Advances in Ultra Clean Bearing Steel

Steel materials are required to have their own characteristics according to the application and operating conditions. The metallographic factors governing these characteristics are now better understood and manufacturing technology for controlling these factors has advanced, making it possible to improve these characteristics. One good example is that of bearing steels.

Bearings are used to support the axis of rotation in machinery and equipment, including automobiles. The structure of a bearing comprises an inner ring and an outer ring, between which steel balls or rollers are sandwiched. Friction is thus minimized by converting a sliding action into a rolling action.

The figure shows the relationship between bearing life and the oxygen content of steel. The bearing life under a given load is expressed as the total number of revolutions until fatigue flaking occurs on the surfaces of the inner and outer rings or steel balls due to the repeated loading.

Failure is generally a probability phenomenon and bearing test samples show large variation in life tests, depending on the surface roughness of the rings and balls and on the lubrication conditions. For this reason, tests are conducted on many bearing samples under given conditions, and the number of revolutions equivalent to a 10% probability of failure is regarded as the life of the bearing.

When the oxygen content of steel is decreased from 10 ppm to 5 ppm (i.e., when the nonmetallic oxide inclusions are decreased by about half), bearing life is much improved, as shown in the figure. Life varies with the same low oxygen content of about 5 ppm due to differences in the size and composition of the oxides. Hard aluminum oxides and large oxides of over 30μm are especially harmful.

The life of bearing steels is greatly dependent on the cleanliness regarding the amount of nonmetallic inclusions. For this purpose, the secondary refining process described later is used to achieve the required ultra-high level of cleanliness, the refining operation being conducted to remove the nonmetallic inclusions and minimize reoxidation of the molten steel. In consequence, at present a value of 3 to 6 ppm is obtained industrially in steels of the lowest oxygen content.

SAB bearings are manufactured by using special steel which, by reducing the amount of large inclusions and lowering the oxygen content, extends the bearing life by almost 5 times in comparison with steels having an oxygen content of about 20 ppm.

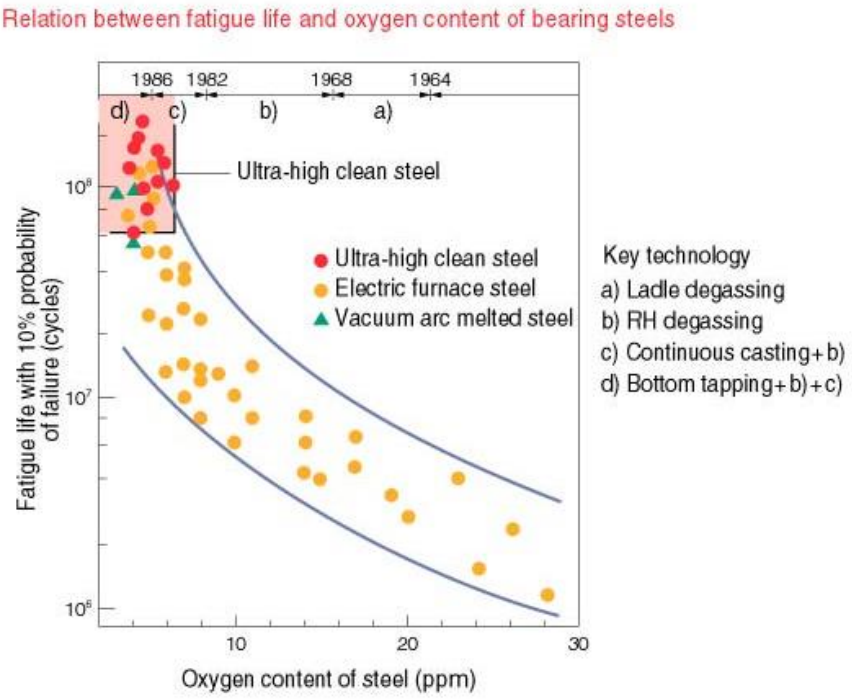

Figure 1: Bearing Steel Cleanliness & Fatigue Life

'SAB' Bearings are proved in service every day, across a wide range of industries. Preferred by leading companies / corporations all over India.

'SAB' Bearings reliability keeps the wheels of industry turning, quite literally, in some of the world's harshest industrial environments.

Mining Applications

- Ball Mill
- Bucket Elevator
- Conveyor
- Drag Feed Conveyor
- Fan
- Pinion Gear
- Pug Mill
- Pulley
- Secondary Slope Conveyor
- Slope Conveyor

Cement Plant Applications

- Conveying Systems (Scroll, Belt, and Bar)
- Ball Mill Drives
- Ball Mill Trunnions
- Kiln Drives
- Kiln Under Rollers
- Elevators
- Clinker Breakers
- Fans
- Crushers
- Cranes
- Preheater Grates
- Cement Pumps
- Separators
- Coal Mills

Quarry Applications

- Conveying Systems
- Mill Drives
- Mill Trunnions
- Under-Rollers
- Elevators
- Fans

- Crushers
- Cranes
- Screens
- Water Treatment Plants
- Mixers
- Motors & Generator Sets
- Washer Graders
- Winch Drums

Power Applications

- Primary Air Fans
- Induced Draft Fans
- Forced Draft Fans
- Conveyors
- Motors
- Generators
- Cranes
- Stacker Reclaimers
- Pumps
- Coal Mills
- Screens
- Dampers
- Penstocks
- Gas Re-circulators

Sugar Applications

- Conveying Systems (Scroll, Belt, Grasshopper, etc.)
- Mill Drives
- Cane Knives
- Rotary Mixers
- Diffusers
- Fans
- Stone Trap Separators
- Beet Washers
- Carriers and Feeders
- Crushers

- Beet Slicers
- Crystallisers
- Cranes

Paper Applications

- Drying Cylinders
- Line Shafts
- Fans
- De-watering Presses
- Mixers
- Conveyors
- Saws
- De-barkers
- Calendar Rolls
- Agitators
- Hydra Pulpers