



Water Based Dry Lamination Adhesives

A quantum leap in Adhesive technology

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Introduction

GLOBAL CONCERNS

- Air pollution
- Food Contamination
- Work place Health & Safety

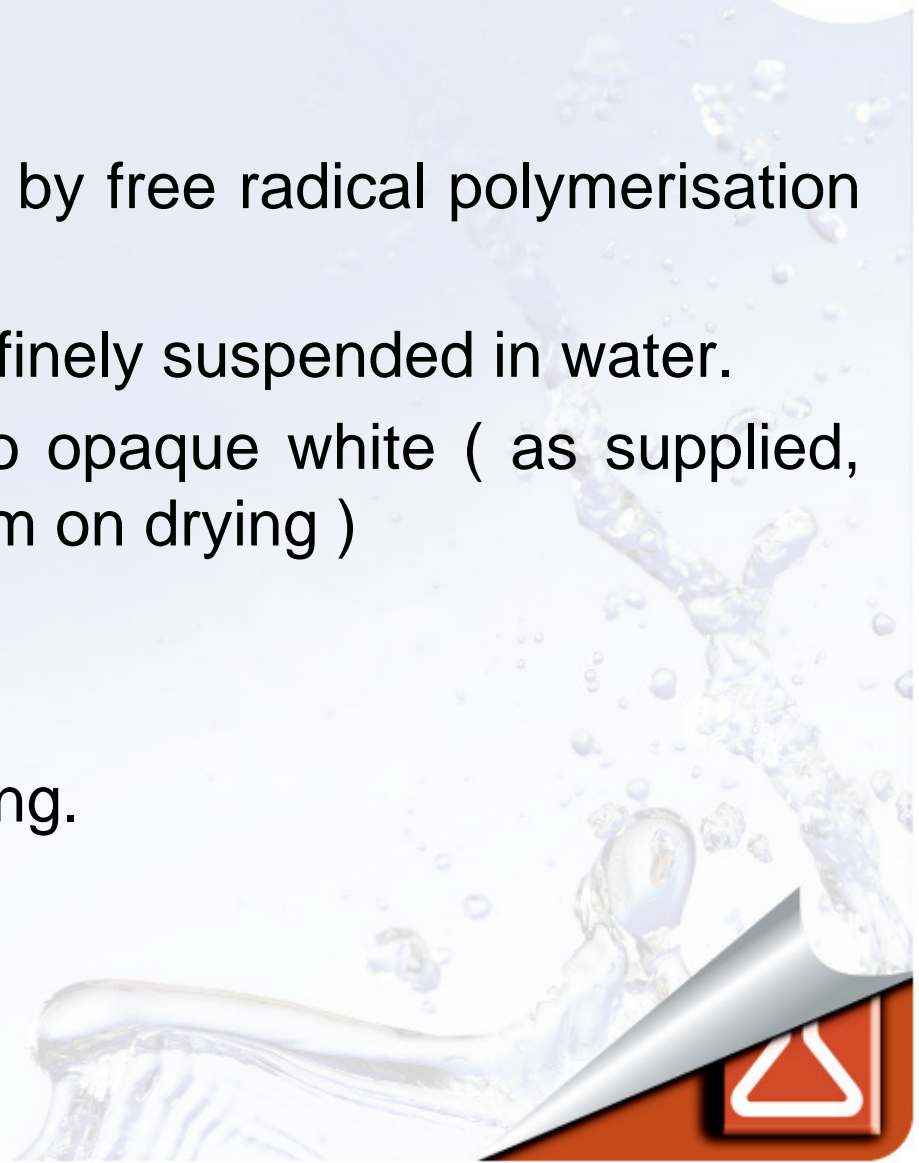
CONVERTOR CONCERNS

- Pressure on price realisation
- Pressure to reduce lead time to supply
- Conformance to EHS as well as Food Safety Regulations.



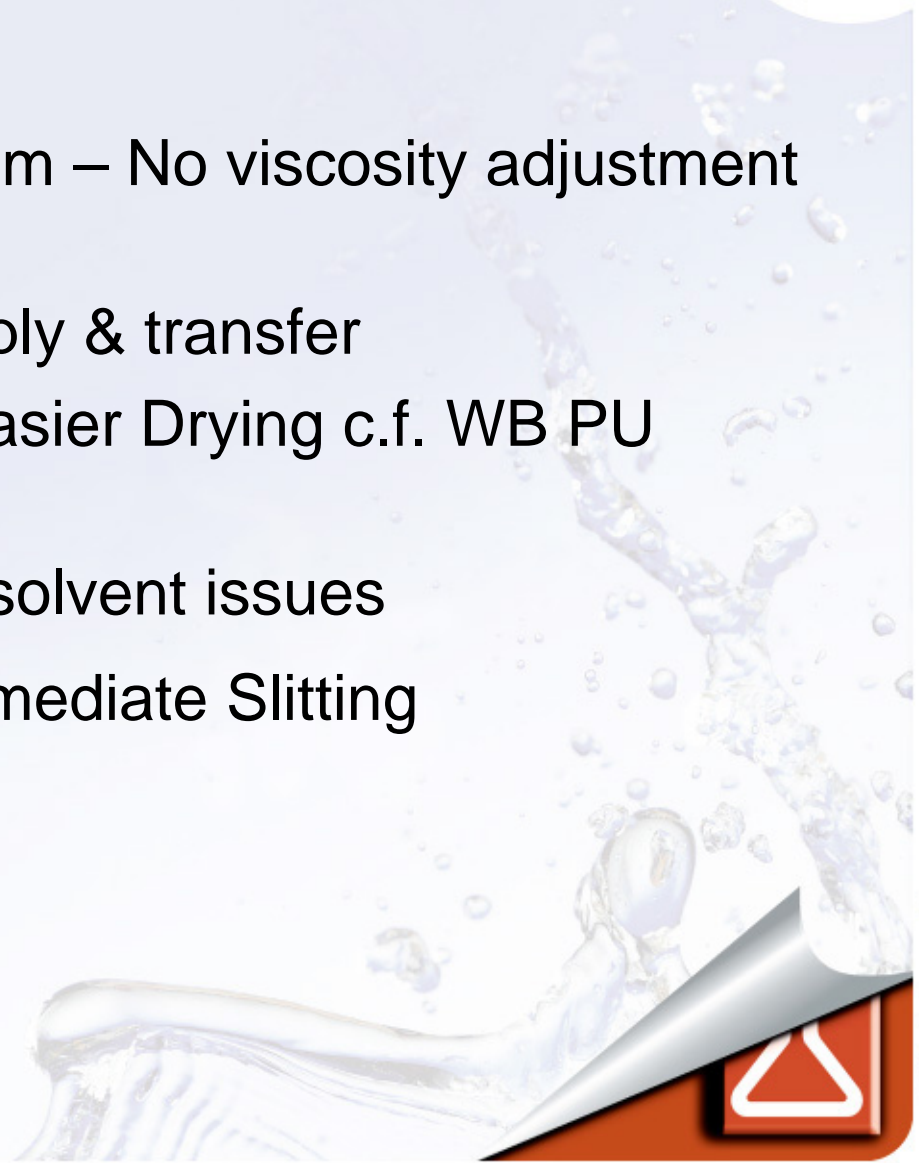
Water Based Dry Lamination Adhesives – The Chemistry

- An emulsion polymer made by free radical polymerisation of monomers in water.
- High MW polymer particles finely suspended in water.
- Appearance : translucent to opaque white (as supplied, converts to a transparent film on drying)
- Particle Size : < 1.0 micron
- pH neutral – no corrosion.
- Forms a flexible film on drying.



What does this mean?

