Tenfold service life under the severest conditions

Rolling Bearings Made of Cronidur 30®

FAG

FAG OEM und Handel AG

Cronidur 30®is a new rolling bearing material which one has yet to become accustomed to – in the positive sense. For rolling bearings made from this material do not merely exceed all known standards relating to corrosion resistance and fatigue life.

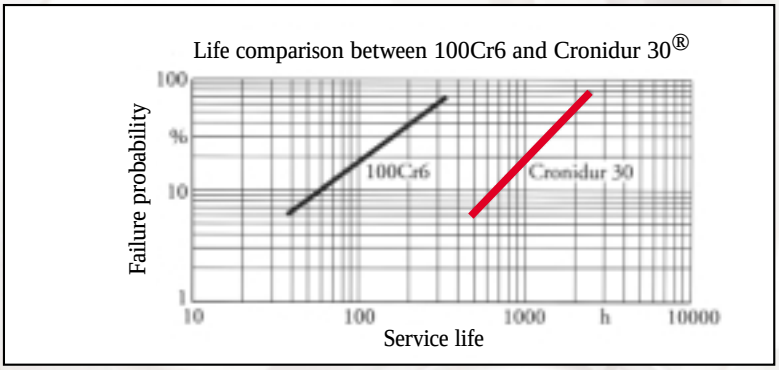
In the sports field you might say: "Rolling bearings made of Cronidur 30® pulverise all previous records".

A new material

Cronidur 30® is a new material employed in the manufacture of severely stressed rolling bearings. It was developed by FAG in cooperation with Ruhr-Universität Bochum and VSG Energie- und Schmiedetechnik Essen. The development of Cronidur 30® achieved recognition in the form of the Steel Innovation Award of the German Stahlinformationszentrum (steel information centre).

Rolling bearings today are normally manufactured from the well-proven standard rolling bearing material 100Cr6 or the corrosion-resistant steel X102CrMo17 (AISI 440C). Nevertheless it had become necessary to create a material which could accept a higher load at the rolling bearing surface and elevate the limiting values relating to life, especially under difficult ambient conditions. Cronidur 30® meets these demands admirably.

Ten times the service life



Considerable improvements

The most important alloying components of Cronidur 30® are nitrogen, carbon, chromium and molybdenum. Their new quantitative composition resulted in a material which offers considerable improvements when compared to former alloys. In particular this applies to the criteria cycling strength, corrosion resistance and high-temperature hardness. Cronidur 30® is a martensitic through-hardening steel which has been remelted in a special process. Cronidur 30® has an extremely fine grain structure.

Heat treatment

The heat treatment used gives Cronidur 30® excellent hardness values even at higher temperatures. Consequently, rolling bearings of Cronidur 30® can be used at higher temperatures than bearings made of 100Cr6.

Multiple service life of Cronidur 30® bearings:
At least Factor 10 in the space shuttle
At least Factor 10 in motor saws
At least Factor 4 in mining pumps

Ultimate life with Cronidur 30®

Tests document that rolling bearings of Cronidur 30® stand out for their substantially extended material fatigue life. At a contact pressure of 2,800 MPa under EHD conditions the calculated life values are exceeded by the factor of 80 without failure. In hybrid bearings incorporating ceramic balls, Cronidur 30® accepts a 25 per cent higher contact pressure. This would relate to a 40 per cent increase in rolling element with point contact.

Reliability under conditions of mixed friction

Even in the mixed friction range, Cronidur 30® proves its superiority. Tests carried out under a defined condition of mixed friction (p_0 = 2,500 MPa) have shown that bearings of Cronidur 30® reach a tenfold service life compared with bearings made of standard material 100Cr6. Furthermore, the wear behaviour of the bearing is considerably improved with Cronidur 30®. This becomes particularly apparent in the case of hybrid bearings with rings consisting of the new material and ceramic rolling elements. Here, the wear rate lies considerably below the former usual values.

Corrosion-resistant

Although the amount of chromium is lower in Cronidur 30® than in rolling bearing steel 440C, which has so far been used as standard material for corrosion-resistant bearings, the combined effect of its other components makes Cronidur 30® far more corrosion-resistant. In a sulphuric acid solution, its passive current density – a measure for the corrosion resistance – is 100 times lower than that of 440C.

