



**An overview of the different polymer
types used in European Carpet
Market back coating applications**

Latex III Conference

Gent, June 11th 2003

by James Kennedy

Dow Benelux



Agenda

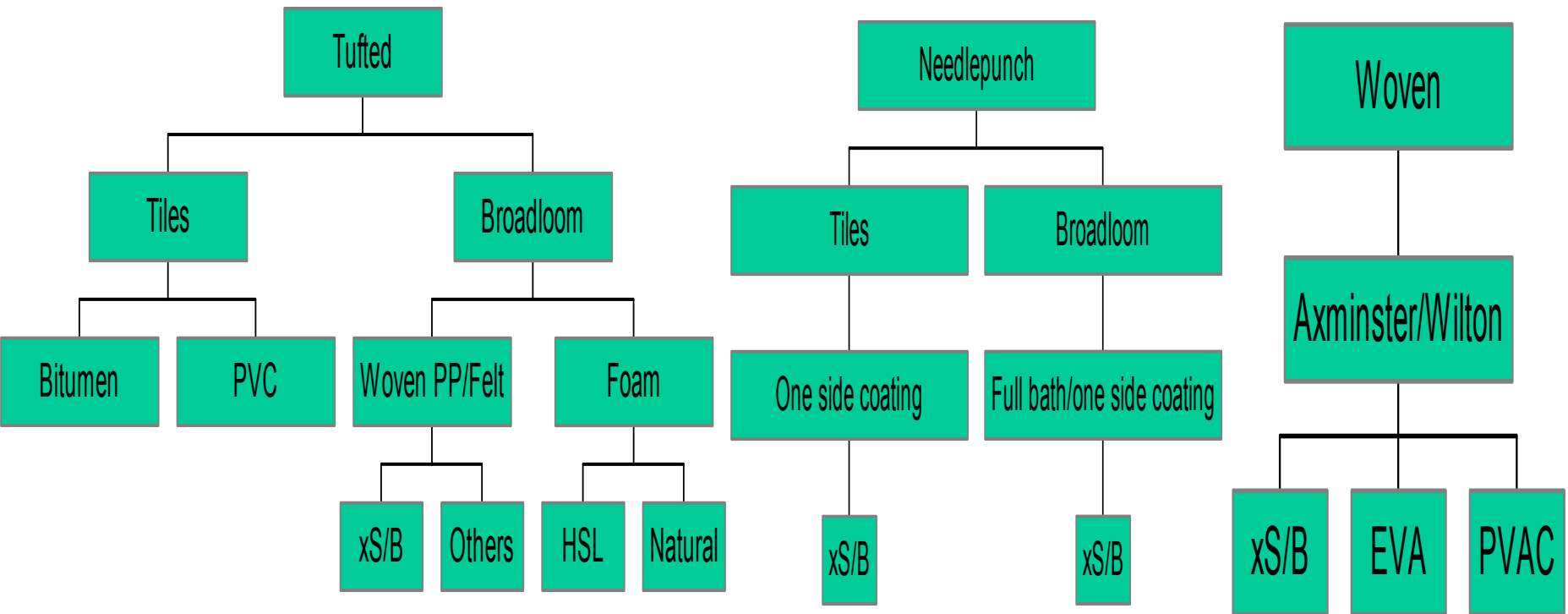
- History
- European Carpet Market segmentation/volumes
- Market trends
- Polymers used in carpet backing
- Cost comparison
- Summary

History



- Carpet produced as long ago as 6000 BC - spinning/weaving techniques used for sheep/goat wool
- Tufting started in US in late 19th century for cotton bed spreads - looms also used for carpet in 1950's
- Back coating required for tufted carpet - started with natural gums and starch - progressed through polystyrene and GR-S to natural and HSL (vulcanized)
- Woven and needlepunch also started to use back coating
- Carboxylated Styrene - Butadiene latexes introduced in late 1950's to carpet industry and remains the market leader 50 years later

