

Solvent based acrylates in a changing environment

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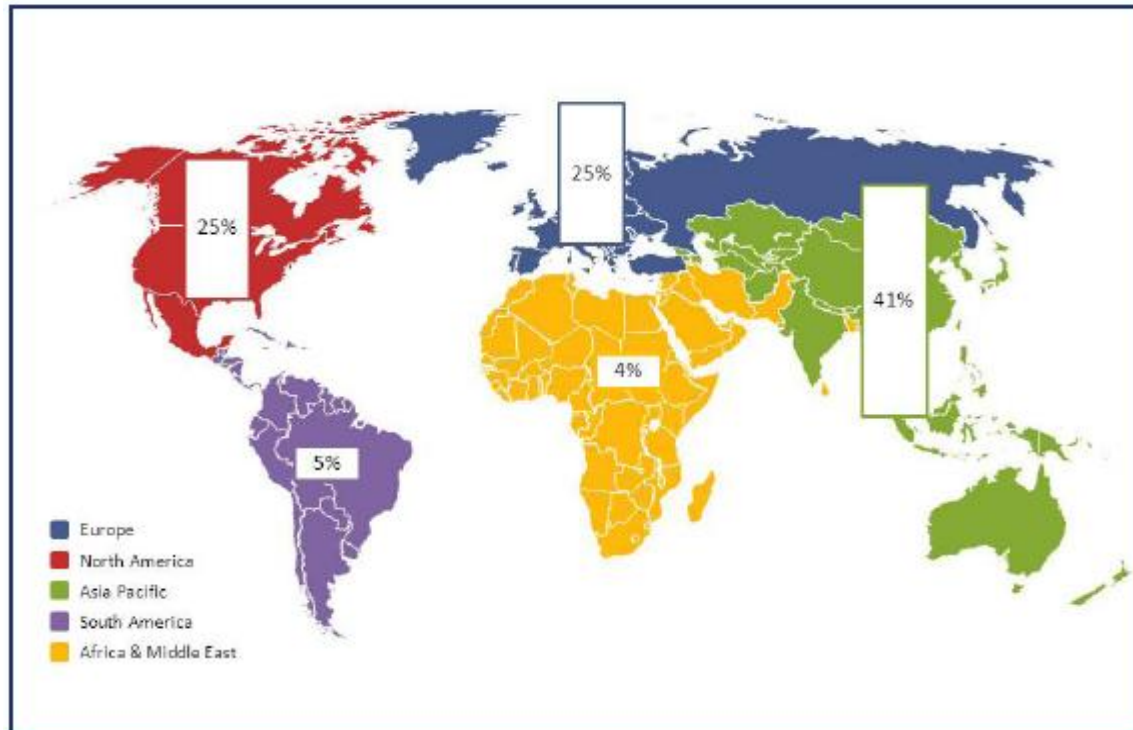


Contents

- PSA Markets and Technologies
- Technology Comparison
- Solvent Based Acrylics
 - Benefits of the Technology / Typical Applications
 - Solvents
(Which, Risks, Functions)
- Initiatives in Henkel
- Summary

