

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

Success in the adhesives 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.

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. No external plasticizer is thus necessary in VAEs.

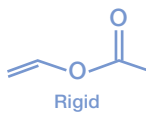
Diverse Applications

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

- Paper & Packaging (e.g. food packaging, envelope manufacturing, film lamination onto paper)
- Wood (e.g. film lamination onto wood)
- Flooring (e.g. textile flooring, flexible coverings)
- Automotive (e.g. door paneling)
- PSAs (e.g. paper labels)
- Sealants (e.g. painter's caulk, intumescent caulk, HVAC mastic)


Two Monomers Creating Best-in-Class Performance

Vinyl acetate



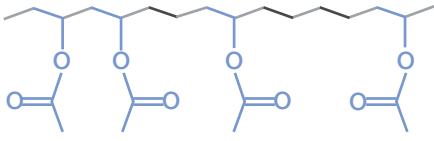
Rigid

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 adhesives and sealants that provide outstanding benefits:

- Excellent adhesion to a wide variety of substrates
- High heat resistance
- Very fast setting
- Excellent machinability and re-emulsification properties
- Very 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

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

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 adhesives applications (e.g. paper & packaging) and application technologies (e.g. roller and nozzle application).

Make the Move to Improved Workability

Surfactant-stabilized VINNAPAS® dispersions typically exhibit higher shear thinning than PVOH-stabilized dispersions. Their advantages include better adhesion to plastics, clearer films, higher water resistance and good sprayability, leading to improved workability in manual applications (e.g. flooring adhesives and sealants). In addition, they have higher filler acceptance.

Make the Move to Low Migration Potential

Due to their copolymer composition, VAE dispersions allow formulations to be made without the use of plasticizers or film-forming agents. This opens up scope for formulating adhesives and sealants with low migration potential.

Make the Move to Eliminating APEO

No surfactants containing APEO are used in the development of new dispersions for adhesives 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 adhesives and sealants market are waterborne, and produced without the use of organic solvents or plasticizers. Many of our VINNAPAS® products also comply with FDA/BFR regulations.

WACKER: FUTURE-BOUND SINCE 1938

WACKER is a leading supplier of vinyl acetate-ethylene (VAE) and vinyl chloride (VC) co- and terpolymers. Our dispersions for waterborne adhesives 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.



2013

WACKER celebrates 75 years of VINNAPAS® dispersions and expands its technical center in Jandira, Brazil.

2015

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

2011

WACKER launches VINNAPAS® EF575 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® VAE terpolymer grades for flooring and sealant applications.

1964

WACKER develops the first terpolymer VINNAPAS® dispersion with vinyl chloride.

