

**WACKER**

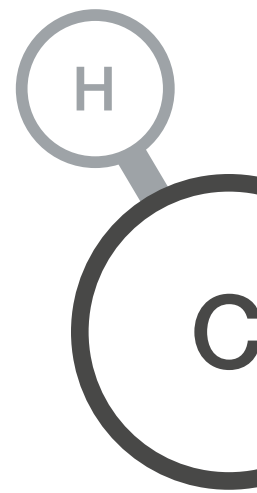
CREATING TOMORROW'S SOLUTIONS

VINNAPAS®

VINNOL®

CONSTRUCTION & SEALANTS | POLYMER BINDERS | NORTH AMERICA

FORMULATING THE FUTURE –  
WITH VINNAPAS® DISPERSIONS  
FOR CONSTRUCTION & SEALANTS

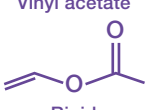


# MAKE THE MOVE TO VINNAPAS® VAE: THE HIGH-PERFORMANCE SOLUTION

Success in the construction and sealants market often depends on choosing the right binder. VINNAPAS® vinyl acetate-ethylene (VAE) technology offers outstanding benefits in terms of performance, safety and versatility.

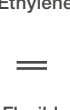
**Two Monomers Creating Best-in-Class Performance**

Vinyl acetate



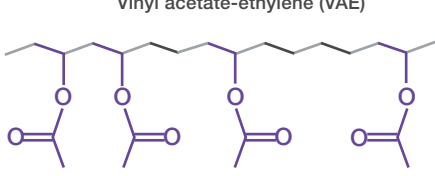
Rigid

Ethylene



Flexible

Vinyl acetate-ethylene (VAE)



**Polymer Properties Provided by Ethylene:**

- Softness ( $T_g$  approx.  $-125\text{ }^\circ\text{C}$ )
- Non-polar, hydrophobic
- Permanent flexibility
- High saponification resistance
- Form ideal copolymers with vinyl acetate

**Vinyl Acetate:**

- Hardness ( $T_g$  approx.  $32\text{ }^\circ\text{C}$ )
- Polar, hydrophilic
- Rigid

**VAE Copolymer and Terpolymer Dispersion Properties:**

VINNAPAS® VAE dispersions can be formulated into construction and sealants applications that provide outstanding benefits:

- Excellent adhesion to a wide variety of substrates
- High heat resistance
- Very fast setting
- Excellent machinability and re-emulsification properties
- Good cost / performance ratio
- $T_g$  range from approx.  $-35\text{ }^\circ\text{C}$  to approx.  $23\text{ }^\circ\text{C}$ , depending on ethylene content

Vinyl acetate-ethylene (VAE) dispersions are copolymers produced by the emulsion polymerization of hard, polar vinyl acetate monomer and soft, hydrophobic ethylene monomer.

Ethylene contributes permanent flexibility to the VAE polymer and so reduces the need for external plasticizers.

### Diverse Applications

VINNAPAS® VAE dispersions can be formulated into various construction and sealants applications:

