



WIND POWER

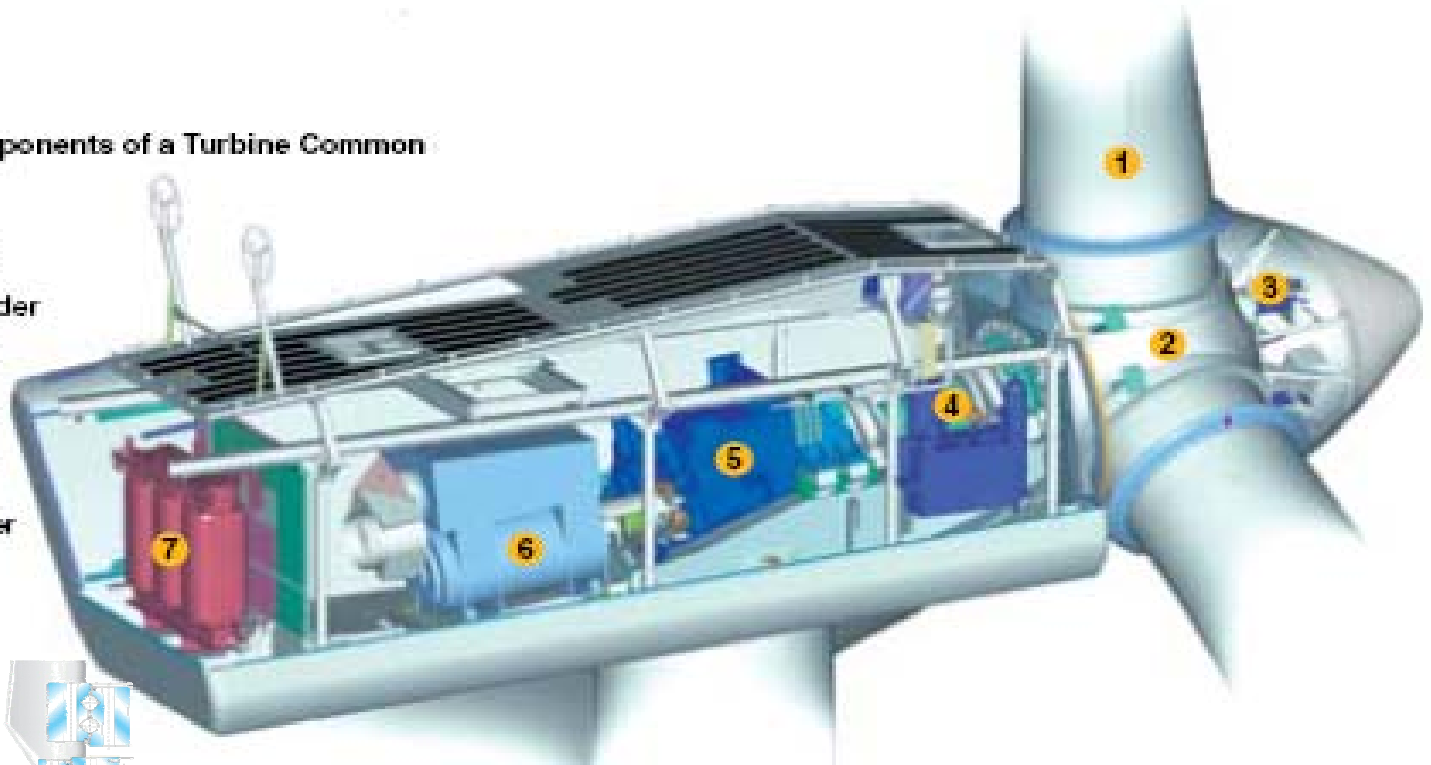
CARCOSEAL APPLICATIONS



WIND TURBINE COMPONENTS

Primary Components of a Turbine Common

- 1 Blade
- 2 Rotor Hub
- 3 Pitch Cylinder
- 4 Main Shaft
- 5 Gear Box*
- 6 Generator
- 7 Transformer



