

OPPURTUNITY

PUR/Curing Hot Melt – Production/Development/Market

PURLIX CONSULTANT



2025

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MBA: Technology for Chemical Industry

Background in Polyurethanes:

3M Brazil (10 years): PUR (Jet Weld line), sealant one pack (PU and MS polymer), 2 pack PU adhesives, potting and casting PU

Lord Corporation (5 years): FPA and structural polyurethane adhesive 2 pack.

COIM Brazil (5 years): PU system for sole, polyester resin and FPA - we start-up the project FPA in Brazil 20 years ago, nowadays Coim is one of the world leaders

-National Starch (5 years): Start up the PUR reactor in Brazil. Production and Technical Manager. And more 3 Years at Henkel which bought National Starch

12 years in a partnership with Cipatex in the Bookbinding PUR Brazilian Market and 2 years in a partnership with COIM Brazil (Neoflex PUR: Wood and Textile)

PUR or Curing Hot Melt

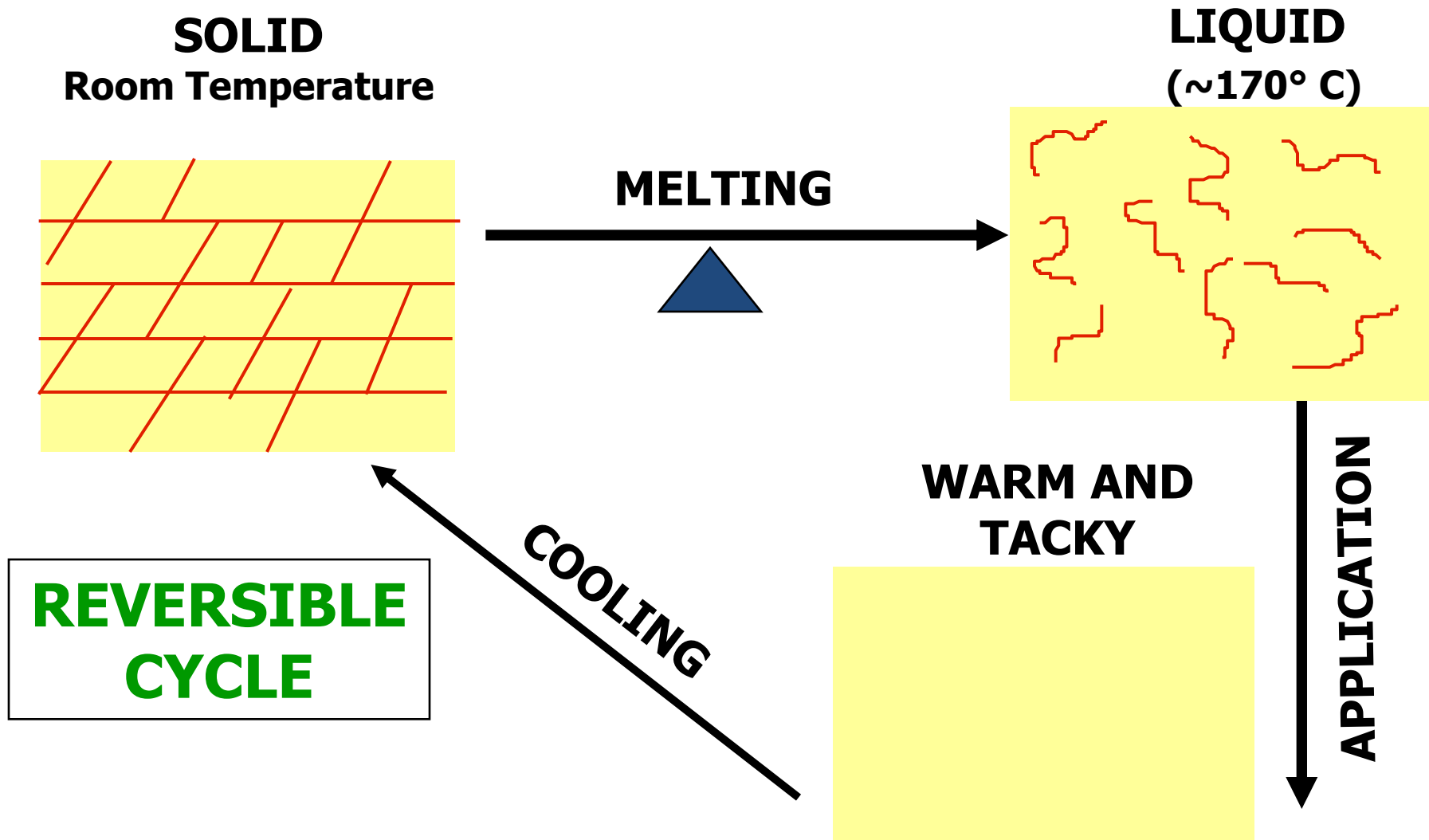
In the last 40 years, it is the most innovative technology in polyurethane adhesives, with fantastic growth every year .