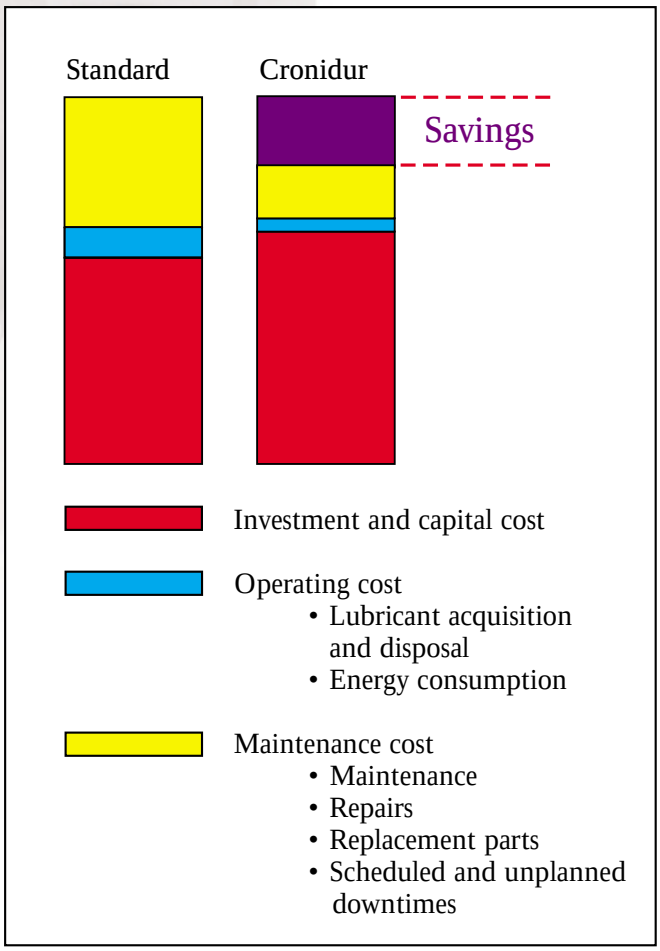
Insusceptible to dirt

Rolling bearings of Cronidur 30® are less susceptible to contaminants. Although dirt particles that penetrate into the bearings leave indentations in the raceways, these indentations do not cause premature fatigue damage. Any bearing damage that does develop spreads four times slower than in conventional bearings.

Media lubrication possible

Due to the small amount of wear particles there is hardly any contamination of the lubricant. As the few wear particles do not corrode, there is no catalytic effect – both with grease and oil lubrication the quality of the lubricant remains at a constant level over a long period. The favourable characteristics with respect to mixed friction and corrosion resistance also permit Cronidur 30® to be used with medium lubrication in many applications, for instance with liquid hydrogen or liquid oxygen. The use in pumps for hydrous hydraulic fluids was especially useful.

Comparison of the two systems' life cycle costs



Fields of application and system cost

Cronidur 30® was developed for applications in the aircraft and aerospace field, for instance for the main engines of the Space Shuttle, where the cost of bearing replacement is several times that of the material cost of the bearings.

The life cycle cost of complete systems including rolling bearings made of Cronidur 30® is clearly reduced:

- Fewer unexpected bearing failures, and consequently fewer machine standstill periods due to
  - a reduced damage probability
  - a slowdown in the progress of damage
- Fewer scheduled machine downtime periods for bearing replacement due to
  - longer service lives, even under extremely adverse ambient conditions
  - corrosion resistance
  - insusceptibility to contamination
- Reduced cost of lubricant acquisition and disposal
- Reduced personnel cost for mounting and dismounting
- Reduced demand for replacement bearings

Cronidur 30® also makes possible an increase in the power density of machines as well as down-sizing and light-weight constructions.

The fields of application for rolling bearings of Cronidur 30® or bearing components made of this material are very diverse, and individual solutions are developed to every problem.

Rolling bearing components made of Cronidur 30® are used for many applications, including:

- swashplate bearings in helicopters
- two-stroke engine crankshafts in chain saws
- hydraulic pumps
- wire guiding rollers
- cutter head bearings in oil production
- spindle bearings
- turbine bearings
- bearings in turbomolecular pumps
- bearings in bordering tools for beverage cans
- ball screw and nut assemblies for flap adjustment in aeroplanes

FAG – worldwide distribution of rolling bearings made of Cronidor 30®

With the new rolling bearing material Cronidur 30®, FAG OEM und Handel AG is pursuing the goal of developing individual problem solutions for customers in a large variety of applications, especially applications where

- the previously used rolling bearing materials have reached their limits
- standard bearings must be replaced quite frequently
- the downtimes of entire systems, and consequently the system cost, are to be reduced.

Give us a ring! We will be happy to advise you individually.

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FAG keep things rolling