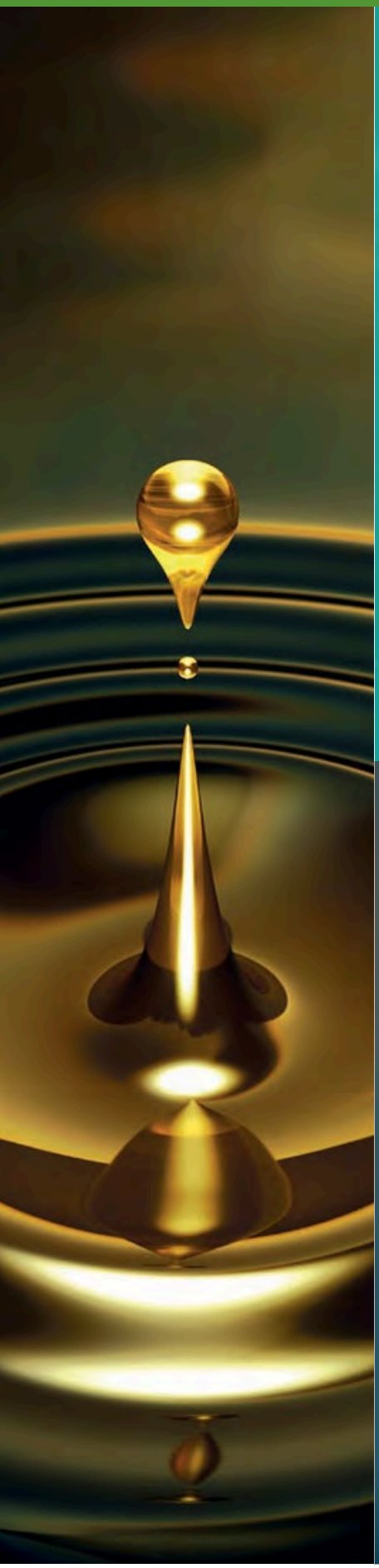
REWITEC™

Improving micropitting and white etching crack (WEC) resistance in gear and bearing systems

Meeting performance challenges in wind turbine bearings and gears with REWITEC™



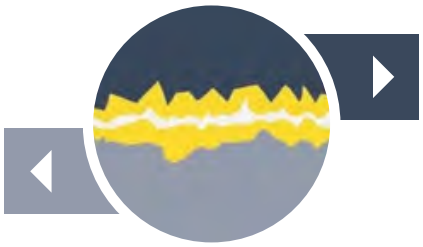
Moving machinery poses challenges to engineers everywhere: How to improve durability, longevity and reduce frictional losses? These losses can significantly increase costs associated with down time, repair and replacement of components; as well as reduce energy efficiency. Founded in 2003 in Lahnau, Germany, REWITEC™ offers lifetime extending and performance-enhancing solutions for gearboxes, bearings and engines within wind turbine, automotive and marine industries worldwide. REWITEC™ additives utilize patented nano- and micro-particles to form reconditioning layers, which have been proven to increase the durability of machinery by lowering friction and reducing wear. Use REWITEC to protect your investments against wear and premature failure.

A different perspective to lubrication

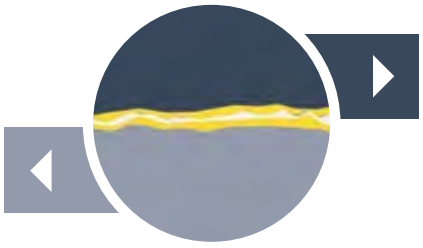
Although tribological research has made significant progress in recent years, especially in the field of computer simulation, it is still difficult or impossible in many cases to record all the influencing parameters on wear and tear. Therefore, since establishing ourselves in the field of lubrication, we have developed an unrivalled relationship with our customers and continue to work side-by-side with them in the field to understand and categorise the different challenges that they face.

