WACKER

CREATING TOMORROW'S SOLUTIONS

HDK®

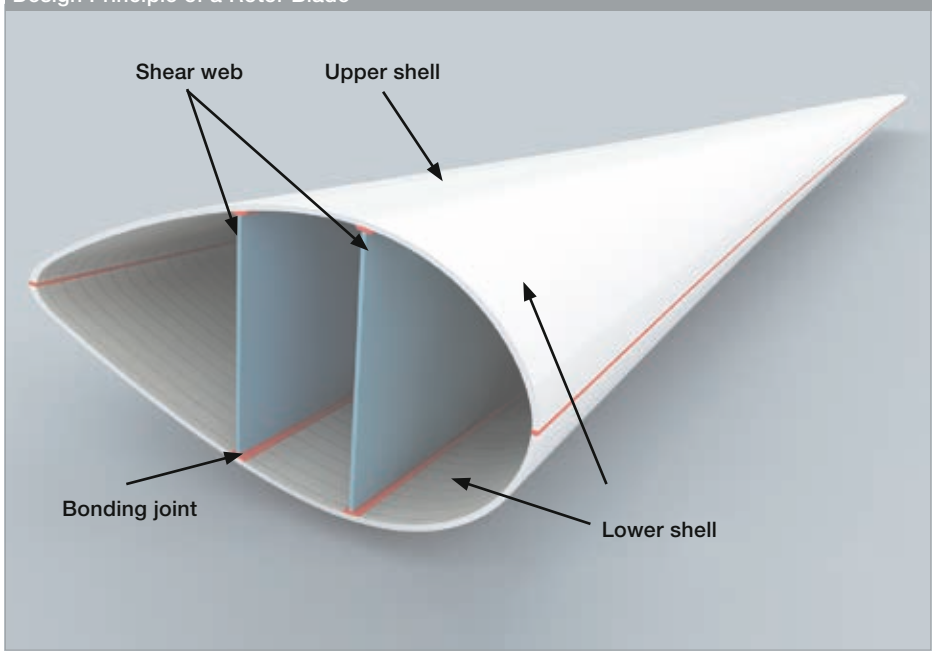
ADHESIVES I PYROGENIC SILICA

FOR EFFICIENT BONDING PASTES ONE GRADE BETTER: HDK® H18

HDK® H18 – THE BEST GRADE FOR EFFICIENCY

To meet the demand for higher energy yields from wind turbines, ever longer rotor blades must be constructed – meaning heavier blade weight. This impacts not only on blade design and materials, but on how the blades are bonded together. The standard adhesives employed are 2-component bonding pastes, which consist of a resin and a curing agent. HDK® pyrogenic silica plays a decisive role in the processing of these two components.

Design Principle of a Rotor Blade



The blades of a wind turbine are made by bonding together half-shells composed of different materials.

An Innovation that Pays Off

In HDK® H18, WACKER offers a new grade of pyrogenic silica that exhibits a superior level of performance, especially in these bonding pastes. It is readily incorporated into epoxy resins to impart an exceptionally high viscosity and remarkable storage stability. What is more, since comparatively little HDK® H18 is required, the cured adhesive has less tendency to embrittle.

A Partner You Can Count On

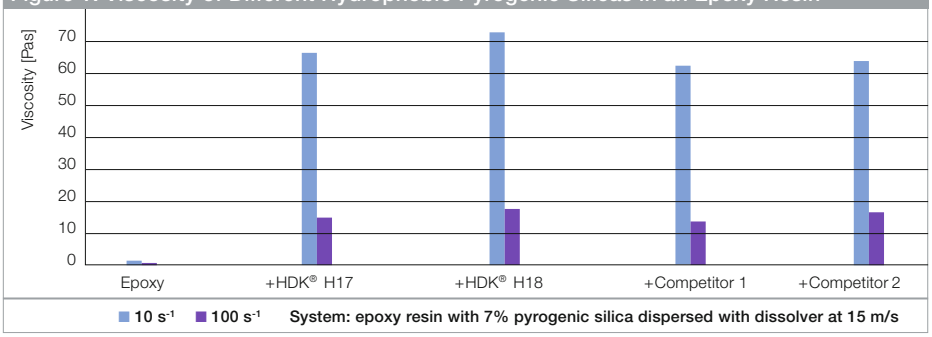
WACKER is one of the world's leading producers of pyrogenic silica and has a product portfolio that is remarkable for its breadth and depth. Driven by innovation, WACKER has a specialty grade for every application, each grade offering a key performance advantage. Why not give us a call? With our research capability and applications engineering, we can find or create an HDK® grade that meets your needs and gives you the all-important edge, whether in processing itself or the final product.

