



Customer  
Success  
Story

We pioneer motion

## Millions of euros in savings – thanks to optimally lubricated shaft bearings

Dongfang Electric Corporation (DEC) was looking for a total solution package for the main shaft bearings of its wind turbines in Fujian Xinghua Bay. The requirement was to guarantee the availability of the wind turbines for more than 25 years, despite harsh conditions, and crucially to avoid failures. Schaeffler supplied the appropriate bearing and optimum lubrication solution.

### The solution impressed with

- Increased grease service life and bearing life: Especially for special designs of the main shaft bearing also with bolt cage
- Customized lubricant: perfectly designed for high loads, low start temperature and large temperature ranges
- High water and corrosion resistance, especially suitable for high humidity and salty environments



#### Customer

Dongfang Electric Corporation

#### Sector

Wind Industry

#### Application

Bearings in wind turbines

#### Solution

Total solution: ideal bearing lubrication

# What our customer drives ...

## Challenge

Dongfang Electric Corporation (DEC) designs and manufactures onshore and offshore wind turbines, including their support blades, generators, electronic control systems, and other core components. This includes the 10 MW wind turbine, one of the largest wind turbines for offshore applications, which is exposed to particularly harsh environmental conditions. The wind turbines are intended to be operational for at least 25 years, with maintenance work kept to a minimum. Any damage is expensive for the plant manufacturer. But where do you start? To avoid failures, the main bearing arrangement and lubrication must be perfectly matched. Since grease is the only dynamically changing medium that can ensure the ongoing operation of the bearing, providing the required grease in the correct quantity for the bearing life is essential. DEC turned to Schaeffler with this challenge.



Wind turbine

### Technical information on the 10 MW wind turbine

Place, installation	Fujian Xinghua Bay, 2020
Capacity for generating electric energy	10MW
Bearing type	2-TRB
Filling volume (grease)	96.91KG 77.55KG
Relubrication Interval	6 months

### Information

DEC has two main manufacturing bases for double-fed WTGs and permanent magnet direct-driven WTGs respectively. WTG sets with a unit capacity covering 1.0MW, 1.5MW, 2.0MW, 2.5MW, 3.0MW, 4.5MW, 5.5MW, and 7WM are suitable for different wind conditions and climate requirements. DEC can supply the entire solution package for the wind power project, covering wind source evaluation, micrositting, WTG type verification, turnkey construction, and project financing through to the O&M.

# What Schaeffler offers ...

## Solution

First, the Schaeffler experts carried out calculations using the BEARINX tool to determine the appropriate bearing arrangement and optimum grease. The overall solution comprised a customized main shaft bearing that was specially equipped with a bolt cage and, for optimum lubrication, the program recommended the use of performance grease Arcanol LOAD460. In addition to providing other information, the BEARINX calculation report and rig test also showed that the viscosity and additive package of LOAD460 ideally meet the requirements for heavy-duty operation. The Arcanol LOAD460 specifications show outstanding corrosion protection properties, as demonstrated by the Emcor test, in addition to a first-rate starting behavior at extremely low temperatures (-40 °C) and excellent wear protection properties. For the customer specifically, this means an increased grease service life, even at high loads and across a wide temperature range, resulting in optimized maintenance intervals and a reduced grease consumption for the system.

## What's special

DEC is highly satisfied with the overall solution. After Arcanol LOAD460 was successfully used in the 10 MW wind power plant for the main shaft of the turbine, the global corporation plans to use Arcanol LOAD460 in further wind power plants. Schaeffler also offers perfectly matched bearing and lubrication solutions for applications in rolling mills, the steel industry, the cement industry, construction machinery, and the paper industry.



Mounting the taper roller bearing inner ring



## arcanol LOAD460 Bearing Grease

### Information on performance grease Arcanol LOAD460

Worked penetration / 0.1 mm	310-340
Prolonged worked penetration (100,000 cycles) / 0.1 mm	Δ 17
Drop point	> 170°C
Copper corrosion after 24h/120°C (T2 cooper, 100°C/24h)	≤ 1
Oxidation stability (99°C 758 kPa, 100h)	22 kPa
Pumpability / suitability for central lubrication systems	good
Oil separation at +40°C / +80°C / +100°C	3,5% / 13,1% / 18,2%
Start torque (-30°C)	< 1000 Nmm
Steady torque (-30°C)	< 100 Nmm
Base oil viscosity 40°C	400 mm <sup>2</sup> /s
Water resistance (79°C, 1h)	≤1-90%
FE8 (536050,7.5/80-RT)	≤35 mg
FE9 bearing service life (A/1500/6000-130°C, L50)	289h
EMCOR (water)	= 0/0
at 0,5% NaCl	≤ 0/0



Preferred lubrication: Arcanol Load460 for high loads in wind turbines

# What the customer saves ...

Damage to offshore wind turbines and the resulting outlay associated with dismantling bearings and replacing components can incur huge costs.

The rental costs of boats, cranes and other equipment for the replacement of a main shaft bearing alone are around 800,000 euros.

An unplanned downtime takes an average of 20 days. By losing 2.2 million kilowatt hours, costs arise in the amount of 200,000 euros.

## Cost of replacing the main shaft bearing (excluding bearing cost)

Rental of facilities used in replacing the bearing (boat, crane, etc.)	800,000 €
Power loss (20 days)	2,200,000 kWh, which corresponds to circa 200,000 €

# > 1,000,000 €

Savings achieved by avoiding unplanned downtime

## ADDITIONAL INFORMATION

### Test rig FE8 / DIN 51819

Used to assess the anti-wear protection properties under various operating conditions in different bearing types.

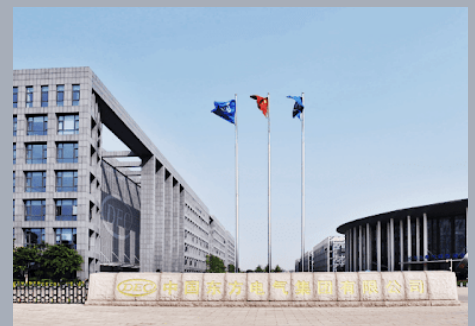
### Test rig FE9 / DIN 51821

Used to assess the grease operating life and to determine the upper operating temperature of greases.

## Customer

The Dongfang Electric Corporation (DEC), founded in 1958, is one of the backbone enterprise groups under the direct administration of Chinese Central Government. DEC is one of the world's largest power-generating equipment manufacturers and international project contractors. DEC operates two main production facilities within the wind sector for double-fed WTGs and direct drive permanent magnet WTGs. Its products include 1.5mw-4.5mw series onshore wind turbines and 5.0mw-10mw series offshore wind turbines. The products are exported in volume quantities to Sweden, Russia, Finland, Ethiopia, Cuba, Ecuador, and other countries.

More than 10,000 wind turbines of various types have already been delivered to domestic and foreign users. Dongfang Wind Power continues to promote product improvement and industrial development through technological innovation and is committed to providing users with the best total solutions for energy efficiency as well as scientific and customized solutions for operation and maintenance.



Dongfang headquarters in Chengdu, China