

Presented by

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# Protection and lifetime improvement for bearings and gears by using silicon- based additive technology

# Agenda

1. Key facts about REWITEC
2. Challenges in O&M
3. Solutions with REWITEC
4. Our services
5. Conclusion

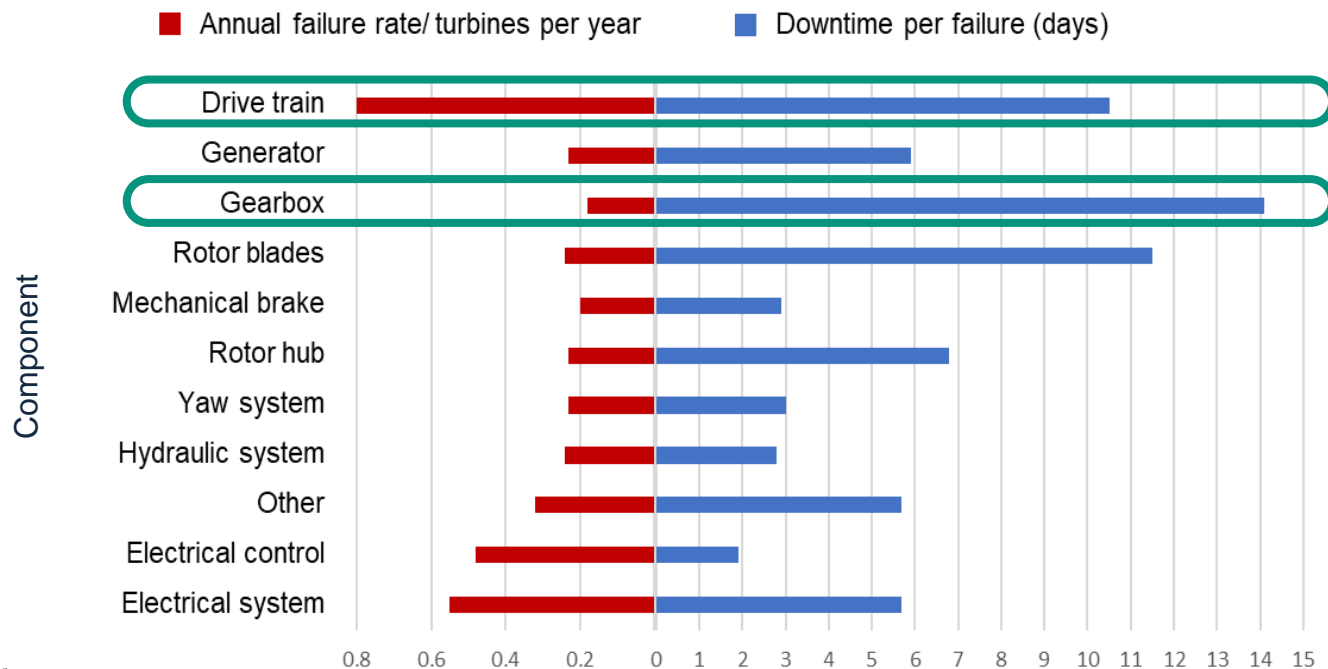


## Key facts about REWITEC

- ⇒ Founded in 2003
- ⇒ Close cooperation with several universities and research institutes
- ⇒ Supported by the German Government
- ⇒ Patents in Europe, China, USA
- ⇒ Acquisition by CRODA in 2019
- ⇒ Windenergy, Marine, Automotive, Industry

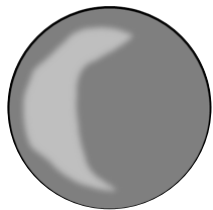


# Wind turbine reliability remains an issue

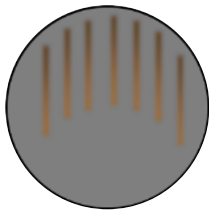




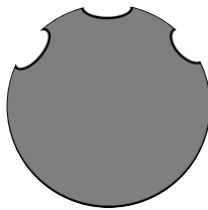
# Typical damage to wind turbine gears & bearings