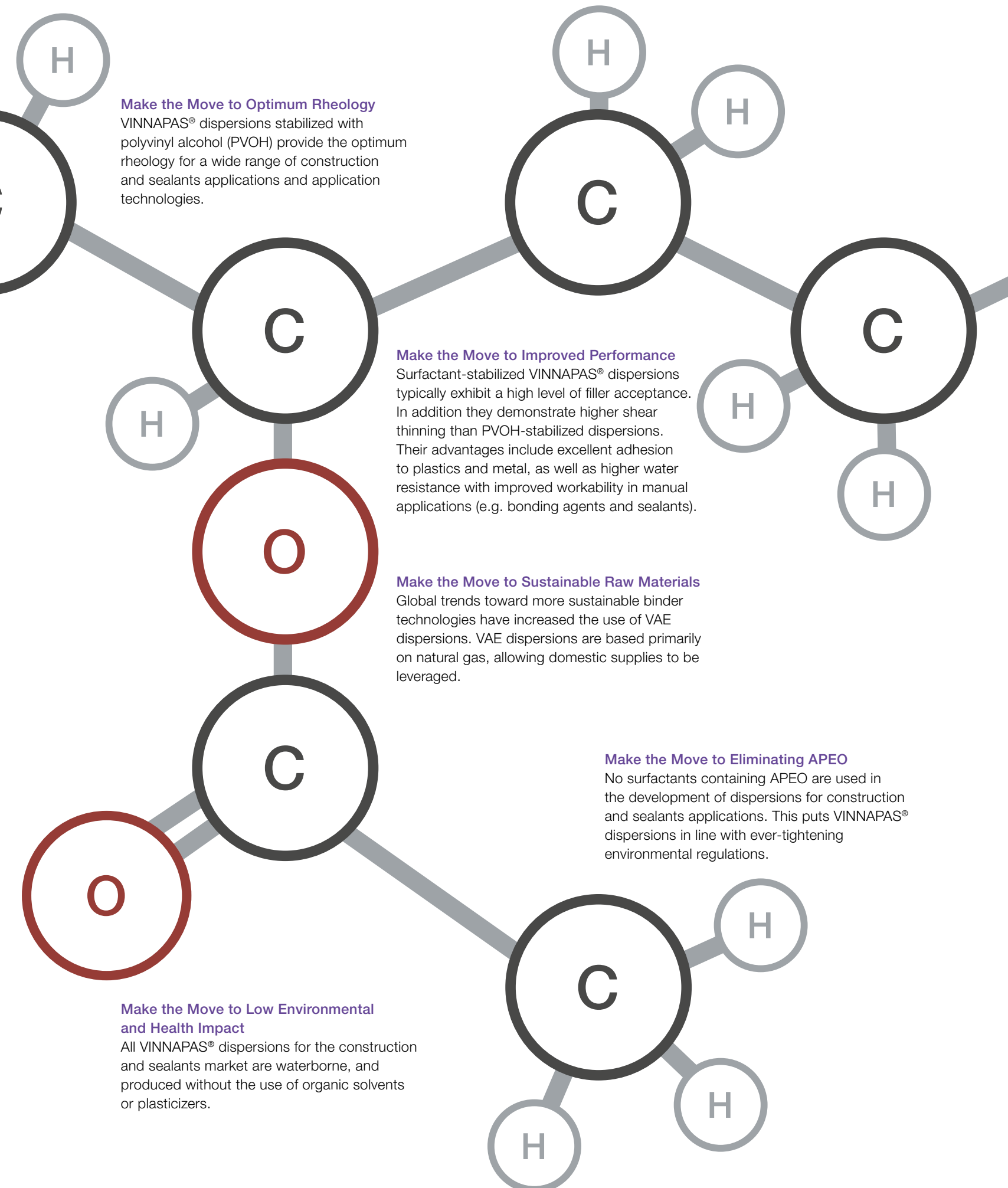
- Mastics
- Caulks
- Duct liner adhesives
- Ready-to-use drywall joint compounds
- Cement admixtures
- Bonding agents

VINNOL® dispersions are based on VC (vinyl chloride) – a monomer known for its inherent fire retardancy. VC can be easily polymerized with ethylene and vinyl acetate monomer to form co- and terpolymers. Aside from being fire retardant, VINNOL® dispersions are ideal for specialty applications thanks to their hydrophobicity and other properties.



For more information  
on VAE technology, visit:  
[www.wacker.com/move](http://www.wacker.com/move)

VINNAPAS® and VINNOL® are registered trademarks of  
Wacker Chemie AG.



**Make the Move to Optimum Rheology**

VINNAPAS® dispersions stabilized with polyvinyl alcohol (PVOH) provide the optimum rheology for a wide range of construction and sealants applications and application technologies.

**Make the Move to Improved Performance**

Surfactant-stabilized VINNAPAS® dispersions typically exhibit a high level of filler acceptance. In addition they demonstrate higher shear thinning than PVOH-stabilized dispersions. Their advantages include excellent adhesion to plastics and metal, as well as higher water resistance with improved workability in manual applications (e.g. bonding agents and sealants).

**Make the Move to Sustainable Raw Materials**

Global trends toward more sustainable binder technologies have increased the use of VAE dispersions. VAE dispersions are based primarily on natural gas, allowing domestic supplies to be leveraged.

**Make the Move to Eliminating APEO**

No surfactants containing APEO are used in the development of dispersions for construction and sealants applications. This puts VINNAPAS® dispersions in line with ever-tightening environmental regulations.

**Make the Move to Low Environmental and Health Impact**

All VINNAPAS® dispersions for the construction and sealants market are waterborne, and produced without the use of organic solvents or plasticizers.

# WACKER: FUTURE-BOUND SINCE 1938

WACKER is a leading supplier of vinyl acetate-ethylene (VAE) and vinyl chloride (VC) copolymers and terpolymers. Our dispersions for waterborne construction materials and sealants are trademarked under the brand names VINNAPAS® and VINNOL®. WACKER is globally renowned for its expertise in polymer dispersions and its innovative edge in the business.

**2015**

WACKER increases production capacity for VAE dispersions at its North American site in Calvert City, KY.

**2013**

WACKER celebrates 75 years of VINNAPAS® dispersions, and introduces VINNAPAS® 404 ND as a bonding agent.

**2011**

WACKER introduces VINNAPAS® 446 ND for cement admixtures, bonding agents and drywall joint compounds as well as VINNAPAS® EF575 developed for caulk and mastic applications.

**2008**

WACKER acquires the share previously held by Air Products and Chemicals – and so strengthens its global position and market leadership in all key markets.

**1980**

WACKER develops VINNAPAS® 400 H which has become an industry standard.

