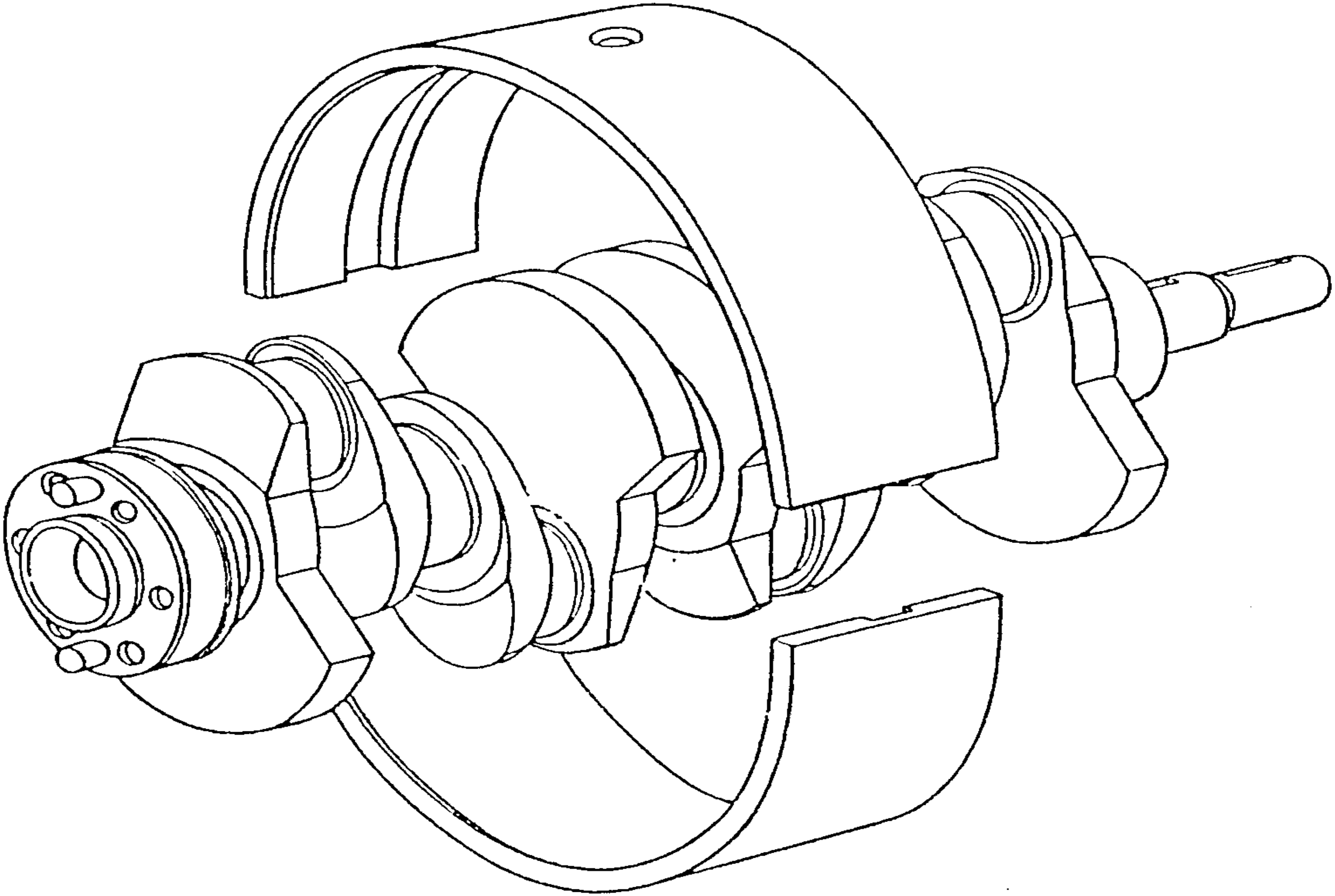
MAIN BEARING

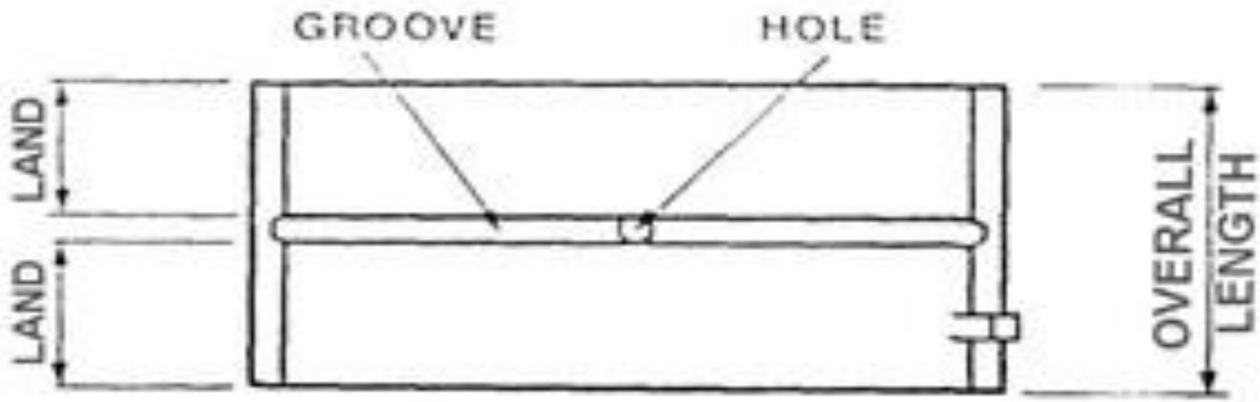
DIESEL ENGINE BEARING

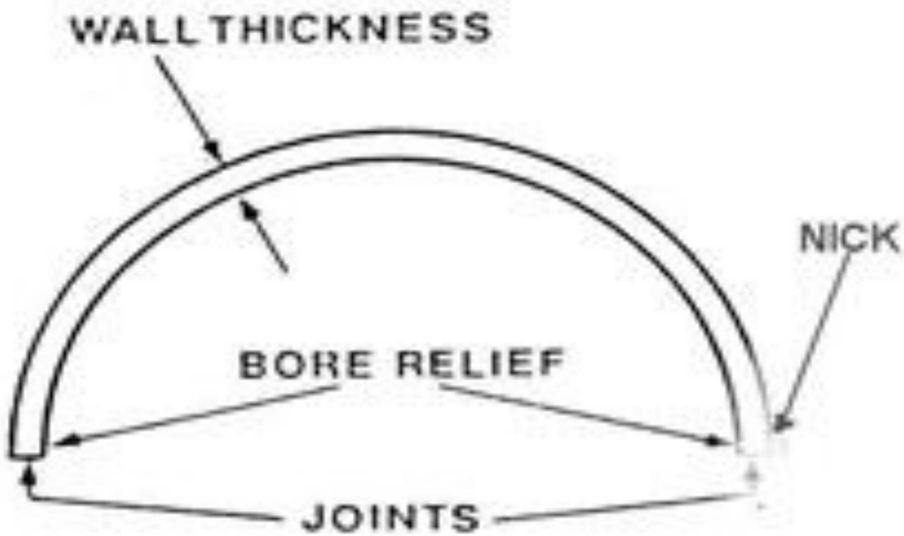


Bearing Terminology

A thinwall bearing is a prefinished precision made steel backed component lined with an appropriate bearing material that should be capable of withstanding the applied load and be compatible with the crankshaft.

Thinwall bearings offer the engine designer a range of materials and allow good repeatability of a bearing assembly. In a bolted up assembly, bearings will conform to the profile of the housing bore and therefore any irregularities in that housing will be reflected in the bearing.





