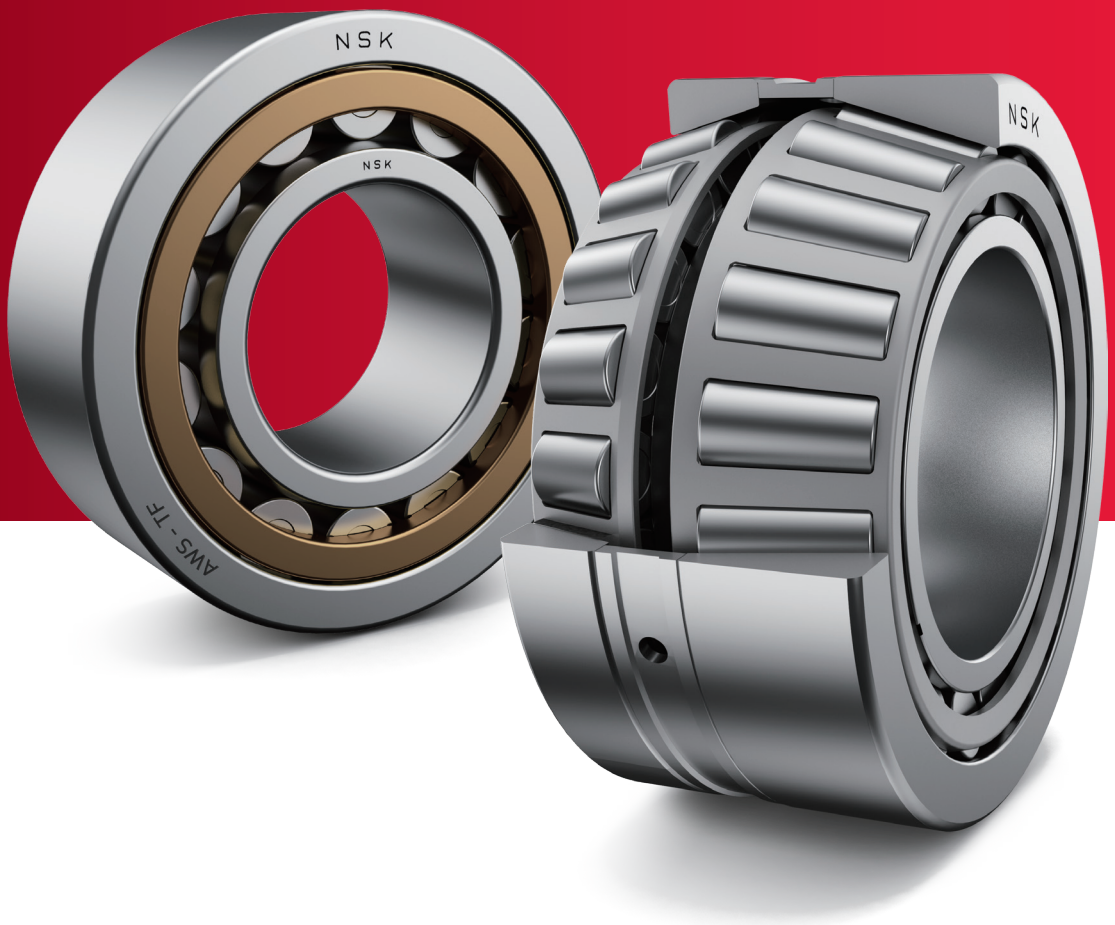


NSK

AWS-TF ANTI-WHITE STRUCTURE BEARINGS

For the challenge of hydrogen induced embrittlement and white etching crack formation that impacts bearings used in wind turbine gearboxes, NSK has introduced our AWS-TF technology to attack premature bearing failure at the core of its generation: the metallurgy. Applying advanced material composition and the innovative heat treatment technology of our TF long-life steel, NSK has set a new standard for extending service life and improving total cost performance.