**1960**

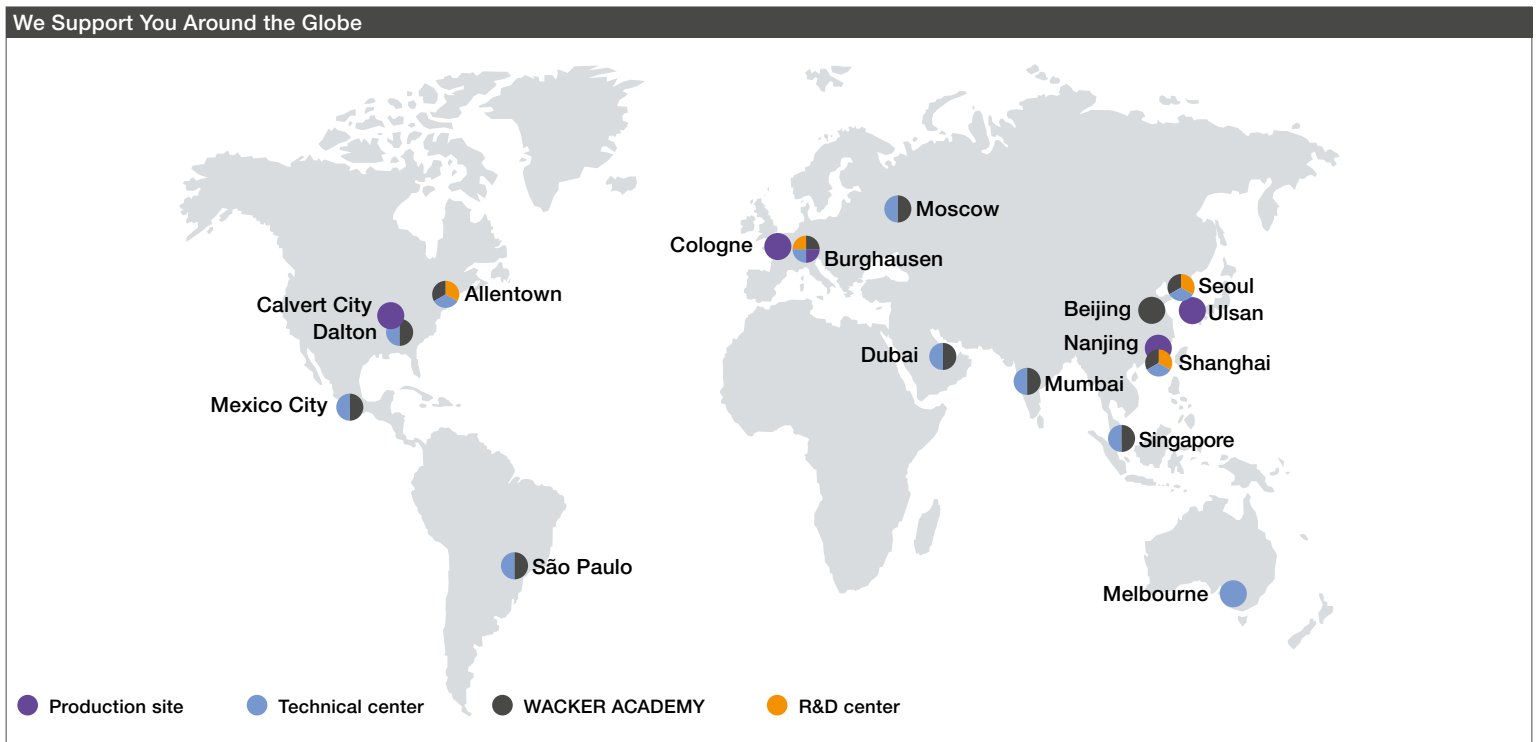
The development of VAE technology marks a new era and is an important milestone in the history of dispersions.

**1938**

Industrial-scale production of polyvinyl acetate dispersions starts at our Burghausen site in Germany: the first polyvinyl alcohol-stabilized dispersion is developed for wood glue.

# BECAUSE GLOBAL IS LOCAL

WACKER today is a global player in the polymeric binders market. We have come so far because we have always been close to our customers and their markets, establishing subsidiaries and providing experts in our focus regions.



## Global Expertise

WACKER is present with some 100 subsidiaries and sales offices in all key regions. Our VINNAPAS® grades are produced in five manufacturing plants across Europe, the Americas, China and the Asia-Pacific region. We also maintain an extensive, global network of R&D, process and analytical expertise that can provide additional support for our customers.

## With Local Focus

Although global in scope, we are local in focus thanks to our in-depth understanding of local market needs and emphasis on close relationships with our customers. We offer you technical support through technical centers in all key regions. These laboratories are designed to assist you with applications as well as in developing new systems and formulations. The WACKER ACADEMY offers market-specific product training and interdisciplinary

seminars. North America benefits from multiple WACKER ACADEMY courses, an advanced R&D and technical center as well as regional production capabilities.