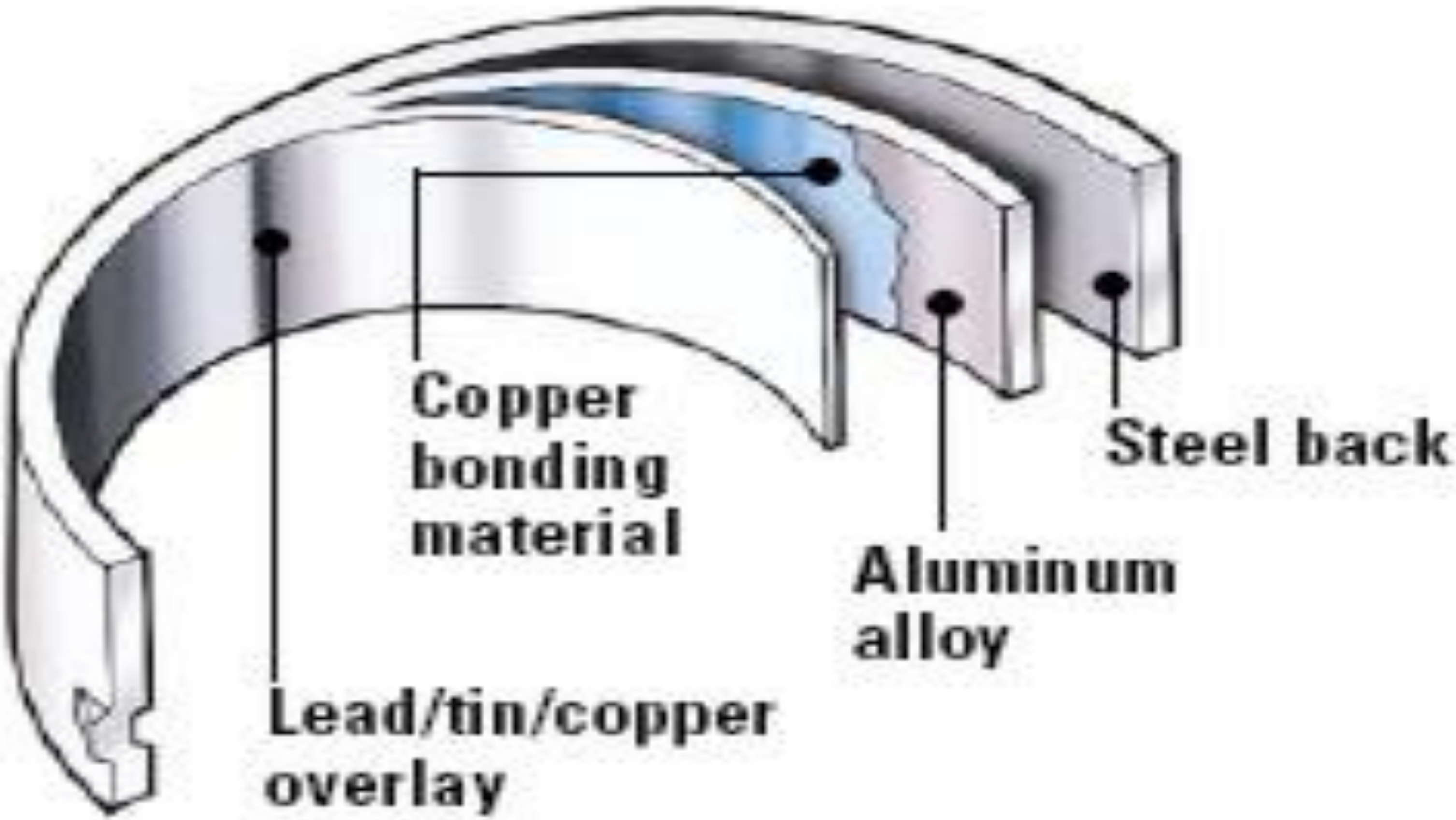
Typical features of a thinwall half bearing