European Carpet Market Segmentation



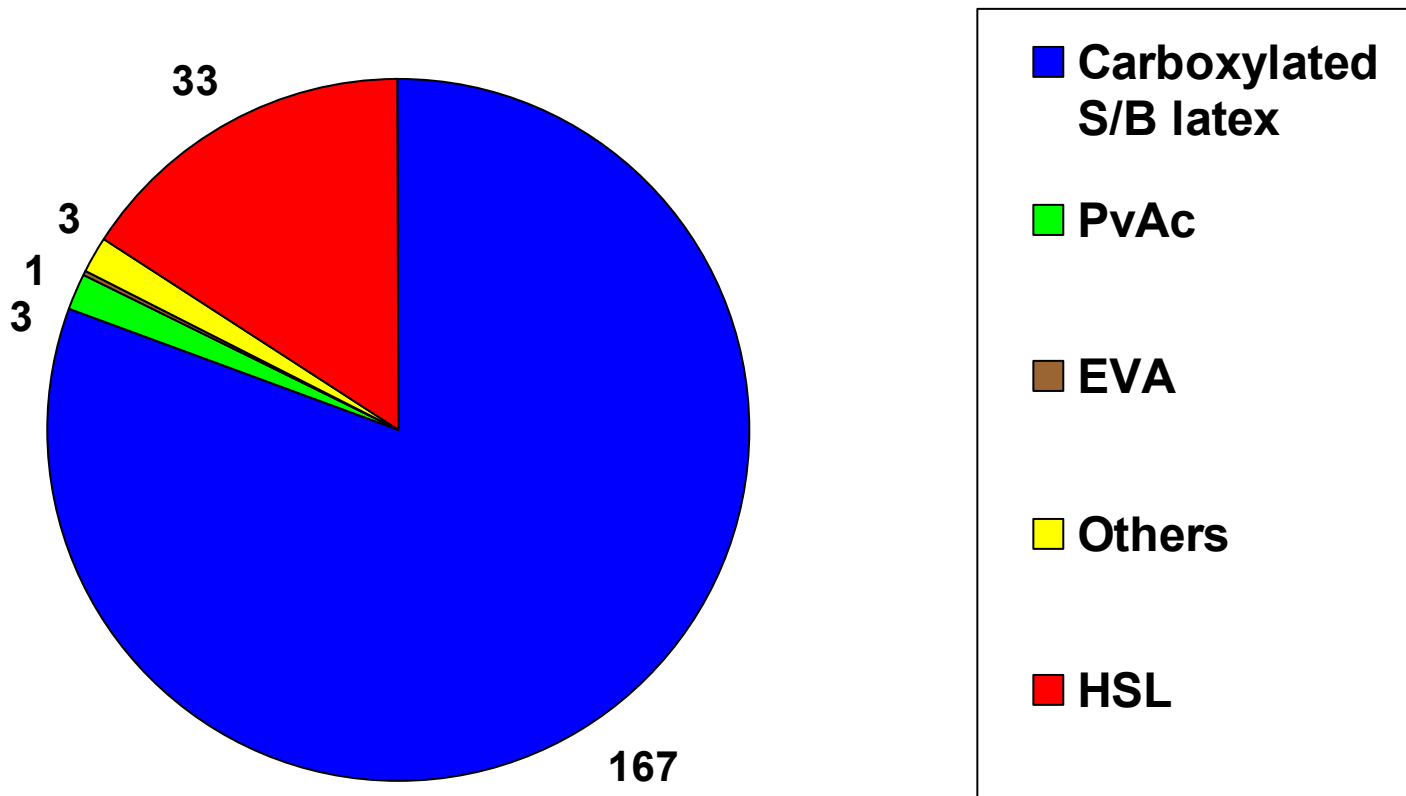
Carpet Market Trends



- Remains a cost oriented industry
- Carpet under threat from other floor-coverings
- Increased imports from Mid East, Eastern Europe
- Industry consolidation
- Environmental concerns drive projects on recycling /energy conservation
- Ergonomics drives need for lighter carpets
- Alternatives to traditional latex are being promoted with alternative application methods



Types of polymer used in W. Europe carpet backing market 2001 (m dmt)



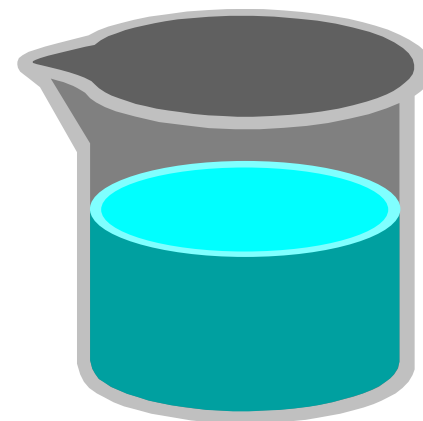
Source: Kline

Carboxylated S/B Latex



Carboxylated Styrene - Butadiene Latex has remained the binder of choice since its introduction !

Why?