The difference REWITEC™ makes

Damaged metal surfaces within a gearbox or bearing increase the likelihood of failure. The existing lubricant is used as a carrier to deliver REWITEC technology to the mixed friction areas within the lubricated component.



The REWITEC particles react to the increased temperatures produced in the mixed friction zones, forming a protective and reparative layer.



The modified surfaces provide a more even load distribution and friction, wear and temperatures become significantly reduced. The properties of the existing lubricant remain unchanged.

Application areas

Wind Energy

Manufacturers and operators of wind turbines rely on smooth and continuous operation. REWITEC offers innovative ingredients for the wind industry that are able to prolong asset life and improve operational safety.

MAIN GEARS • MAIN BEARINGS • GENERATOR BEARINGS • PITCH AND AZIMUTH GEARS/BEARINGS

Industry

REWITEC offers long-term investment protection for engines, transmissions and bearings, leading to reduced downtime for maintenance.

GEARBOXES • GENERATORS • COMPRESSORS • BEARINGS

Marine

Low sulfur fuels can have a negative impact on marine 2-stroke engines. REWITEC can improve operational reliability in these challenging conditions, as well as in auxiliary 4-stroke engines and other lubricated moving machinery.

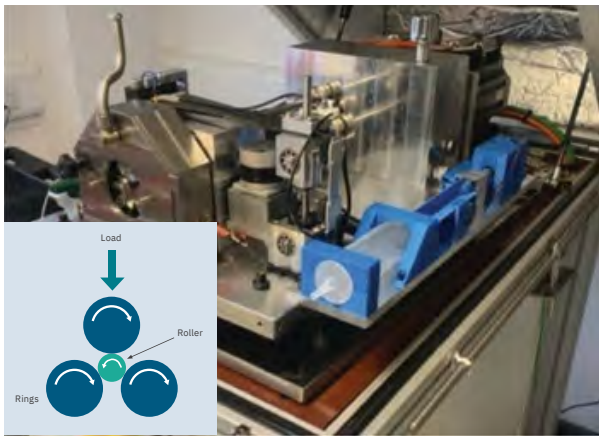
MAIN ENGINES & AUXILIARY DIESELS • WINCHES • SEPARATORS

Au tomot ive

REWITEC provides a multitude of benefits for automotive applications. The mechanism of action of REWITEC allows for improved energy efficiency as well as reduced vibrations, noise and torque. REWITEC products are also suitable for construction and performance racing vehicles, having outstanding effects.

ENGINES • GEARBOXES • BEARINGS • DIFFERENTIALS

White etching crack (WEC) testing: oil



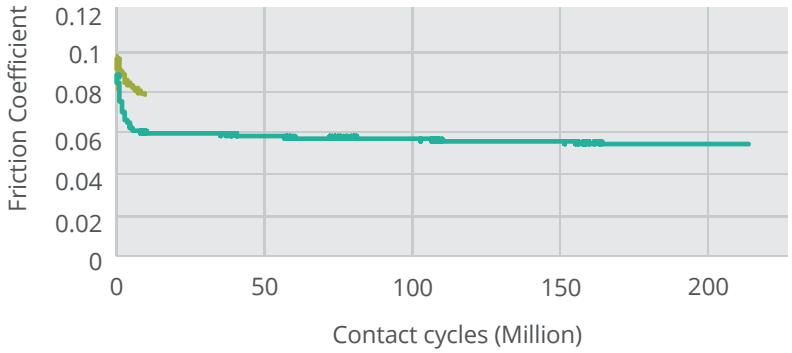
Load (N)	Speed (ms-1)
500	3.4
SRR (%)	**Temperature (°C)**
30	100

WEC is a form of premature failure in hardened steel bearings. It is the subsurface transformation of the steel that forms a network of damage that can be initially hidden. It manifests itself as pits, spalls and cracks in the surface of the bearing and can take as little as one year to produce measurable results in the field.

WEC testing was conducted on behalf of Cargill by Ingram Tribology using a 3-disc machine and the test was run for 200 hours or until spalling occured.