- Very Stable Adhesive System – No viscosity adjustment required on the machine.
- Low viscosity : Easier to apply & transfer
- Particle Nature – Faster / Easier Drying c.f. WB PU systems
- Water Based : No retained solvent issues
- High Molecular Weight : Immediate Slitting



Water based Adhesives:

A wide range from General to Medium Performance Applications

Water Based

Acrylic Dry Bond
Laminating Adhesives

Mono Component

General Purpose
Biscuit, Candy, Dry Powders

Two Component

General Purpose
Higher bonds on CPP & PE

Two Component

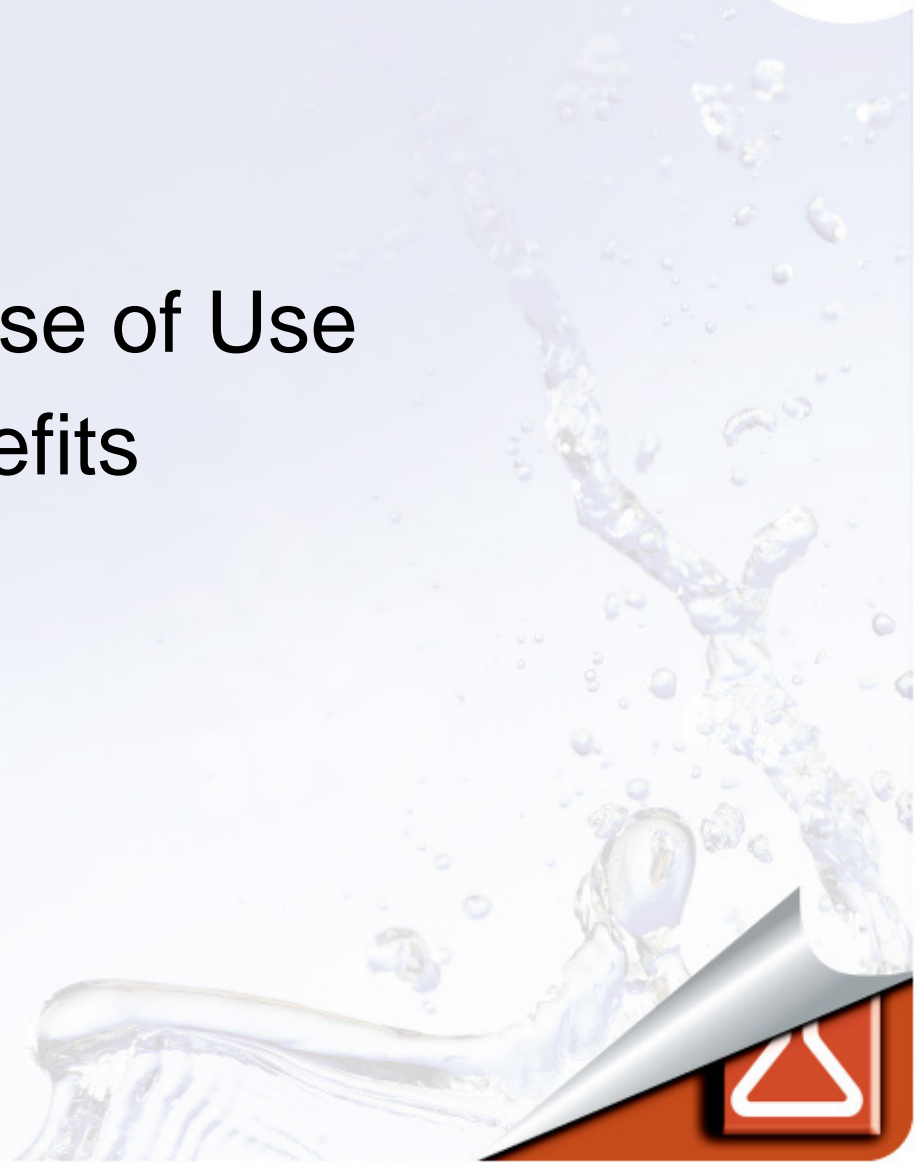
Medium Performance
Shampoo, Ketchup, Oil etc



Why Move to Water Based technology?

The Value Proposition

- Economics
- Performance & Ease of Use
- Supply Chain Benefits
- EHS Benefits

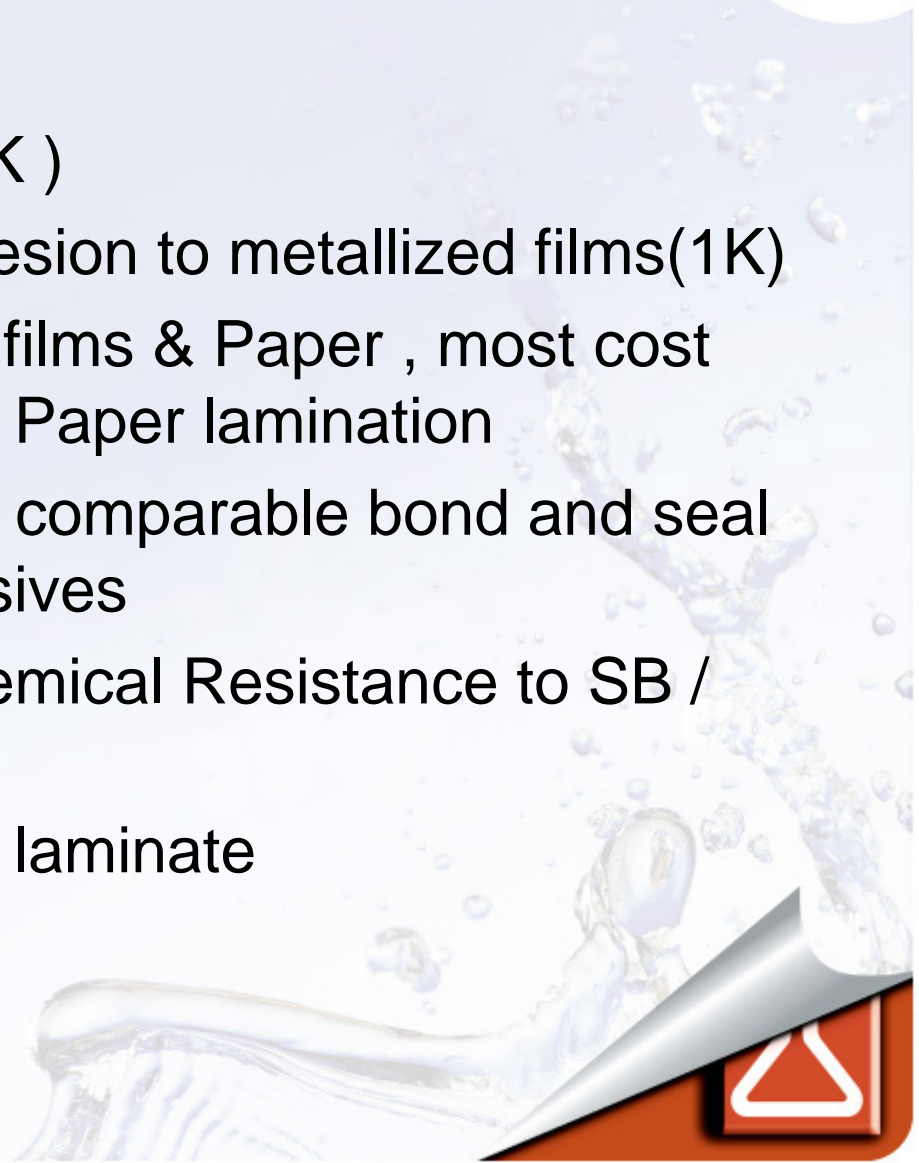


Economics

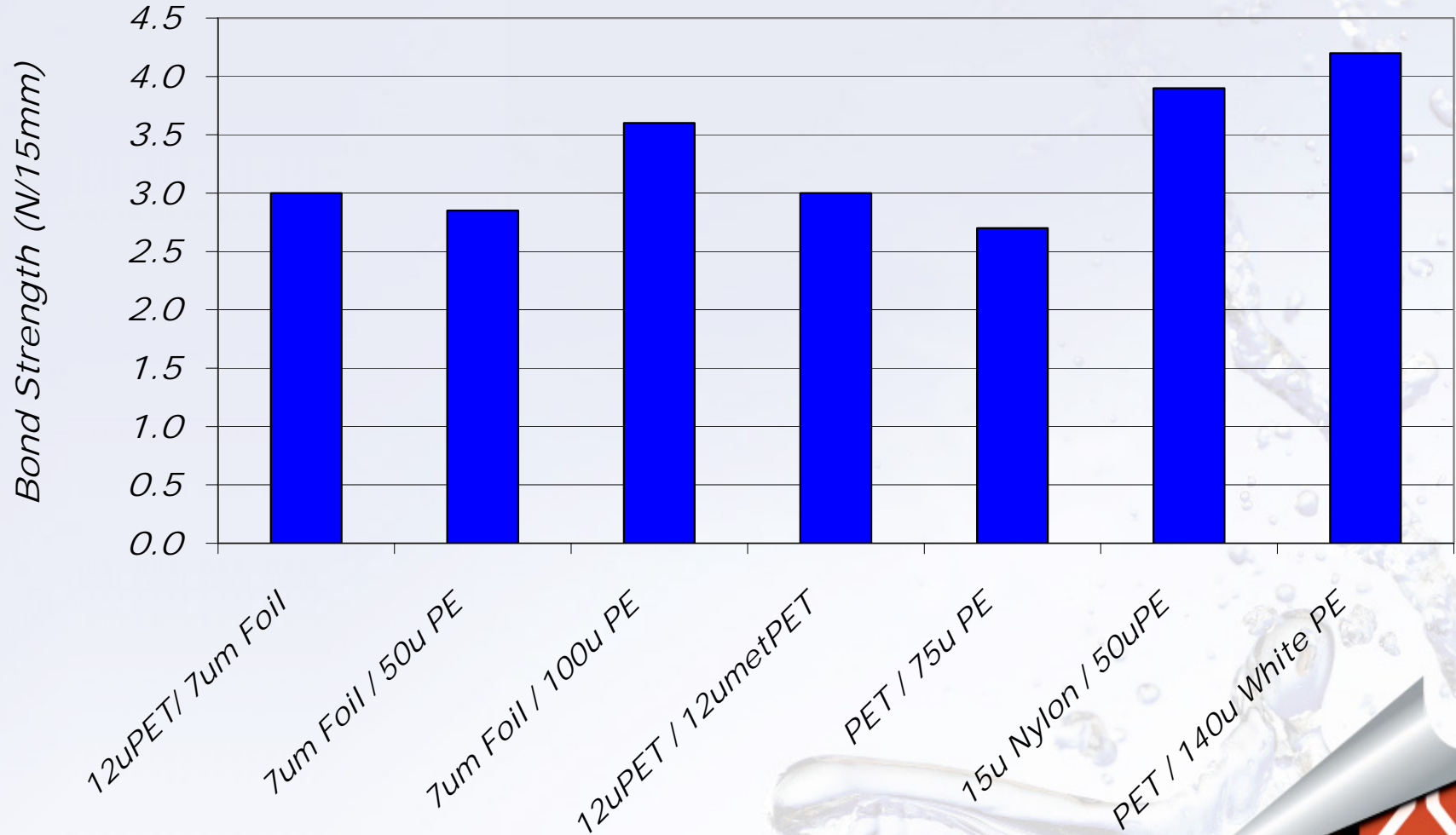
- Lower Coating Weight / Lower Applied Cost as compared to Solvent Based adhesives
- Low Capital Expenditure & Savings in Working Capital
 - Run on existing Dry Laminators with minor modifications
 - Lower inventory carrying cost due to immediate slitting advantage
- Lower Waste Costs (1 K)
 - No mixed adhesive wastage during roll changes & at the end of the day.
 - No waste through wrong mixes
 - Reduced waste disposal costs as product is non-hazardous