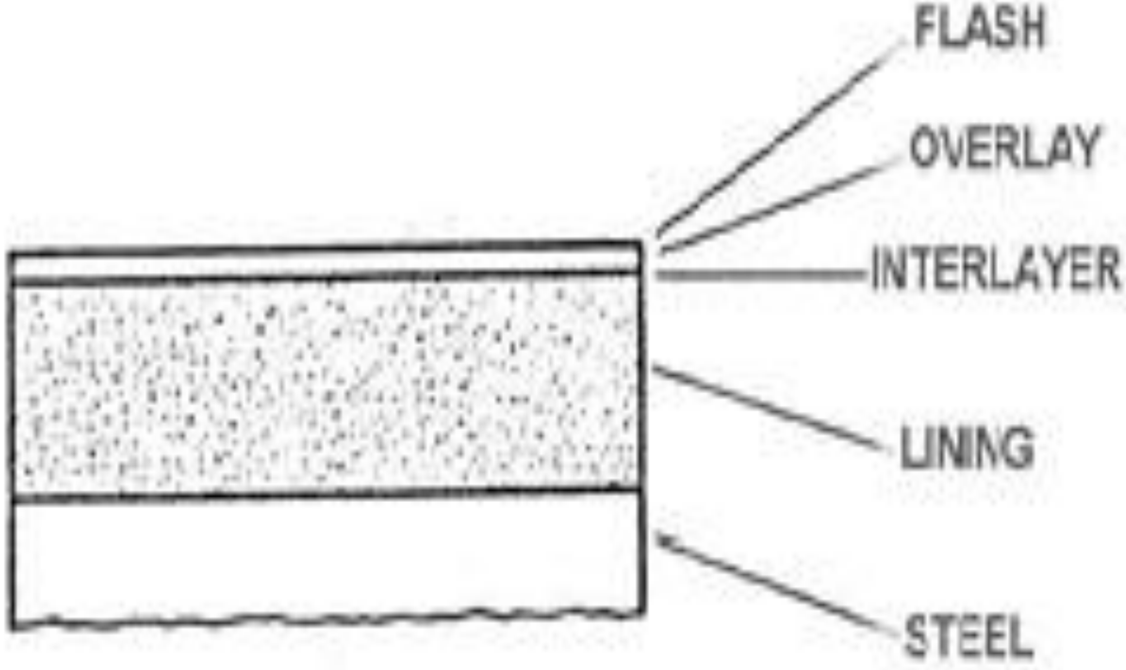
Bearing Lining

A bearing is made up of various layers of materials .The lining is bonded to the steel backing. In some cases via a thin bonding layer of aluminium or copper based material.