## Leading the Way

WACKER is one of the most research-intensive chemical corporations worldwide. Recent developments in VINNAPAS® extend the range of applications beyond those of traditional construction and sealant markets to new markets such as duct liner adhesives.

## Key facts about WACKER

- R&D rate: 3.9 percent
- New-product rate (NPR): 22.7 percent
- About 5,500 active patents worldwide, with 2,400 patents pending

# DUCT LINER

VINNAPAS® dispersions provide adhesion to a variety of substrates, along with a high level of wet tack.

## Featured Solutions

VINNAPAS® 400 H, VINNAPAS® EP6300 and VINNAPAS® EAF 68 are ideal for formulating duct liner and assembly adhesives. These binders provide good initial tack and adhesion to insulating materials.



## Benefits

- Good adhesion to a variety of substrates (e.g. fiberglass, metal, wood, plastics)
- Low odor, low VOC, low formaldehyde, low emissions, and produced without APEO surfactants
- Internally plasticized
- Improved ease of application and cleaning

**Please note:** The benefits stated above are a summary of those possible. Not every individual product can provide all the benefits stated.

## Applications

- Duct liner adhesives

# MASTICS

VINNAPAS® and VINNOL® dispersions provide excellent metal adhesion and high filler acceptance.

## Featured Solutions

VINNAPAS® EF575 and VINNOL® 728 provide high filler acceptance and are ideal for formulating mastics and sealants. These binders can be formulated with various pigments, fillers, thickeners and lubricants to pass UL 181A and UL 181B. In addition, VINNAPAS® EF575 is manufactured without the use of alkylphenol ethoxylate (APEO) components.

## Raw Material Advantage

Derived from sustainable C1 and C2 value chains, VAE offers desirable long-term advantages. The feedstock versatility of C1 chemistry (including renewable sources) lowers price volatility and makes for a reliable value chain

## Featured Applications

VINNAPAS® dispersions are used as binders in high-performance products for HVAC duct mastics and sealants. They are compatible with other latex dispersions, epoxy resins and water-based urethane dispersions. They are especially suitable for interior applications and – due to their ease of application and cleaning – are ideal for both professional and DIY applications.