PROVEN BENEFITS

- As much as seven times the service life of standard bearing steel in hydrogen charged environments
- Significant resistance to microstructural change / subsurface formation of white structure / axial crack initiation
- Superior wear and seizure resistance

CONDITIONS

HL HIGH LOADS

HS HIGH SPEED

APPLICATIONS

- Wind turbine gearbox

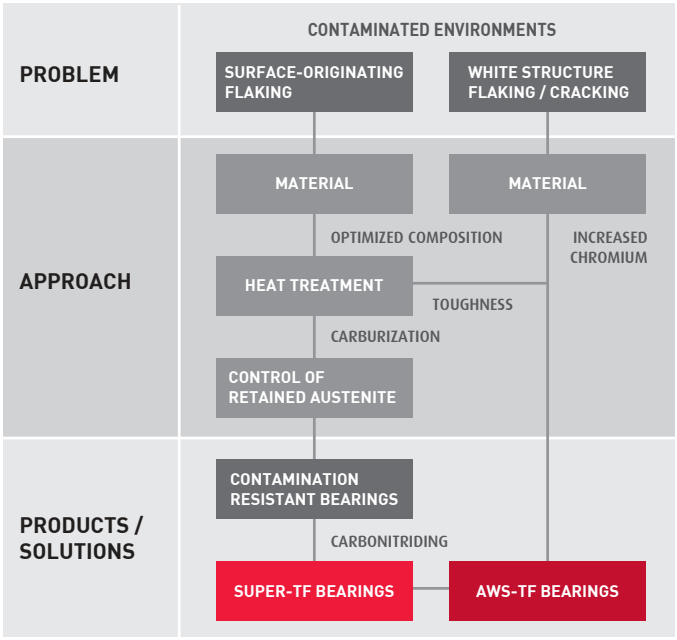
STAY IN MOTION. STAY IN CONTROL.

AWS-TF ANTI-WHITE STRUCTURE BEARINGS

DESIGN FEATURES

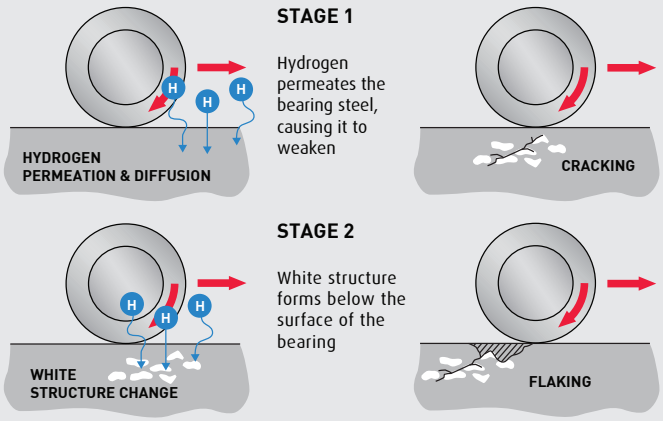
- Advanced material composition containing optimized levels of chromium and molybdenum for increased hardness
- Innovative and patented heat treatment technology to optimize retained austenite and formation of finer carbide and carbonitride particles
- Steel composition significantly decreases the diffusion rate of hydrogen and delays microstructural changes within the bearing
- Increased resistance to crack formation and the development of white structure flaking
- Available for tapered roller bearings and cylindrical roller bearings

RANGE OF AVAILABILITY



In rolling fatigue tests conducted in hydrogen charged environments, AWS-TF delivered 7 times the life of standard bearing steel (SUJ2).

FIG. 1 - WHITE STRUCTURE FLAKING IN HYDROGEN CHARGED ENVIRONMENTS



STAGE 1

Hydrogen permeates the bearing steel, causing it to weaken

STAGE 2

White structure forms below the surface of the bearing

STAGE 3

Crack formation begins along the boundary of white structure during repetitive stressing

STAGE 4

Cracks propagate under the load of each passing roller, leading to flaking

FIG. 2 - COMPARISON OF SERVICE LIFE