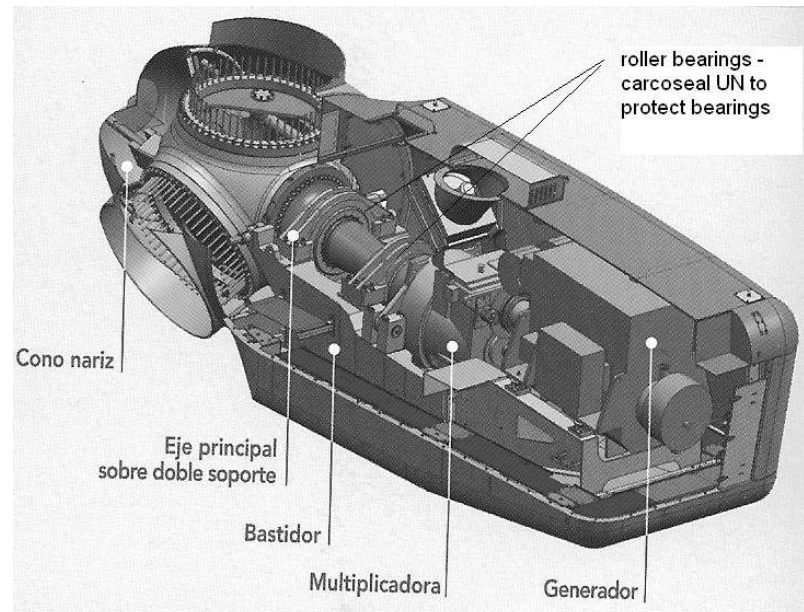
CARCOSEAL APPLICATIONS

- Typical application :

- Main shaft bearings
- Rotor bearing
- Multiplier shafts
- Generator output shaft
- Blade pitch bearing
- Yaw bearing

- Typical Carco Products :

- Carcoseal/UN
- Carcoseal/UN/Split
- Carcoseal/UN/LA
- Carcoseal/UN/LA/Split
- Carcoseal/SCA
- Carcoseal/SCA/Split
- Customized rubber profiles



CARCOSEAL APPLICATIONS

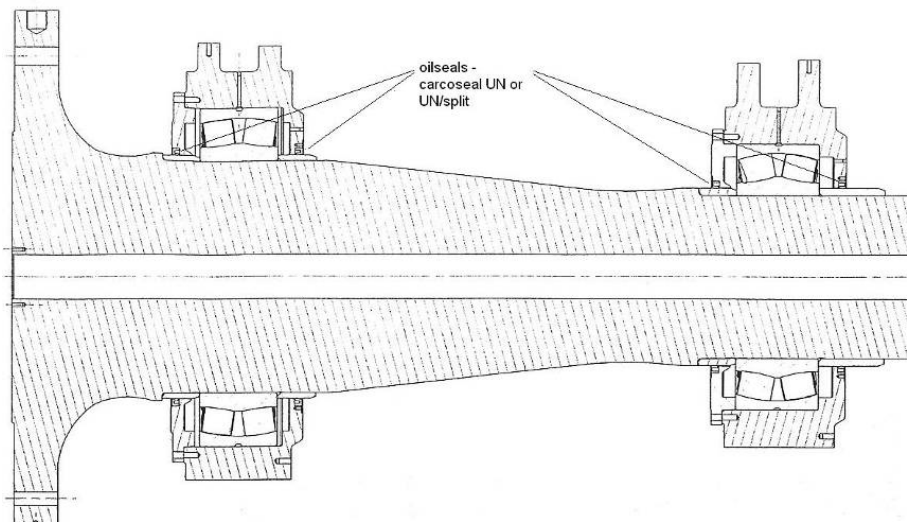
CARCOSEAL FITTED MAINLY ON MAIN SHAFT BEARINGS:

-ENDLESS VERSION FOR NEW BUILD

VIRTUALLY NO REPLACEMENT FOR THE ENTIRE WIND TURBINE LIFETIME (SPECIAL RUBBER COMPOUND RECOMMENDED FOR BEST FRICTION AND OZONE RESISTANCE)