BETTER PERFORMANCE
SHORTER PRODUCTION CYCLES

HDK® H18 has been developed specifically for use in polar systems, such as epoxy resins and polyurethanes. It is characterized by a high specific surface area, and has a specific coating which renders it highly hydrophobic. This makes it particularly adept at controlling the rheology of polar systems.

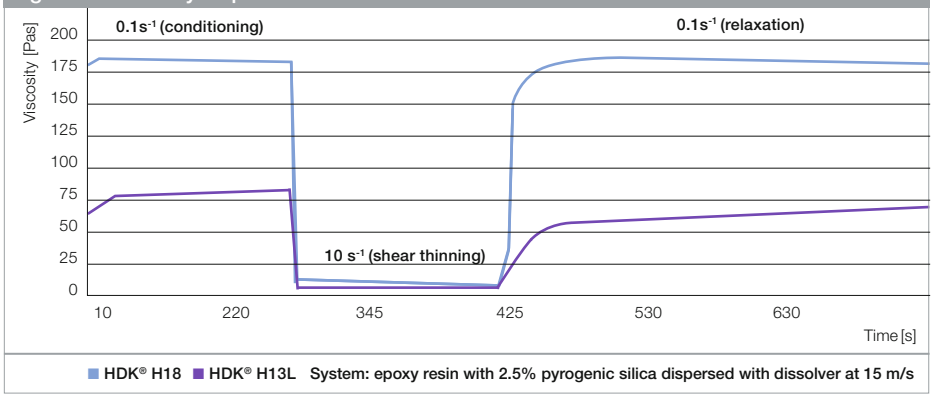
The resultant bonding pastes have an extremely high viscosity and produce non-sag adhesive beads directly upon application. Furthermore, as formulations containing HDK® H18 undergo shear-thinning, users can be assured of perfect processing results.

Figure 1: Viscosity of Different Hydrophobic Pyrogenic Silicas in an Epoxy Resin



HDK® H18 has a typical performance advantage of 10 – 15%, e.g. for wind turbine bonding pastes.

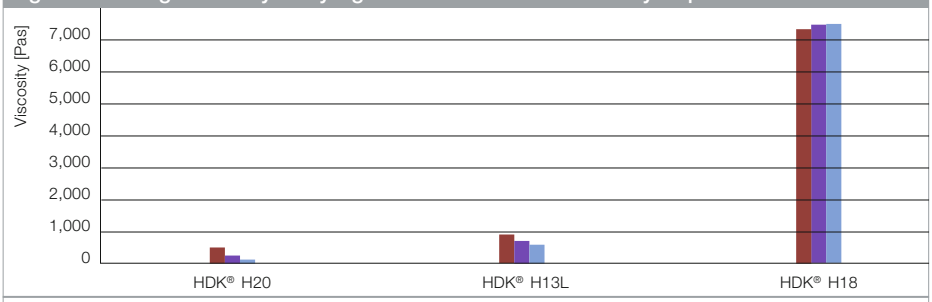
Figure 2: Viscosity Dependance on Shear Rate



The viscosity of HDK® H18 in epoxy resins recovers fast after shear thinning.