The most common lining materials for modern medium speed diesel engines are tin-aluminium and lead bronze materials. A typical bearing lining thickness will lie in the range of 0.5 — 1.00 mm.

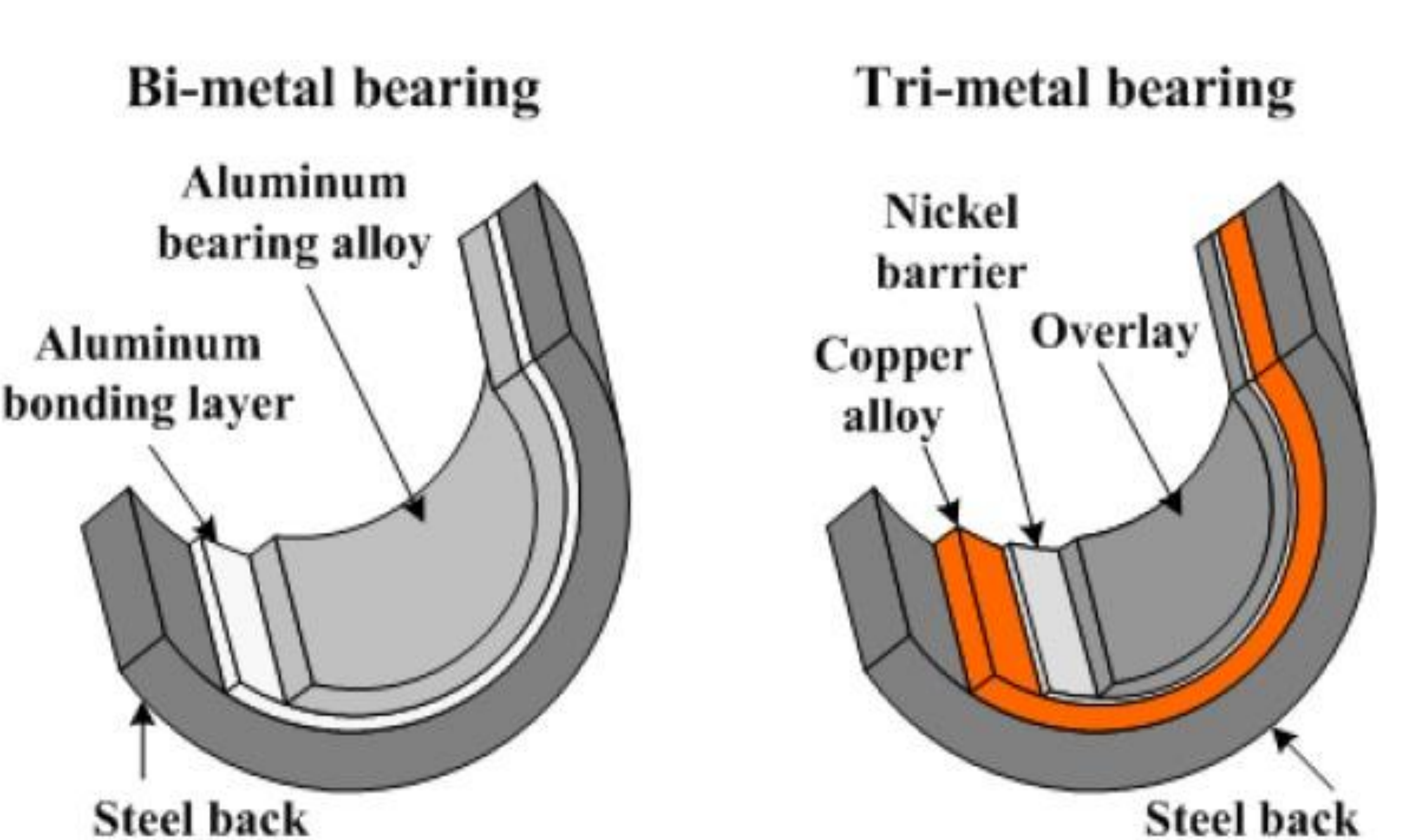
Aluminum alloy bearing
(with overlay)