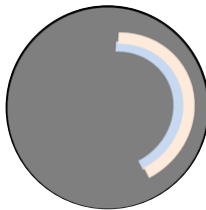
**Micropitting/  
grey staining**



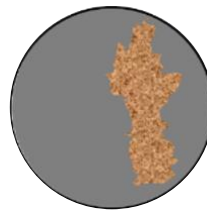
**Fretting  
corrosion**



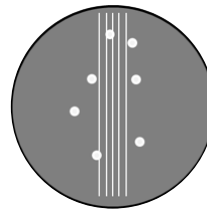
**False brinelling**



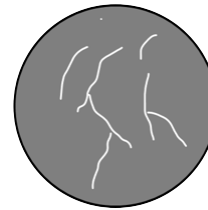
**Smearing and  
scuffing**



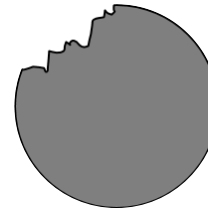
**Chemical  
corrosion**



**Electric  
damage**



**White etching  
areas/ cracks**



**Macropitting**



# How REWITEC helps

⇒ Over 3,000 successfully treated wind turbines globally



**DuraGear<sup>TM</sup>**



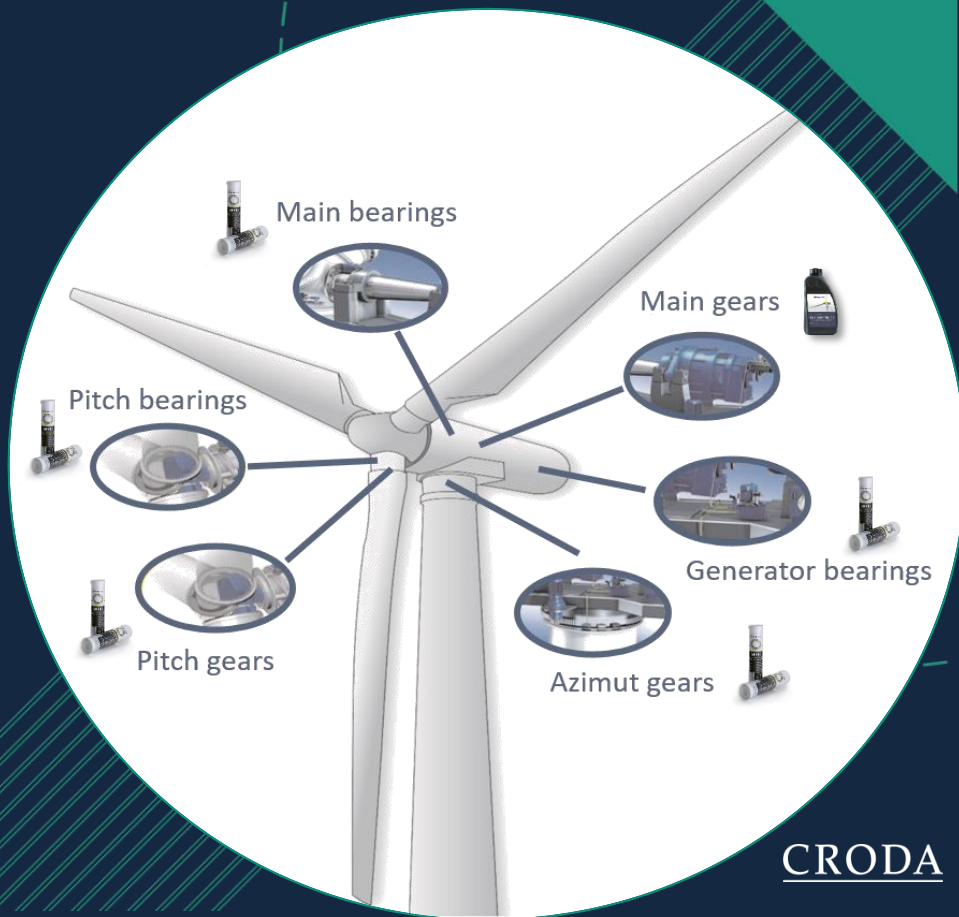
**Gears**



**GR400**



**Bearings**



# How REWITEC works

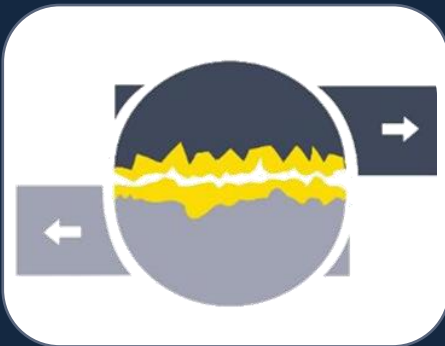