Compete and replace the adhesives with many advantages: hot melt, 2K polyurethanes and water-based (textiles application). Superior performance with low thickness of bonding line.

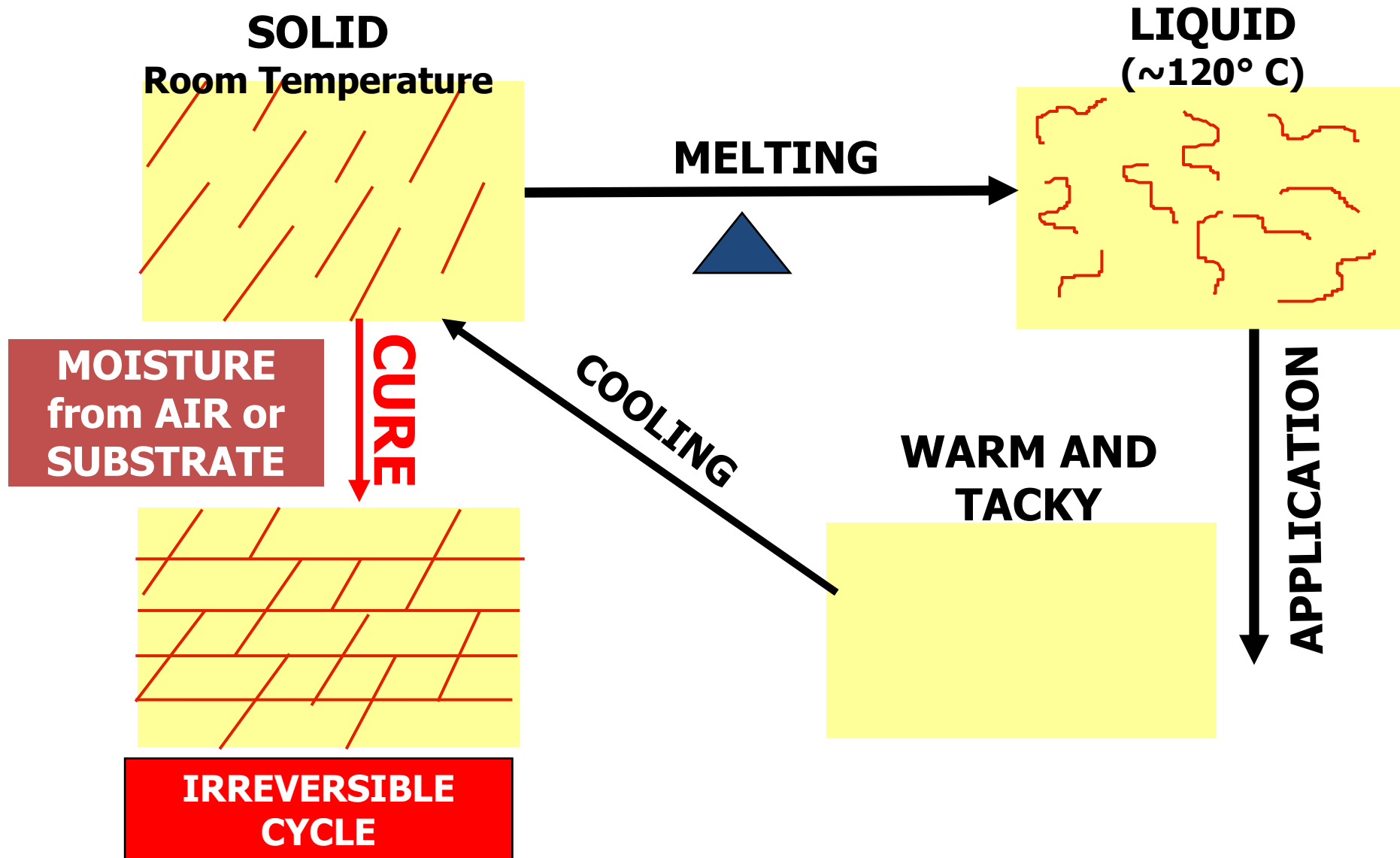
OG Analysis/2024 \$ Million +/- 2,800 (PUR market value)