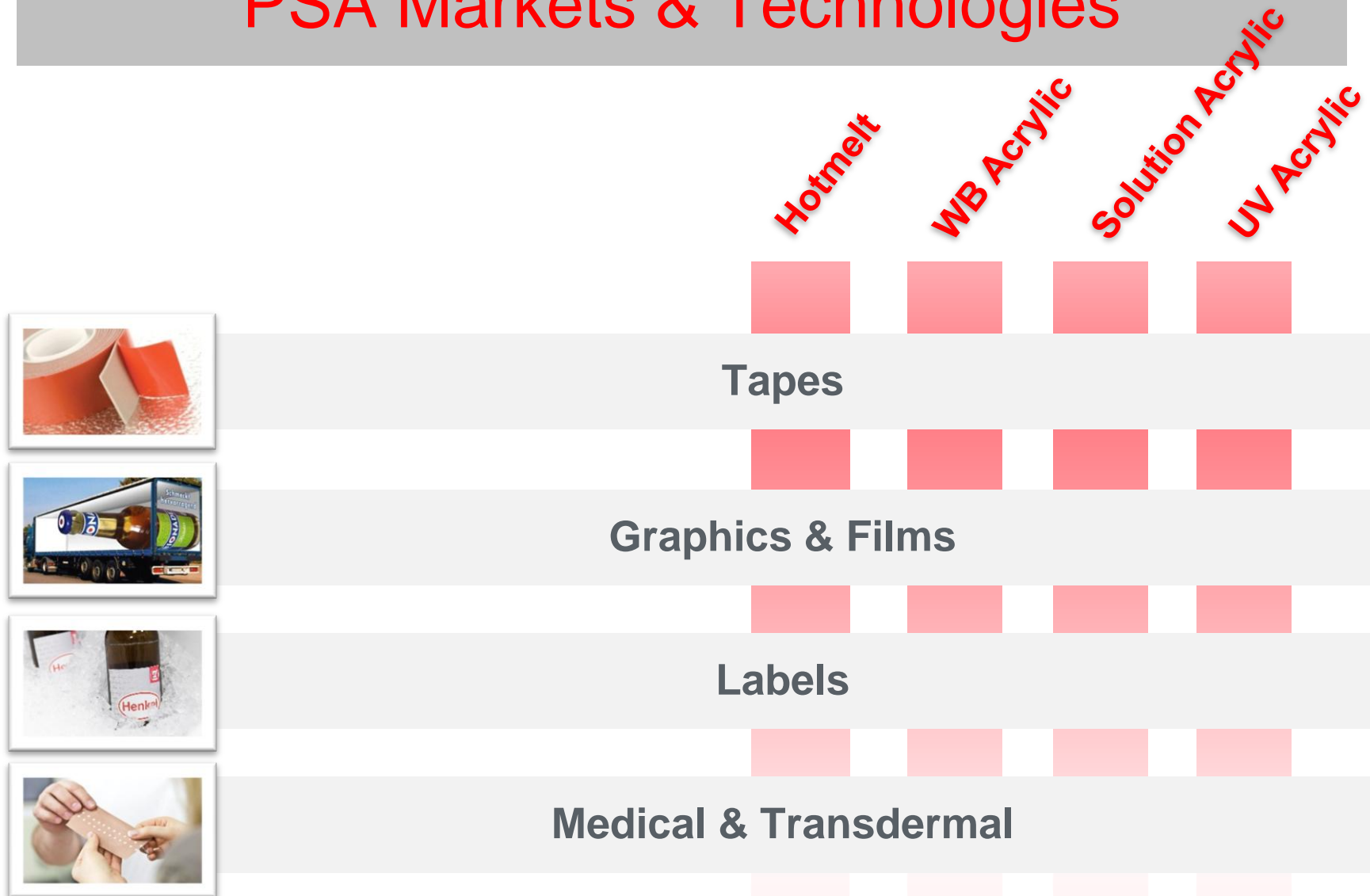
PSA Markets & Technologies

Global PSA Demand (1.58 M dry tons) - % by Region, 2011



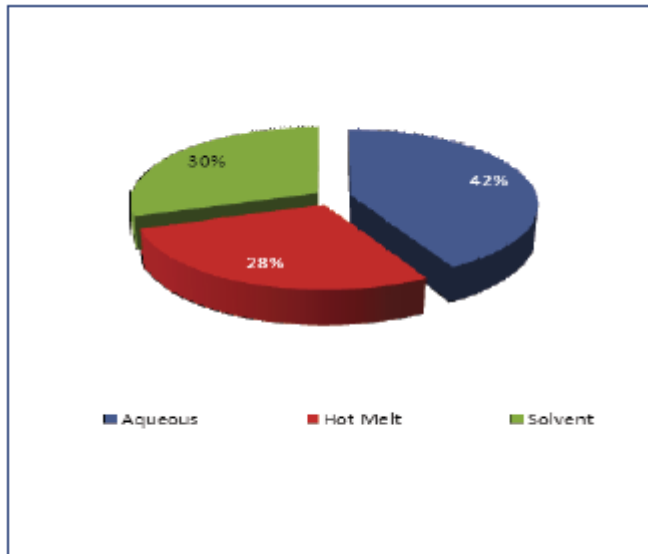
Source AWA 2012

PSA Markets & Technologies

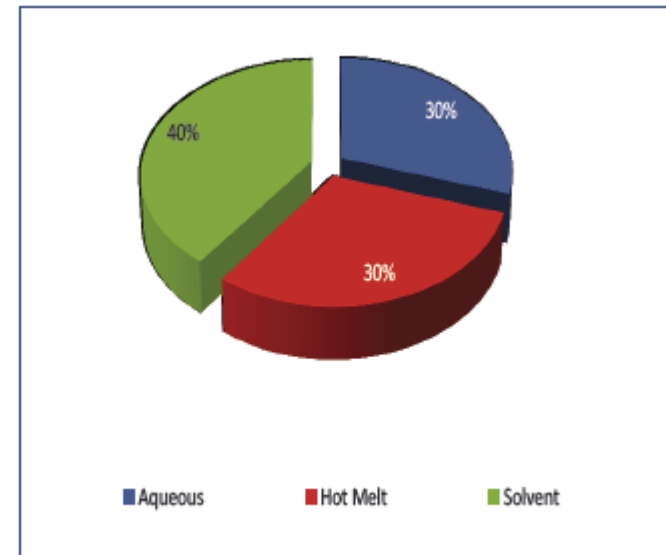


PSA Markets & Technologies

Global **PSA** Demand by Adhesive Type
% Share, 2011



Global **Tape Market** Demand for PSA
by Adhesive Type - % Share , 2011



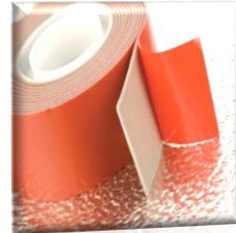
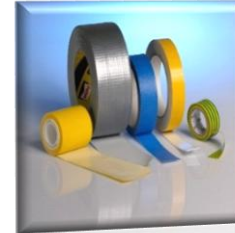
Source AWA 2012