Strengths of x S/B Latex

- **Continuous development by the latex manufacturers**
- **Imparts a wide range of benefits to final carpet**
 - ***Binding power***
 - extremely effective binder, adhesion to range of substrates, edge -fray properties, bundle wrap etc
 - ***Versatility***
 - wide range of S/B ratio's which ensures soft to stiff end product handle can be achieved
 - ***Ease of use***
 - low viscosity aqueous medium
 - application flexibility
 - can be applied by lick roll, direct spreading
 - have anti-foam properties or made to foam
 - fast drying rate
 - ***Carrier***
 - acts as a carrier for additives such as anti-static and fire retardant agents



Strengths of x S/B Latex

- *Fillers*
 - can accept high quantities of inorganic fillers (up to 1000 parts/100 parts dry latex !)
 - organic /rubber crumb fillers can also be used
 - Filler is described as the great leveler !
- *Aesthetics*
 - clear backing allowing textile to be seen
 - used to laminate attractive secondary backings
 - can be dyed etc
- *Service*
 - expert TS and D support available
- *Cost*
 - polymer is relatively inexpensive !

Weaknesses of x S/B Latex



Weakness	Description	Latex manufacturers' response
<i>Energy</i>	Evaporating water requires energy	Higher solids latexes/ compounds faster drying products
<i>Odour</i>	Consumer awareness	Reduction in residual monomers (EPDLA/ GUT)
		Reduction in odour from raw material additives, e.g. 2 ethyl-hexanol in surfactant
<i>Bacteria</i>	Customer awareness	Increased protection of latexes
		Education in storage & handling of latex/ compound
<i>Recycling</i>	Growing trend towards recycling/ sustainability	Incineration plus energy recovery remains most likely short/ medium term alternative to landfill
<i>Weight</i>	Filler increases the weight	Lower filler level, organic filler

Cold S/B latex (H.S.L)



Mainly used in foam backing applications due to handle/lower strength (versus carbox. S/B)

Strengths

- High solids
- Very strong polymer
- Can be blended with natural latex for improved wet strength/anti slip properties
- Cost

Weaknesses

- Too soft for sec. backing application
- Environmental concerns over accelerators, heavy metals etc



Natural latex also used mainly in foam backing application (blended with HSL)

Strengths

- Washable
- High gel strength

Weaknesses

- Cost
- Vulcanization step
- Protein allergy issue

Polyvinyl Acetate (PVAc)



Now only used as a binder in some woven carpet applications

Strengths

- Low odour

Weaknesses

- Low binding strength
- Filler acceptance
- Needs plasticizer to soften
- Poor wet strength

Ethylene Vinyl Acetate (EVA)

The DOW logo is a red diamond shape with the word "DOW" in white capital letters inside.

- **Still used by some woven carpet manufacturers and as a precoat for PVC tiles**
- **Also used in powder form in hot melt application**

Strengths

- Ignition resistance
- compatability with PVC plasticisers
- Solvent resistance

Weaknesses

- Cost
- Odour
- Filler acceptance



- **Styrene Acrylics/Vinyl Acrylics**
- **Very minor share in woven carpet application also precoat for PVC tiles**

Strengths

- Improved ignition resistance
- Wet strength
- Low odour

Weaknesses

- Cost
- Low binding power



- **Used only for carpet tiles**
- **Provides a heavy backing**

Strengths

- Cost
- Can be modified with latex/filled with Calcium Carbonate
- Weight
- Dimensional stability (with glass fleece)

Weaknesses

- Odour emissions in factory
- Hot application (>160 deg C)
- Softens in high temperatures
- Colour !
- Wall soiling during installation

Polyvinylchloride (PVC)



- **Used for carpet tiles**
- **Provides a heavy backing**

Strengths

- Can be filled with Calcium Carbonate
- Dimensional stability
- Fire retardant properties
- Good light/water resistance

Weaknesses

- EH& S issues (Cl, plasticizers)
- Poor binding power
- Fibre restrictions
- Release of HCL/smoke in fire conditions
- Poor low temperature performance
- Requires EVA/SA precoat



Polyolefins

- **Used in powder scattering - Low density polyethylene**
- **Extrusion coating of tufted carpets - PE/PP blends**
- **Hot Melt Adhesive spray technology - pilot plant stage**
- **Lamination using melt bonded fibres - on hold**

Strengths

- High running speeds possible
- No waste water (for adhesive coating)
- Total containment easier
- Low emissions, VOC's
- Lower energy costs

Weaknesses

- Tuft lock/pilling/fuzzing
- Overall running costs higher
- Capital
- Aesthetics (on synthetic PP open weave backing)
- New system - some issues to resolve (polarity,D.S.,consistency etc)



