DEWEK 2017

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Bearing Lifetime Optimization with Ceramic Greases

Dr. Holger Streetz • Bathan AG

Session #16 Lifetime Extension / O & M

Agenda

1. Company & Technology
2. Application in Wind Power
3. Analysis Objects
    1. AN Bonus 600 MK4
    2. AN Bonus 1.3 MW
    3. Flender AN Bonus
4. Results
5. Conclusions

1. Company & Technology

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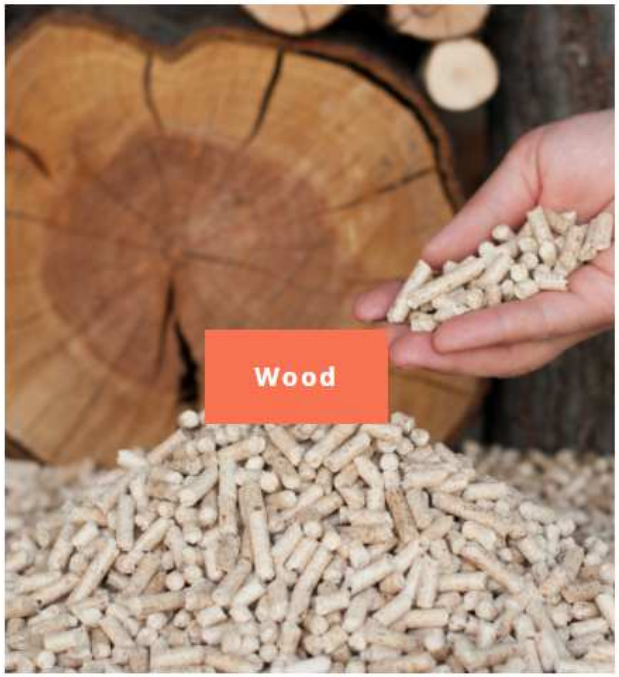