The addition of 0.2% REWITEC™ to a standard transmission oil significantly reduced the risk of spalling caused by WECs and extended the duration of the test from 8.4 hours to at least 200 hours

Friction coefficient

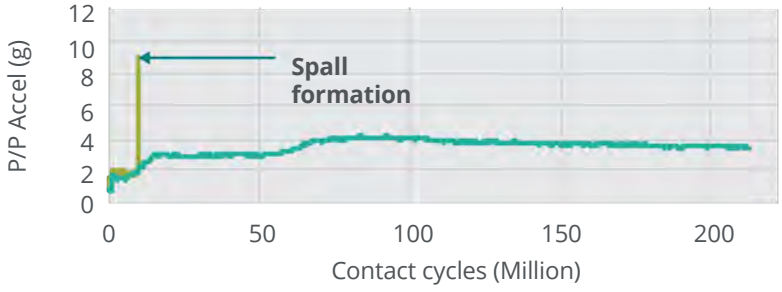


- Spalling occured with the the standard oil after 8.4 hours.
- For the untreated oil, the test was stopped after 9.4 million cycles because the acceleration limit in this test is 10g.

Standard oil

Standard oil + 0.2% REWITEC™

Disc acceleration

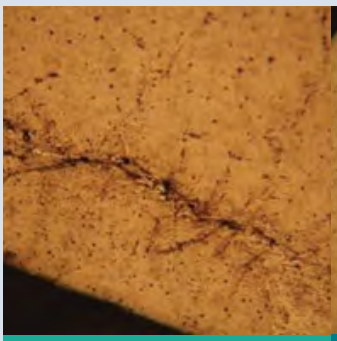


- The addition of 0.2% REWITEC™ extended lifetime to at least 213 million cycles (the test was manually stopped at this point)
- Reduction in friction observed suggests lower stress on the surface

REWITEC reduces micropitting formation

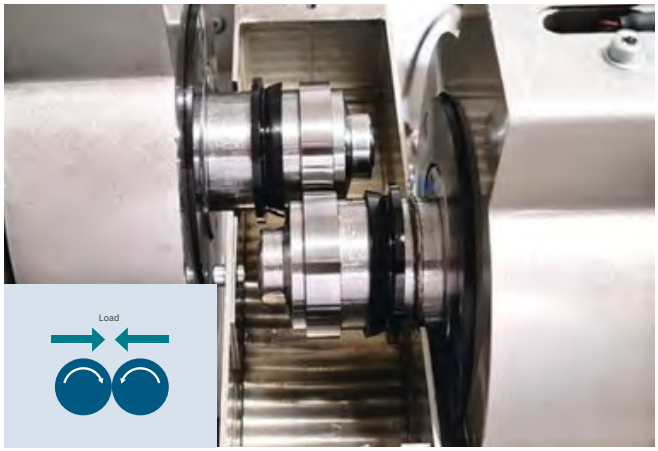
Standard oil After 8.4 hours		Standard oil + 0.2% REWITEC™ After 200 hours	
			
Micropit formation after 8.4 hours running (9.4 million cycles)	Micropit formation after 8.4 hours running (9.4 million cycles)	200 hours running) (213 million contact cycles)	Significantly reduced micropit formation

REWITEC reduces WEC under the surface in the three-disc test

Standard oil After 8.4 hours		Standard oil + 0.2% REWITEC™ After 200 hours	
			
Top of wear track	0.55 mm through wear track	Top of wear track	0.55 mm through wear track

The addition of 0.2% REWITEC™ to a standard transmission oil improves performance in the three-disc test. While surface damage remains, checking 0.55mm through the wear track reveals no WEC damage versus the untreated oil, even after a 20-hour test, representing more than 200 million cycles at 500N load.

