SHELL LUBRICANT SOLUTIONS

SHELL GADUS S5 V110KP 1

An exceptional, next-generation **blade bearing grease**

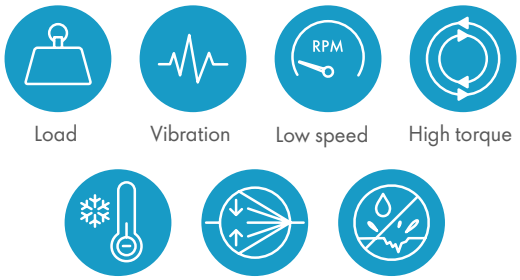
SUPPORTING THE LATEST WIND TURBINE INNOVATIONS

Shell Gadus S5 V110KP 1 is an outstanding synthetic grease for onshore and offshore wind turbines.

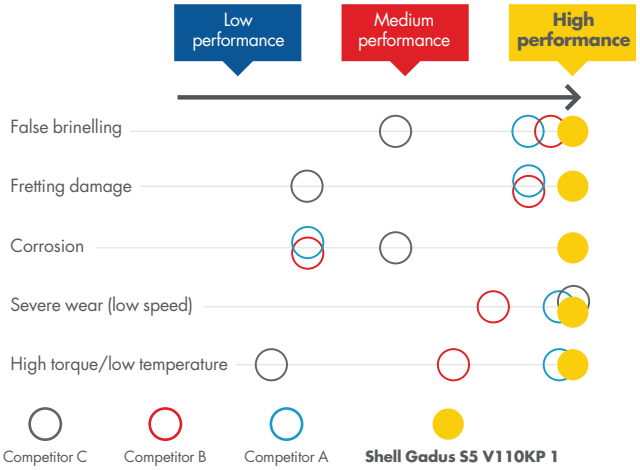
- Designed for turbines from 3 MW capacity up to next-generation 12 MW capacity and beyond.
- Developed with leading manufacturers and certified by major wind turbine OEMs.
- Also offers optimum protection for generator bearings and yaw roller bearings.

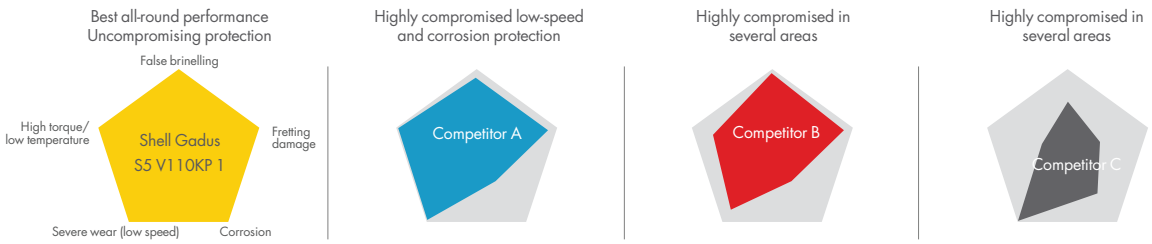
STEP CHANGE IN PERFORMANCE

In-depth field trials and laboratory tests confirm this grease provides exceptional protection against challenges, including:

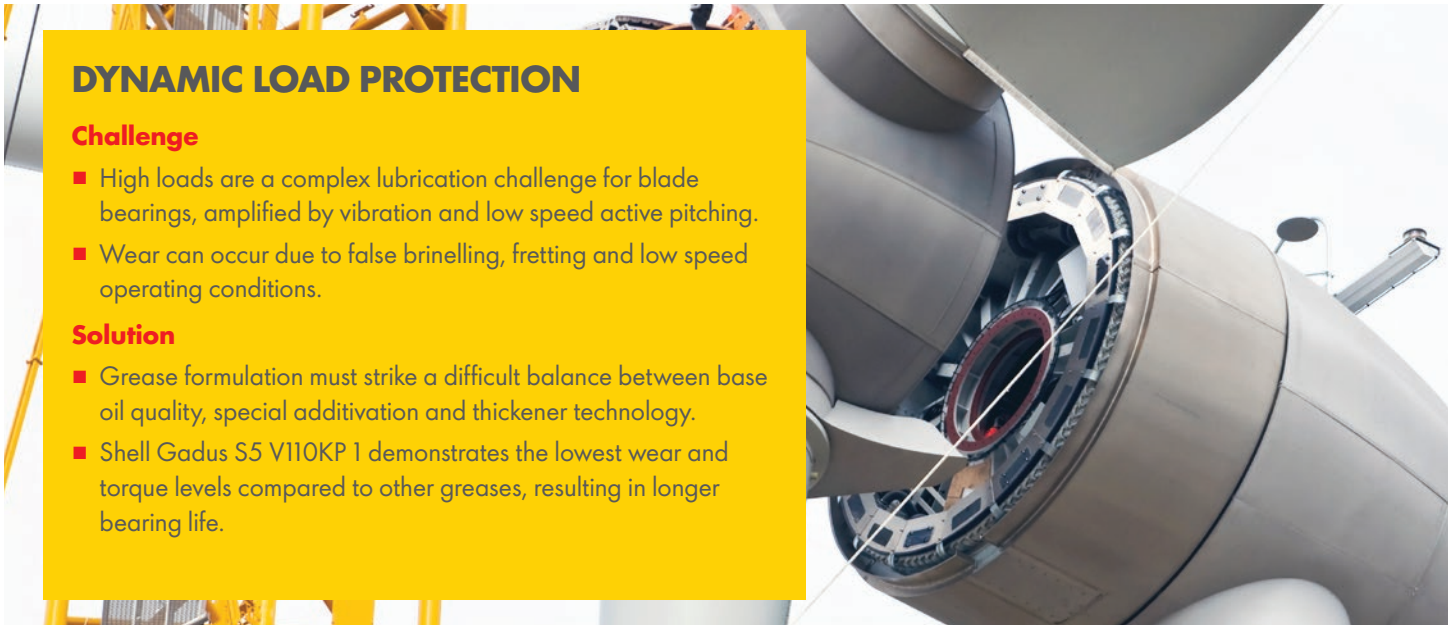


BENCHMARK FOR FAILURE PREVENTION





Real data from testing carried out by Shell. Graphs are scaled to be visually understandable and is the standard approach for all products.



DYNAMIC LOAD PROTECTION

Challenge

- High loads are a complex lubrication challenge for blade bearings, amplified by vibration and low speed active pitching.
- Wear can occur due to false brinelling, fretting and low speed operating conditions.

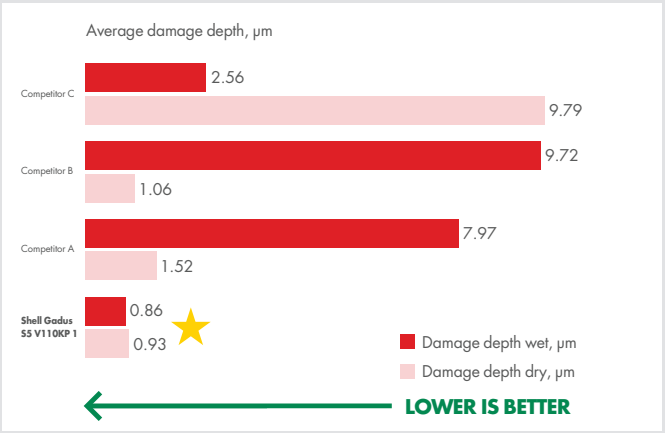
Solution

- Grease formulation must strike a difficult balance between base oil quality, special additivation and thickener technology.
- Shell Gadus S5 V110KP 1 demonstrates the lowest wear and torque levels compared to other greases, resulting in longer bearing life.

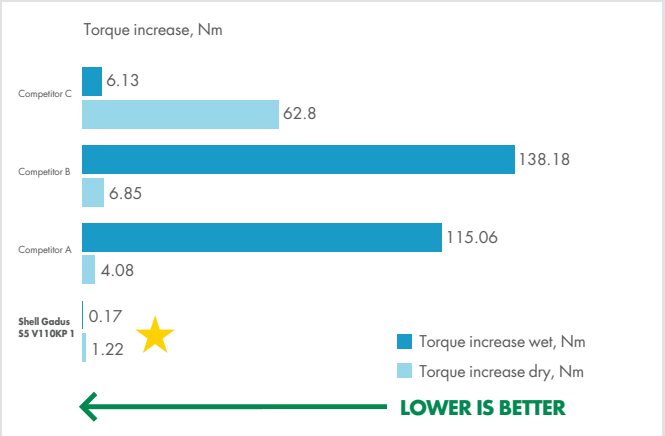
MODIFIED RIFFLE TEST

- Two axially loaded greased bearings.
- One flooded with 1% salt water, one runs dry.
- Vibrated at 7 Hz for 43 hours.
- Torque and damage analyzed.

