas on the overlay due to sharp changes of pressure in the oil film.

POSSIBLE CAUSES

Vapor cavities (bubbles) in the oil – when the load applied to a bearing fluctuates at high frequency (high RPM). The oil pressure can instantly fall, causing vapor cavities (bubbles) due to fast evaporation (boiling). When the pressure rises, vapor cavities (cavitation bubbles) contract at high velocity. Such collapse results in impact pressure,that can erode the bearing material.

CORRECTIVE ACTIONS

- Select stronger (harder) bearing material
- Decrease oil clearance
- Avoid running engine at extremely high rotation speeds

Spinning of Bearing in the Housing

APPEARANCE

Highly polished area on the bearing back caused by bearing spinning in the housing.

POSSIBLE CAUSES

- Insufficient crush height
- Oil starvation/lugging the engine causing seizure
- Housing diameter greater than specified value

CORRECTIVE ACTIONS

- Choose bearings with sufficient crush height
- for the application
- Eliminate the cause of seizure
- Check housing diameter for size and roundness
- Tighten bolts to the specified torque value

Fatigue in the Crush Relief Area

APPEARANCE

Fatigue cracks in the area of crush relief.

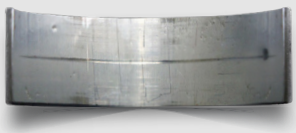
POSSIBLE CAUSES

- Excessive crush height - upon torqueing the housing, the parting line region of the bearings deflects inward. This reduces the gap between the journal and bearing surfaces. Such change of bearing profile at the parting line region produces localized peak oil film pressure, which can cause fatigue of the bearing material.
- Excessive RPM producing rod bore stretch

CORRECTIVE ACTIONS

- Prevent excessive crush height
- Check the housing diameter
- Avoid over-torqueing the rods
- Choose more rigid connecting rods

Damage Caused by Foreign Particles



APPEARANCE

Circumferential scores/scratches on bearing surface.

POSSIBLE CAUSES

- Particles of grinding abrasive entrapped in crankshaft
- oil passages and/or other engine block components
- Ambient dirt, sand or dust
- Metal particles (e.g. fragments of fatigued material
- from failed components)

CORRECTIVE ACTIONS

- Find the origin of the abrasive particles and other contaminants
- Replace air filter, oil and oil filter
- Check crankshaft oil passages and all engine components. Thoroughly clean them with hot soapy water prior to assembly.