

**Engine bearings:**

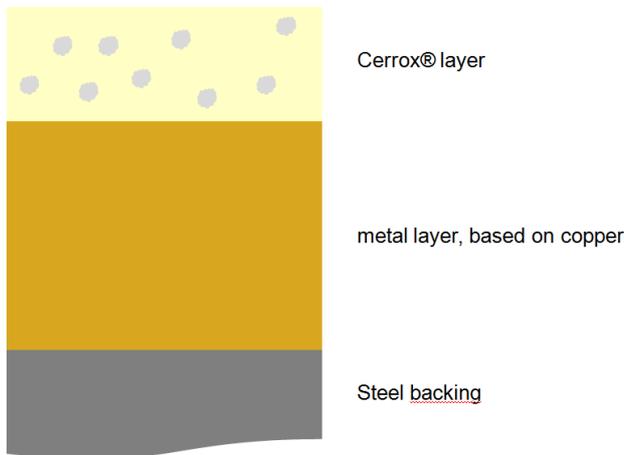
**Maximum performance under high pressure – Cerrox®, the powerful solution**

When developing new engines, the engineers are facing real challenges. A successful engine has to be economical but also powerful. Turbochargers, direct injection and downsizing lead to higher pressure – not only on the developers but also in the engine itself. Bearings in high-power gasoline and diesel engines have to withstand ignition pressures of up to 200 bar and surface pressures of up to 120 N / mm<sup>2</sup>. Common two- or three-layer bearings are no longer able to meet these requirements.



By introducing sputter bearings, the competitors raised the bar – here is NE's answer: three-layer bearings with Cerrox®-technology.

The following picture illustrates the structural design of the newly developed three-layer bearing:



The steel backing, which is only shown in a stylized manner, is the basis of the bearing. The metal layer, based on copper, is applied by sintering. The well balanced rate of hardness and stability guarantee a high lifetime of the bearing. The core of our 3-layer bearing with Cerrox®-technology however is an anti-friction layer containing particles of hard material.

Only decades of experience in coating technology leads to the necessary know-how to combine exactly the right components in exactly the right quantities in order to achieve the perfect mixture.

In order for a bearing to meet the mentioned requirements, it has to fulfil different tasks:

Adaptability

The bearing has to adapt itself in a perfect way to the shaft's geometry respectively to the geometry of the surrounding bore hole. However, its material must not be too soft.

Resistance to wear

In spite of the adaptability, which is most important, the bearing must not show inappropriate abrasion.

Resistance to scuffing

The bearing has to resist high pressure and extreme strain. Even if lubrication is everything but perfect the bearing must not cause any engine damage.

Resistance to corrosion

All materials of the bearing have to be chosen and adjusted very carefully in order to avoid any corrosion even when the oil is of lesser quality oil or may contain aggressive components.

Resistance to material fatigue

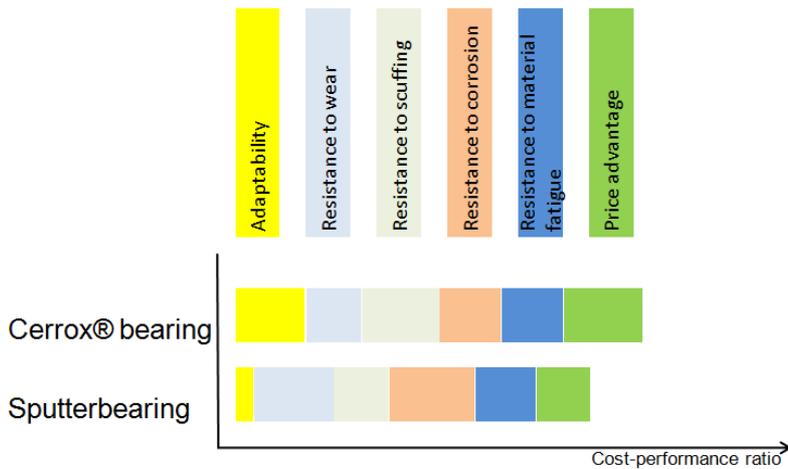
The bearing has to fulfil its tasks in a perfect way, even after long running times and under high pressures.

Price advantage

Using galvanising processes instead of the complex sputter technology leads to a significantly lower price with equal performance.

Eventual residue in the lubrication system of the engine will not cause any problems thanks to the adaptability and absorption capacity of the anti-friction layer. Scuffing of the engine can be ruled out almost completely. This characteristic, together with the high resistance against wear, scuffing, corrosion and fatigue leads to engine life-times of more than 1.500.000 km in a truck using the Cerrox-technology.

The following picture compares strengths and weaknesses of the individual characteristics of Cerrox® and sputter bearings:



The lower resistance to wear of a 3-layer bearing with Cerrox-technology compared to a sputter bearing will be equalled by the higher resistance to scuffing. Above all, our bearing is distinguished by its extreme adaptability. Eventual residue is absorbed by the soft anti-friction layer. However, when using a harder sputter bearing, scuffing is unavoidable.

When comparing all these technical characteristics, both the sputter bearing and the Cerrox® bearing do equally well. However, if you add the price advantage the Cerrox® bearing offers to you as a further important point to the comparison, the Cerrox® bearing clearly wins the competition.

Using Cerrox® bearings not only treat your engine with care, but also your budget!

NPR of Europe GmbH does not accept any liability for incomplete or incorrect information in this report. It is exclusively up to the customer to form his opinion about the characteristics of the material and its adequacy for the purposes intended by the customer. Furthermore, NPR of Europe GmbH points out that any information given in this materials brochure does not constitute a legal guarantee for the appearance, characteristics and workmanship nor does it represent a warranted quality.