HIGH LOAD, 3 GPA



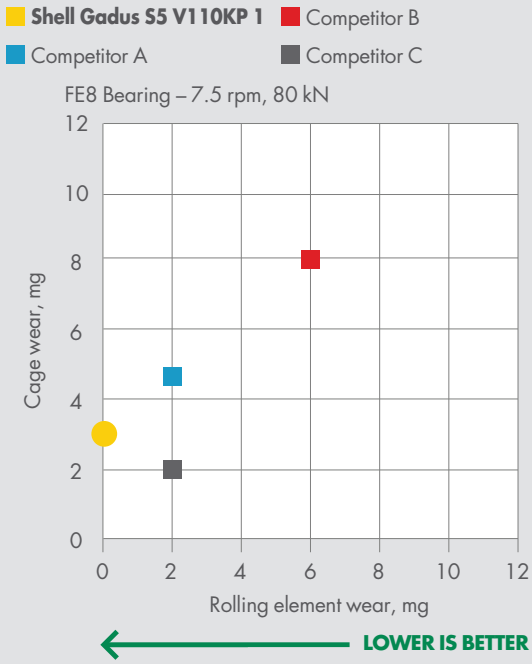
VIBRATION PROTECTION

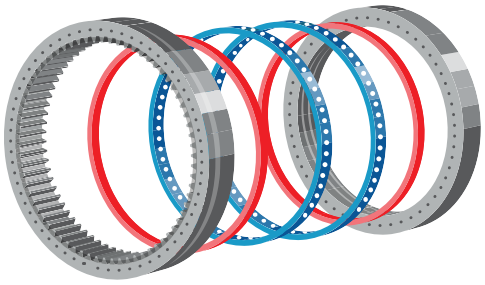


FE8 BEARING TEST

- Two loaded greased bearings per test run.
- Run for 500 hours at ambient temperature.
- Two test runs for the full test.
- Components weighed to determine weight loss.

ROLLING ELEMENT AND CAGE WEAR





Tests were conducted in laboratories of Shell Lubricant Solutions or partners using accepted standard methods.

CORROSION PROTECTION

Challenge

- Both humidity and condensation will be present in any type of wind turbine operating environment.
- This makes bearing surfaces vulnerable to rust and corrosion pit formations.

Solution

- Lubricants must maintain a stable film against water ingress.
- Choice of thickener, base oil, and additives will be critical to product performance.

EMCOR RUST TEST

- Two greased bearings in separate housings.
- Each housing roughly 1/3 filled with synthetic sea water.
- Predefined stop and start running for one week.
- Outer rings rated for rust from 0 to 5.

Shell Gadus S5 V110KP 1

0-Excellent

Competitor C

2-Fair

Competitors A and B

3-Poor

Low Quality Grease

5-Very poor

HIGH TORQUE PREVENTION AND PUMPABILITY AT LOW TEMPERATURE

Challenge

- Greases with poor pumpability can block lubrication systems, increase the starting torque in bearings, and risk mechanical wear through grease starvation.

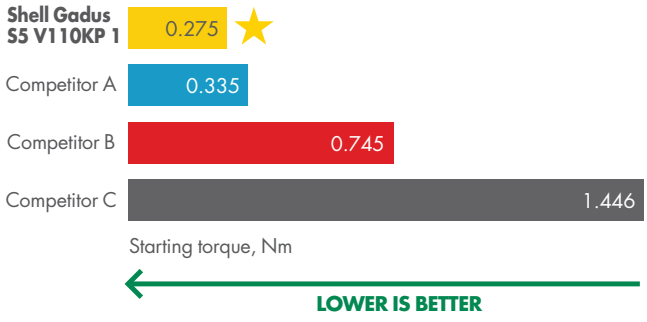
Solution

- Formulated with select synthetic base oils and optimized thickener technology ensure grease mobility at arctic temperatures.
- Choice of thickener, base oil, and additives are critical to product performance.

LOW TEMPERATURE TORQUE

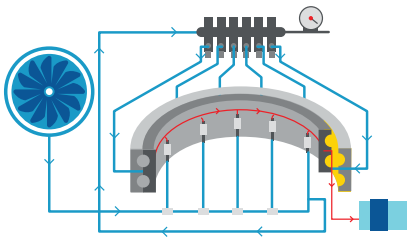
- Bearing greased and kept at -40°C for two hours.
- Accurate motor starts the bearings.
- Torque needed recorded as starting torque.

FIGURE RIGHT: Testing shows that Shell Gadus S5 V110KP 1 allows for better starting torque than competitor greases.