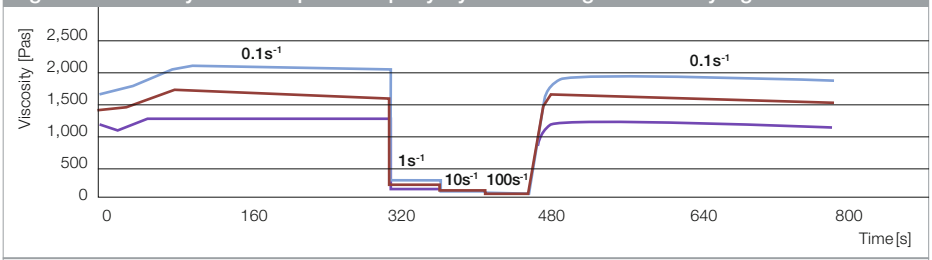
EFFECTIVE IN LOWER AMOUNTS
WHAT COULD BE MORE EFFICIENT?

Figure 3: Storage Stability of Pyrogenic Silicas with Different Hydrophobic Treatments



System: epoxy resin with 8 w% HDK®
Dispersing equipment: dissolver
Viscosity measured at shear rate 0.1 s^{-1} after relaxation

Figure 4: Viscosity of 2-Component Epoxy Systems Using Different Pyrogenic Silicas



HDK® H18 Competitor 1 Competitor 2
System: component A = 92% Epikote 828 epoxy resin / 8% hydrophobic pyrogenic silica (HDK® vs. competitor 1 vs. competitor 2); component B = Epikure 137 amine hardener

2-component epoxy systems containing HDK® H18 are more viscous than their benchmarks.

HDK® H18 also imparts remarkable long-term storage stability and excellent efficiency. This means not only that the proportion of pyrogenic silica in bonding pastes can be reduced, but also that the cured resin has less tendency to embrittle.

The blend of the two adhesive components, too, exhibits superior rheological properties at very low HDK® H18 content.

Joint Solutions

We also offer you optimized grades for other resins and adhesive formulations, too. Just contact us! Together we'll find a solution – one grade better.

WIND POWER – HARNESSED BY WACKER

HDK® Hydrophobic Grades – Physicochemical Properties		
HDK®		**H18**
BET surface area of hydrophobic silica DIN EN ISO 9277/DIN 66132	[m^2/g]	Approx. 120
pH in 4% dispersion (1 : 1 mixture of water/methanol) DIN EN ISO 787-9		4.0 – 6.8
Tamped density, DIN EN ISO 787/11	[g/l]	Approx. 50
Loss on drying, ex works (2 h at 105 °C) DIN EN ISO 787-2	[wt. %]	< 0.6
Sieve residue DIN EN ISO 787-18	[wt. %]	< 0.3
Carbon content, DIN ISO 10694	[wt. %]	Approx. 4.0 – 5.2
Surface modification		Polydimethylsiloxy

Note: These figures are intended as a guide and should not be used in preparing specifications.

Our Expertise Goes Far Beyond Rotor Blades

WACKER is one of the most research-intensive chemical companies in the world and has been developing solutions for sustainable energy supplies for many years. In the wind power sector, we provide highly specialized product solutions for a successful future with renewable energy technologies. Simply call one of our experts or visit our internet site.

HDK®

HDK® is not just used in bonding the rotor blades. It also serves to secure the turbine in its foundations.

