VENTOGUARD® MATERIALS

For long, trouble-free plant operation:
Ventoguard® premium class materials

In order to further improve the technical availability of wind turbines, we have developed a new generation of materials: Ventoguard®.

In addition to a longer service life, excellent dependability and functional reliability, these premium materials also offer clear cost advantages. Extreme climates in the different regions of use and exposure to greases, salty air and ozone – seals in wind power plants are exposed to extreme conditions.

With Ventoguard®, Freudenberg Sealing Technologies, the world's leading supplier of sealing technology, has now developed a new generation of premium materials, tailored to various applications in wind turbines. For a long, trouble-free plant operation.

VALUES TO THE CUSTOMER

- Significantly better relaxation behavior than before over the long term and at higher temperatures
- Particularly resistant to weathering and greases
- Excellent ozone resistance
- Very good abrasion resistance
- Can be used in a wide temperature range
- Long-term sealing effect
- Contaminant-free according to Freudenberg standard

Freudenberg
Sealing Technologies

VENTOGUARD® MATERIALS

FEATURES AND BENEFITS

Ventoguard 453
In addition to an excellent relaxation behavior, as well as a very good long-term resistance to a variety of greases, Ventoguard 453 is characterized by its excellent low-temperature behavior. The material retains its low-temperature flexibility even at temperatures of -55 °C (statical range).

Ventoguard 454
The most important feature of Ventoguard 454 is its compatibility with all common greases. The NBR material is both cold- and ozone-resistant and has an aging behavior that may permit a doubling of the durability at the same temperature (see fig. 2). Also significant is the better resilience of Ventoguard 454 compared with standard materials.

Ventoguard 461
The FKM profile material Ventoguard 461 impresses by a maximum resistance to weather, heat and media. The long-term stability of the material ensures reliable and economic operation of the wind turbine on a sustainable basis. This is especially true for applications in high temperature areas.

Ventoguard 467
An excellent resistance to wear and tear and outstanding resistance to UV light, ozone and aging are the prominent features of the HNBR material Ventoguard 467. With operating temperatures of up to 120 °C, it builds a bridge between NBR and FKM variants. Ventoguard 467 is used especially in the sealing of main bearings and gears and wind turbines.

Ventoguard 471
Due to its high weathering resistance, the EPDM material Ventoguard 471 is typically used in nacelle seals. Ventoguard 471 can be used at temperatures between -40 °C and +80 °C (for short periods at up to +100 °C) and is resistant to ozone.

Ventoguard 472
On account of its excellent relaxation behavior and salt water resistance, this material is used, for example, to seal the fittings at the transition between pile and foundation of wind turbines. Ventoguard 472 was specifically designed to satisfy narrower tolerance limits and to ensure a flawless seal effect for many years.

VENTOGUARD® MATERIALS

FEATURES AND BENEFITS

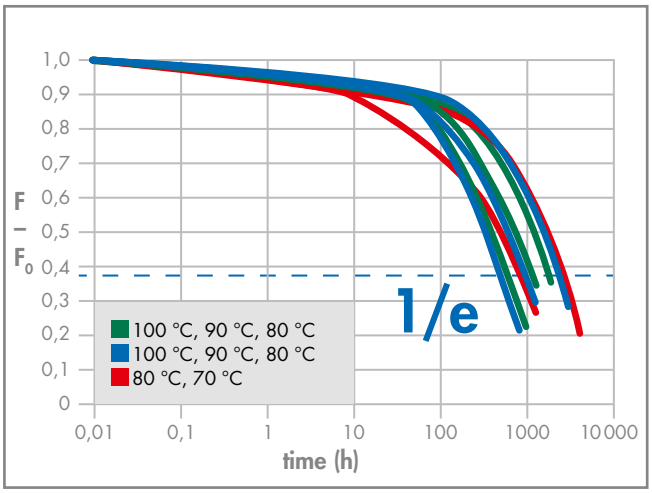

Fig.1: Laboratory results of the continuous tensile stress relaxation, unlubricated elastomer rings in warm air at 20% elongation