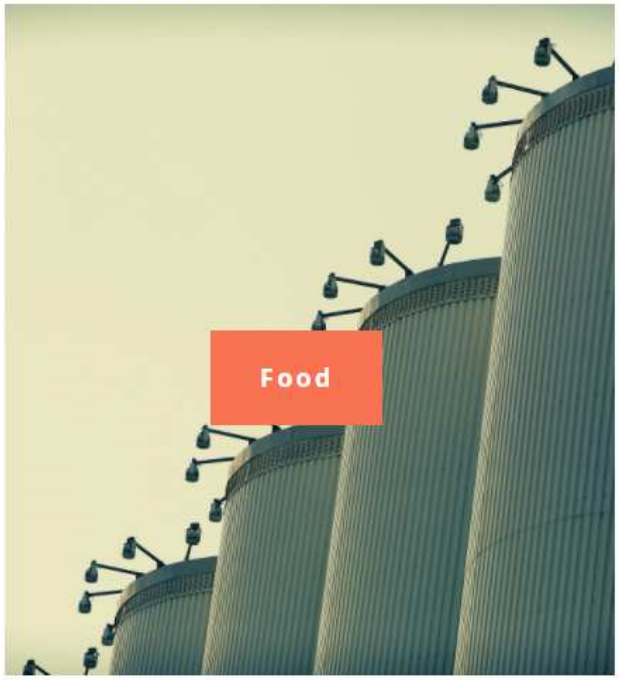

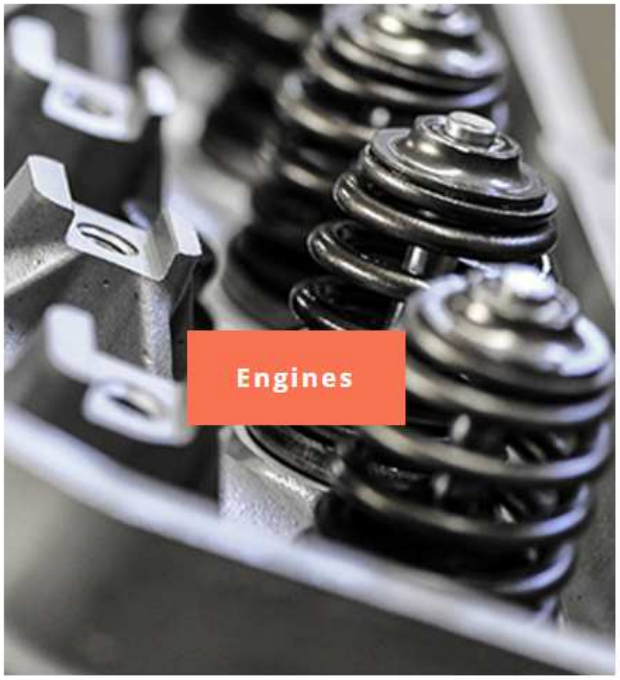

1. Company & Technology

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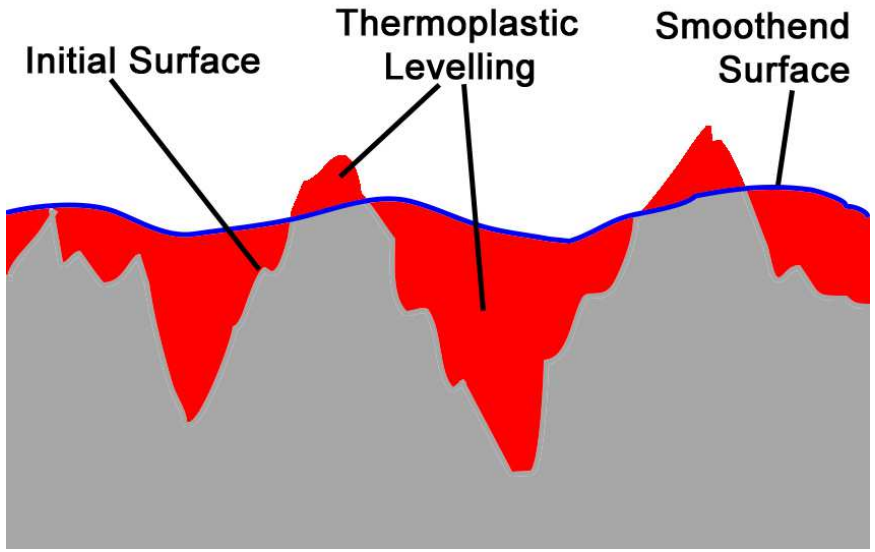
Bathan is a combination of ceramic particles with a distinct crystalline structure, low density and high thermal conductivity.

Under pressure, ceramic particles fill friction valleys and reduce friction peaks (thermoplastic levelling).

- Wear reduction
- Increased load bearing capacity
- Lower risk of failure
- Prolonged lifetime of equipment
- Low operating & maintenance costs



