



# North American Wind Farm Benefits from Main Bearing Life Extension

*Romax unique life-extending grease flushing process enables repairs to be postponed for up to two years*

## Client

Large wind farm in North America owned by a global utility, that uses Romax for condition monitoring, failure root cause analysis, predictive and preventative maintenance support.

## Challenge

With a failing main bearing regularly running over allowable temperatures, the site operations team wanted to extend bearing life and so delay repairs to a more suitable and cost-effective time.

## Solution

Romax's proprietary uptower grease flushing process removed highly contaminated grease from the main bearing, with Romax then repacking with clean grease.

## Benefits

Extended life. The risk of a potentially expensive and disruptive failure reduced considerably, with further cost reductions by enabling O&M work to be postponed for up to two years and scheduled alongside other repairs requiring rotor removal using a large crane.

In operation for a number of years, this is one of the world's largest wind farm sites, with a total generation capacity of more than 500 megawatts (MW). It is owned and operated by a Fortune 200 global company that generates and distributes electricity. An existing Romax customer, the wind farm was experiencing problems with a failing main bearing, regularly running at above permitted temperatures. To extend the bearing life, Romax's innovative grease flushing technique was requested, to remove large metal slivers, debris-ridden, blackened and hardened grease from the bearing. The result: the bearing friction and heat generation reduced, progression of the failure mode was effectively slowed down and further remedial action able to be planned.

The wind farm's General Manager was pleased with the results: "We saved significant money on this bearing failure due to the Romax process by optimizing repair scheduling and reducing downtime. We would look to this process on future failing bearings to save money again."

**The Romax flushing process delivers an innovative new maintenance practice for the wind industry, providing a highly effective solution to help reduce the risk of failures, delay expensive repairs and so reduce costs.**



*Bearing in as found condition (left) and after flushing to remove grease (right)*

## 'Running hot'

Main bearing failure is a common challenge for many sites and the double row spherical bearings in particular require an effective O&M program to minimize the cost of failures. For this customer, phases of the wind farm complex already benefited from Romax vibration condition monitoring (CMS), allowing the damage to be detected at an early stage, at the onset of macropitting and typically 12-24 months before failure. In this case bearings are easily identified for proactive flushing when flagged with initial damage or wear to extend life by many years. Another phase of the complex has no CMS and depends on SCADA temperature analysis and inspections to determine bearing health. This case study covers the latter case and the remarkable life extension for a bearing found in very poor condition.

With the bearing running hot and observation of metal debris in the grease trap, the wind farm's lead Performance Engineer recommended action and Romax flushing was scheduled for January 2014. The original intent was to at least extend the damaged bearing's life to the summer, enabling a change-out to be scheduled during the low wind season. Much more was achieved.

*"We will save significant money on this bearing failure by using the Romax process to optimise repair scheduling and reduce downtime. We would look to this process on future failing bearings to save money again."*

## Wind Farm's General Manager

### Inspections before (left) and after (right) flushing



*Outer race fracture after first flush (left) and 5 months later (right), showing damage progression has slowed*



*Debris evident in original flush grease (left), outer race condition before first flush (right) showing severe spalling*



*Micropitting and debris denting on the roller at first flush (left) and 5 months later (right) damage progression has slowed*



*Typical samples showing condition of grease before flushing (left) and improved quality 5 or more months after flushing (right)*

## Grease flushing and repacking for 'cool running'

During the flushing procedure Romax engineers inspected the bearing, finding micropitting on the rollers and severe damage (macropitting and cracks) on the outer race (load zone) and inner race/rollers. The engineers then removed more than 95% of the grease using Romax's flushing process\*, allowing a complete repacking with fresh grease.

Post-flush, the bearing cooled over several weeks and according to the site's Performance Engineer, changed from running very hot to being one of the coolest running bearings in the park. "We originally intended to change the bearing in the summer of 2014, after monitoring progress for several months, but, observing temperature stabilisation to one of the coolest running bearings in the park, we decided to push repair to 2015. This allowed a reduction in crane costs."

## 'A highly effective process'

Based on Romax inspection photos of the bearing and the poor condition found during the flush, the expectation was that delaying repairs for 3-6 months was optimistic. However, the Romax process proved to be so effective that wind farm managers decided to repeat the flush after six months and delay repairs for an entire additional year. Romax returned in June 2014 and repeated the flush to support this life extension. Thorough inspections showed little additional damage progression since the original flushing, with the turbine successfully run over the 2015 winter - allowing the delay of expenditure and optimisation of repairs for lower crane costs. Throughout 2015 the bearing continues to run.

With the client extremely pleased with this success, they employed Romax to analyse data for the other phase of the wind park, using the condition monitoring system and proactively flushed further machines in the early stages of damage to help prolong their life. With Romax's custom methods to reveal vibration trends helping to detect main bearing damage early, alongside accompanying inspections, main bearing grease flushing at such an early stage is optimal for life extension.

*\*Patent pending*

- **Extends bearing life and reduces unscheduled O&M and repair costs**
- **Smart custom methods to detect and pinpoint emerging problems earlier**
- **Innovative flushing technique removes large metal slivers, debris-ridden hardened grease**
- **Reduced bearing friction and heat generation resulting in slowed progression of the failure mode**
- **Delay expensive maintenance, repairs and replacements for as long as possible**

## To find out more

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