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WORK CYCLE – HOT MELT



WORK CYCLE – PUR



History of the Curing Hot Melt

1980s: – Switzerland

1990s: 3M (Jet Weld), National Starch, etc.

First generation: MDI+polyether+polyester

Second generation: +EVA + Acrylic + APAO
and special co-polyester

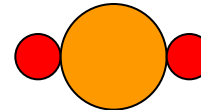
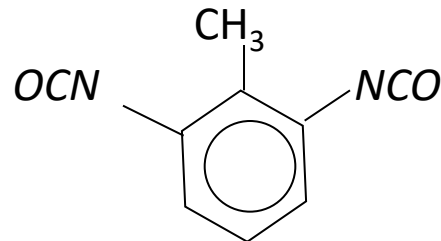
Nowadays: SPUR, low ME, bio-based polyol
and domestic production of the polyester resin:
adipate of 1.6 hexane diol.

Example of a reaction between Isocyanate (MDI or TDI) and a polyol

POLYOL

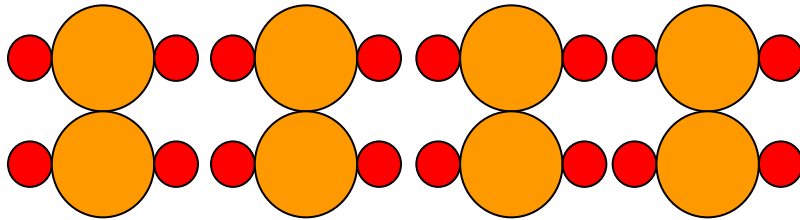
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ISOCYANATE (TDI)

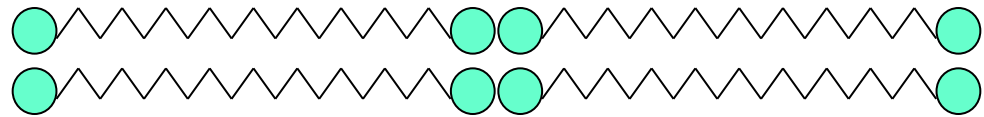


PUR: Linear Reaction of the MDI with polyol

ISOCYANATE (MDI)



POLYOL (Polyether and/or Polyester)



Main Market and Applications of Polyurethanes

- Foam:

Flexible

Rigid

Molded

Shoes/Sole

- CASE:

Coating

Adhesive

Sealant

Elastomer

PU Foam Market Brazil/2022

Kind of Foam	Main Application	Chemical Base	Potential ton/month
Flexible	Mattresses Upholstery	100% TDI + Polyol Polyether	20.000
Molded	Seat of cars, etc.	TDI and MDI Polyether/Polyester	6.000
Rigid	Thermal Isolation	MDI crude Polyether/Polyester	10.000
Shoes/soles	Fashion and Safety Footwear	MDI pure 100% Polyester	3.000