1. Company & Technology

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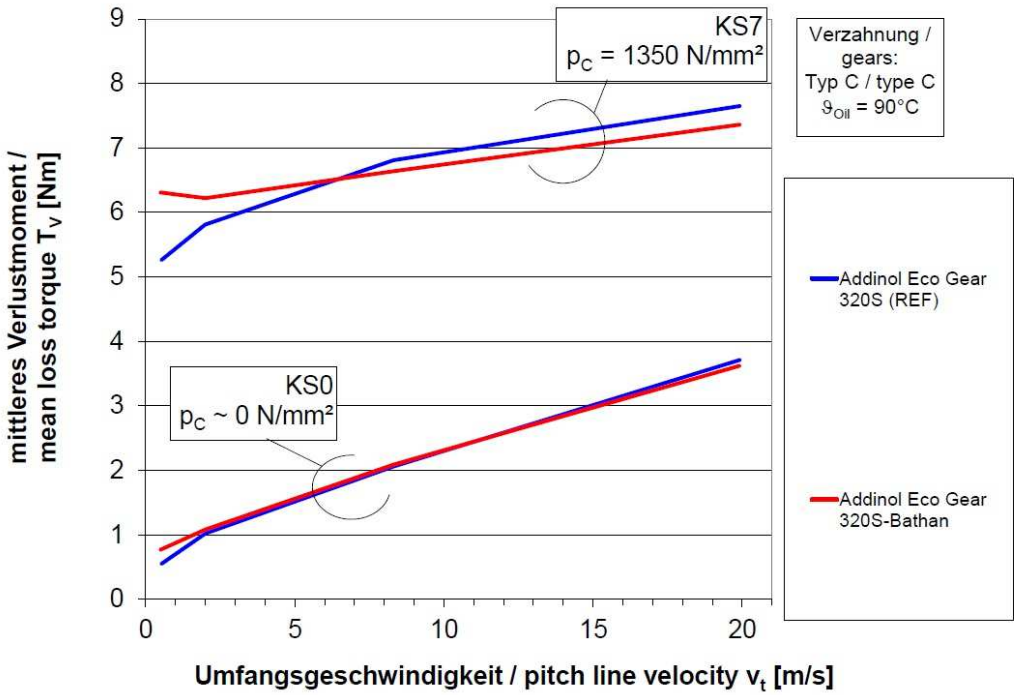
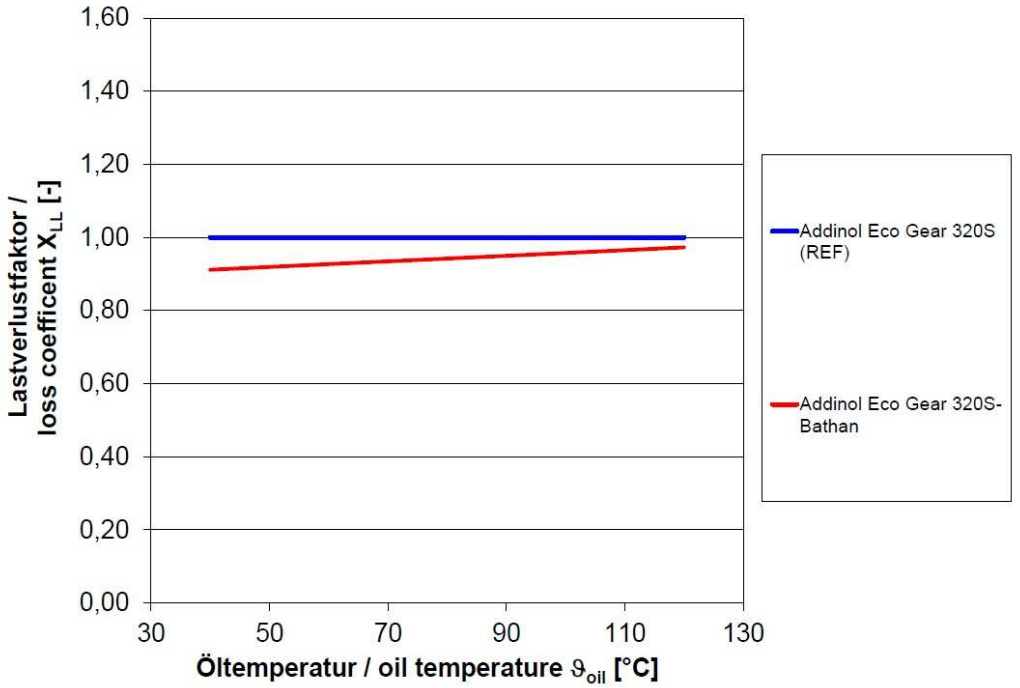
Analyses at the Institute of Machine Elements at TU Munich show up to 9 % lower power losses and 1,5 % lower cumulated mean loss torque.