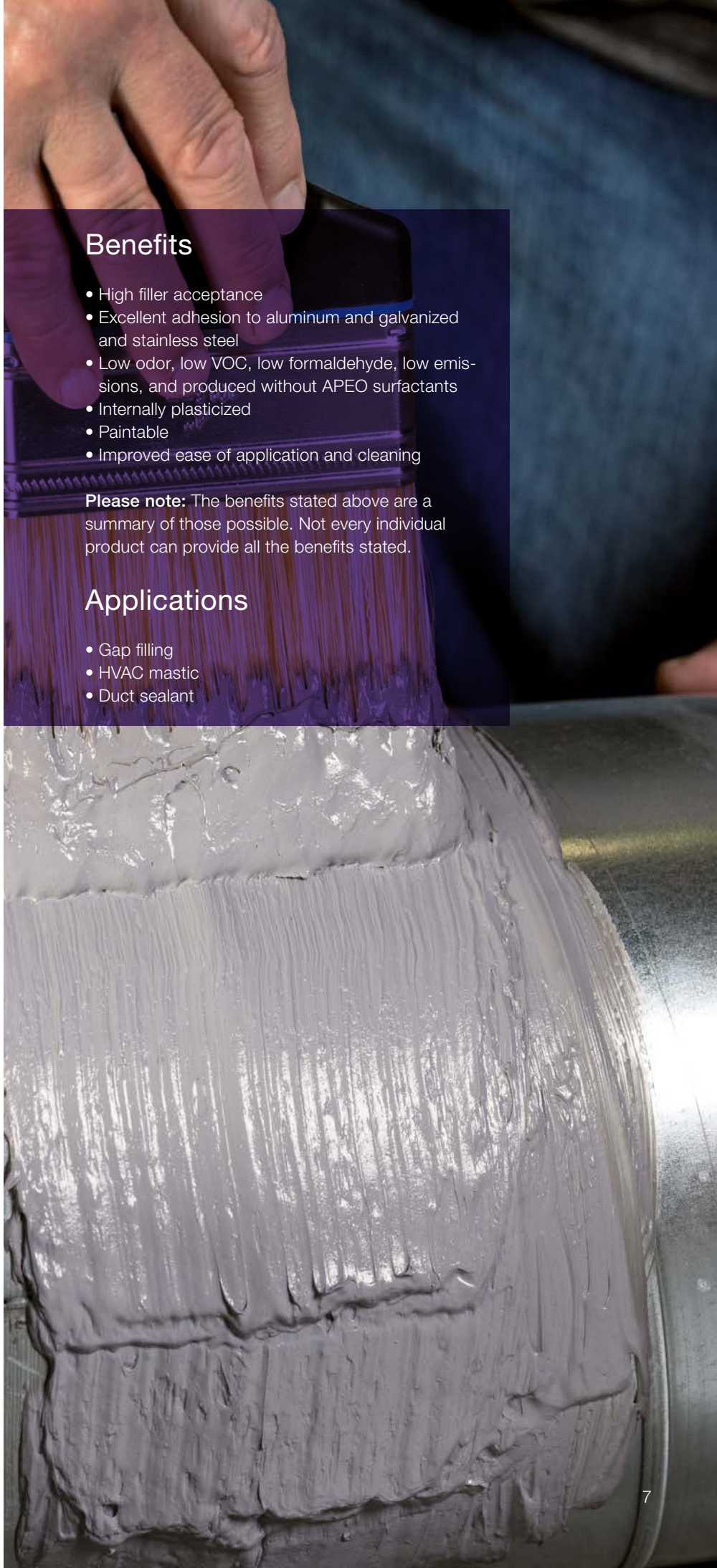
## Benefits

- High filler acceptance
- Excellent adhesion to aluminum and galvanized and stainless steel
- Low odor, low VOC, low formaldehyde, low emissions, and produced without APEO surfactants
- Internally plasticized
- Paintable
- Improved ease of application and cleaning

**Please note:** The benefits stated above are a summary of those possible. Not every individual product can provide all the benefits stated.

## Applications

- Gap filling
- HVAC mastic
- Duct sealant





# CAULKS

As core-strength binders in caulks and sealants, VINNAPAS® and VINNOL® dispersions offer numerous advantages, such as high filler acceptance and excellent adhesion to many substrates. Due to their low odor and low VOC content, they are ideal for interior applications.

## Featured Solutions

VINNAPAS® 400, VINNAPAS® 400 H, VINNAPAS® EF539, VINNAPAS® EF575, VINNAPAS® EP7000, VINNAPAS® EAF 68 and VINNOL® 728 provide high filler acceptance and are ideal for formulating sealants and repair adhesives. Additionally, VINNAPAS® EAF 68, which has a low glass transition temperature, is an excellent choice when the use of external plasticizers is not desired. VINNAPAS® EF575 is a versatile binder that provides flexibility in performance and can be formulated to pass ASTM C834 requirements. VINNOL® 728, a vinyl acetate-ethylene-vinyl chloride terpolymer, is an ideal choice for intumescent caulks due to its flame retardancy.

## Raw Material Advantage

Derived from sustainable C1 and C2 value chains, VAE offers desirable long-term advantages. The feedstock versatility of C1 chemistry (including renewable sources) lowers price volatility and makes for a reliable value chain.

## Benefits

- High filler acceptance
- Good adhesion to a variety of substrates (e.g. concrete, metal, wood, plastics)
- Low odor, low VOC, low formaldehyde, low emissions, and produced without APEO surfactants
- Internally plasticized
- Paintable
- Improved ease of application and cleaning

**Please note:** The benefits stated above are a summary of those possible. Not every individual product can provide all the benefits stated.

## Applications

- Gap filling
- Painter's caulk
- ASTM C834 caulks
- Intumescent caulks
- Repair products

ASTM C834 Test		Performance of VINNAPAS® EF575
C 732	Artificial weathering	Pass
C 1241	Volume shrinkage	26%
C 734	Low temperature flex	No cracking
C 736	Extension recovery	97%
D 2202	Slump	0.00 cm
D 2203	Stain index	0
D 2377	Tack-free time	< 1 h
C 1183	Extrusion rate	10 g/min

Performance of formulated VINNAPAS® EF575 against ASTM C834 test criteria.

# READY-TO-USE DRYWALL JOINT COMPOUNDS

VINNAPAS® dispersions provide enhanced adhesion to the substrate. They also improve workability and crack resistance.

Joint compounds are used to embed tape and mesh in gaps between gypsum wallboards and to fill nail holes and other irregularities. VINNAPAS® dispersions optimize these properties.

## Application Latitude

VINNAPAS® dispersions enable joint compounds to be applied under a wide variety of environmental conditions. Workability and cold temperature performance are greatly improved.

## Improved Adhesion

VINNAPAS® enhances adhesion to both joint tape and the substrate through its excellent film-forming properties.

## Benefits

- Enhanced adhesion
- Improved workability
- Increased crack resistance
- Improved low temperature performance

## Applications

- Gypsum wallboards
- Walls and ceilings



# CEMENT ADMIXTURES

VINNAPAS® dispersions improve placing, pumping, finishing, appearance and physical characteristics.

VINNAPAS® dispersions are ideal for modifying all kinds of mortars and grouts, thus improving their properties, especially in critical applications.

## Improved Performance

Specialty VINNAPAS® grades can also be used to specifically increase mechanical strength, flexibility, crack-bridging and water resistance.



Cement admixtures modified with VINNAPAS® dispersions are easy to use and provide the basis for a variety of applications.