1960

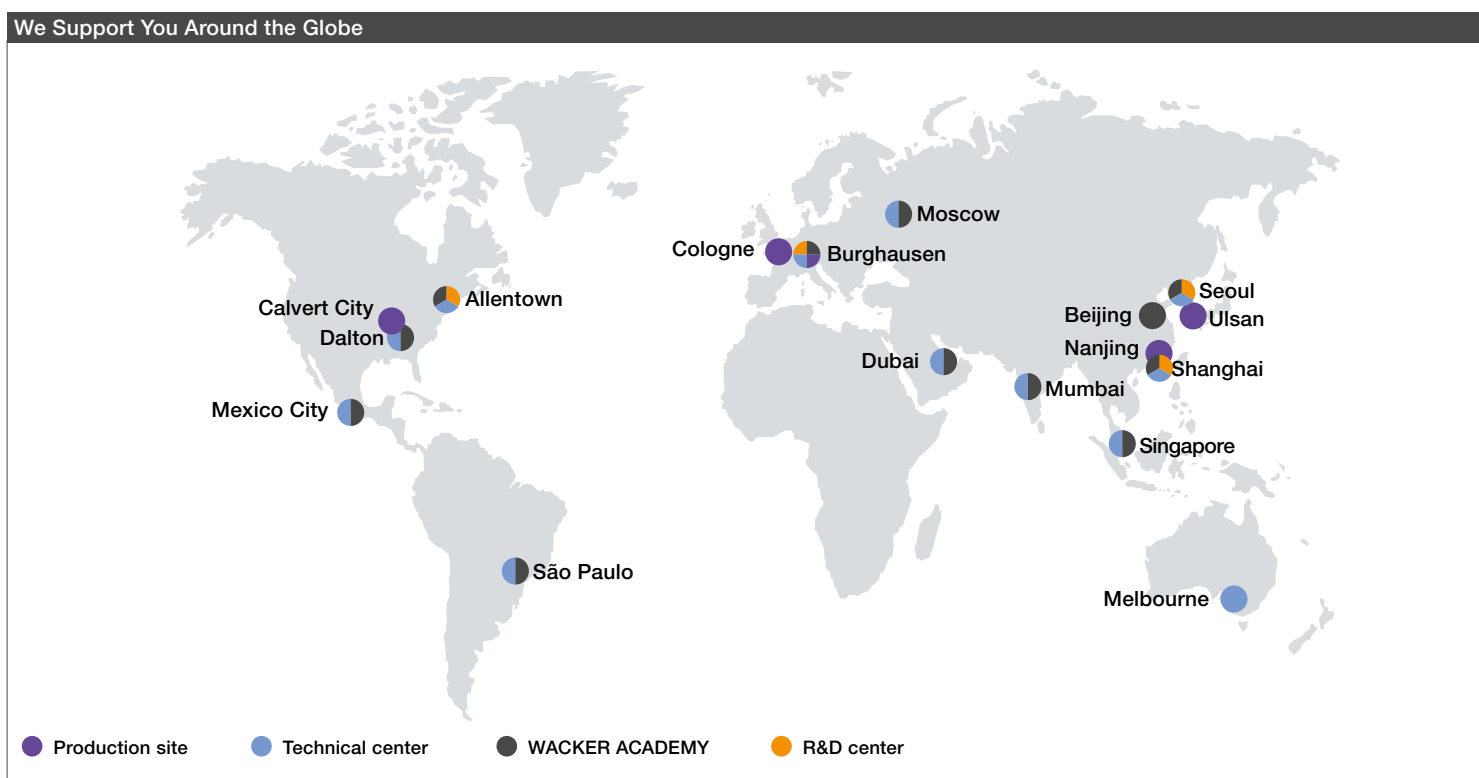
The development of VAE technology marks a new era and is an important milestone in the history of dispersions. VINNAPAS® 400 has become an industry standard.

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 for adhesives applications 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. Their 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.

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 adhesives, such as paper & packaging, wood working and flooring, to new markets, such as automotive adhesives and sealants.


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



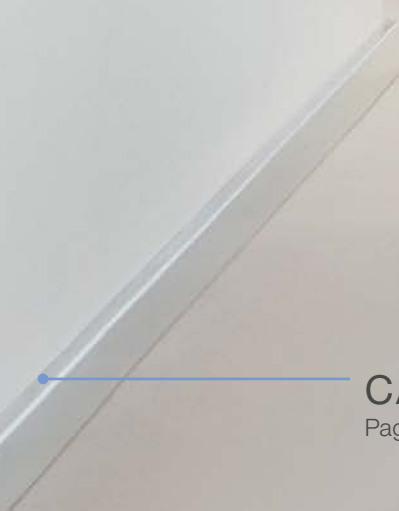
PRESSURE-SENSITIVE ADHESIVES

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FILM-TO-WOOD ADHESIVES

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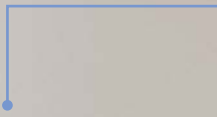
CAULKS & SEALANTS

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AUTOMOTIVE ADHESIVES

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**FLOORING
ADHESIVES**

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**PAPER & PACKAGING
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PAPER & PACKAGING ADHESIVES

VINNAPAS® dispersions are used to formulate a wide range of paper & packaging adhesives. They are notable for their strong adhesion to a large number of substrates, very high heat resistance, excellent machinability and high formulation versatility.