2-disc testing: oil



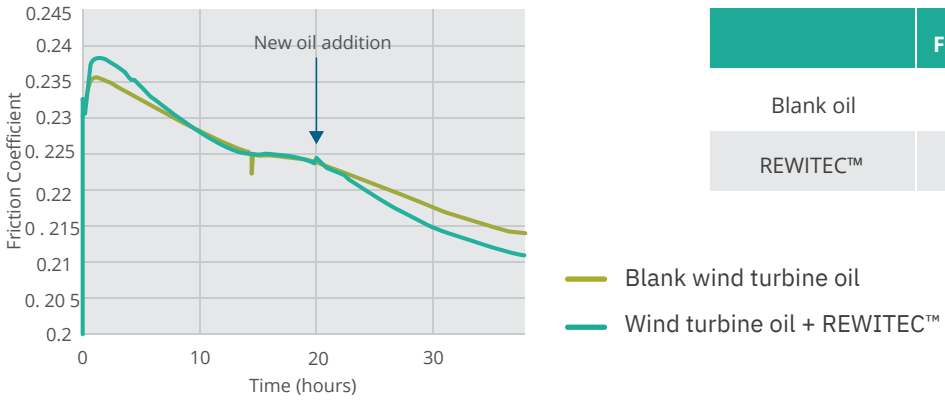
The 2-disc test is a high load rolling contact simulator. We used 100Cr6 bearing steel discs with an Ra surface roughness of 0.4 µm

The 2-disc machine is a high load rolling contact machine, used to simulate conditions found in both wind turbine bearings and gears. We use the 2-disc test to understand the friction reduction effects of REWITEC between high-load rolling-line contacts.

An untreated wind turbine oil was fed into the contact at 60°C. After 20 hours, the oil was topped up with more oil or more oil containing REWITEC™

Time (hours)	Slip (%)	Speed (rpm)	Load (N)
40	20	424	3,063

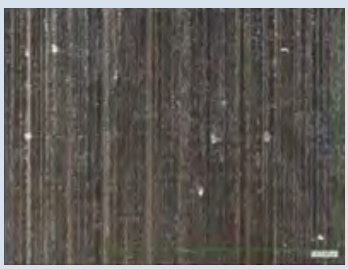
After 20 hours, the addition of oil containing 0.2% REWITEC™ reduced the final friction by 5.5%.



	Friction reduction at the end of the test
Blank oil	-3.3%
REWITEC™	-5.5%

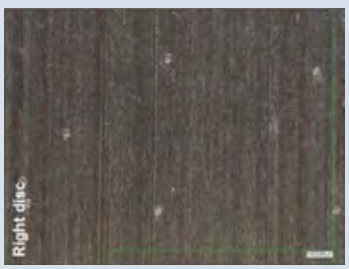
Surface repair

Gear oil



Ra = 0.30 µm
Rz = 2.70 µm

Gear oil + REWITEC™



Ra = 0.20 µm
Rz = 1.62 µm

REWITEC™ reduced the 2-disc surface roughness: Ra: - 34%, Rz: -40%

FZG temperature test: oil

The FZG test was used to assess the operating temperature over the different load stages.

Sliding speed (ms-1)	Initial temperature (°C)	Time per step (hours)
8.3	40	4

		Load stages – results after four hours			
Load stage	**Units**	**6**	**7**	**8**	**9**
Temperature, untreated wind turbine oil	°C	70.7	93.9	103.6	124.9
Temperature, wind turbine oil + 0.2%	°C	70.7	91.9	98.9	114.5
Temperature change	**%**	**0**	**-2**	**-5**	**-8**

At each load stage, the addition of 0.2% REWITEC™ top treated into a wind turbine oil reduced the operating temperature over the four-hour test.

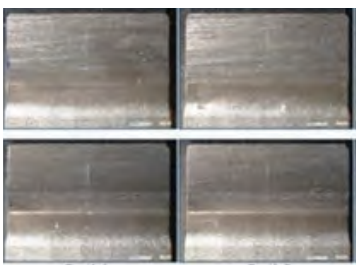
After the end of load stage 9, REWITEC™ resulted in an 8% temperature reduction versus an untreated oil.