-SPLIT VERSION FOR RUNNING TURBINES

REDUCING TO A MINIMUM MAINTENANCE TIME TO REPLACE OTHER OIL SEALS



“We want the customer to save money”

CARCOSEAL rotary shaft seals

- NO LEAKAGE OF BEARING LUBRICANT
- NO CONTAMINATION OF BEARING LUBRICANT
- LONGER BEARING LIFETIME
- SPLIT VERSION AVAILABLE, SHAFT REMOVAL NOT NEEDED
- DOWNTIME REDUCTION
- MANPOWER COST REDUCTION
- LESS OIL SEALS PURCHASED
- **BIG SAVINGS IN MAINTENANCE !**

“We want the customer to save money”

CARCOSEAL rotary shaft seals

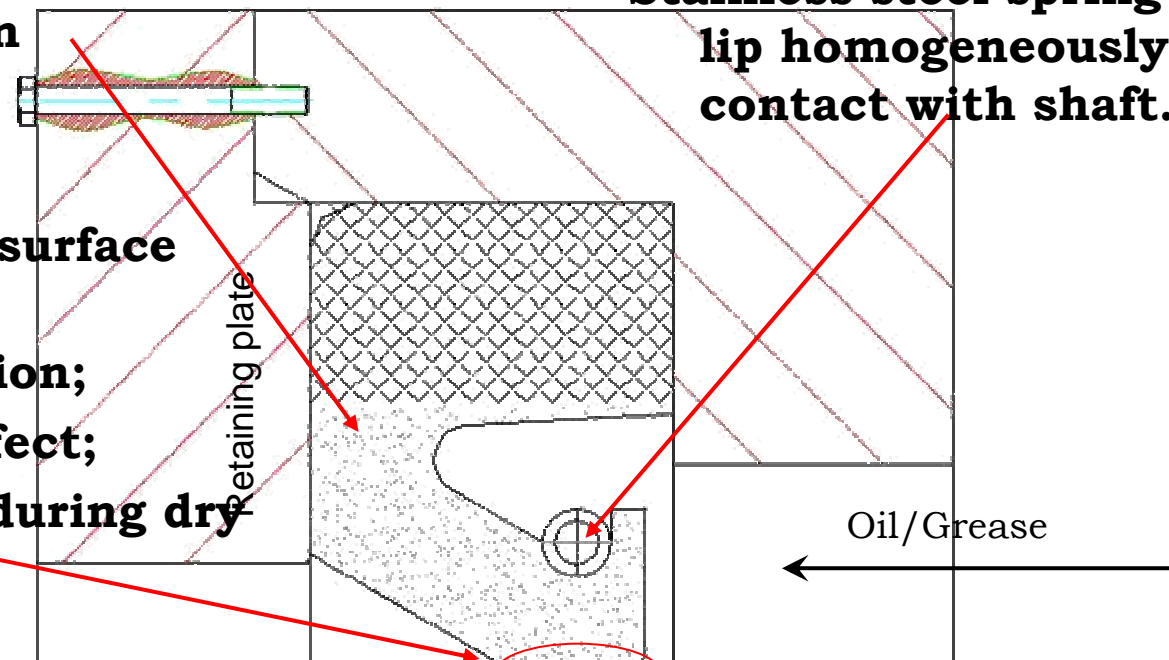
OTHER CLUES:

- OUR OIL SEALS ARE EASY TO FIT
- OUR OIL SEALS CAN BE UNFIT AND FIT AGAIN SEVERAL TIMES
- NO LEAKAGE THROUGH SEAL AND HOUSING
- NO HOUSING DAMAGE DURING SEAL FITTING

Carcoseal Benefits

Rubber with PTFE to reduce friction

Stainless steel spring keeping lip homogeneously in contact with shaft.