Performance & Ease of Use

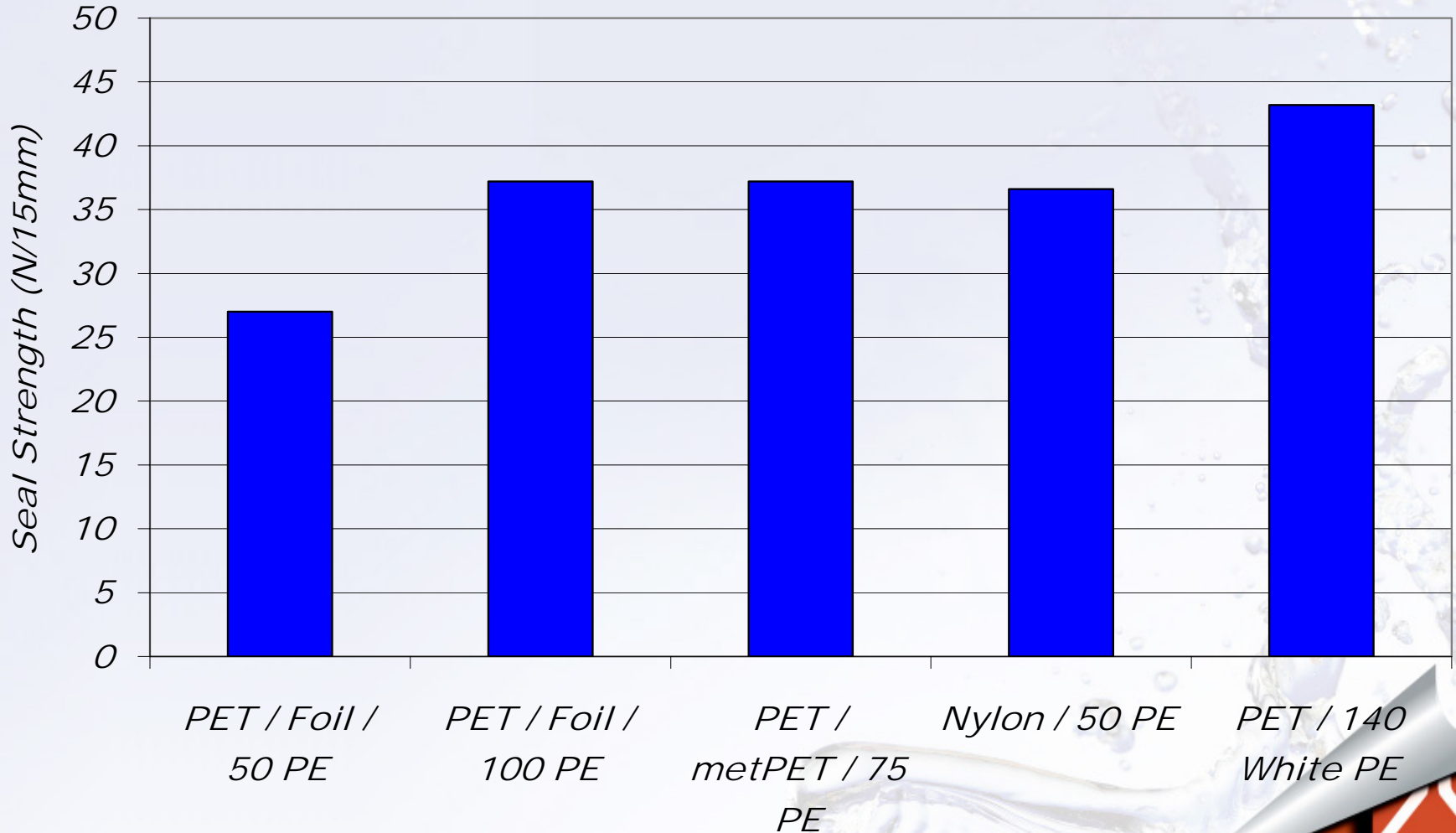
- Supplied ready to use (1 K)
- Excellent wet out and adhesion to metallized films(1K)
- Bonds to a wide variety of films & Paper , most cost effective solution for Film / Paper lamination
- Excellent green shear and comparable bond and seal strengths to SB / SL adhesives
- Comparable Heat and Chemical Resistance to SB / SL adhesives
- Excellent gloss & clarity of laminate
- Water wash up



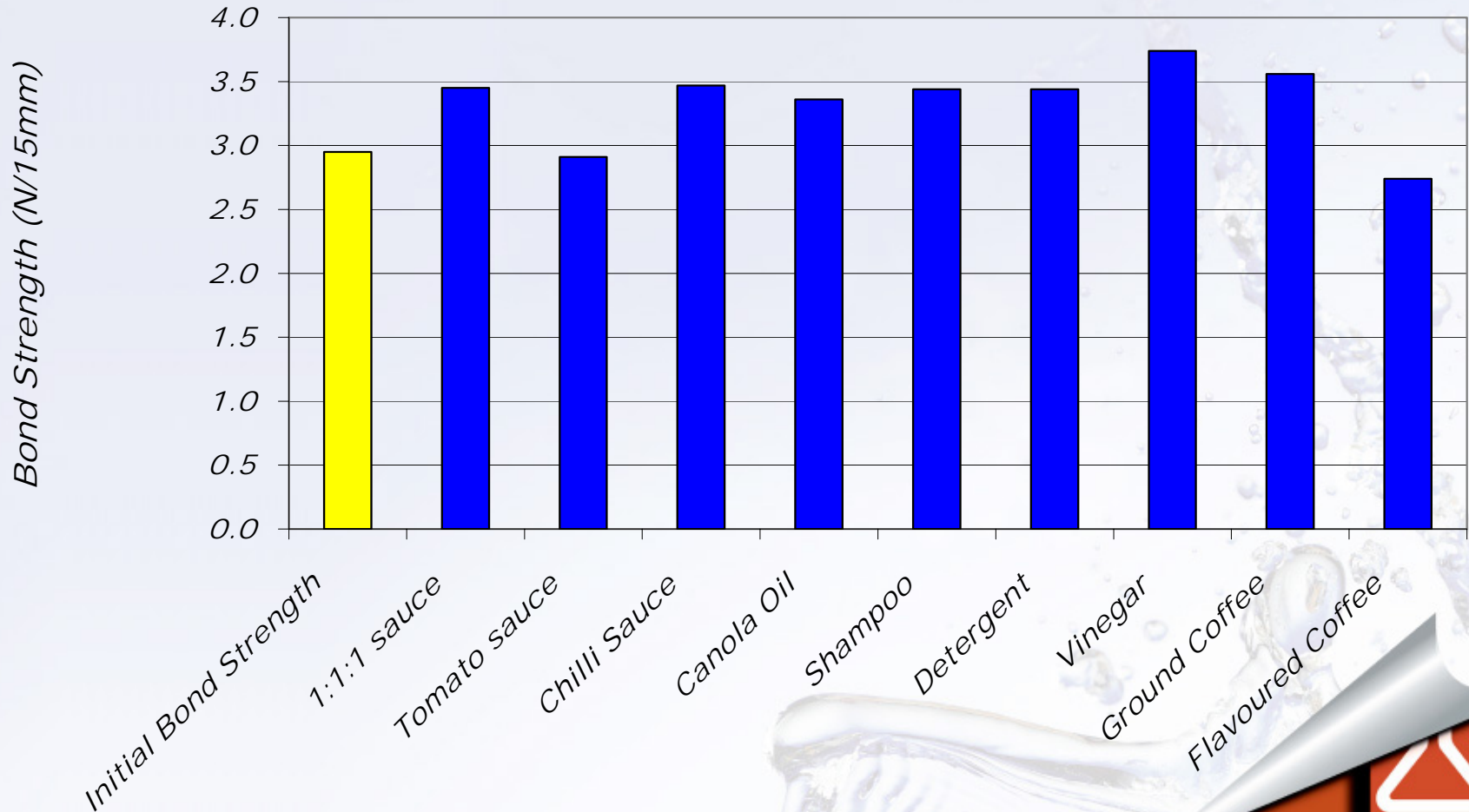
Robond L208 + CR3A MP Adhesive Bond Strength