2. Application in Wind Power

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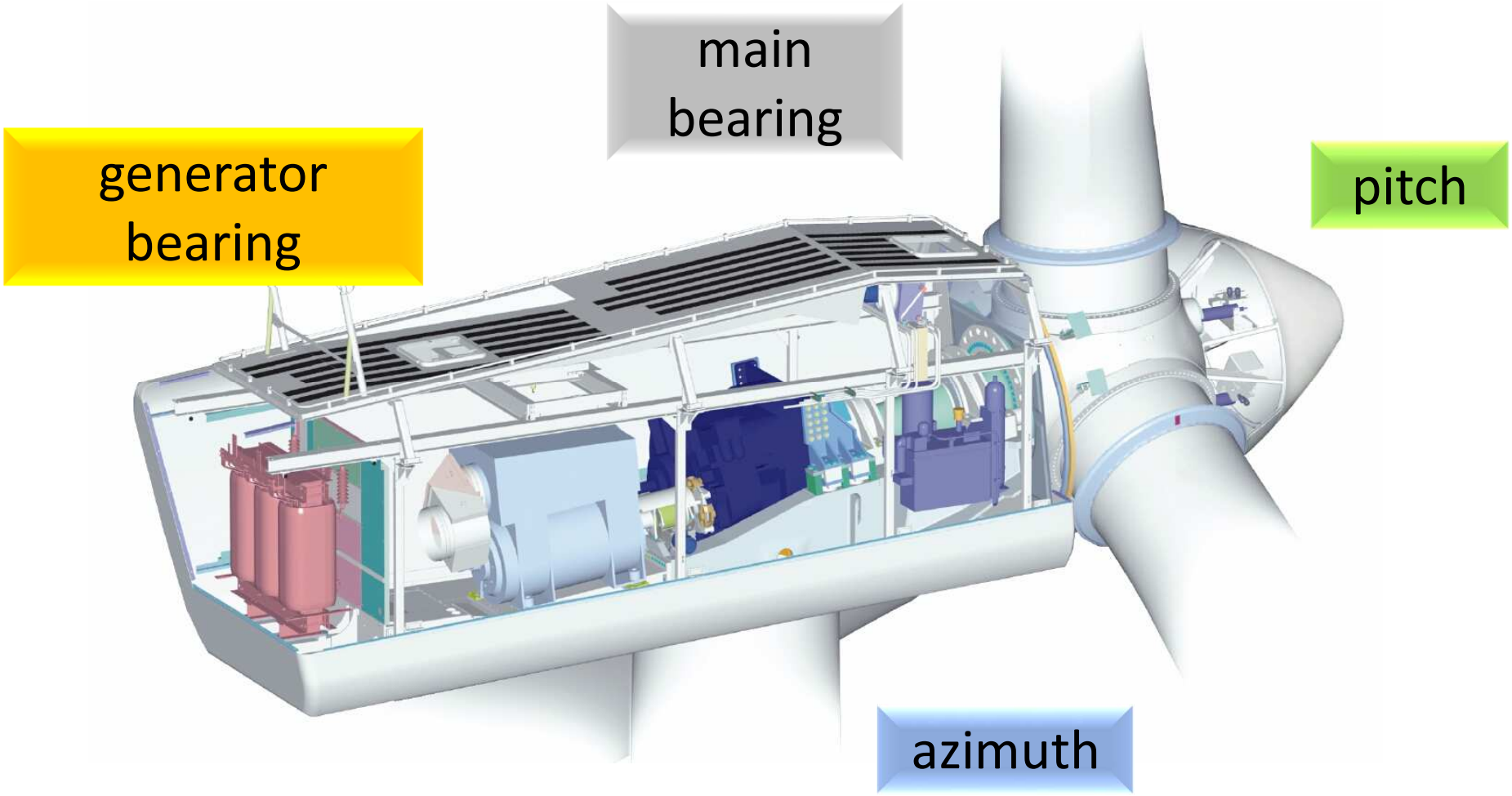
Operators search for the most efficient cost-benefit ratio.
Efficiency improvements are one way to the goal.