## Step 1

The Silicon based product uses the lubricant as a carrier to reach the contact surfaces.



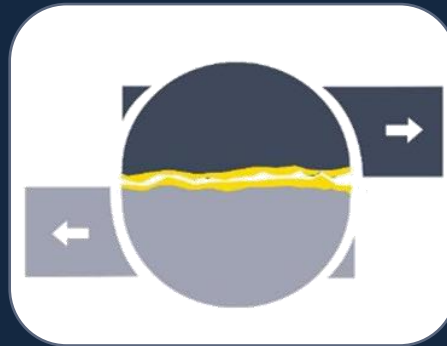
## Step 2

REWITEC particles adsorb at the metal surfaces and build a repairing and protective layer.



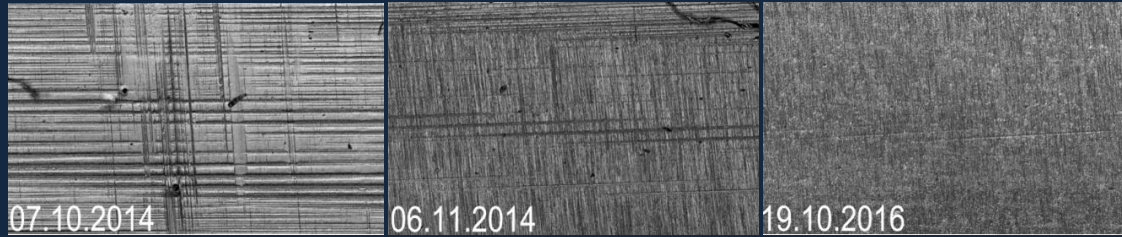
## Step 3

The new, smooth surface ensures lower tribological stress, less friction, higher efficiency and longer lifetime.



## Example of application

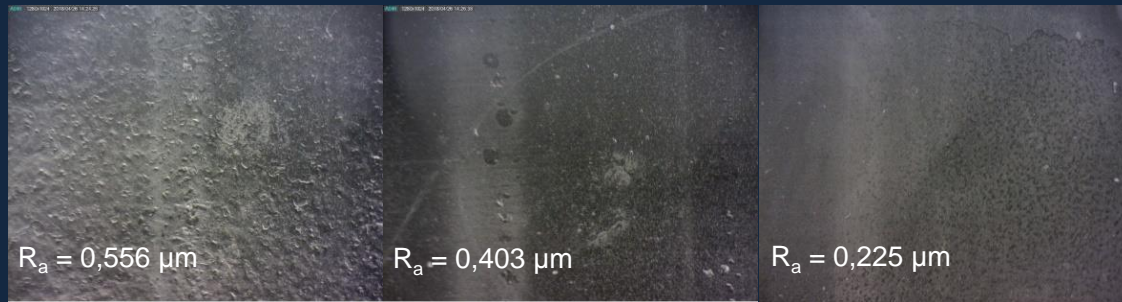
⇒ Wear development on a Bosch Rexroth gear tooth (GE 1.5 SL) over a period of two years



⇒ Run through mark development on a tooth flank:

- ⇒ Reduction of surface roughness and friction force
- ⇒ Improved load carrying capacity
- ⇒ Less stress for the tooth flank