Robond L208 + CR3A MP Adhesive Seal Strength



Robond L208 + CR3A MP Adhesive Chemical Resistance 12uPET / 50um LLDPE 45oC / 1 Month

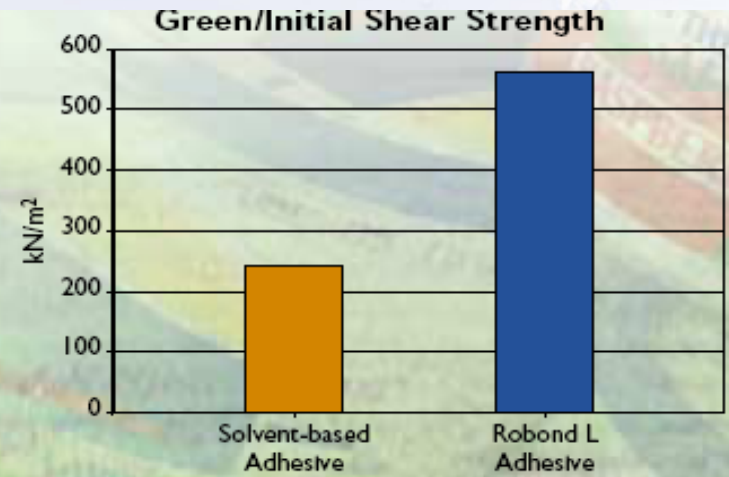
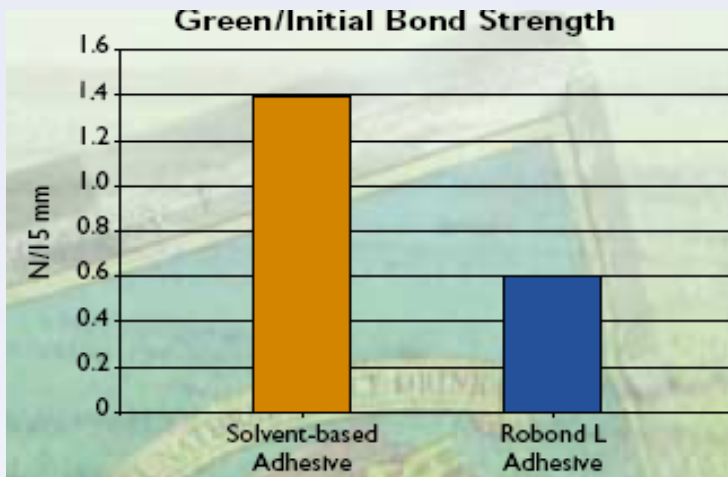


Supply Chain Benefits

- Laminates can be slit immediately resulting in shorter lead time to customer
- Lower rework / rejection of laminate due to solvent retention / odour issues
- Reduced requirement of warehousing area for finished laminate
- Most economical and suitable for short job runs due to better pot life (especially 1 K)



WB ADHESIVES – SHEAR STRENGTH



Note: Tested on PET/adhesive/PET, with 3.0 gsm dry coating weight for solvent-based and 2.0 gsm dry coating weight for Robond L water-based adhesive, and a 60°C nip.



Environment / Health & Safety Benefits

- Safer work place (solvents have extremely low flash points and are a potential fire hazard)
- Reduced staff exposure to solvents
- No **P**rimary **A**romatic **A**mine issues (Liquid food packaging)
- Compliance with all major Food Safety regulations such as FDA 175.105, 177.1395 and EU FC/P
- No solvent vented to the atmosphere – no air pollution during lamination



Regulatory Compliance

No MEK	No Phthalates
No Toluene	No ATBC
No Formaldehyde	No Chloro anisoles
Neutral pH	No Aromatic Amines
No BHT	No DEHA
No BHA	No PCB's
No BADGE	No NCO's



Water Based Dry lamination – The Value Proposition...

Advantages over Solvent-Based Adhesives

- More cost effective
 - Lower dry adhesive cost.
 - Lower coat weights can be applied.
 - No need for dilution for machine runs.
 - Avoids viscosity control requirement during production.
 - Lowers inventory costs for laminated stock – instant slitting & cure.
- Odor free laminate – no solvents from the adhesive.

Advantages over Solvent-Free adhesives

- Runs on Existing Dry laminators – No new Capex required
- Can run metallized jobs without sacrificing machine speed
- Ideal for Film/Paper – Soap Wrapper jobs
- No increase in COF after lamination
- No Primary Aromatic Amines (PAA) issues
- No adhesive wastage due to machine stoppages.

Laminating Adhesives : How they Stack Up?

SL	Good	Low	High	Fair
WB	Fair	Low	Low	Easy
SB	Low	High	Fair	Easy
	Economics	Safety, Odor Risk	Cure Time*	Processing

* - Slitting, heat sealing



Water Based Dry lamination - The Misunderstood Technology

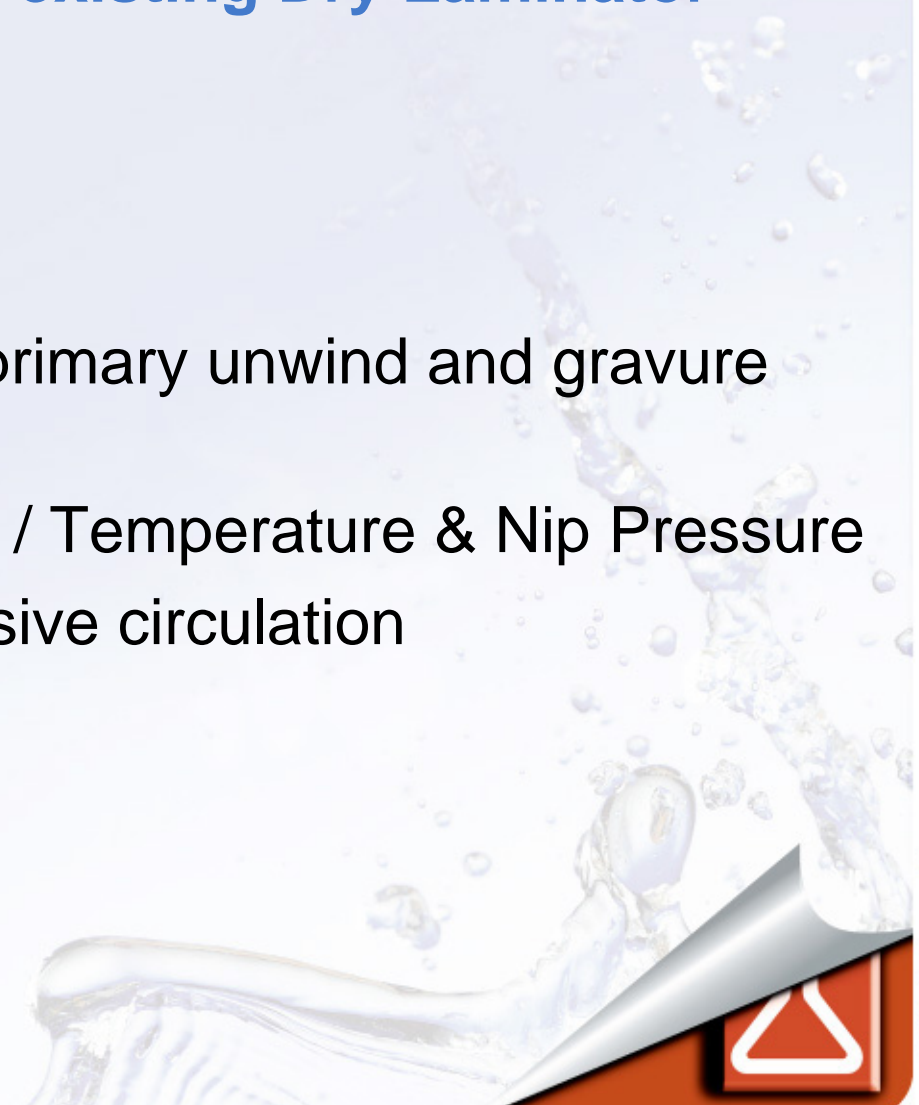
“I can not run water based adhesives because...”