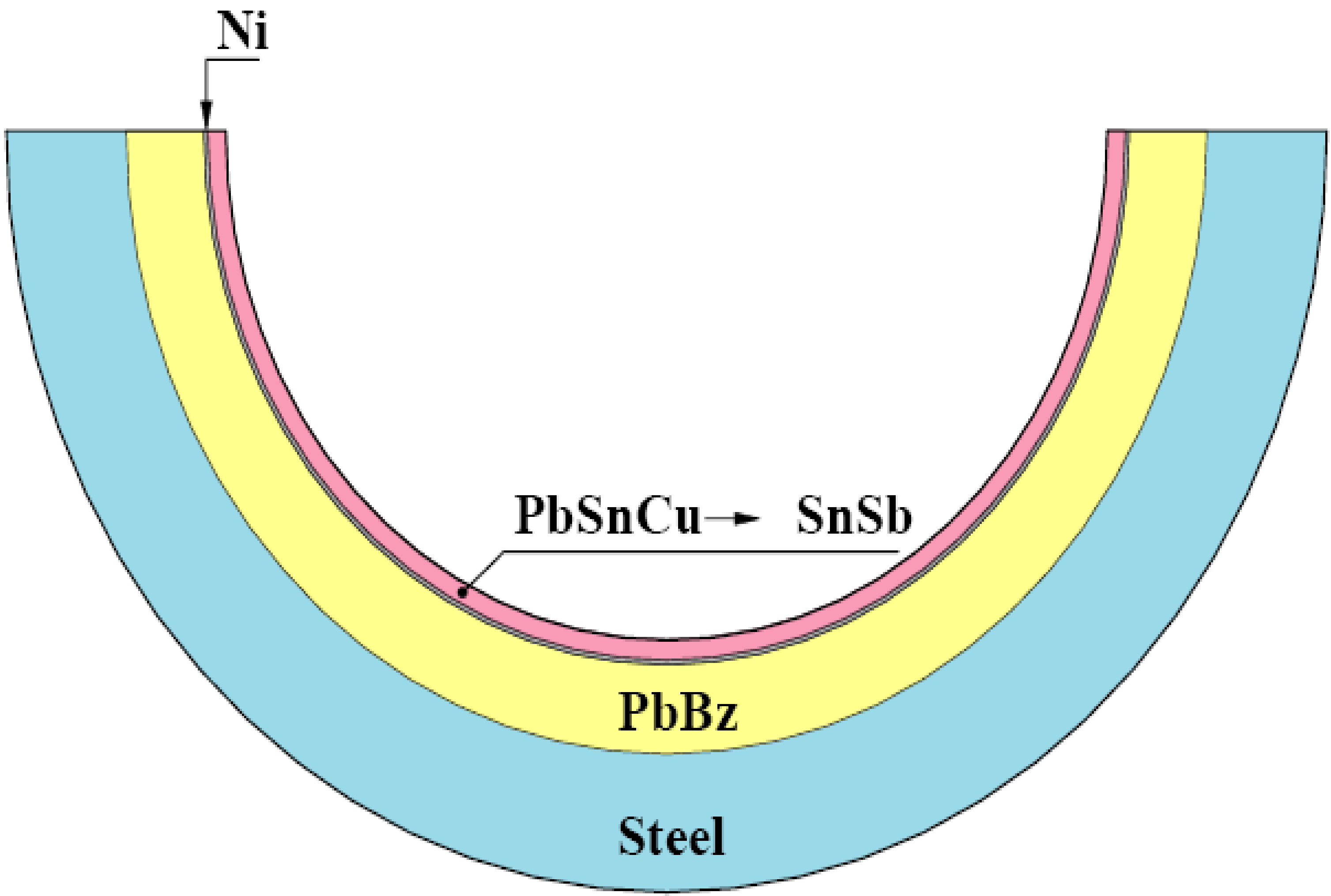


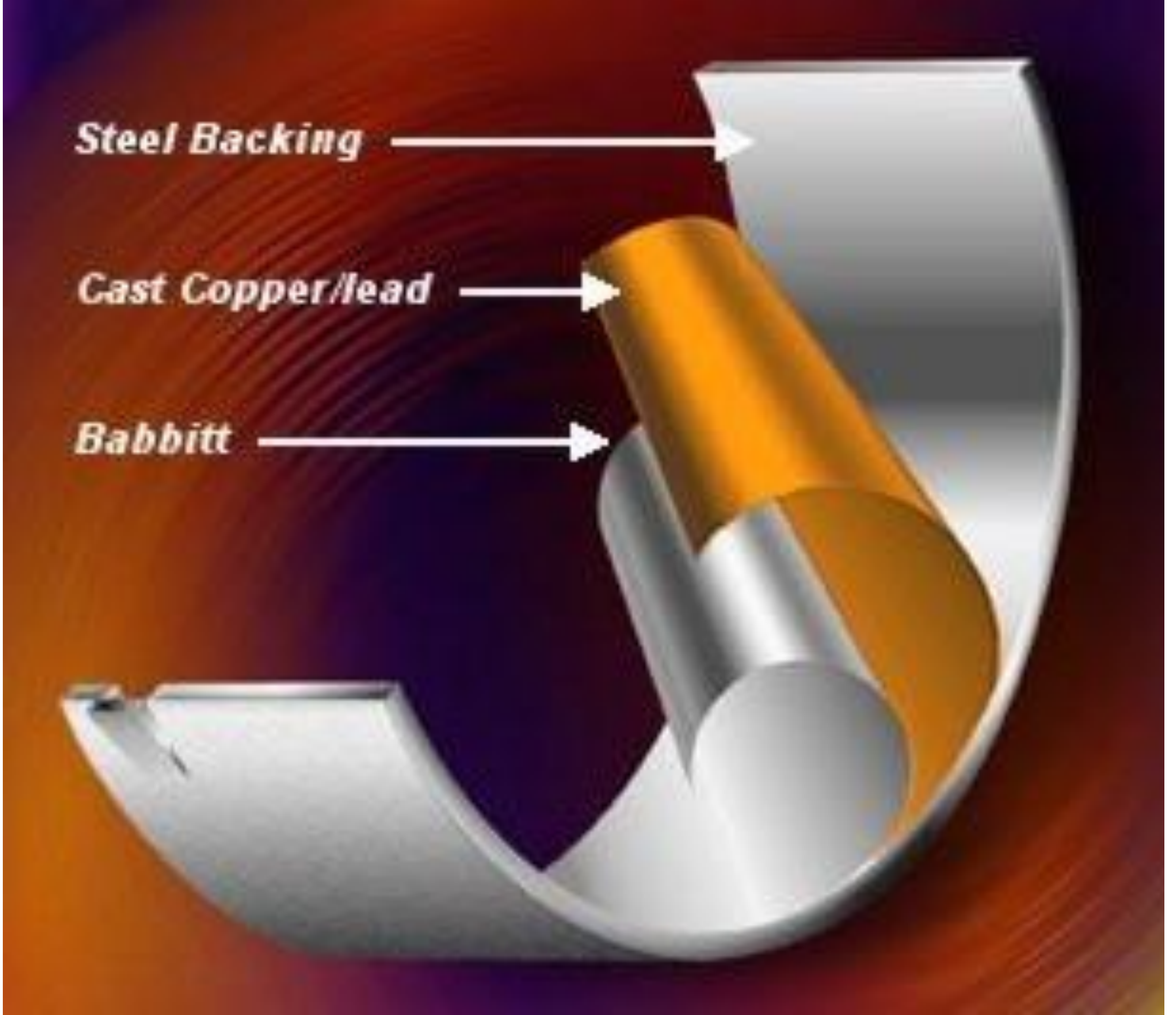
Typical material composition

Engine bearings structure



Trimetal Bearing




Steel Backing
Cast Copper/lead
Babbitt

Overlay

On the majority of medium speed diesel engine bearings, a thin soft overlay plate is applied to the lining material. The overlay provides better conformability and embeddability characteristics and consequently improves the wear rate and the bearing life.

Crankshaft wear is also reduced, particularly when the harder bearing materials are used. The most common overlays are lead-tin and lead-tin-copper. On corrosion prone copper lead lined bearings, an intact overlay will also provide some protection against corrosion by degraded or contaminated oils.

Interlayer

On certain bearings a thin interlayer, typically nickel of no more than 5 μm, is applied between the bearing lining and overlay plate. On tin-aluminium bearings the nickel is required to ensure satisfactory bond of the overlay.

On lead bronze bearings the nickel interlayer generally reduces the rate of tin diffusion and wear rate and increases the corrosion resistance of the overlay.

Flash

On the majority of bearings a thin "flash" of either tin or lead tin will be applied to the bearing bore and back. This flash provides protection against corrosion prior to the installation of the bearing. A typical thickness of flash would be of the order of 1-2 μm.

Bearing Assembly Check List

This check list itemises the most important aspects that should be covered prior to and during assembly of crankshaft bearings.

a) Ensure bearings are to correct design.

b) Bearings should be free from burrs and thoroughly cleaned.

c) Ensure housing, crankshaft and oil ways are thoroughly cleaned.

d) Ensure any locating dowels are satisfactory and free from burrs. The locating nick should be correctly positioned.

e) Ensure bearing has positive free-spread.

f) Clearly mark on bearing its location within the engine.

g) Clearly mark on one end of each bearing housing its position within the engine.

h) Do not apply oil between bearing back and housing bore.

i) Apply liberal coating of oil between bearing bore and crankshaft surfaces.

j) Tighten bolts in the correct sequence to the correct torque or stretch as defined in the engine instruction manual.

k) Check that shaft can rotate freely

Bearing properties

Good fatigue strength due to the both fine micro-structure and hardening effect of silicon and copper;

- Very good seizure resistance particularly with cast iron crankshafts.

This is
provided by silicon particles. They continuously polish the crankshaft surface and prevent seizure.