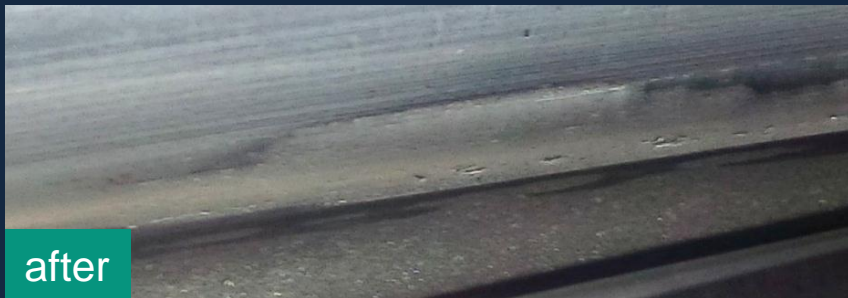
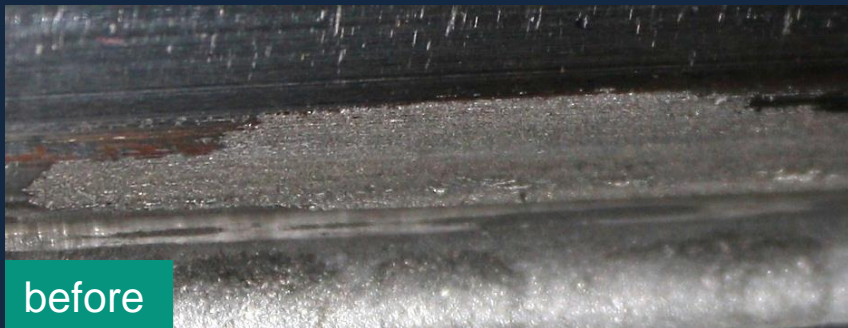
⇒ Coating and analysis of a GE 1.5 wind turbine main bearing (outer ring)



- ⇒ Before REWITEC application
- ⇒ 5 months after REWITEC application
- ⇒ 12 months after REWITEC application



## Example of application – Gear tooth flank

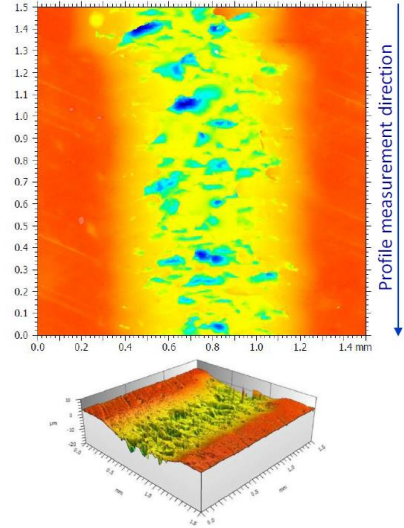


- ⇒ Significant operational wear visible
- ⇒ In the foot area visible micro pitting
- ⇒ Corrosion visible

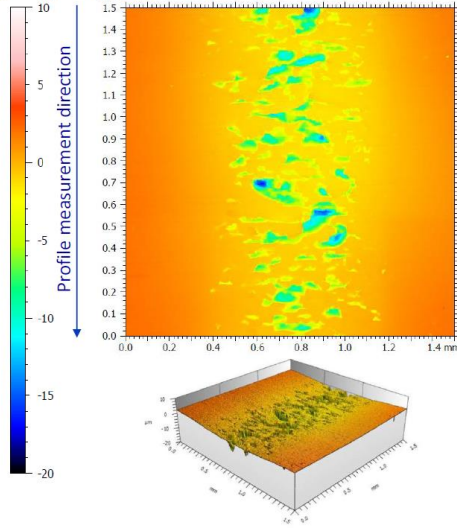
- ⇒ Operational wear noticeable reduced
- ⇒ Reduction of micro pitting
- ⇒ The contact pattern is optimized
- ⇒ Corrosion disappeared