- It will not work for film to film lamination...
- My machine can not dry water...
- I will need to run my machine slower...
- My ovens will rust...
- I will not get the performance necessary for my packaging requirement...



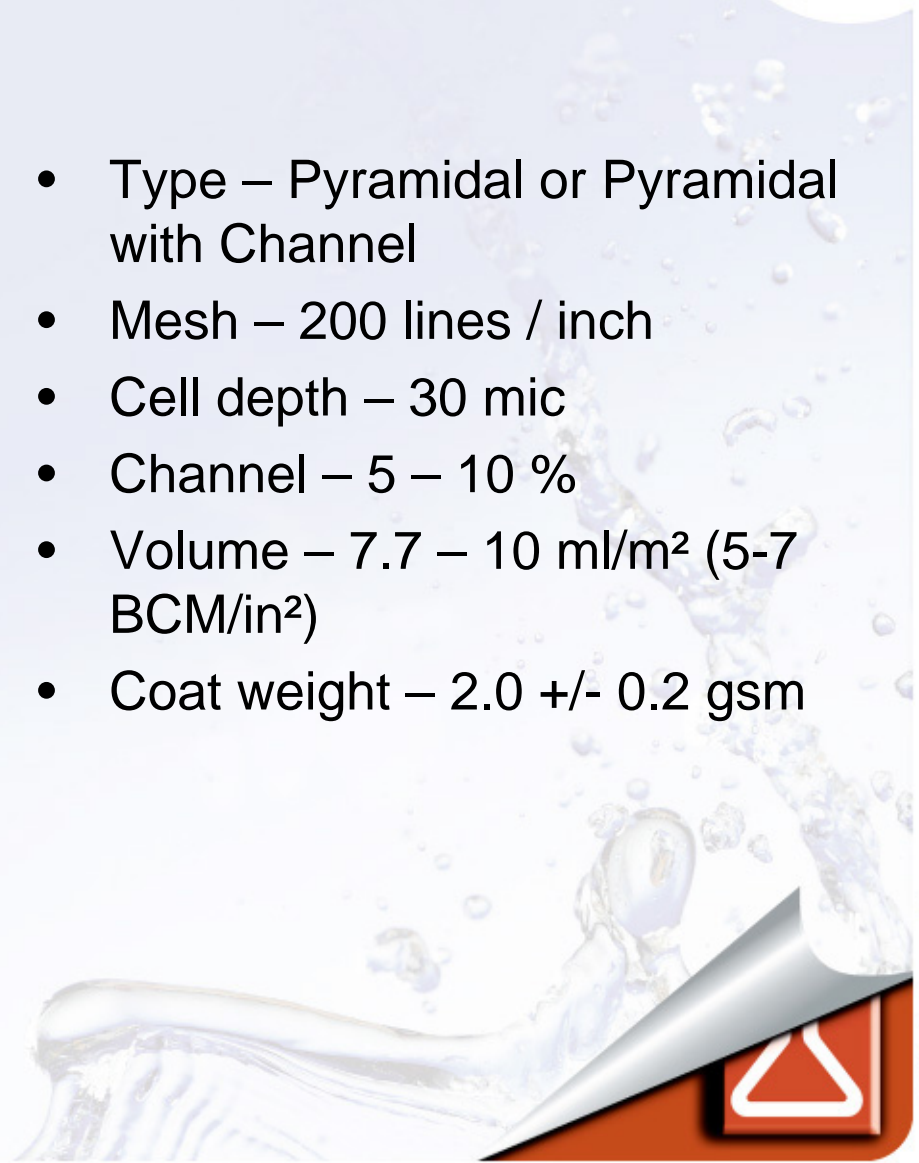
What does one need to run Water Based Adhesives ? The Key requirements on an existing Dry Laminator

- Suitable Gravure Cylinder
- Suitable Drying Tunnel
- Corona Treater (between primary unwind and gravure cylinder)
- Laminating Nip Wrap angle / Temperature & Nip Pressure
- Recirculation tank for adhesive circulation
- Smoothing bar

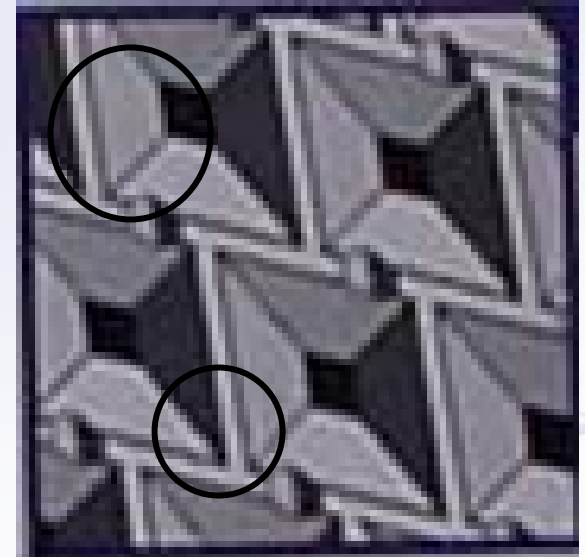
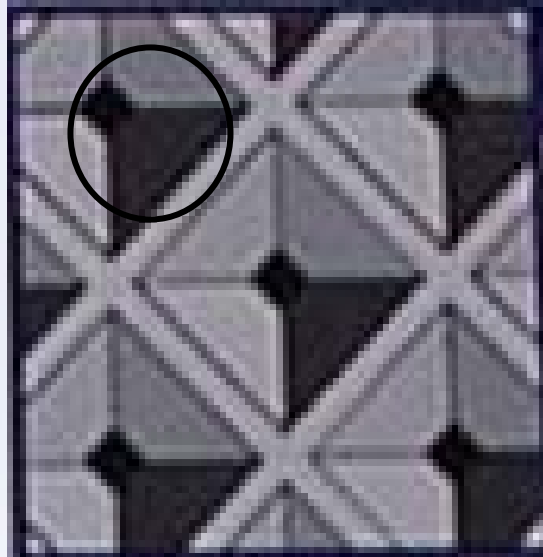
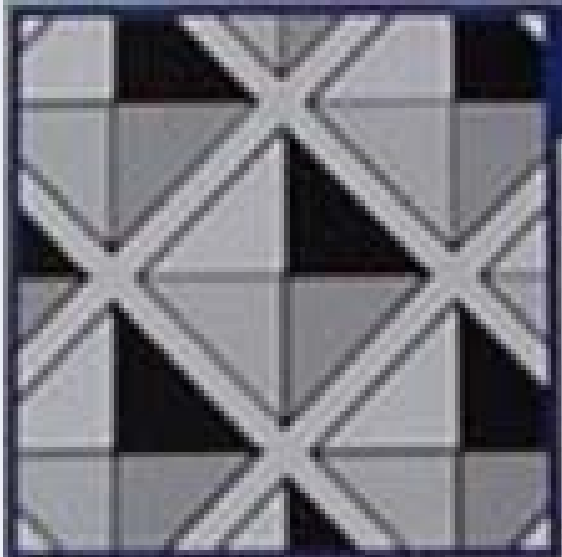


Gravure Cylinder specifications

- Type – Quadrangular or Quadrangular with Channel
 - Mesh – 180 – 200 lines / inch
 - Cell depth – 25 – 30 mic
 - Channel – 5 – 10 %
 - Volume – 7.7 – 10 ml/m² (5-7 BCM/in²)
 - Coat weight – 2.2 +/- 0.2 gsm
- Type – Pyramidal or Pyramidal with Channel
 - Mesh – 200 lines / inch
 - Cell depth – 30 mic
 - Channel – 5 – 10 %
 - Volume – 7.7 – 10 ml/m² (5-7 BCM/in²)
 - Coat weight – 2.0 +/- 0.2 gsm



Cylinder Cell Geometries



Pyramid

Quad

Channel Quad
(QCH)

Drying Tunnel

Particle Nature = Easier Drying.

White when Wet, Clear when Dry.