Market CASE in Brasil/2022

CASE	Main Application	Chemical base	Potential ton/month
Coating	Paints and Coatings	TDI/MDI/Alif. Polyether/Polyester	300
Adhesive	FLA (flexible Package), PUR and 2K	TDI/MDI/Alif. Polyether/Polyester	1.800
Sealant: MS, NCO end, SPUR	Civil Construction And Automotive	TDI/MDI/Alif. Polyther/Polyester	500
PU Elastomer molded/poting	Footwear, wheels and Technical pieces	TDI and MDI pure Polyether/Polyester	400

Brazil PU Marketing Summary

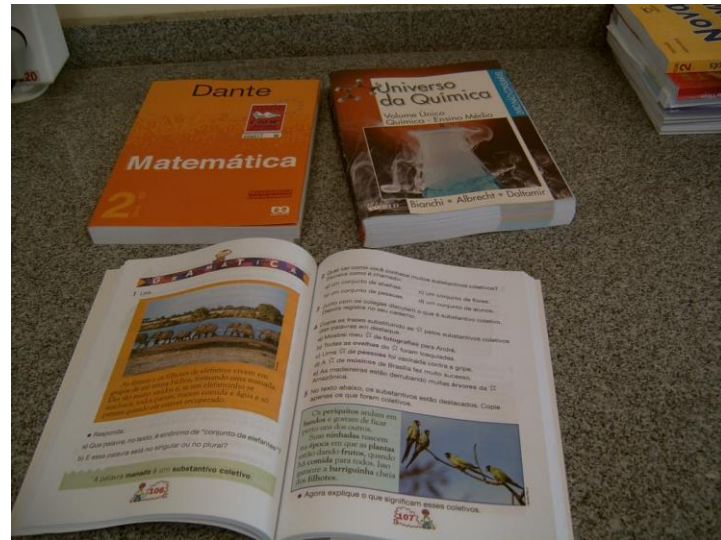
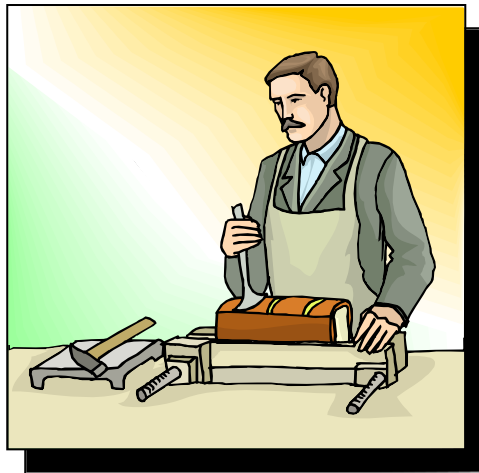
- **Foam Market** : very high volume, players: giant polyurethane companies and system houses
+/- 39.000 ton/month
- **CASE Market** : pulverized company and need technical assistance, low volume
+/-3.000 ton/mês

PUR/Curing Hot Melt World Market

- Bookbinding (Brazil is leader - student books)
- Textile Lamination(Europe and Asia)
- RV Recreational Vehicles (very big in USA)
- Profile Wrapping/Edgebanding (Woodworking)
- Panel Trucks/Refrigerators
- Automotive: Headlamps/Speaker and Plastic Bond
- Window glazing
- Clear Box (packaging)
- Footwear/Tennis

Bookbinding

Once upon a time



Nowadays 15.000 Book/hour

Brazil PUR Bookbinding/Case

- 1- **PNLD** National Plan Book Didactics.
- 2- Around **220 million books/year** purchased by the government for public school students.
- 3- Page pull: adhesion $> 7,0 \text{ N/cm linear}$, book are used for 3 years.
- 4- **+/- 100 ton** of Bookbinding PUR/months.