Technology Comparison

	Hotmelt	UV acrylics	Solution Acrylics	Waterborne Acrylics
Performance	Highest adhesion	Balanced ad- and cohesion	Highest cohesion	Balanced ad- and cohesion
Ageing	No UV-resistance	Good	Very good	Limited
Safety	Hot surfaces	Hot surfaces, UV irradiation	Flammable solvents	--
Storage	Easy	Easy	Outdoor / flameproof	Indoor / No frost
Plant Size	Compact	Compact	Large	Large

Why solvent borne PSAs?

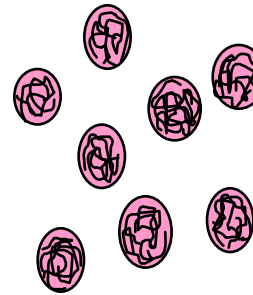
- High heat & shear performance
 - Very clear and colourless adhesives
 - Excellent outdoor & UV resistance
 - Excellent resistance to water & many solvents incl. petrol
 - Very good ageing resistance
 - Chemically "pure," non toxic, Skin-friendly
- **SB is still a leading technology for PSA applications!**



A solvent PSA film is intrinsically strong




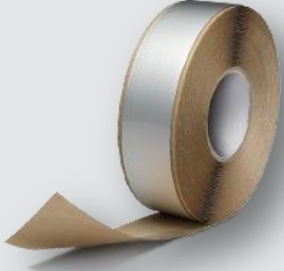




Solvent PSA
upon drying, long
polymer chains
entangle.
Cohesive strength
built by chemical
crosslinking.



Water based PSA
the PSA film is
not a homogeneous
film of polymer
chains, but rather
packed particles.
Means less shear and
heat resistance.

Solvent PSA offers a combination of high shear/temperature resistance with good tolerance towards UV, solvents, humidity, ...

Typical applications for solvent PSA

<p>Vinyl graphics</p>	<p>High performance tapes</p>	<p>Medical</p>
		
<p>Durable labels</p>	<p>Protective Films</p>	<p>Removable Labels</p>
		

Solvents in PSAs – Which?

Typical content of solvents: 45-65%

Kind of solvent:

- Ethylacetate
- Isopropanol, Ethanol, Methanol
- Hexane, Heptane
- Less common: Isopropylacetate, Isobutylacetate, Acetone, ...

Risks linked to solvent handling

- Organic solvents are flammable, this means for the user:
 - Fire protection in the storage area: air control, high air exchange rates, special fork lifts, ...
 - Explosion protection in the coating area: encased drives, charge bleeders for the substrates, ...
 - Explosion protection in the oven: LEL control, low line speeds, high air flow, ...
- ⇒ Because of all this a solvent based coating line is about 3 times more expensive than a water based coating line
- Some solvents are harmful, means the user has to consider maximum exposure scenarios

But are solvents only hassle?

Functions of solvents



Medium for the polymerisation

- Ethylacetate



Stabilisation in the wet adhesive

- Alcohols, Acetone, Pentandione



Viscosity adjustments

- More effective decrease by adding aliphatics or alcohols



Coating characteristics

- Depending on substrate: apolar / polar solvents



Drying characteristics

- Good mix of solvents with high and low boiling points

Initiatives in Henkel

- Development of Higher TS Acrylates → less solvent
- Avoid more critical solvents like Toluene, Hexane
 - since several years new products Toluene free,
 - substitution in existing products by less harmful alternatives where possible
- Adjustment of solvent composition to recovery system / incinerators of customers where possible
- New Developments in direction even higher performance grades
 - further increase of temperature resistance
- **Henkel does not only focus on improvements in solvent based acrylics, but also uses the its technical know-how to push UV-Technology as well as Water Based-Technology developments in direction to higher performance products**

Summary

- Global Demand of PSA Solvent Based Adhesive of 30% (2011)
- Solvent Based Acrylic is still a leading technology in PSA
→ high performance products, no alternative using other Technologies
- Solvents are not only a hassle, they have important functions during the production process of the adhesive itself as well as later during the converting process at the customer.
- There are several initiatives inside Henkel to improve solvent acrylics adhesives, but also to work on the other technologies to improve the performance of the adhesives there as well.

Thank You