Polyurethane dispersions (PUD'S)

- **Manufacturer controls the chemistry; fully reacted waterborne polyurethane dispersion**
- **High performance polyurethane polymer delivered in “latex” medium**
- **PU dispersions established in U.S- e.g. Dow Lifespan (guaranteed performance of carpet)**

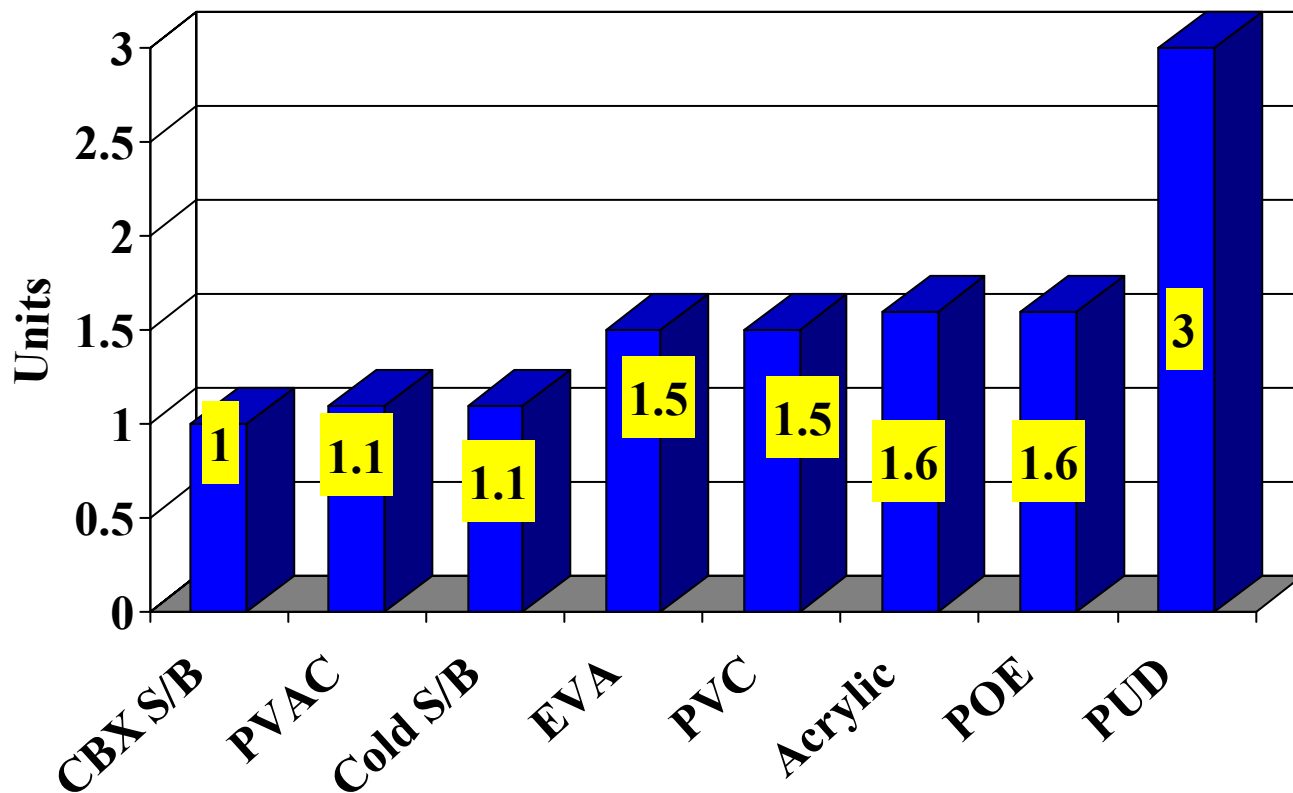
Strengths

- Can be applied on conventional backing lines
- Polymer strength
- Improved FR
- Can provide liquid barrier (impermeable backing)
- Low VOC's
- Good fiber adhesion

Weaknesses

- Cost
- Some formulation constraints

Cost comparison of carpet backing polymers



Filler increases the difference between Cbx S/B and other backings



Summary

- Consumer is generally unaware of the backing polymer !
- Cost/performance is keeping carboxylated S/B latex as the market leader
- New polymers/application techniques challenging the status quo
- Capital requirement, performance issues are currently barriers to real growth for these alternatives in main stream carpet backing
- Specialty/niche markets may however offer opportunities (artificial grass, impermeable backing etc)

Carboxylated S/B Latex is likely to remain the preferred polymer for the European carpet industry for the foreseeable future