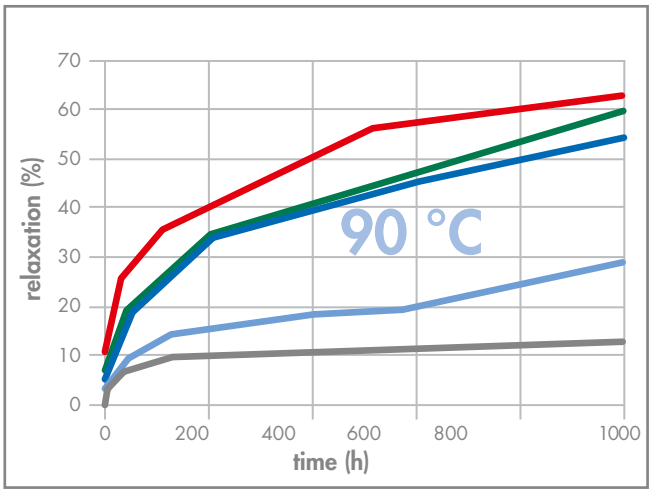

Fig.3: Laboratory results of the compression stress relaxation pursuant to DIN ISO 3384-A at 90 °C

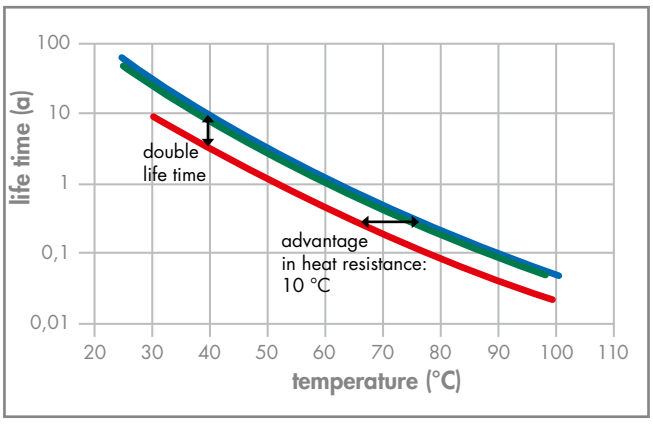

Fig.2: Estimate of the service life on the basis of measurements analogous to laboratory conditions from fig. 1

- Ventoguard® 453
- Ventoguard® 454
- Ventoguard® 454 + grease film
- Ventoguard® 461 (FKM)
- 70 NBR 215544

VENTOGUARD® MATERIALS

FEATURES AND BENEFITS

Materials		70 NBR 215544	Ventoguard 453	Ventoguard 454	Ventoguard 461	Ventoguard 467	Ventoguard 471	Ventoguard 472
Typical applications		**Profiles for pitch bearings, dust seal**				Radial shaft seal ring for gears, main bearings	Profiles for nacelle sealing	
Density	g/cm²	1,23	1,20	1,24	1,87	1,26	1,13	1,15
Hardness	ShA	71	72	75	76	75	70	73
Modulus 100%	N/mm²	5,7	6,4	6,1	5,7	7	5,2	8,9
Tensile strength	N/mm²	19,9	16,3	19,0	11,0	20,0	15,0	16,6
Elangation at break	%	255	225	270	305	306	290	150
Compression set (24h/70 °C)	%	23	15	14	13	15	28	9
Ozone resistance (50 pphm)	Cracking stage	0	0	0	0	0	0	0
Glass transition temperature Tg (DSC)	°C	–32	–49	–38	–18	–21	–49	–56
Application range (static)	°C	–40 to +70	–55 to +80	–45 to +80	–25 to +200	–50 to +120	–50 to +80	–40 to +120
Application range (dynamic)	°C	–30 to +70	–45 to +80	–35 to +80	–20 to +200	–20 to +120	–40 to +80	–50 to +120

21 US 001 0.5 14.09 brn.abf