LINCOLN P203 PUMPABILITY TEST

- Grease pumped through lubrication system.
- Temperature reduced to -40°C.
- Pump pressure measured during cooling.



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APPROVALS & COMPATIBILITY

Shell Gadus S5 V110KP 1 meets the grease requirements of major wind turbine, wind bearing, and lubrication system OEMs. Official documentation of OEM approvals is available, such as Vestas, ZWZ, and BEKA on the product TDS. Please consult your Shell Technical Advisor to confirm suitability for use.

The grease is compatible with:

- A wide range of materials used in wind turbines, such as metals and polymers.
- Most other greases used in the industry.

Please consult your Shell Technical Advisor before replacing an existing grease with Shell Gadus S5 V110KP 1.

A COMPLETE PORTFOLIO FOR WIND TURBINES

1 MAIN GEARBOX
- Shell Omala S5 Wind 320
- Shell Omala S3 Wind 320

2 YAW & PITCH GEARED DRIVE
- Shell Omala S5 Wind 320
- Shell Omala S4 GXV oils
- Shell Omala S4 WE oils

3 GENERATOR BEARING
- Shell Gadus S5 V110KP 1
- Shell Gadus S5 V100 2

4 PITCH/BLADE BEARING
- Shell Gadus S5 V110KP 1
- Shell Rhodina BBZ

5 HYDRAULIC BRAKE & PITCH
- Shell Tellus S4 VE 32
- Shell Tellus S4 VX 32
- Shell Tellus S2 VX 32

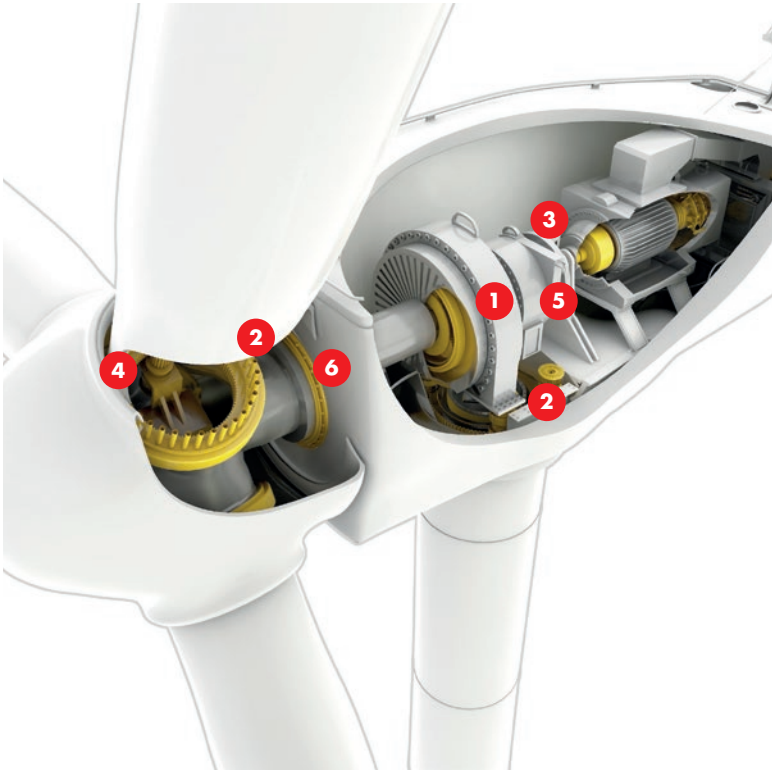
6 MAIN SHAFT BEARING
- Shell Gadus S5 V460KP 1.5

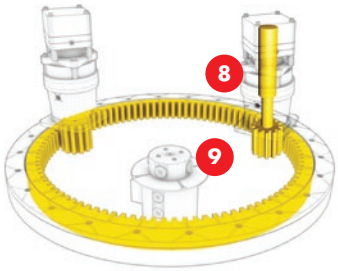
7 TRANSFORMER
- Shell Diala S5 BD
- Shell Diala S4 ZX-IG

8 YAW ROLLER BEARING
- Shell Gadus S5 V110KP 1
- Shell Rhodina BBZ

8 YAW PLAIN BEARING
- Shell Gadus S5 V460KP 1.5
- Shell Gadus S5 T460 1.5

9 YAW & BLADE OPEN GEAR
- Shell Gadus S4 OG greases





CONTACT US

For more information, visit shell.us/wind
or contact your Shell representative.