2. Application in Wind Power

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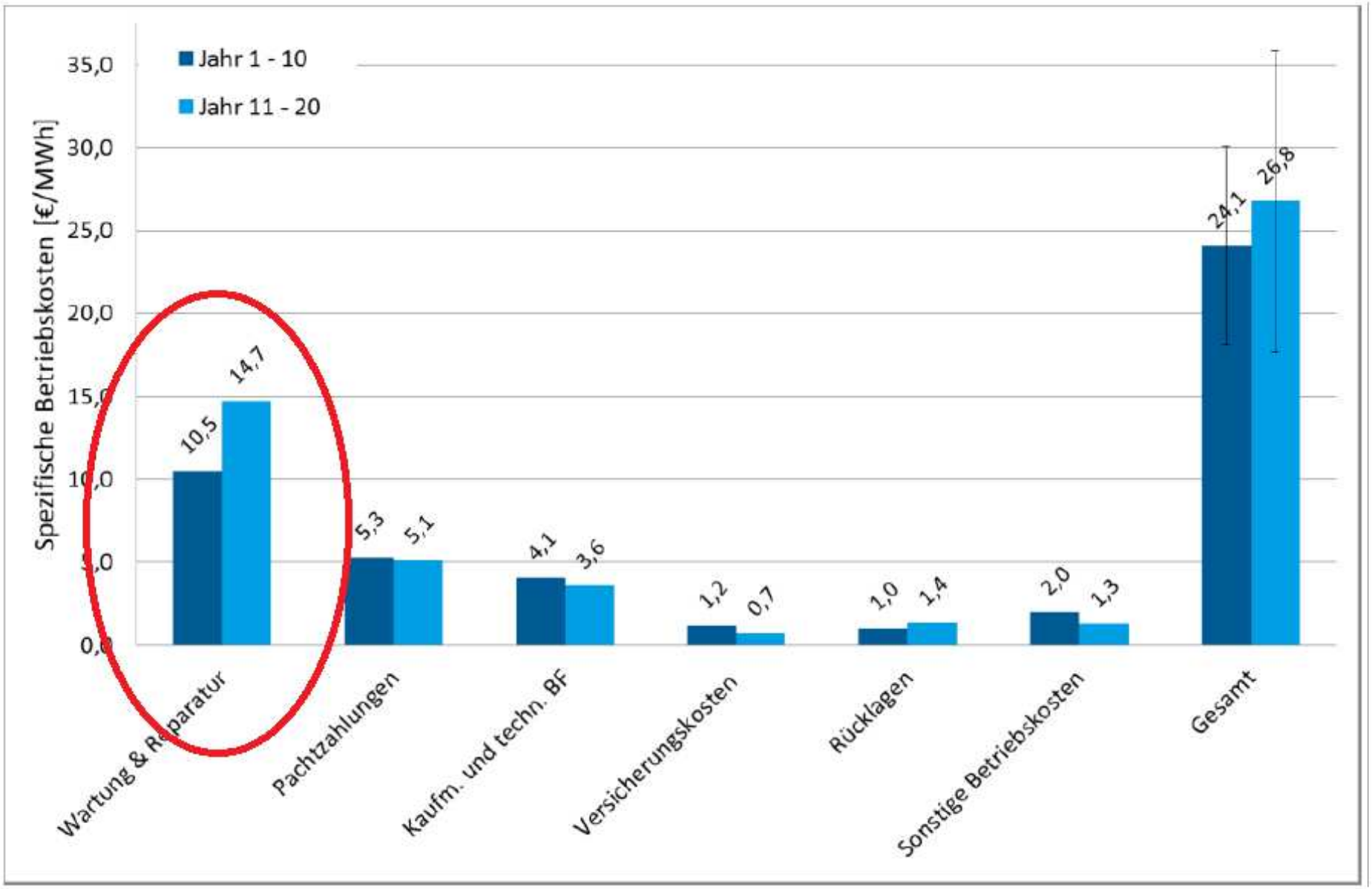
Why are we talking about efficiency improvements?



3. Analysis Objects

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The analysis objects for the long-term study are AN Bonus (Siemens) wind turbines

- Straightforward technology
- Easy collection of data
- “Good” age of wind turbines

- Nominal capacity: 600 / 1.300 kW
- On/Nom./Off speed: 3 / 15 / 25 m/s
- Rotor: 44 m, 3 blades
- Gear: Spur / Planetary
- Generator: asynchronous, 1500 U/min.