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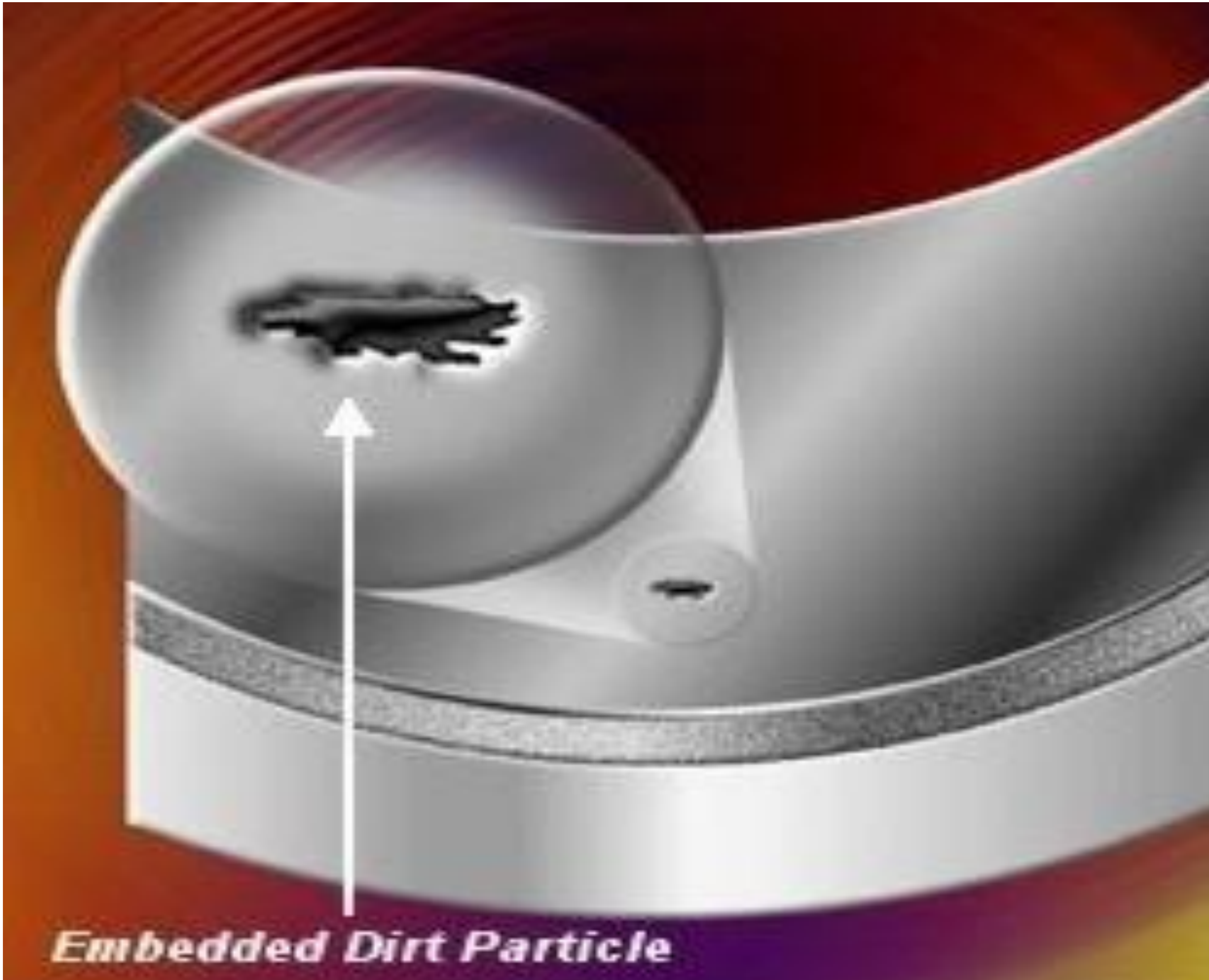
Good embedability.

The lining is thick so it is capable to absorb both small and large dirt particles circulating with the oil;


Embedded Dirt Particle

- Good conformability. In contrast to tri-metal bearings with thin overlays, bimetal materials are capable of accommodating greater misalignments;
- Good wear resistance due to the relatively hard aluminum alloy, which is harder than the soft overlays of tri-metal bearings.

TYPES OF BIMETAL & TRI METAL BEARING DEFECTS

1. FATIGUE FAILURES
2 CHEMICAL CORROSION

3 WATER EFFECT
4 CAVITATION AND ERROSION
5 MECHANICAL WEAR AND SCORING
6 WIPING AND SIZURE
7 BOND FAILURE
8 SPLIT LINE FRETTING
9 STATIC FRETTING
10 BACK FRETTING AND CREEP
11 MISC DEFECT

TYPES OF MECH. WEAR

1 UNIFORM WEAR
2 BAISED WEAR
3 LOCALISED WEAR
4 EMBEDDED FOREGN MATTER
5 SCORING
6 ABBRATION
7 CAM WEAR

8 SINESOI DAL WEAR

To assist an investigation of bearing damage, the following check list itemises particular points that should be established.

a) Duration of operation of bearing.

b) Engine designation and application.

c) History of engine operation.

d) Have bearings from same engine previously shown similar damage, particularly in the same assembly?

e) Has bearing been examined during service and if so what was the condition of the bearing at that time?

f)What is the condition of the other bearings within the engine?
g) Have any other engine components suffered damage, eg piston?
h) What is the condition of the crankshaft?
i) What is the condition of the bearing housing?
j) Is there a defect within the engine, eg faulty oil pump, blocked filter, water leak?
k) Have there been any changes to the bearing installation procedure?

Bearing Damage Associated with Assembly