Reforestation forest: Eucalyptus /Pines

A Eucalyptus tree produces around 100 books
(100 pages) – per year Brazil PNLD **saves +/-**
2.200.000 trees/year



Comparative Performance PUR x Hot Melt Bookbinding

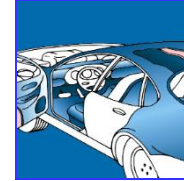
Properties	PUR	Hot Melt
Page pull	+/- 14 N/cm linear	Maximum of 4 N/cm linear
Thickness (bond line)	0,4 to 0,8 mm	1,0 to 1,2 mm
Sale Price (Brazil)	+/- US\$ 6,00/Kg	+/- US\$ 3,00/Kg
Polymer characteristic	Thermosetting	Thermoplastic

Textile Lamination

Lingerie



Automotive



Sportswear



Military



Medical



Footwear



Cleaning
Sponge



Household



Woodworking:

Profile wrapping/Edge banding/Door faces



Panel and Refrigerated Truck – RV



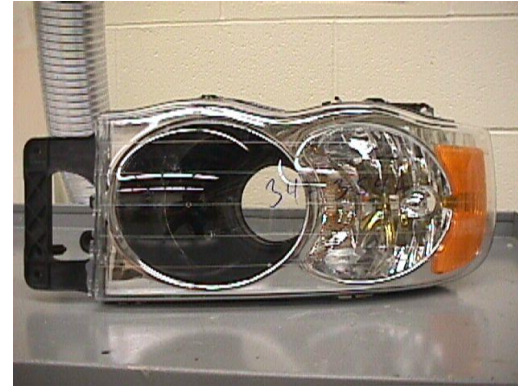
RV Recreational Vehicles – Big Market in USA

