

# Black oxide bearings boost gearbox reliability

## Benefits

- Helps prevent premature crack failures
- Improved running-in behavior
- Enhanced corrosion resistance
- Improved resistance against smearing damage
- Better performance in low lubrication conditions
- Increased oil and grease adhesion
- Reduced risk of chemical attack from aggressive oil additives on the bearing steel
- Reduced chance of hydrogen permeation in the bearing steel
- Decreased risk of fretting corrosion in the fits

## Applications

Bearing types used in key wind gearbox systems:

- Tapered roller bearings
- Cylindrical roller bearings
- Ball bearings



## SKF surface treatment adds layer of defense against WEC/axial cracks

Wind gearbox bearings must endure widely varying temperatures, speeds and loads, plus exposure to contaminants, moisture and chemicals. These conditions can limit bearing life cycles and create a non-classical failure mode resulting in white etching (WEC) and/or axial cracks.

Black oxide coated bearings from SKF can help. Featuring an enhanced black oxidation surface treatment applied to the rings and rollers, these bearings help prevent premature failure due to WEC/axial cracks. Suitable for new installations or as a replacement for untreated conventional bearings, black oxide coated bearings from SKF offer manufacturers, operators and maintenance providers an affordable solution which will improve gearbox uptime.

## Protection from the causes of premature bearing failure

Black oxide coated bearings from SKF can deliver significant performance improvements at an acceptable cost. They can resist a range of damaging operating conditions. They offer better performance in poor lubrication situations because their treatment delivers improved lubricant adhesion and enhanced smearing resistance. The risks of fretting, micropitting and cracks can be limited. Resistant to corrosion and chemicals, black oxide bearings reduce the effects of moisture and aggressive oil ingredients. They also help improve friction behavior and reduce wear, particularly under mixed friction conditions which are present in wind gearboxes.



## Proven to be extremely effective against WEC/axial cracks

More than 80 000 SKF black oxide coated bearings are operating in the field with no reported failures due to WEC/axial cracks. In addition, for one wind gearbox manufacturer, the improvement was impressive. In a sample of 1 000 standard cylindrical roller bearings in a gearbox application, the manufacturer reported a failure rate from 40 to 70% after two years. In a sample of 1 150 black oxide coated cylindrical roller bearings from SKF for a similar application, the failure rate was 0,1% over the same period!



## Advanced technology for greater reliability

Since 2006, SKF engineers have been at work defining optimized treatment specifications for our black oxidation process. It has allowed us to develop surface treatments that are individually tailored to bearing type, size and application, thereby extending the benefits of black oxide to large bearings.

## A better black oxidation process

The black oxidation process used by SKF involves a chemical reaction at the surface layer of the bearing steel. Performed in an alkaline aqueous salt solution at defined temperatures, the process can require up to 15 different immersion steps, resulting in a dark black surface layer about 1-2  $\mu\text{m}$  thick.

This thin black layer delivers a significant performance upgrade to a broad range of bearing types and sizes used in wind turbines – up to 2,2 m in diameter, and up to 1 000 kg per individual bearing component.

## A proven solution

Our enhanced black oxidation surface treatment is just one of a number of cost-saving, high performance solutions that SKF has developed during our extensive involvement with the wind energy industry.

For wind gearboxes in particular, black oxide has proven to be an extremely effective solution, resulting in reduced turbine O&M costs by enhancing bearing reliability and performance.

**To order black oxide rings and rollers, add the L4B suffix to the part number, e.g. NU 2326 ECML/L4BC3.**



*High-capacity cylindrical roller bearings*



*Double row tapered roller bearing*



*Tapered roller bearing*

© SKF and CARB are registered trademarks of the SKF Group.

© SKF Group 2014

The contents of this publication are the copyright of the publisher and may not be reproduced (even extracts) unless prior written permission is granted. Every care has been taken to ensure the accuracy of the information contained in this publication but no liability can be accepted for any loss or damage whether direct, indirect or consequential arising out of the use of the information contained herein. Any cost savings and revenue increases in this publication are based on results experienced by SKF customers and do not constitute a guarantee that any future results will be the same.

PUB 74/S7 14608 EN • August 2014

Printed in Sweden on environmentally friendly paper.

Certain image(s) used under license from Shutterstock.com.