# Example of application – Main bearing

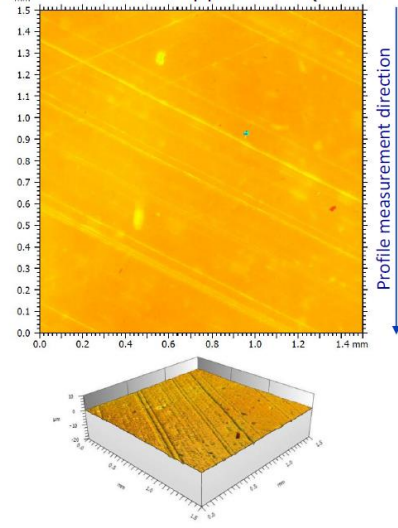
Before Rewitec application (05.06.20)



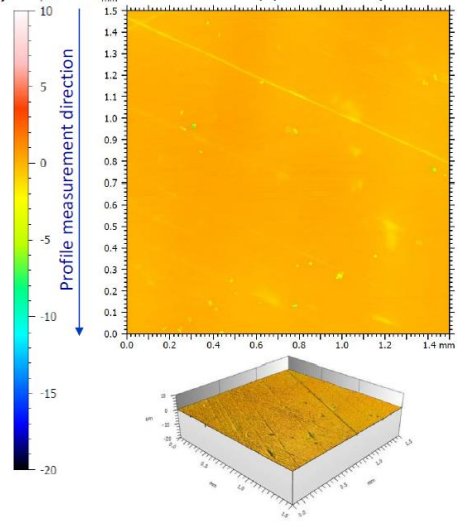
After Rewitec application (06.01.21)



Before Rewitec application (05.06.20)

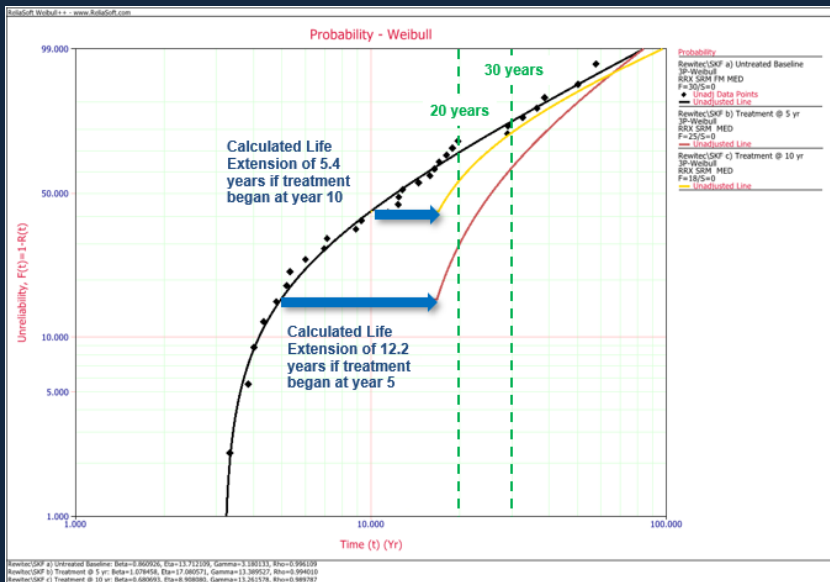


After Rewitec application (06.01.21)



# Lifetime improvement

⇒ Mainshaft Bearing Life Extension by REWITEC GR400 Grease using Sentient Science' DigitalClone<sup>®</sup>



## ⇒ Results:

- ⇒ Significant reduction in the probability of failure of a main bearing by REWITEC
- ⇒ Less roughness
- ⇒ Less friction
- ⇒ More even load distribution
- ⇒ Lower local pressure/stress

⇒ The earlier the application, the greater the effect

# Our services



Component surface  
imprinting



Component damage  
analysis and reporting



Technical advice,  
including up-tower  
inspections

## Conclusion

- ⇒ Less surface roughness, friction and temperature in the drive train system means:
  - ⇒ Less stress and wear for the gearbox and bearings
  - ⇒ Less stress for the lubricants
  - ⇒ Repairing and protection effect
  - ⇒ Higher drive train efficiency
  - ⇒ Higher reliability and availability, no downtime
  - ⇒ Significant lifetime improvement
  - ⇒ Cost savings, higher earnings





# Thanks for your attention!

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Germany

Smart science to improve lives<sup>TM</sup>



CRODA