Automotive

Speaker



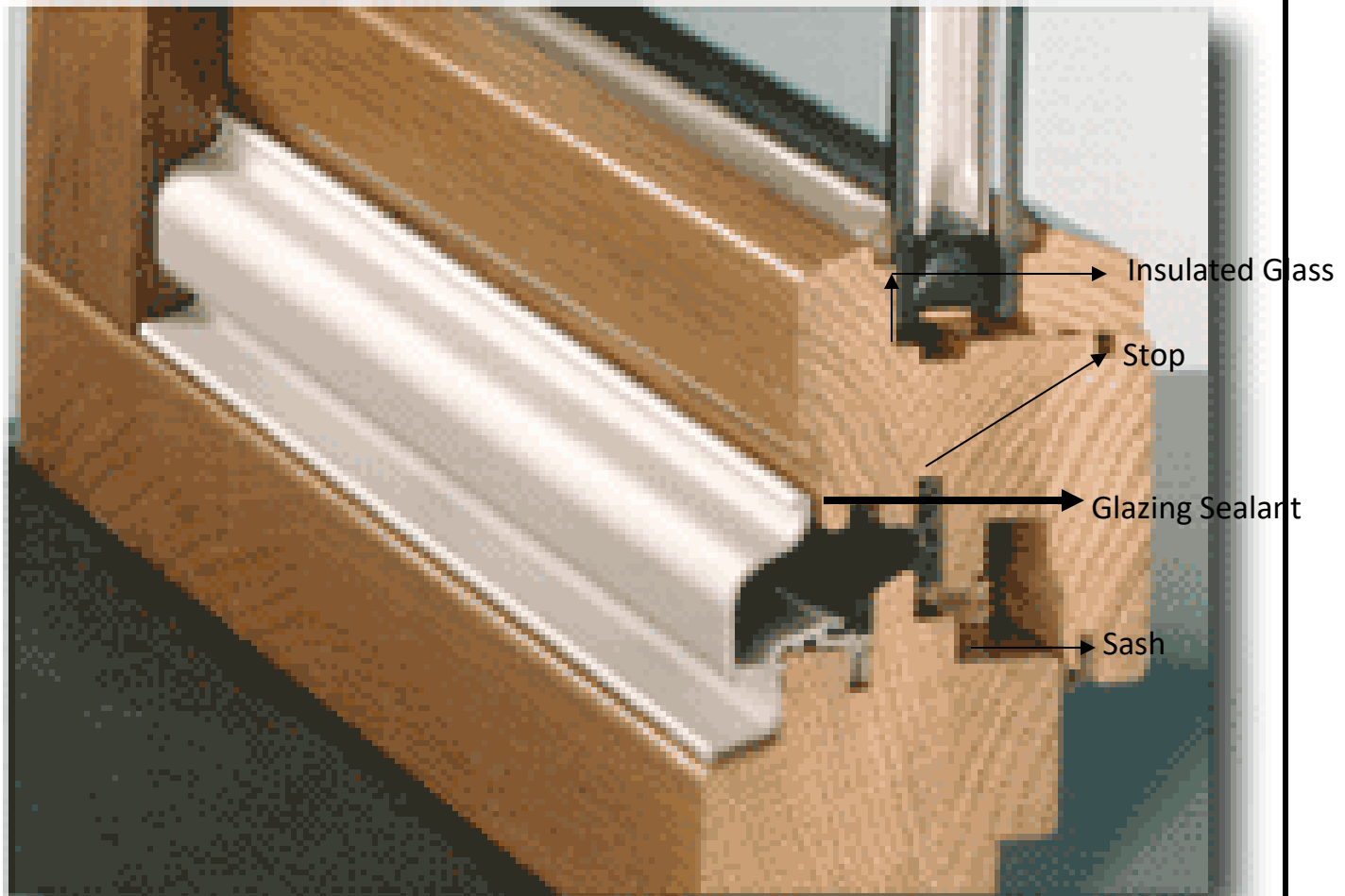
HeadLamps



Clear Box



Window Glazing: Hurricane Grade



compete against silicone sealant

Footwear/Tennis (sole)



Formulation PUR/Curing Hot Melt

- PUR or Curing Hot Melt is like a pre-polymer from MDI (pure/solid) mixed with polyether (PPG), polyester resin (adipate 1.6 hexanodiol), modifier (help in the set time): acrylic resin, EVA, APOA and co-polyesters. + additives: (tensoative and pigment).
- Big amount of adipate of 1.6 hexanodiol are used in several PUR formulations. If possible, domestic production of this polyester will help a lot to reduce costs.

PUR General Production Process/One reactor

- Polyurethane reactor with vacuum, nitrogen, good agitation, heating and cooling facilities: steam is better because it needs to cool before MDI add.
- Add all the polyester, start heating, add the acrylic resin/EVA/APAO/Co-polyester and the polyester resin pre-heat. Mix at 120°C with vacuum until moisture below 600 ppm. Cool to 95°C and add very quickly the MDI (one shot). Control one hour at 120°C, then add the catalyst (if necessary).

PUR/General Production Process/2 reactor

- **One reactor/mixer:** for mixing at 120°C with vacuum the: polyether, polyester, acrylic resin/EVA/APAO, copolyester and additives. Control the moisture below 600 ppm - transfer to:
- **Reactor 2:** with Pure MDI pre-heat inside – add the above mixture and control the reaction at 120°C until NCO end, then add the catalyst if necessary
- **Double productivity**

PUR/Packaging and Quality Control

- **Discharge** can be in metal drums, metallic pail or cardboard of 20 Kg and 2 Kg with aluminium bag inside the packaging. Always with nitrogen or vacuum after heat has sealed the aluminium bags.
- **Quality control** – Requires a good Karl Fischer to check moisture very quickly during the process, NCO Titrator and Thermosell Brookfield viscosity at 120/140°C.

Pictures from Brazilian Reactor 2 ton

Acrylic addition (vacuum)



Filter System



Sealing the foil bags



Other opPURtunities

FPA: Flexible Packaging Adhesives

solvent base 2K/high polymer cross-linked

solventless 2K (soybean oil)

one component solvent base

one component 100% solid

alcohol base 2K

Thanks a lot

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