3.1 AN Bonus 600 MK4

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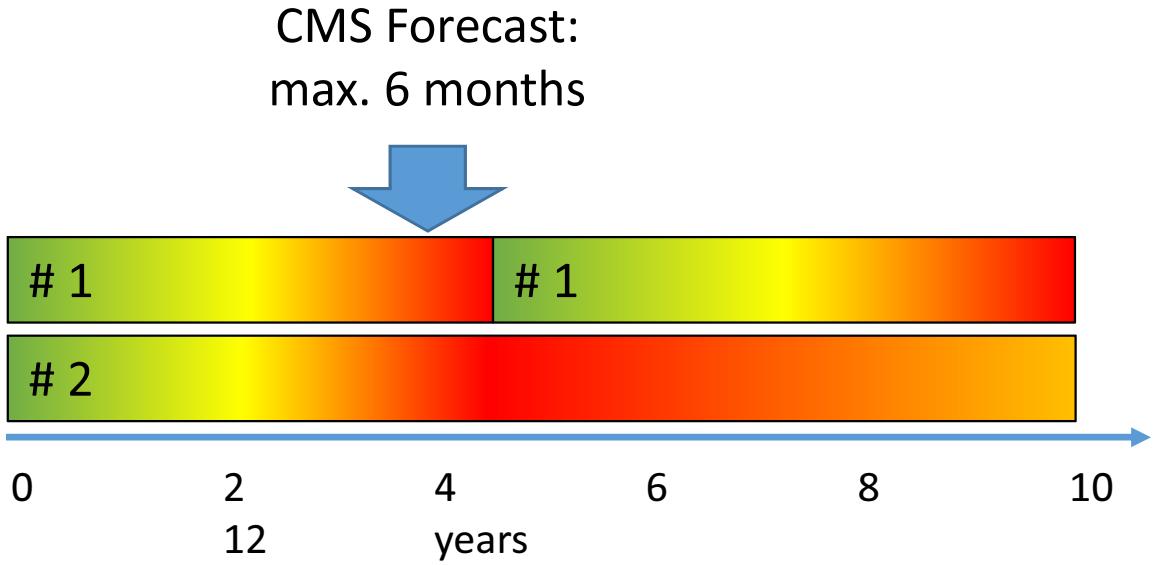
Two wind turbines with comparable wear degree of main bearings:

 # 1: Main bearing had to be changed (blocked shaft)

 # 2: Lubrication with Bathan KF7 grease and 400 g every 6 months

 # 2: Bearing condition did not worsen, but still in operation without failure



3.2 AN Bonus 1.3 MW

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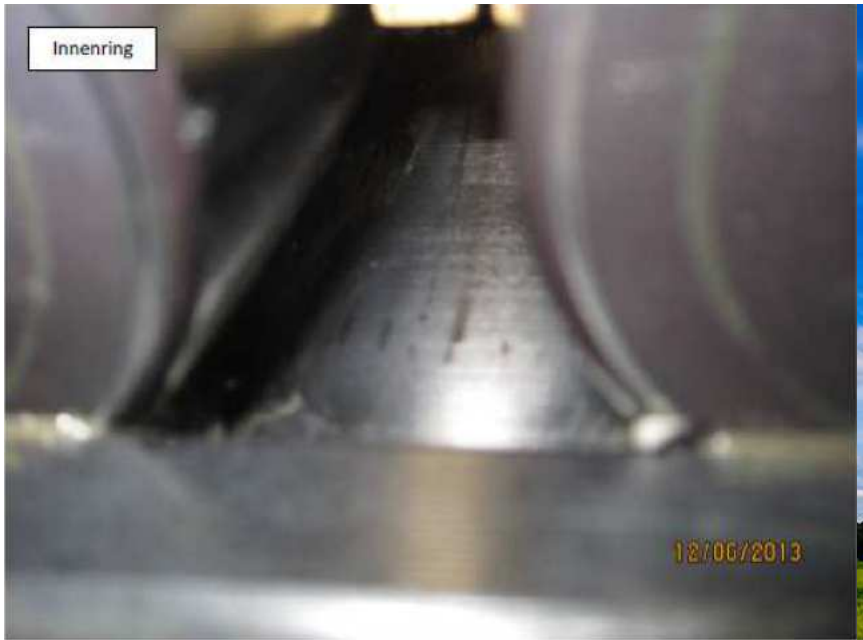
Objects:	3 wind turbines AN Bonus 1.3 MW
Problem:	September 2013 imminent main bearing failure
Solution:	Lubrication with Bathan KF7 / 60M
Result:	Bearing condition improved
	Bearings are operating in their fourth year after 2013



