

Bearing steel status and development direction

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Bearings are widely used in major equipment fields such as mining machinery, precision machine tools, metallurgical equipment, heavy equipment and high-end cars, and emerging industries such as wind power, high-speed rail and aerospace. The bearings produced are mainly medium and low-end bearings and small and medium-sized bearings, which are characterized by low-end surplus and high-end lack. Compared with foreign countries, there is a big gap between high-end bearings and large bearings. All the special wheelset bearings for high-speed railway passenger cars need to be imported from abroad. In the key bearings used in aerospace, high-speed railway, high-end cars and other industrial fields, there is a big gap between the bearing and the advanced level in terms of service life, reliability, Dn value and bearing capacity. For example, the service life of foreign automobile gearbox bearings is at least 500,000 kilometers, while the domestic similar bearing life is about 100,000 kilometers, and the reliability and stability are poor.

1 Aviation

As a key component of the aero engine, the second generation of aerospace engine bearings with a thrust ratio of 15-20 is being developed abroad, and is ready to be assembled into the 5th generation aircraft by 2020. In the past 10 years, the United States has developed the second generation of bearing steel for aerospace engines. The representative steel grades are high-strength corrosion-resistant bearing steel CSS-42L resistant to 500 °C and high-nitrogen stainless steel bearing bearing X30 (Cronidur30) resistant to 350 °C. The development of bearings for the second generation of aerospace engines was carried out.

2 [Automotive](#)

For automotive wheel bearings, the first and second generation of hub bearings (ball bearings) are widely used, and the third generation of hub bearings has been widely used in Europe. The main advantages of the 3rd generation of hub bearings are reliability, short payload spacing, easy installation, no adjustment, and compact structure. At present, most of the imported models use this lightweight and integrated structural wheel bearing.

3 Railway vehicles

At present, the bearings for railway heavy-duty trains are made of domestic electroslag remelting G20CrNi2MoA carburized steel, while the vacuum degassing smelting technology and inclusion homogenization technology (IQ steel) of ultra-high-purity bearing steel (EP steel) have been adopted abroad. Ultra-long life steel technology (TF steel), fine heat treatment technology, surface super-hardening treatment technology and advanced sealing lubrication technology are applied to the production and manufacture of bearings, which greatly improves the life and reliability of bearings. Electroslag bearing steel not only has low quality, but also costs 2000-3000 yuan/ton higher than vacuum degassed steel. In the future, it is necessary to develop ultra-high purity, fine-grained, homogenized and stable quality vacuum degassing bearing steel to replace the current use. Electroslag bearing steel.

4 Wind energy aspects

For wind power bearings, it is still impossible to produce spindle bearings and speed increase [bearings](#) with high technical content, basically relying on imports, and the localization of bearings for wind turbines above 3MW has not been solved. In order to improve the strength, toughness and service life of wind power bearings, a new special heat-treated steel SHX (40CrSiMo) was adopted. For yaw and pitch bearings, the surface hardness, surface hardness, soft belt width and width of the hardened layer were controlled by surface induction hardening heat treatment. Surface crack; carbonitriding for the gearbox bearings and spindle bearings, resulting in more stable residual austenite volume fraction (30%-35%) and a large number of fine carbides and carbonitrides on the surface of the part, improving the bearing Service life under contaminated lubrication conditions.

In order to improve the service life and running accuracy of the [rolling mill bearings](#), it is necessary to carry out research and development of ultra-high-purity vacuum degassing and smelting of bearing steels such as GCr15SiMn and G20Cr2Ni4 for rolling mills and large austenite volume control heat treatment of bearing surfaces. Japan's NSK and NTN Bearing Company have developed surface austenite strengthening technology, which has developed TF bearings and WTF bearings by increasing the surface austenite content, thereby increasing the bearing life by 6-10 times.