Benefits:

- Broad adhesion and heat resistance spectrum
- Excellent adhesion to a wide range of different substrates, including low-energy substrates, such as PET and PS
- High setting speed
- Reliable, clean machinability
- Formulation versatility
- Formulation of adhesives compliant with food-contact regulations
- Outstanding nozzle compatibility
- Suited to various application technologies

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

Applications:

- Paper and cardboard packaging
- Case and carton packaging
- Film-to-board lamination
- Tube winding and honeycomb
- Envelopes
- Bags
- Folded boxes
- Bookbinding

VERSATILITY MEETS EFFICIENCY



Featured Solutions

Excellent adhesion

The excellent adhesion of VINNAPAS® VAE dispersions makes them an ideal base for adhesives for a variety of difficult surfaces within paper & packaging. Examples of these are envelope windows, folded boxes, and film lamination to paper.

Food safety

Thanks to their copolymer composition, our VINNAPAS® VAE dispersions can be used to formulate plasticizer-free paper & packaging adhesives with low migration potential that comply with legislation in the Americas on food-contact materials.

Reliability and clean machinability

VINNAPAS® VAE dispersions are suited to a broad range of paper & packaging adhesives for all types of application technologies.

Featured Applications

Envelopes

Envelopes have changed dramatically in style and uses, and are now made not only with paper but also with specialized substrates. VINNAPAS® dispersions are vital for ensuring that envelopes made with such materials do not fall apart.

Folded boxes

VINNAPAS® dispersions offer the strong adhesion/cohesion balance, low temperature flexibility, good wetting and setting speed necessary to make these packaging applications possible.

Bags

VINNAPAS® VAE dispersions offer adhesives manufacturers the necessary balance of setting speed, adhesion, heat resistance and strength for complex multi-wall bags.

Bookbinding

VINNAPAS® dispersions offer the necessary balance of adhesive and cohesive strength, along with great flexibility and the desired rheological properties.

CAULKS & SEALANTS

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.

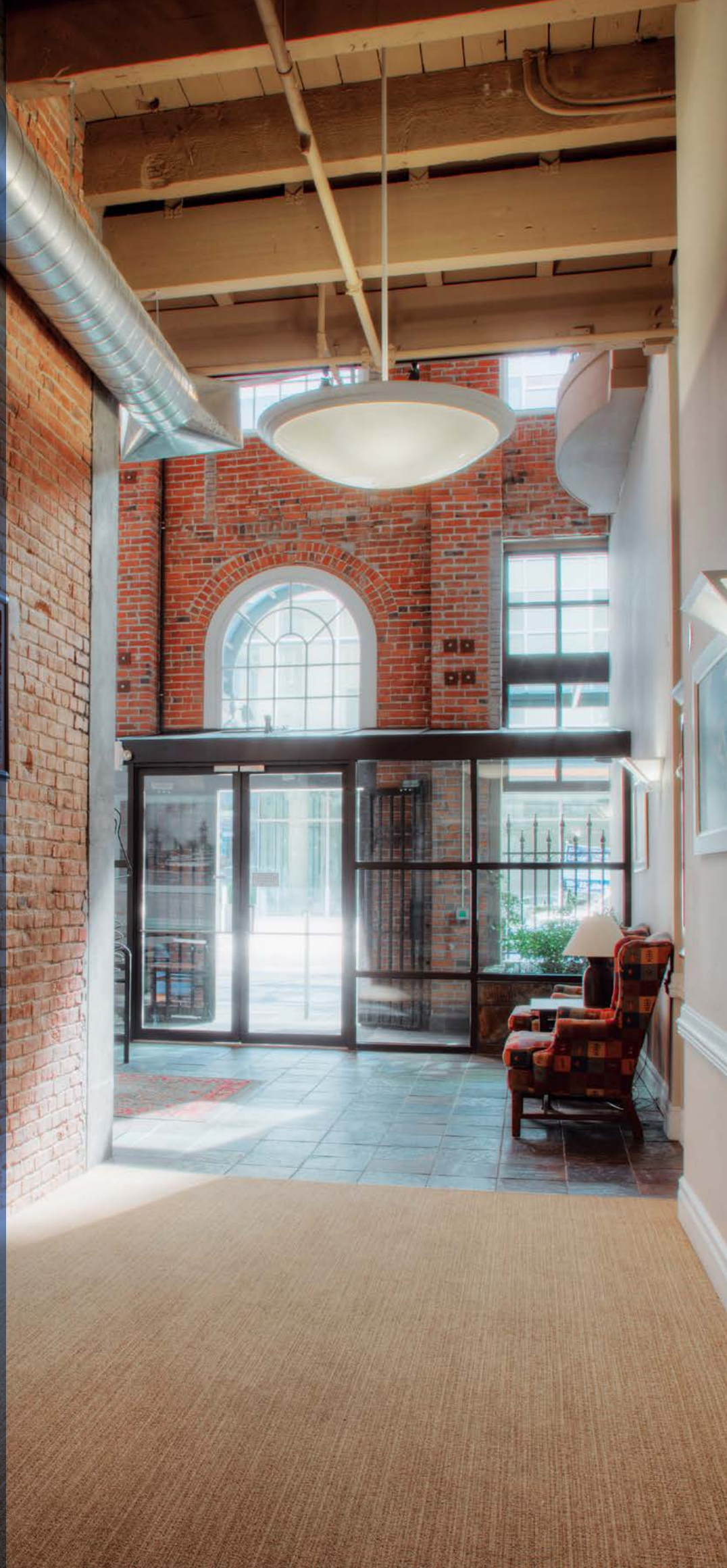
Benefits:

- 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
- Ceilings
- Floors
- Duct work



PERFECT RESULTS, EASY APPLICATION



Featured Solutions

VINNAPAS® EF575 and VINNAPAS® EAF 68 provide high filler acceptance and are ideal for formulating sealants, mastics and repair adhesives. VINNAPAS® EAF 68, which has a low glass transition temperature, is an excellent choice when the use of external plasticizers is not desired. 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® VAE dispersions are used as binders in high-performance products for sealing gaps, cracks and holes in walls, ceilings, floors and duct work. They are especially suitable for interior applications and – due to their ease of application and cleaning – are ideal for both professional and DIY applications.





FILM-TO-WOOD AND FLOORING ADHESIVES

VINNAPAS® dispersions possess an extraordinary range of properties for wood-laminating adhesives that are designed to perform to the highest standards. Their outstanding properties include excellent adhesion and high setting speed.

Benefits:

- Good overall properties especially for impregnated paper or PVC lamination
- Excellent adhesion to PVC film for wet lamination
- Excellent adhesion to difficult substrates
- Very high setting speed

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

Applications:

Vinyl, plastic film and paper lamination to wooden materials

VINNAPAS® VAE copolymer and terpolymer dispersions are recommended for flooring adhesives due to their combination of performance advantages and environmental benefits. They are ideal for a wide variety of flexible floor coverings.

Benefits:

- Formulation compatibility
- Long-lasting, highly durable bonding
- Strong adhesion to various substrates
- High cohesive strength
- Outstanding workability
- Excellent dimensional stability

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

Applications:

Textile flooring and flexible floor coverings

- PVC
- Rubber
- Linoleum
- Cork
- Textile



PRESSURE-SENSITIVE AND AUTOMOTIVE ADHESIVES

Specific VINNAPAS® dispersions are used in the formulation of pressure-sensitive adhesives (PSAs), either by themselves or in blends with acrylates.

Benefits:

- Excellent balance between tack and cohesion
- Excellent adhesion to a variety of surfaces

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

Applications:

- Industrial and DIY tapes
- Paper labels

VINNAPAS® VAE copolymer and terpolymer dispersions can serve in a wide variety of high-performance adhesives for car interior applications, including film-to-board lamination, PSA labels and textile lamination.

Benefits:

- Excellent balance of tack, adhesion and heat resistance
- Low fogging potential

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

Applications:

- Door paneling
- Headliners
- Parcel shelves
- Trunks
- Dashboards

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



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