3.3 Flender AN Bonus 600

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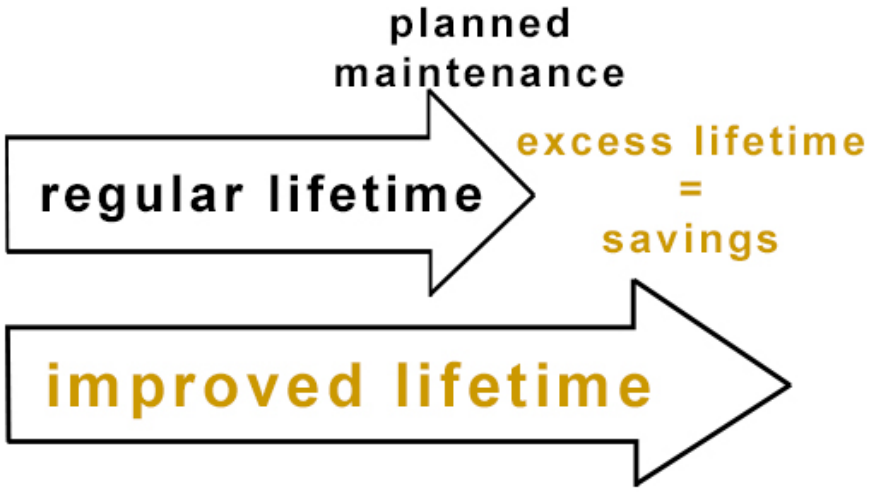
Object:	Flender gear of AN Bonus 600 wind turbine, built 1990
Problem:	High wear (PQ index at 140)
Solution:	Bathan Additive for Gears in 2013
Result:	Gear was not changed; PQ Index at 37
	Wind turbine is operating in its fourth year
Side effect:	Viscosity at 40°C from 310 to ≤ 290 mm^2/s



4. Results

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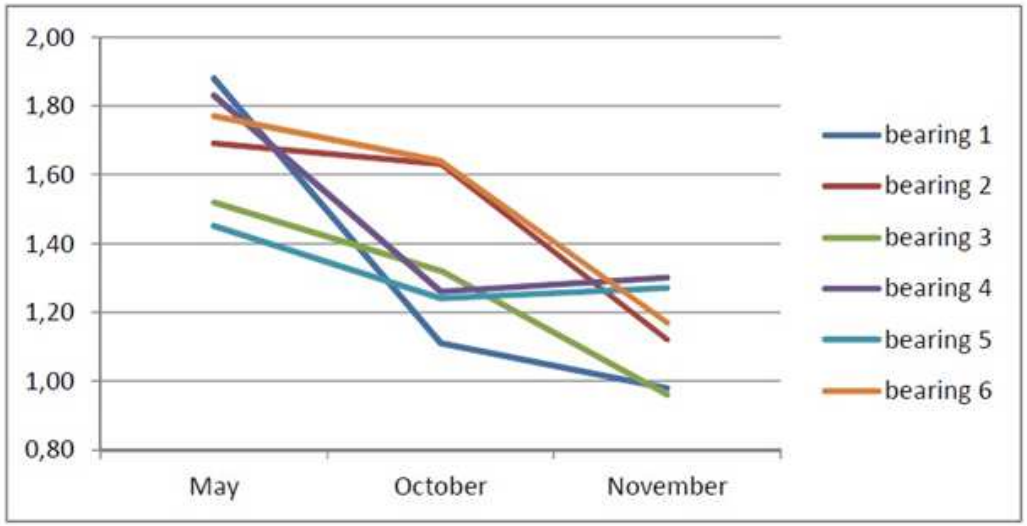
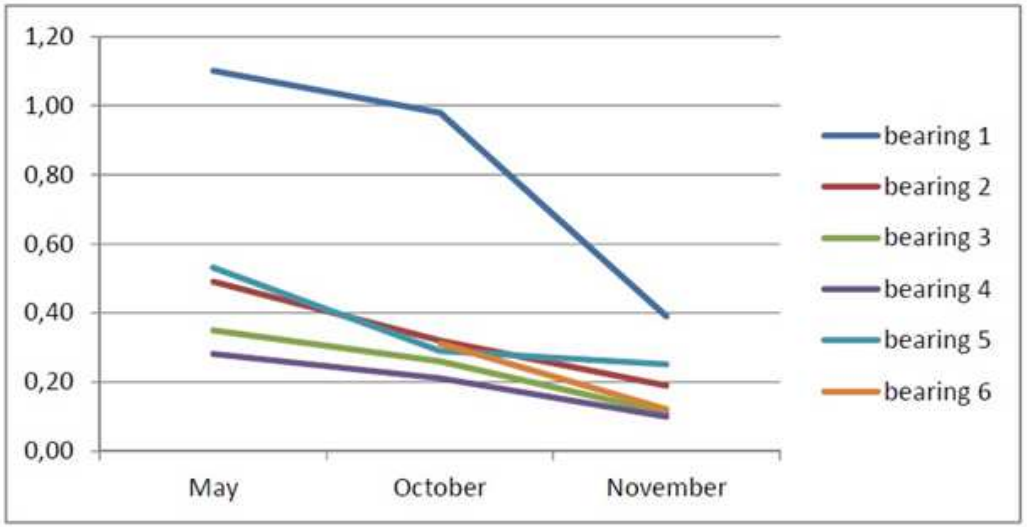
BEFORE
- High friction and wear
- High micropitting
- Excessive need for lubrication
- Alert for component failure
- Component change suggested