Mass loss after load stage 9

Lubricant	Mass loss –wheel (mg)	Mass loss –Pinion (mg)	Profile shape deviation of pinion (mg)
Wind turbine oil	11	18	4.7
Wind turbine oil + REWITEC™	7	7	2.6

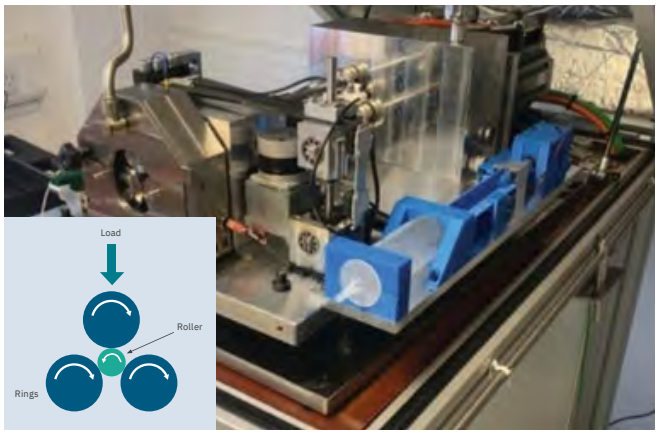
Before test

After test



The addition of 0.2% REWITEC™ to the wind turbine oil significantly reduced mass loss at the wheel (36% improvement) and pinion (61% improvement) and reduced shape deviation of the pinion by 45%, overall indicating significantly less wear.

Micropitting testing – in grease

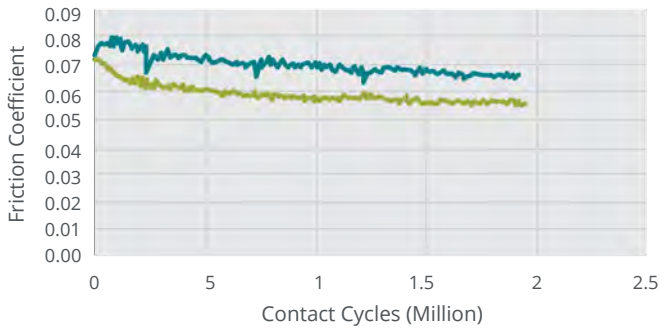


Within highly loaded gear and bearing systems such as those in wind turbines, micropitting is an ongoing challenge with various potential solutions discussed within the industry.

Here we demonstrate the ability of REWITEC to mitigate the effects of micropitting in the three-disc test when added at 2% to a lithium complex wind turbine main bearing grease.

After 2 million cycles, a grease treated with REWITEC reduced friction by 17% versus an untreated grease

Load (N)	Speed (ms-1)	SRR(%)	Temperature(°C)
600	1	30	57



Grease	Start of test	243 K cycles	729 K cycles	1.215 M cycles	1.945 M cycles
Main bearing grease					
Main bearing grease + 2% REWITEC™					

The addition of 2% REWITEC™ to the grease significantly reduced micropitting damage after 2 million cycles, potentially significantly improving the lifetime of a bearing or gear system.

Optimise bearing and gear efficiency and lifetime

Notes

About us

The technology company, founded in 2003, is dedicated to promoting the longevity and energy efficiency of plants, machines, and gearboxes. With the development of nano- and microparticle-based lubricant additives, REWITEC® aims to enhance the sustainable lifespan of treated engines and gearboxes, thereby contributing significantly to energy efficiency.

With the goals of protecting investments from wear and excessive energy consumption, as well as achieving system safety and ease of repair, the medium-sized lubricant specialist REWITEC® markets its solutions worldwide.

For its own development, however, the independent company places great importance on high-quality manufacturing in Germany. For this reason, all research, development, and production take place at its headquarters in Lahnau.

Further information

For further information or guidance please contact us:
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