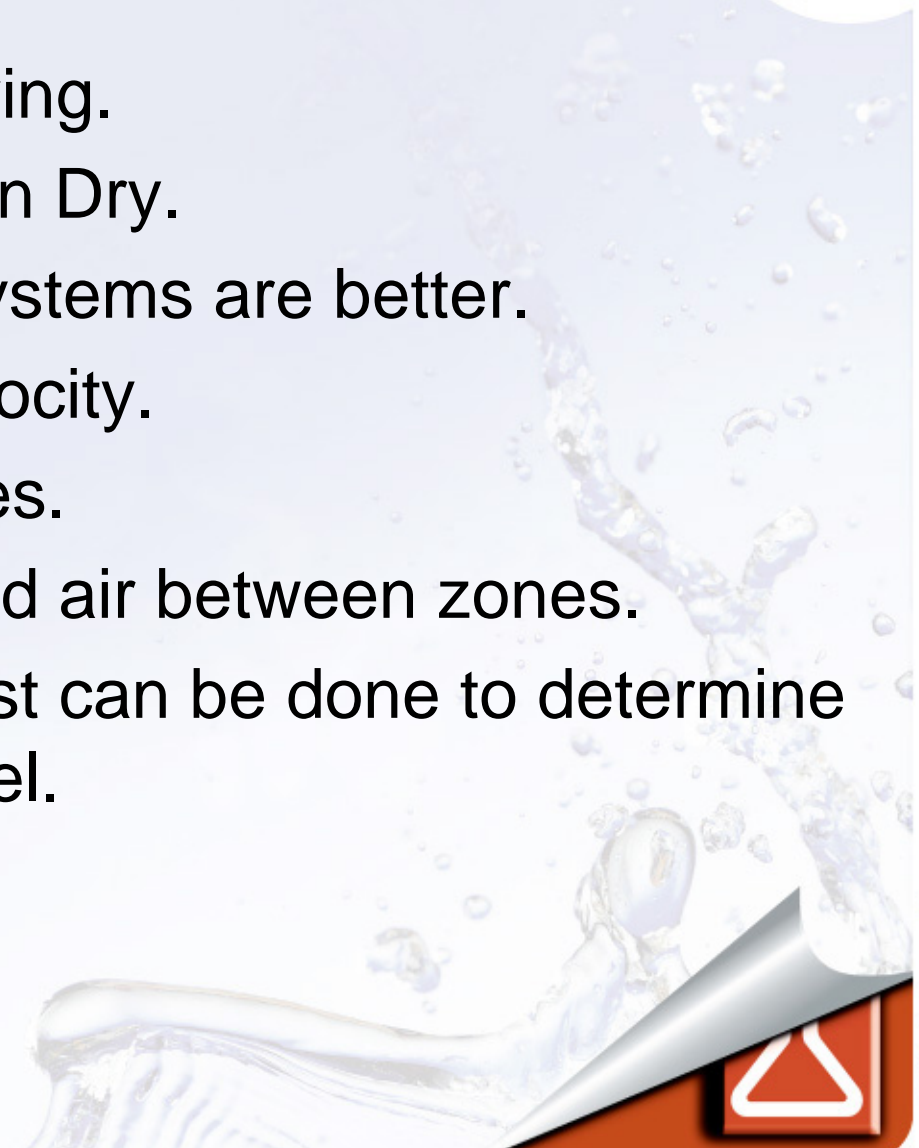
Long Tunnels with Zoned systems are better.

Good Air Volumes & Air Velocity.

Positive Air Exhaust Volumes.

No recirculation of exhausted air between zones.

Simple retained moisture test can be done to determine efficiency of the drying tunnel.



Corona treater

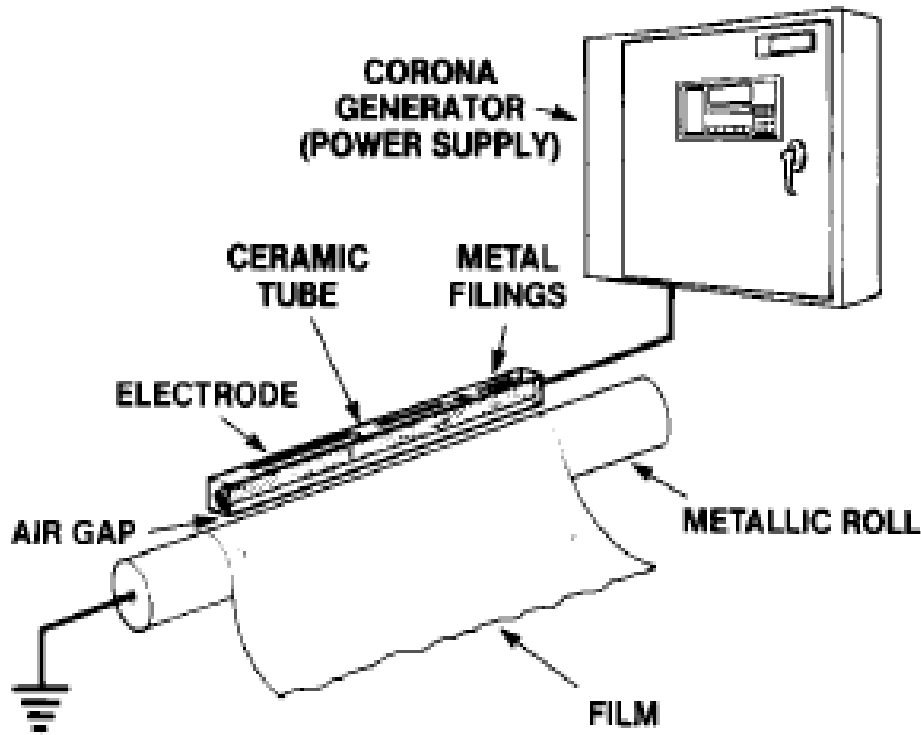


Figure 18. Ceramic Electrode/Bare-Roll.

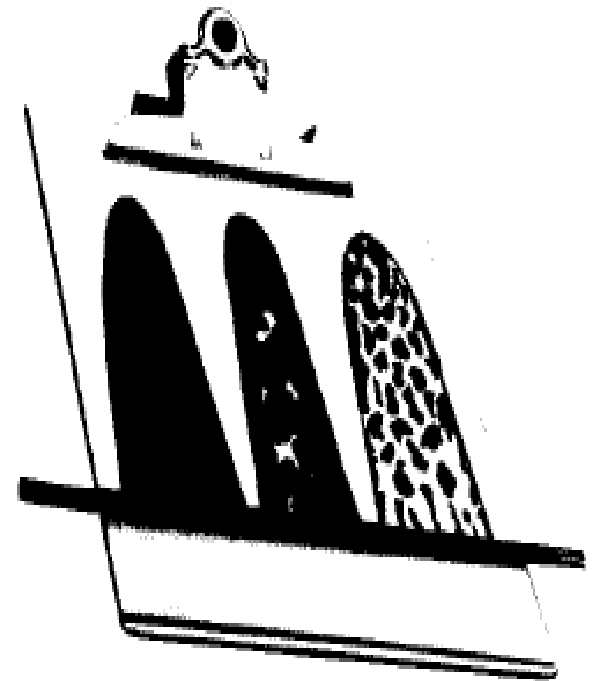
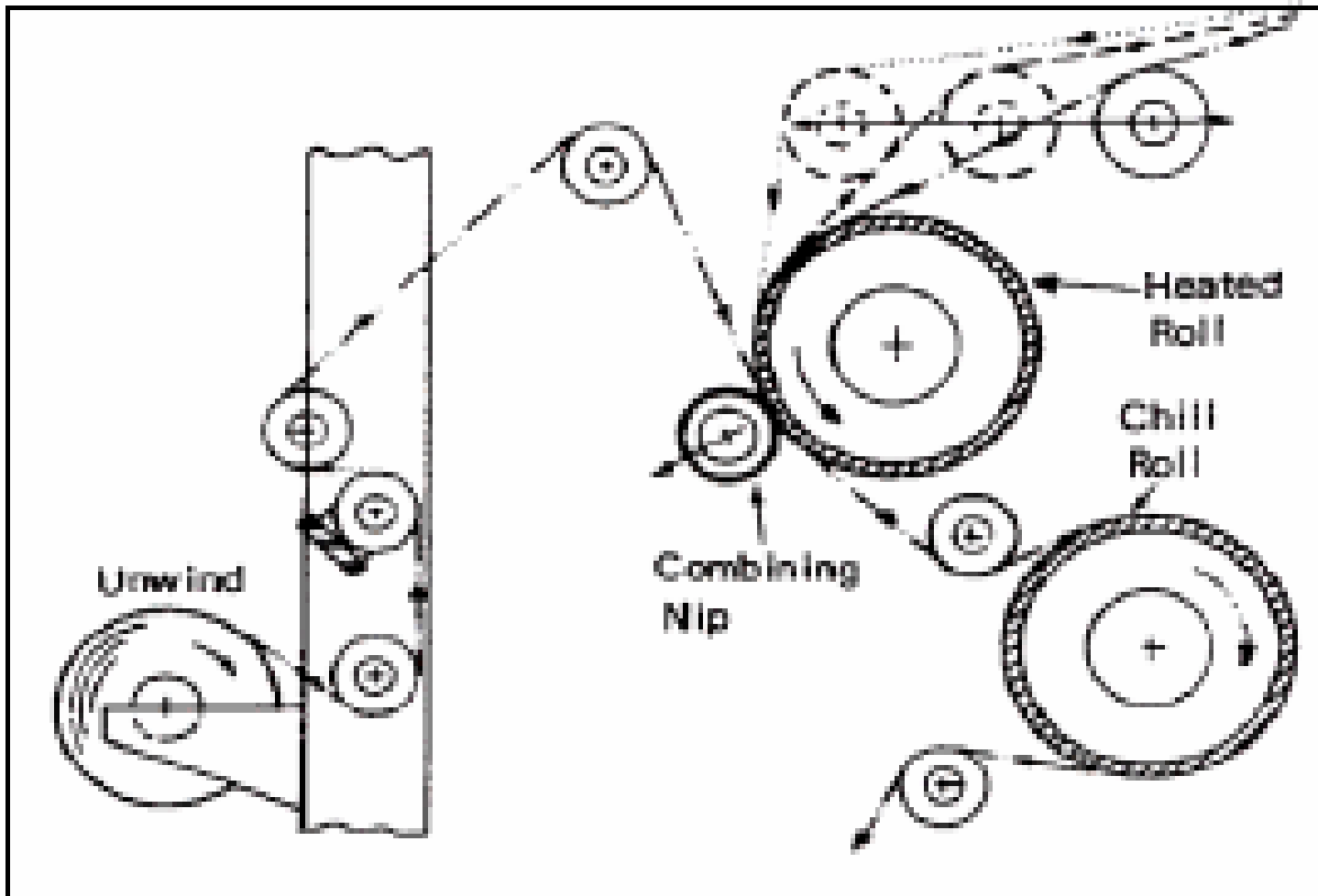