## Benefits

- Excellent compatibility with cement
- Increased flexural strength and lower elastic modulus
- High green strength
- Excellent workability with long pot life

## Applications

- Modification of field-mixed mortars
- "Fortifiers" to improve adhesion, cohesion and durability of critical substrates or to meet higher performance requirements

# BONDING AGENTS

VINNAPAS® dispersions are excellent bonding agents for a variety of applications.

In bonding agents, VINNAPAS® dispersions provide the necessary properties at the interface between mortar and substrate.

## Ideal for Many Applications

Most buildings are built one layer upon the next. Bonding agents are essential to ensure long term adhesion between layers in either interior or exterior applications. In hot or dry weather, VINNAPAS® dispersions provide a longer application window.

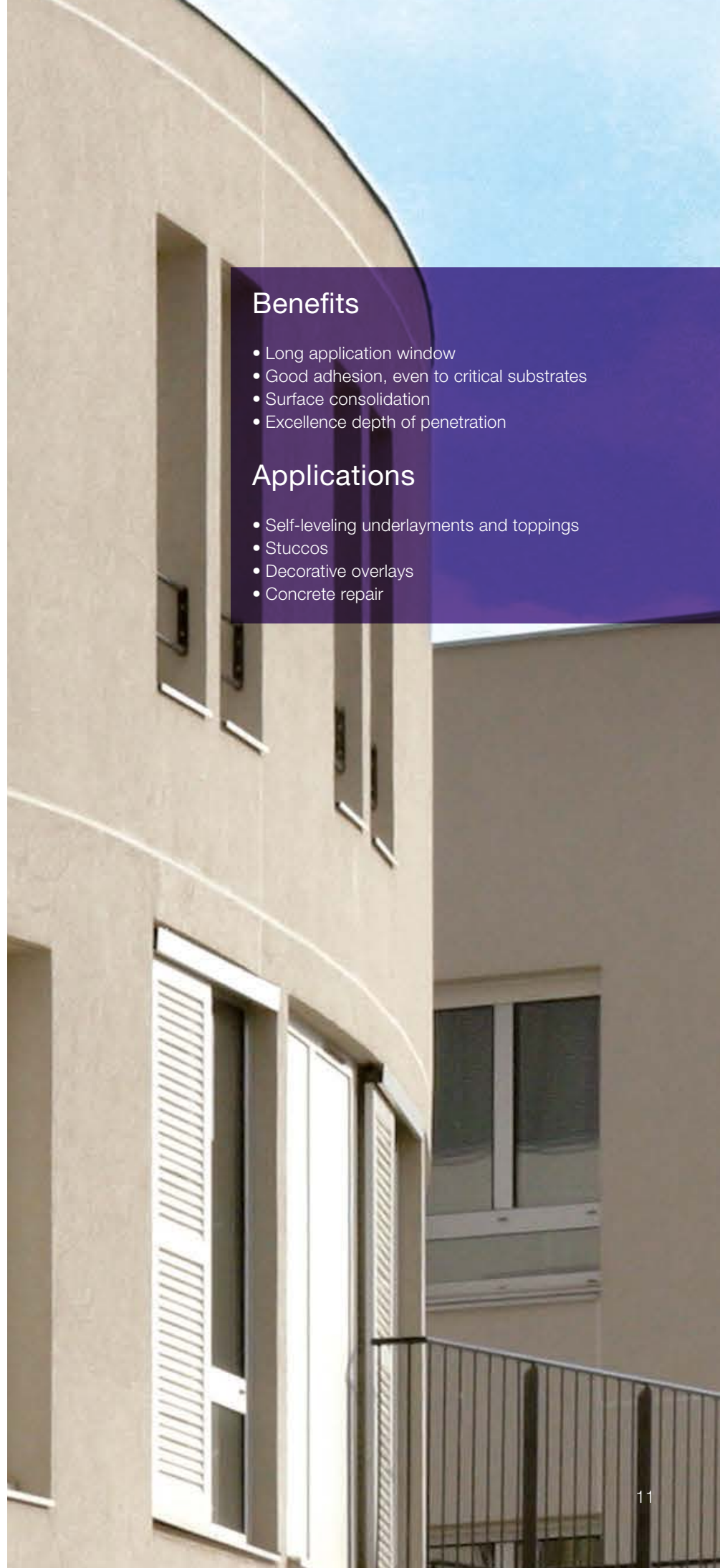
Under outdoor conditions, bonding agents need to be water resistant and have good barrier properties – this is where hydrophobic VINNAPAS® dispersions come in. Dispersions of small particle size, penetrate readily into the surface and consolidate open-pore substrates, such as concrete, cement and gypsum wallboards, regulating the absorbency of the substrate.