AFTER
- Smoother metal surfaces
- Less micropitting
- Less friction and wear
- Less vibrations
- Continued operation



Schwingungsreduktion in mm/s: -32.3%



Lagerverbesserung: -62.1% g (Virbation)

5. Conclusions

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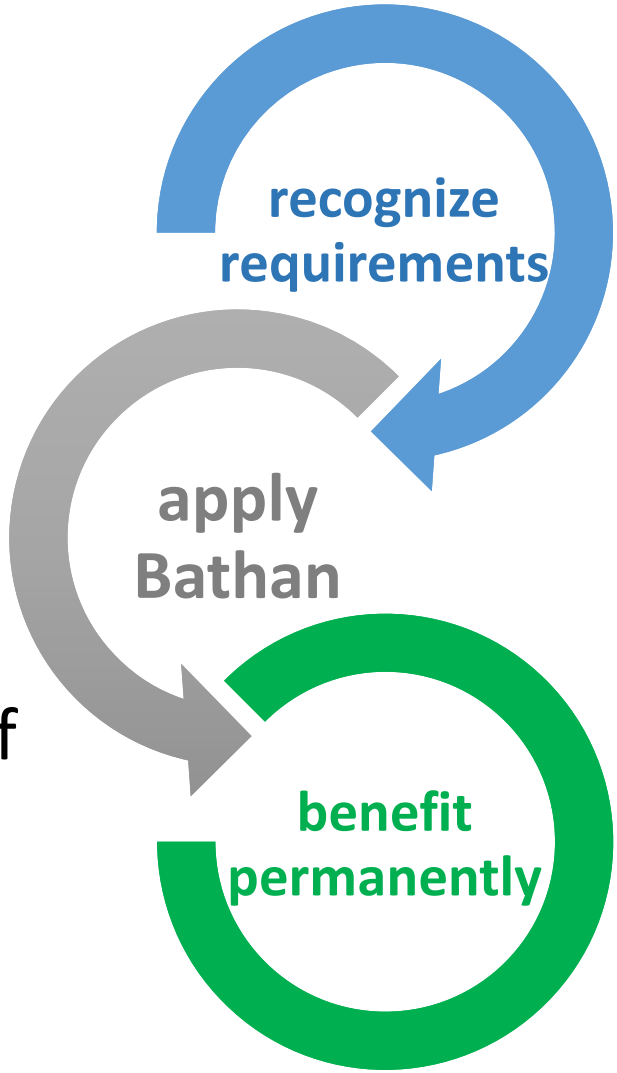
- Modern lubricants protect against wear
- Solid lubricants improve the condition
- Lubrication counts in the long term
- Predictive maintenance measures pay off
- Even small changes have a big effect



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Thank you!

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