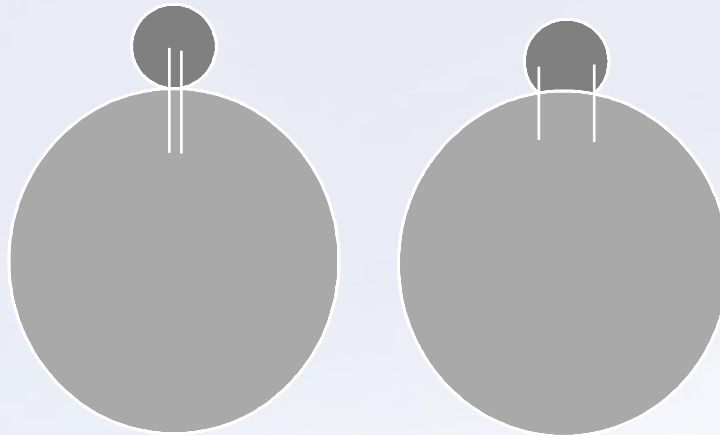
Figure 8. Drawdown of Three Dyne Solutions.

Laminating nip wrap angle / temperature / pressure



Nip Roll – Hardness & Pressure

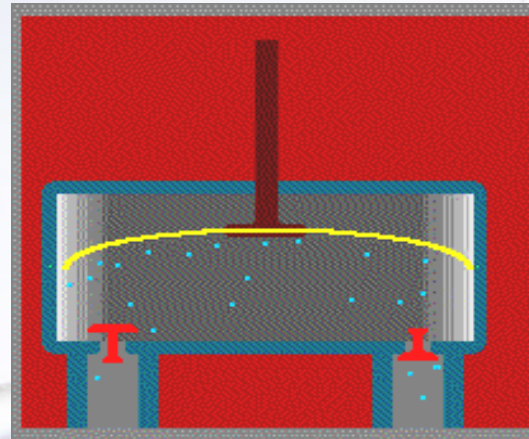
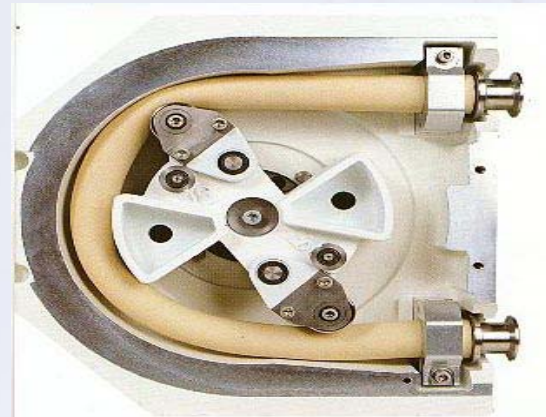
- The rubber roll should have 80+ Shore A hardness.



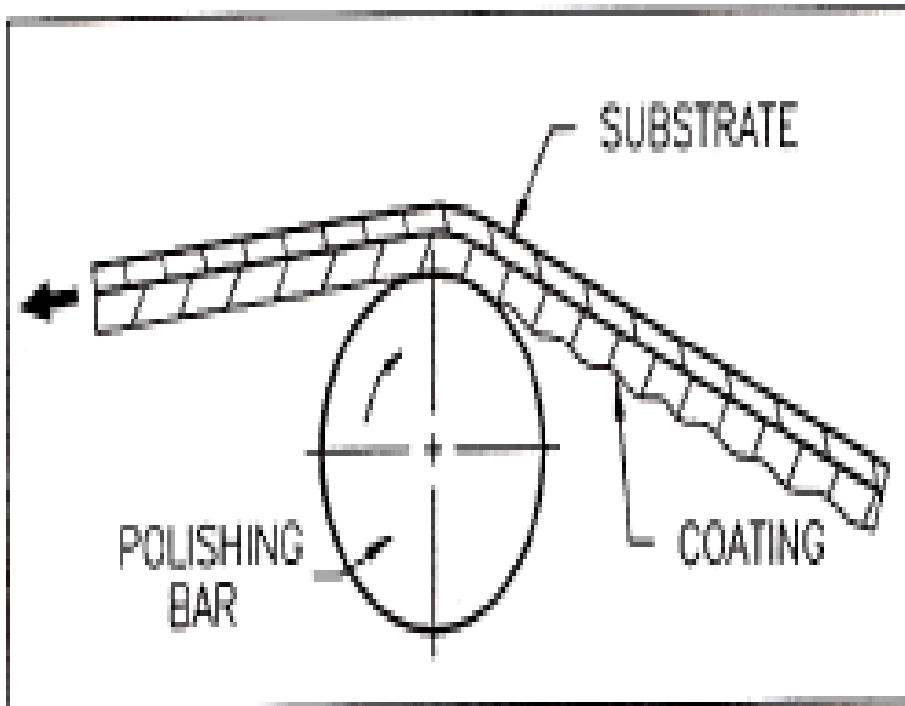
- It should be free of damage, dried adhesive, tape etc.

Recirculation Pump

- Critical to minimize foaming
- Select pumps with minimum shear
- Do not use ink pumps, centrifugal or gear pumps
- Recommendation:
 - **peristaltic or**
 - **diaphragm**



Smoothing bar



Final Word

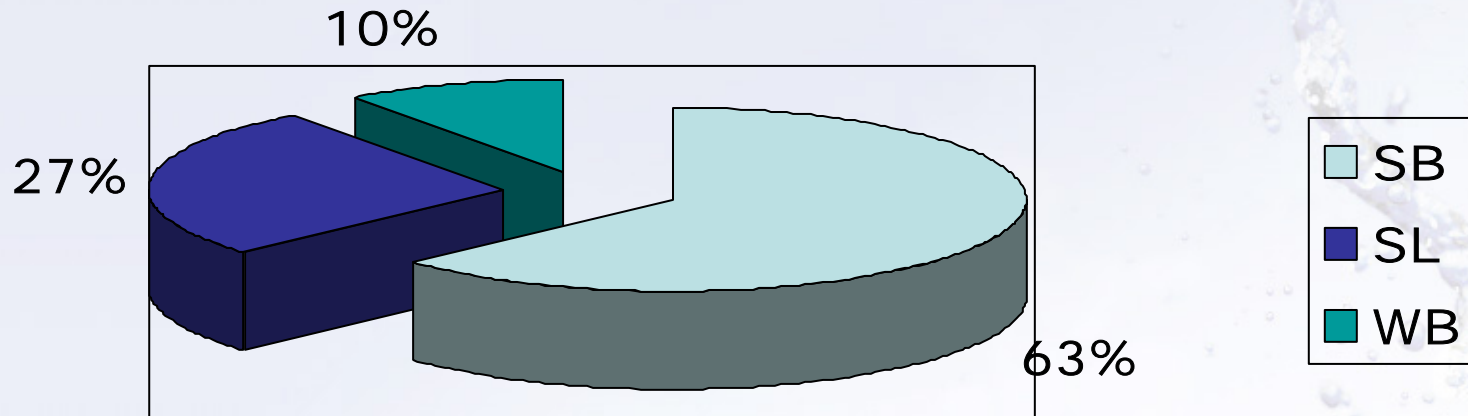
Water Based Adhesive Technology

- Runs on existing dry laminators with minor modifications
- User Friendly – Easy Mixing / No Viscosity Adjustment
- Excellent clarity and improved gloss of laminate
- No VOC or DG Issues. Safer , improved Regulatory Compliance.
- Superior economics as compared to Solvent based adhesives
- Faster Processing – No WIP , superior speed to market
- Most suitable for short lamination runs , lamination of metallised structures and film / paper applications.
- Most suitable for liquid food packaging
- Odour free laminates
- General to Medium Performance (liquid packing) adhesives available.