## Benefits

- Long application window
- Good adhesion, even to critical substrates
- Surface consolidation
- Excellence depth of penetration

## Applications

- Self-leveling underlayments and toppings
- Stuccos
- Decorative overlays
- Concrete repair



# PRODUCT OVERVIEW

Product		Technical Data <sup>1</sup>							Product Benefit	Performance Attributes						Product													
Product Source	Base Polymer <sup>2</sup>	Solids Content (DIN EN ISO 3252)	Viscosity – Brookfield** [mPa.s]	pH (ISO 976)	Glass Transition Temperature (Onset point) [°C]	Minimum Film-Forming Temperature (MFFT) (DIN ISO 2115) [°C]	Stabilizing System <sup>3,4</sup>		HVAC Mastics	Duct Liner	Sealants Caulks	Construction Ready-to-Use Drywall Joint Compounds	Cement Admixtures	Bonding Agents															
<b>Products for HVAC and Sealants</b>															<b>Products for HVAC and Sealants</b>														
VINNAPAS® 400	USA	VAc-E	54 – 56	1,800 – 2,700	4 – 5	0	PVOH	Excellent adhesion to a variety of substrates.		● ●	●				VINNAPAS® 400														
VINNAPAS® 400 H	USA	VAc-E	54 – 56	3,100 – 4,400	4 – 5.5	0	PVOH	Good initial wet tack and suitable for repair grades.		● ● ●	●				VINNAPAS® 400 H														
VINNAPAS® EF539	USA	VAc-E	54 – 56	150 – 650	4 – 5	6	ST	Suitable for general caulk applications.			● ●				VINNAPAS® EF539														
VINNAPAS® EF575	USA	VAc-E	54 – 56	200 – 850	4 – 5	0	ST	Excellent metal adhesion and filler acceptance.	● ● ●		● ● ●				VINNAPAS® EF575														
VINNAPAS® EP6300	USA	VAc-E	62 – 64	600 – 1,500	4.3 – 5.3	0	PVOH/ST	High-solids dispersion with high tack and good adhesion to metal.		● ● ●					VINNAPAS® EP6300														
VINNAPAS® EP7000	USA	VAc-E	69.5 – 71.5	1,200 – 2,700	4.5 – 5.5	-3	PVOH/ST	Ultra-high-solids dispersion, suitable for repair grades.			●				VINNAPAS® EP7000														
VINNAPAS® EAF 68	Germany	VAc-E-A	58 – 61	4,500 – 9,500	4 – 5	-35*	ST	Low T <sub>g</sub> VAE co-acrylate terpolymer with great balance between cohesion and adhesion. Especially suited to high flexibility requirements where plasticizers are not desired.	●	●	● ● ●				VINNAPAS® EAF 68														
VINNOL® 728	USA	VAc-E-VC	52 – 54	100 – 500	5 – 6.5	0	ST	Suitable for fire-retardant applications, such as intumescent caulks.	● ● ●		● ● ●				VINNOL® 728														
<b>Products for Construction</b>															<b>Products for Construction</b>														
VINNAPAS® 404 ND	USA	VAc-E	54 – 56	1,300 – 2,300	5 – 6	23	PVOH	High T <sub>g</sub> dispersion with excellent adhesion performance as a bonding agent.				● ●			● ● ●	VINNAPAS® 404 ND													
VINNAPAS® 430 ND	USA	VAc-E	49 – 51	250 – 900	5 – 6	4	PVOH/ST	Designed to improve open time, bond, tensile and flexural strength of Portland cement mixes.				● ● ●	● ● ●			VINNAPAS® 430 ND													
VINNAPAS® 446 ND	USA	VAc-E	54 – 56	1,800 – 2,700	4 – 5	0	PVOH	A product used as a bonding agent and a polymer modifier for Portland cement mixes.				● ● ●	● ● ●		● ● ●	VINNAPAS® 446 ND													
VINNAPAS® 435 ED	USA	VAc-E	54 – 56	150 – 650	4 – 5	6	ST	Excellent vehicle for cement free finishes.								VINNAPAS® 435 ED													
VINNAPAS® 224 HD	Germany	S-A	49 – 51	6,000 – 12,000	7.5 – 8.5	12	ST	Proven benchmark for a wide range of applications.							● ● ●	VINNAPAS® 224 HD													

<sup>1</sup> These figures are intended as a guide only and should not be used in preparing specifications.

<sup>2</sup> VAc = Vinyl acetate  
A = Acrylic ester  
E = Ethylene  
S = Styrene  
VC = Vinyl chloride