“Carcoflon” PTFE surface treatment:

- **Friction reduction;**
- **No stick slip effect;**
- **Lip protection during dry running.**

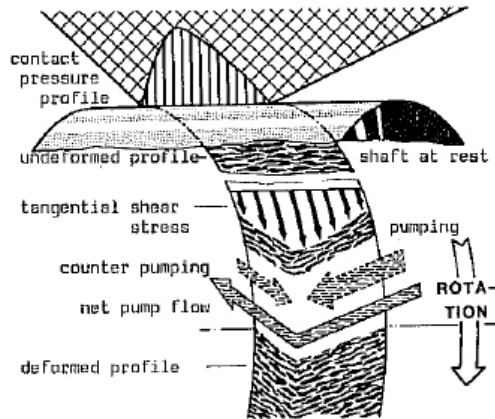
Oil/Grease

Large contact area:

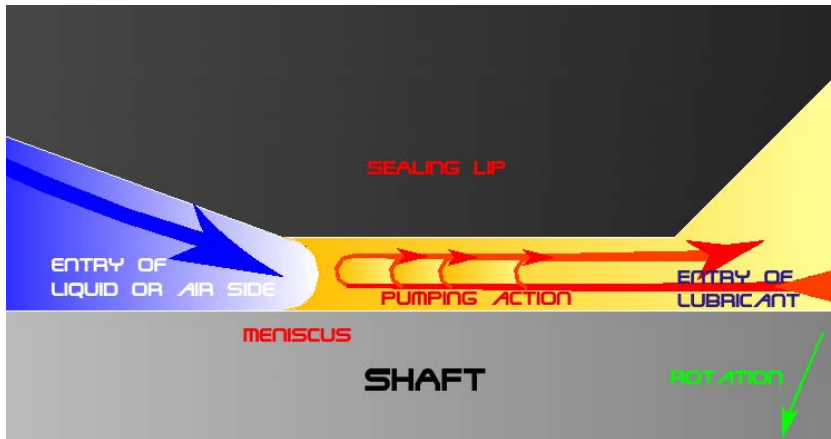
- **Guarantee against leakage;**
- **Less lip interference on the shaft;**
- **Less heat generation;**
- **No shaft damage.**



MENISCUS EFFECT



- Lubricant is pumped into the contact zone by the shaft rotation and provides a separating oil film, reducing friction and providing cooling. The reverse pumping effect keeps the lubricant contained in the contact band.



THE ORBITAL 2 PROJECT

CARCO WAS RECENTLY INVOLVED BY AN ENGINEERING COMPANY INTO THE SEAL DESIGN OF A NEW GEARBOX FOR A 3 MW WIND TURBINE.

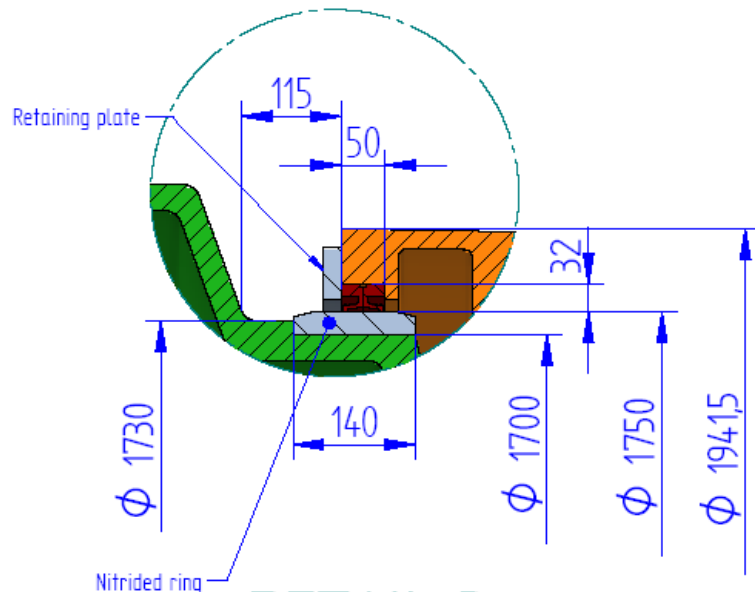
THE BIG GEARBOX IS CONNECTED DIRECTLY TO THE ROTOR.

