



Engines Main Bearing



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Main Bearing Description:

A ship engine comprises heavy rotational parts which exert different forces on various parts of the [engine crankshaft](#). One of the significant load-bearing parts of [the crankshaft system](#) is the main bearings.

The marine engine bearings are subjected to multiple forces which include:

- Gas pressure generated inside the liner
- Dynamic Inertial forces because of different reciprocating and rotating motions of the [engine parts](#)
- Centrifugal forces because of different reciprocating and rotating motions of the [engine parts](#)
- Friction between the [crankshaft](#) and bearing because of engine vibration



The main bearing is thus designed to tackle various forces along with supporting the [crankshaft](#) rotating at high speed. Hence, the material used in making the bearing is essential so that it can support the [crankshaft](#) journal and also adjust to minor surface irregularities.

The engine bearing cannot do the work alone. They need a compatible lubricating oil to bear the load and allow the rotation of [crankshaft](#) journal smoothly. The lubricating oil enables the bearing to withstand abrasive particles, which create friction between journal and bearing.

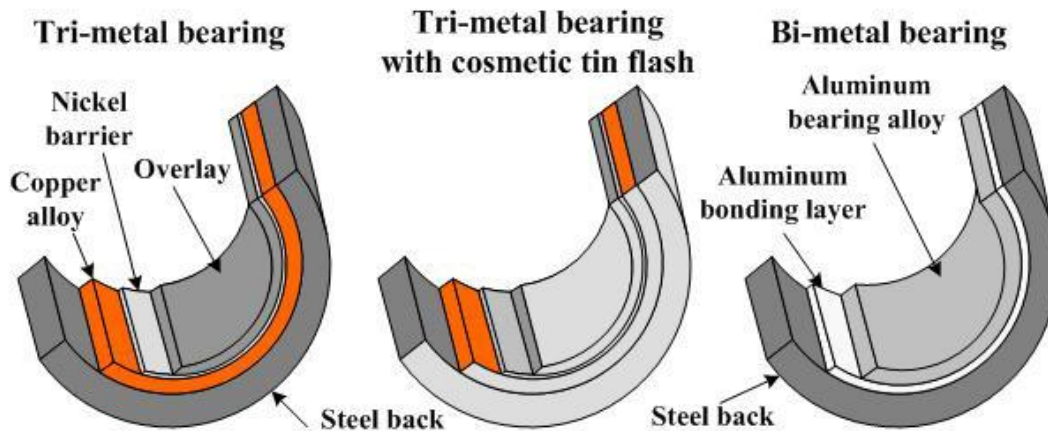
Main Bearing Material:

- White Metal
- Copper Lead & Lead Bronze
- Aluminum Tin

3 Types of main bearings:

There are 3 famous types of Main bearings used for both propulsion engines, which are normally 2-stroke engines and power generation engines, which are 4 stroke engines, they are as followings:

Engine bearings structure



1. Lead Bronze Bearing:

These bearings comprise the following layers

- **Flash layer:** It is the topmost layer with a thickness of 0.035mm made up of tin and lead. It is used to protect the bearing from corrosion and dust when not in use. This layer flashes off when a bearing is running.
- **Nickle Barrier:** It is the second layer made up of nickel with a thickness of 0.02mm. Its main function is to prevent corrosion and avoid the diffusion of tin into bearing metal.
- **Lead Bronze:** The third layer is composed of lead bronze, which has an excellent anti-seizing property and is the principal component that acts as a bearing out of all layers.
- **Steel back:** Steel back is the last and backing part of the bearing used for shape and support over which all the layers are bonded together.

Gudgeon Pin bearing in a 4-stroke engine is usually made of lead bronze bearing and is also used for the main bearing for smaller engines.

2. Bi-metal Bearing:

This bearing comprises the following layers

- **Aluminium Tin:** The first layer of bi-metal comprises Al and Sn with a thickness of 0.5 to 1.3mm and this is the main element of this type of bearing.
- **Bonding Layer:** The bonding layer comprises aluminum, and is 0.1mm thick. The main function of the bonding layer is to obtain a good bond between the shell and the top layer.
- **Steel Back:** The backing part is used for shape and support.



This type of bearing is used in 4-stroke engine main bearings

3. Tri-Metal Bearing:

These bearings are called tri-metal bearings because they comprise three main layers (excluding the flash layer as it flashes off) and a steel back. It comprises-

- **Flash Layer:** It is the top-most layer with a thickness of 1 micron made up of tin and lead and used to protect the bearing from corrosion and dust when not in use. This layer flashes off when the bearing is in running during the period.
- **Overlay:** The second layer is made up of white metal (Tin Antimony Copper) which is the main component in this type of bearing. Its thickness is 20 microns.
- **Interlay:** It is the third layer used as an anti-corrosive layer for overlay. It is of 5 microns' thickness.
- **Lining:** It is the lining layer between interplay and steel back with a thickness of 1 mm made up of lead and bronze.
- **Steel Back:** The backing part is used for shape and support.

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