GLOBAL ADHESIVE CONSUMPTION CY 2006 (% split by technology in \$\$)

WB adhesives for dry lamination command a 25 % + market share in North America. Within Asia Pacific , this technology has been very successful in China & Indonesia



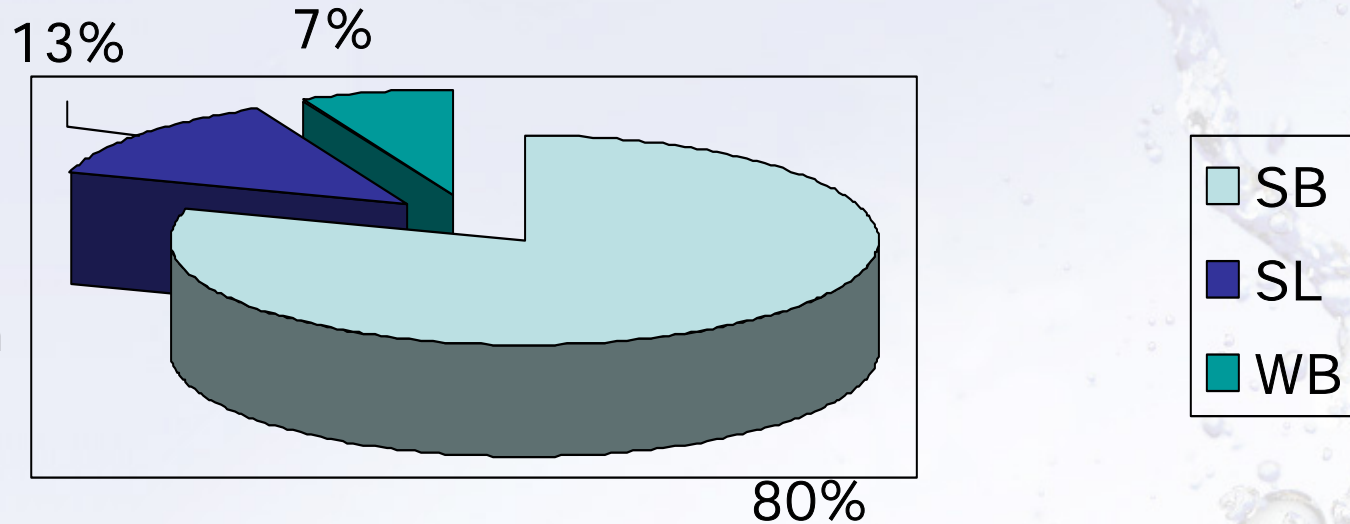
Solvent-free adhesives have been most successful in Europe and Latin America as well as in India

Solvent based adhesives continue to lose market share to both SL & WB adhesives

ASIA PACIFIC ADHESIVE CONSUMPTION CY 2006 (% split by technology in \$\$)

WB adhesives for dry lamination have been most successful in China & Indonesia

Solvent-free adhesives have been most successful in India & Indonesia



Solvent based adhesives still dominate in large markets such as Japan , China and India. However , there is steady loss of market share taking place

WB Success Story in Shantou , China

- A town in South China
 - With population of 4 MM
 - With over 100 converters
 - With over USD60MM sales
 - With local machines & materials
 - Some with well trained operator, but some not.
- A town consuming **1000MT/annum** of WB adhesive
 - On OPP/metCPP
 - For confectionary, snacks, noodles, Biscuits



Water based Adhesives: Our range

Robond™ L
Acrylic Dry
Laminating Adhesives

Robond™ L90D

General Purpose
Biscuit, Candy, Dry Powders

Robond™ L150/CR3A

General Purpose
Higher bonds on CPP/PE

Robond™ L208/CR3A

Medium Performance
Shampoo, Ketchup, Oil etc

CONCLUSION

It has been said that there is a tool for every job, but not every job requires the same tool

Our ROBOND™ products are the most versatile of any water-based products on the market.

Our performance and economics surpass that of many solvent-based & solvent-free products

As the only Total Packaging Solutions provider, WB dry laminating adhesives (ROBOND™ series from Rohm & Haas) represents another option to converters in India in addition to the

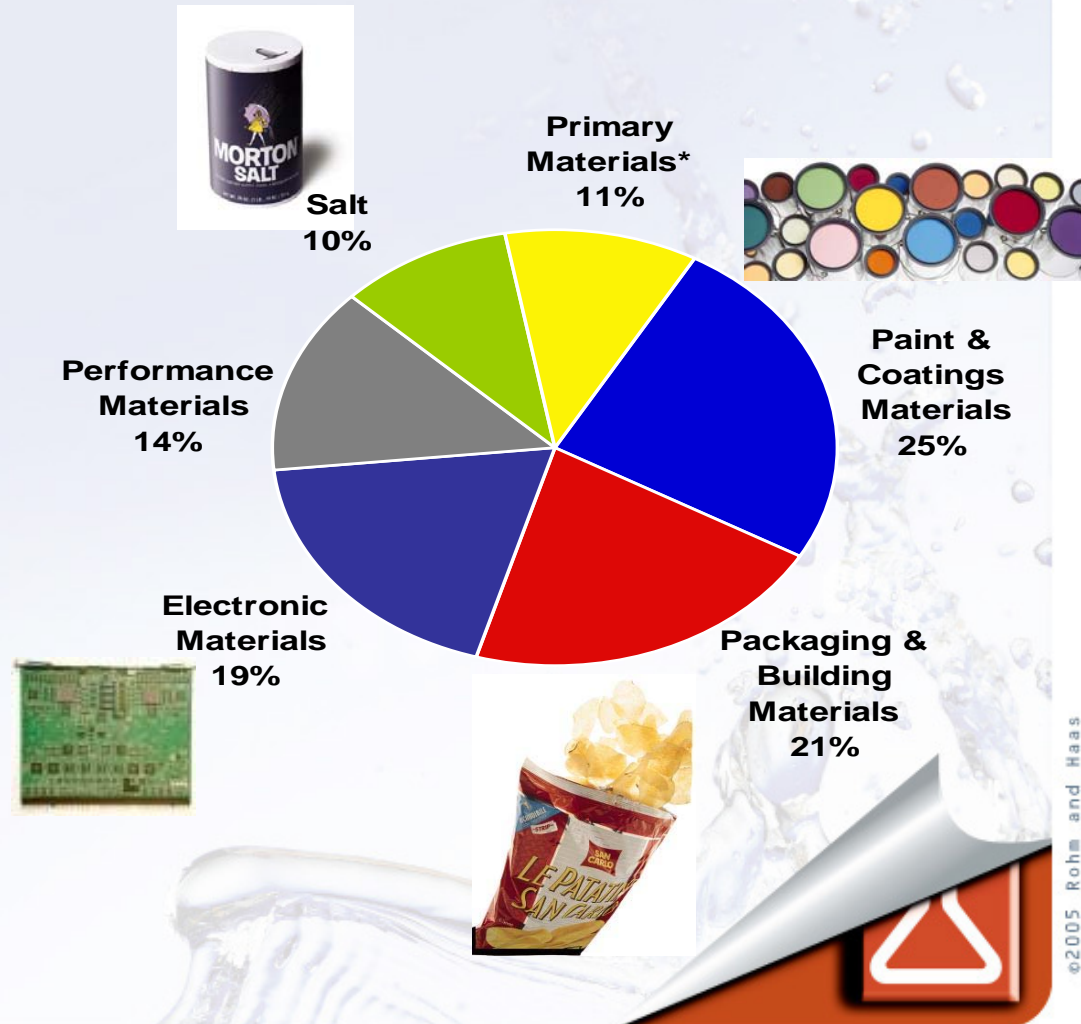
ADCOTE™ range of Solvent based

&

MOR-FREE™ range of Solvent-free adhesives

Rohm and Haas : A global specialty chemicals company

- Among the top 5 specialty chemicals companies in the world with \$8.23 billion in sales in 2006
- Over 100 research and manufacturing locations in 27 countries
- > 15,800 employees worldwide



imagine the possibilities™...



imagine the possibilities™...