THE SHAFT DIAMETER IS mm 1750 AND 2 SEALS ARE DESIGNED TO KEEP LUBRICANT INSIDE THE BIG BEARING AND TO PREVENT LUBRICANT TO BE CONTAMINATED BY DUST AND OTHER POSSIBLE AGENTS.

CARCOSEAL/SCA/SPLIT FITTED BACK TO BACK WAS RECOMMENDED.

SPLIT VERSION TO EASE SEAL FITTING.

H-NBR COMPOUND TO GUARANTEE THE LONGEST SEAL SERVICE LIFE.



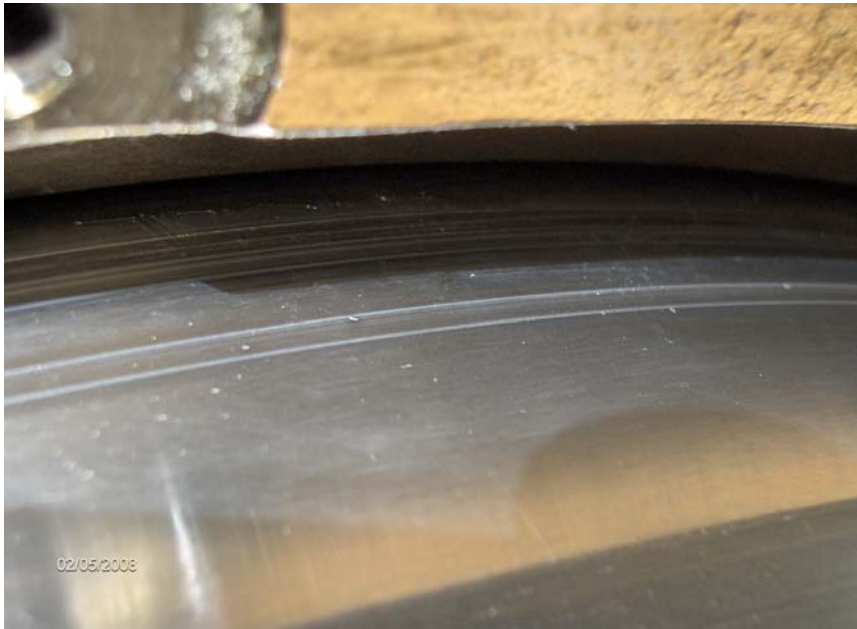
PROBLEM SOLVING FROM CARCO

IN 2007 CARCO SPECIALISTS INSPECTED A 1,5 MW WIND TURBINE IN SPAIN.

WE DETECTED BIG GREASE LEAKAGE FROM MAIN SHAFT BEARINGS DUE TO DEEP GROOVES ON THE SHAFT SLEEVE FROM ORIGINAL OIL SEALS: TOO SOFT STEEL UNDER CHROMIUM COATING.

WE SUGGESTED TO MOVE THE SEAL INSIDE THE HOUSING WITH A SPACER IN ORDER TO CHANGE THE CONTACT AREA ON THE SHAFT.

WE DELIVERED CARCOSEAL/UN/SPLIT WITH FULL SATISFACTION OF THE CUSTOMER.





CARCO

Large diameter seals and packings

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Graph by courtesy of Acciona Energia Spain



C a r c o S e a l



Long life Seals for Wind Turbines



Split Seals for easy maintenance

OUR POSTER FOR WIND POWER EXHIBITION

EWEC 2008 IN BRUSSELS (B)

CARCO®

Large diameter seals and packings

Long life seals for wind turbines
Split Seals for easy maintenance



PPA

Composite Seals

WIND POWER SEALS

OUR FLYER
DEDICATED
TO
WIND POWER
MARKET

News

Carco seals now available in Aflas® compound for excellent resistance to heat and chemical attack.

www.carcoseal.com

Problem solving is a challenge we enjoy