ELASTOSIL® C

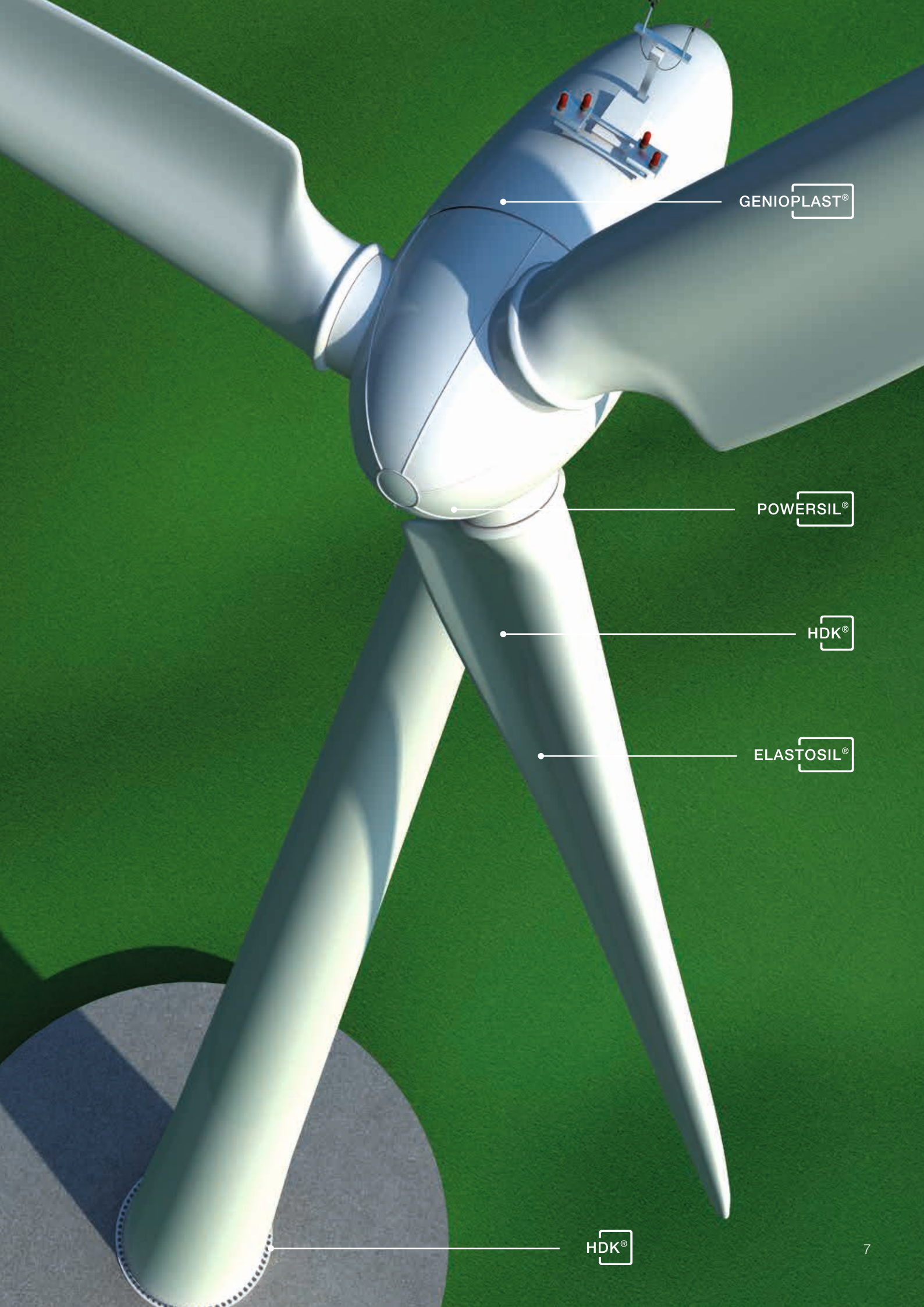
ELASTOSIL® C vacuum bags streamline the manufacture in infusion process of the requisite fiber composites. Multiple use of silicone vacuum bags reduces tooling time and waste.

POWERSIL®

POWERSIL® silicone transformer fluid is used in transformers for cooling and to provide electrical insulation, as it ensures largely maintenance-free operation. This fluid also offers excellent long-term heat resistance, high thermal shock resistance, and cold-start properties.

GENIOPLAST®

GENIOPLAST® performance additives from WACKER aid the extrusion of wind-turbine control cable jackets and enhance abrasion/scratch resistance during final assembly.