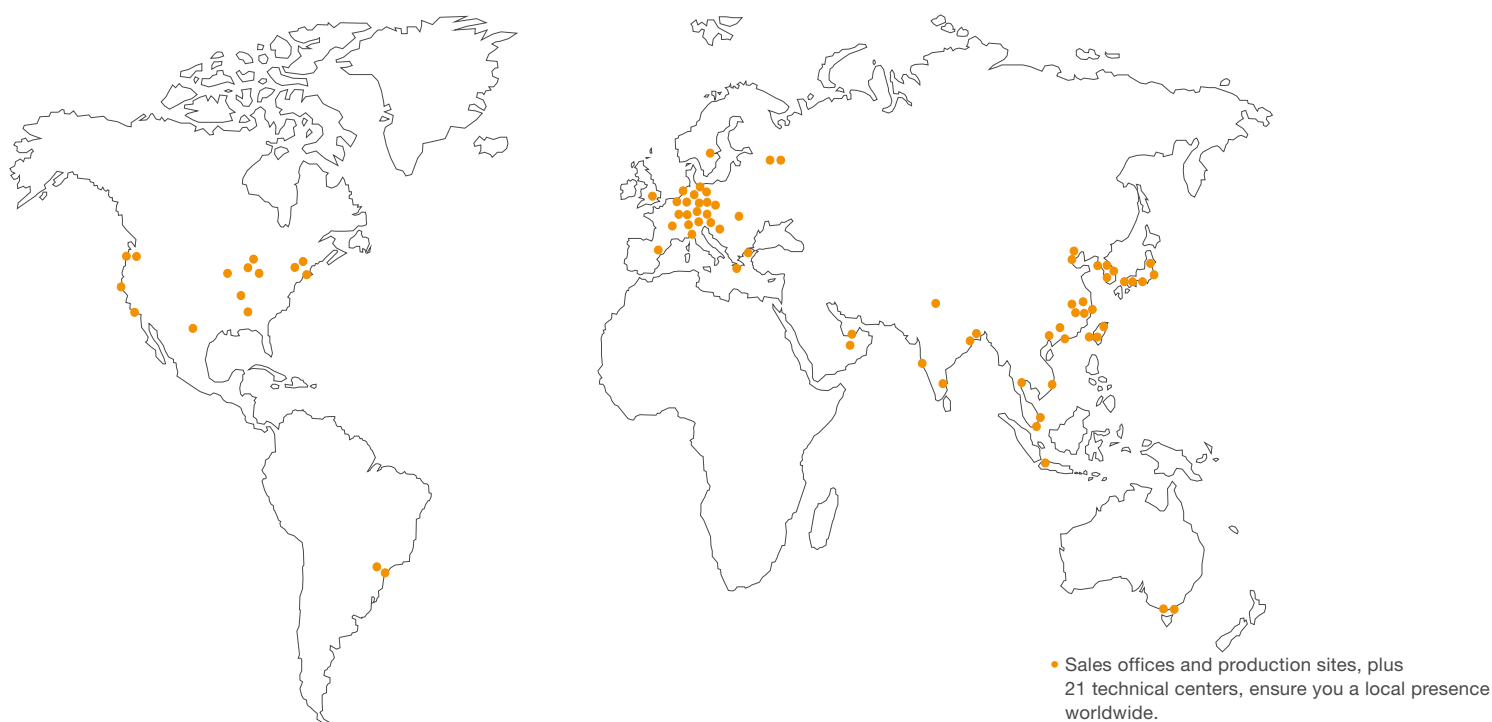
<sup>3</sup> Residue after drying

<sup>4</sup> PVOH = Polyvinyl alcohol  
ST = Surfactant

\*Midpoint  
\*\*PVOH and co-stabilized grades: Brookfield RVF#3 at 20 rpm  
Surfactant grades: Brookfield LVF#3 at 60 rpm  
VC grade: Brookfield LVF#2 at 60 rpm

Legend for performance attributes  
●●● Excellent ●● High ● Medium

# EXPERTISE AND SERVICE NETWORK ON FIVE CONTINENTS



WACKER is one of the world's leading and most research-intensive chemical companies, with total sales of €4.83 billion. Products range from silicones, binders and polymer additives for diverse industrial sectors to bioengineered pharmaceutical actives and hyperpure silicon for semiconductor and solar applications. As a technology leader focusing on sustainability, WACKER promotes products and ideas that offer a high value-added potential to ensure that current and future generations enjoy a better quality of life based on energy efficiency and protection of the climate and environment. Spanning the globe with 5 business

divisions, we offer our customers highly-specialized products and comprehensive service via 25 production sites, 21 technical competence centers, 13 WACKER ACADEMY training centers and 48 sales offices in Europe, North and South America, as well as in Asia – including a presence in China. With a workforce of some 16,700, we see ourselves as a reliable innovation partner that develops trailblazing solutions for, and in collaboration with, our customers. We also help them boost their own success. Our technical centers employ local specialists who assist customers worldwide in the

development of products tailored to regional demands, supporting them during every stage of their complex production processes, if required. WACKER e-solutions are online services provided via our customer portal and as integrated process solutions. Our customers and business partners thus benefit from comprehensive information and reliable service to enable projects and orders to be handled fast, reliably and highly efficiently. Visit us anywhere, anytime around the world at: [www.wacker.com](http://www.wacker.com)

All figures are based on fiscal 2014.

The Wacker logo consists of the word "WACKER" in a bold, black, sans-serif font, centered within a white rectangular box with a thin black border.

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