GENIOPLAST®
POWERSIL®
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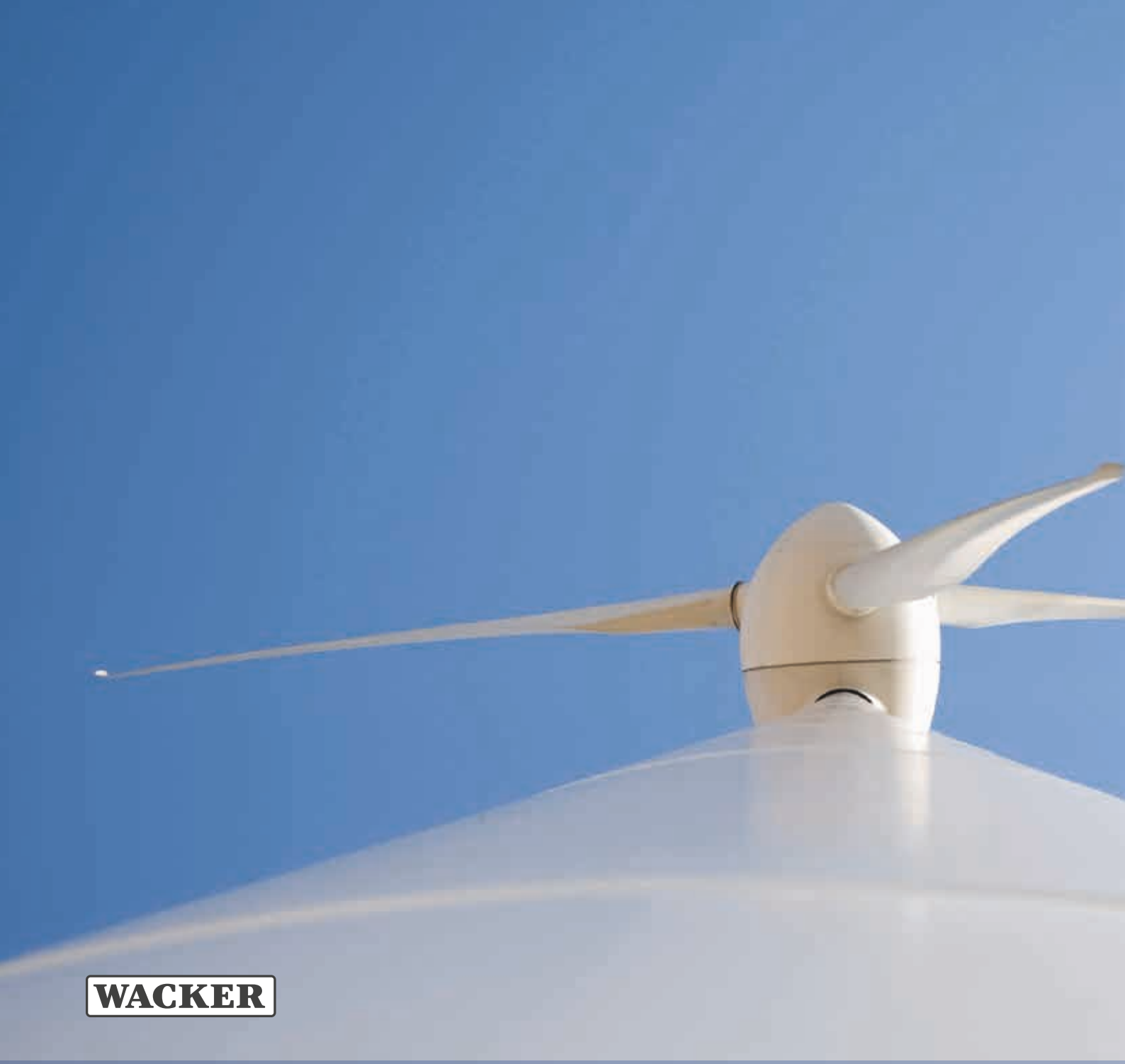

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