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Printing Ink Technologies for Shrink Sleeves

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Agenda

- Introduction
- Different ink technologies
- Requirements for the inks for shrink sleeves
- Tips for water based and solvent based printing
- Deep dive into UV curable inks
- Summary



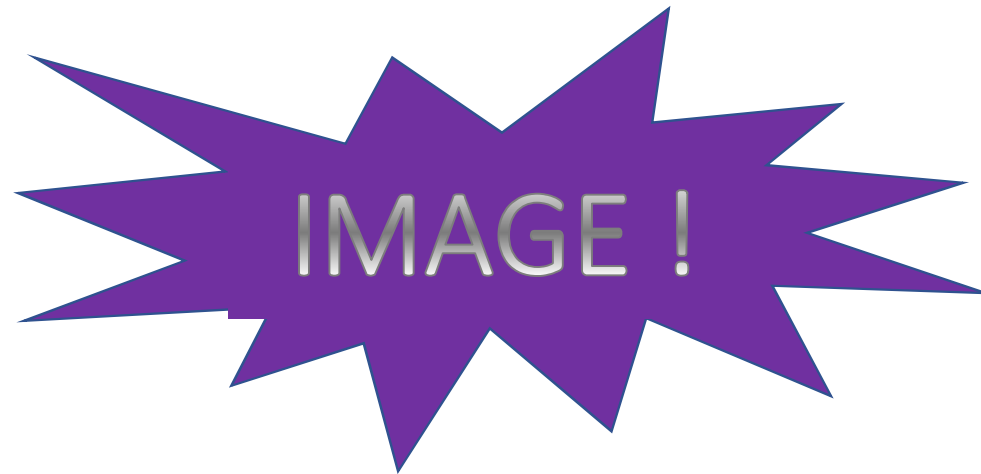
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Role of packaging

protection - increase of shelf life

Brand Recognition

Eye Catching Packaging



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Attractiveness of shrink sleeves



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Eye catching

Possibility to differentiate (360° info)

High quality printing

High resistance (scratch & chemical) properties

Food safety

Ink technologies and printing processes



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Print method	Ink type			
	Solvent	Water	Oil	UV
Flexo	X	X	–	X
Letterpress	–	–	X	X
Offset	–	–	X	X
Screen	X	–	–	X
Gravure	X	X	–	–
"Digital"	X	X	X toner	X

Raw materials



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Ingredient	Solvent	Water-based	UV curing	Oil / Offset
Pigments	Yes	Yes	Yes	Yes
Resins	Nitrocellulose	Acrylic	Oligomers	Phenolic Alkyd
Diluents	Solvents	Water/amine	Monomers	Mineral / Vegetable Oil
Solvents	> 30%	< 5%	0	0
Additives	Wax Antifoam Silicones Plasticizers	Wax Antifoam	Wax Photo initiator Stabilizers	Wax Stabilizers Fillers

Pigments



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- Pigments
 - physically & chemically stable
 - non-soluble
- Denoted by Color Index Number (CI#)
 - Red 57.1, Red 184, Red 177
- CI# indicates properties
 - hue, fastness, cost....
 - important to know CI#!
- Organic nature
 - Pyrazolene, Disazo, Naphthol, Pthalocyanine, Quinacridone
- Inorganic
 - Titanium Dioxide
 - Iron Oxides
 - Metallic



Resins

- Typical resins used
 - Nitrocellulose
 - Polyamide
 - Acrylic (styrene and acrylic acid)
 - Phenolic
 - Epoxy Acrylates, polyester acrylates, etc...: used in UV/EB inks & coatings
 - Urethanes, Polyesters: used in solvent based inks & coatings
- This is the backbone of the ink!
- Will affect adhesion, flexibility, resistance properties, speed of drying/curing, and overall end performance of printed material



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Diluents

- Used to reduce viscosity, to “thin” the ink
- Most common is H₂O for waterbased inks
- UV inks use monomers
- Diluents will affect dry/cure speeds also



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Additives

- Defoamers
- Waxes/Silicones (Coefficient Of Friction=COF)
- Matting agents
- Photoinitiators for UV inks
- Adhesion promoters
- Surfactants
- Optical Brighteners



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Requirements for inks for shrink sleeves



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- Very high color strength
- High cure speed
- Excellent press & print performance
- Ability to shrink (so flexibility !)
- Adhesion to wide range of substrates (PET-G, PVC, OPS, PLA,....)
- Good surface slip properties, especially for ink on the last printing station (usually white)

Why is white ink so important?



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- Usually last down so COF is very important
- Scratch resistance, adhesion and flexibility
- Opacity, adhesion and flexibility
- Low COF (high slip) – last down
- High COF (low slip) – first down
- Some people will print single bump of white and up to 3 bumps to get opacity and performance

Tips for printing water based inks



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- Proper anilox roller selection and press speed
- High air velocity drying (not too much heat!) for proper drying in order to reach the desired physical properties (adhesion and scuff resistance) as well as to prevent blocking in the rewind
- Catalyze inks (whites/last down) if going thru steam tunnel and in case shrink sleeve is used in wet or cold storage conditions
- pH maintenance is critical!



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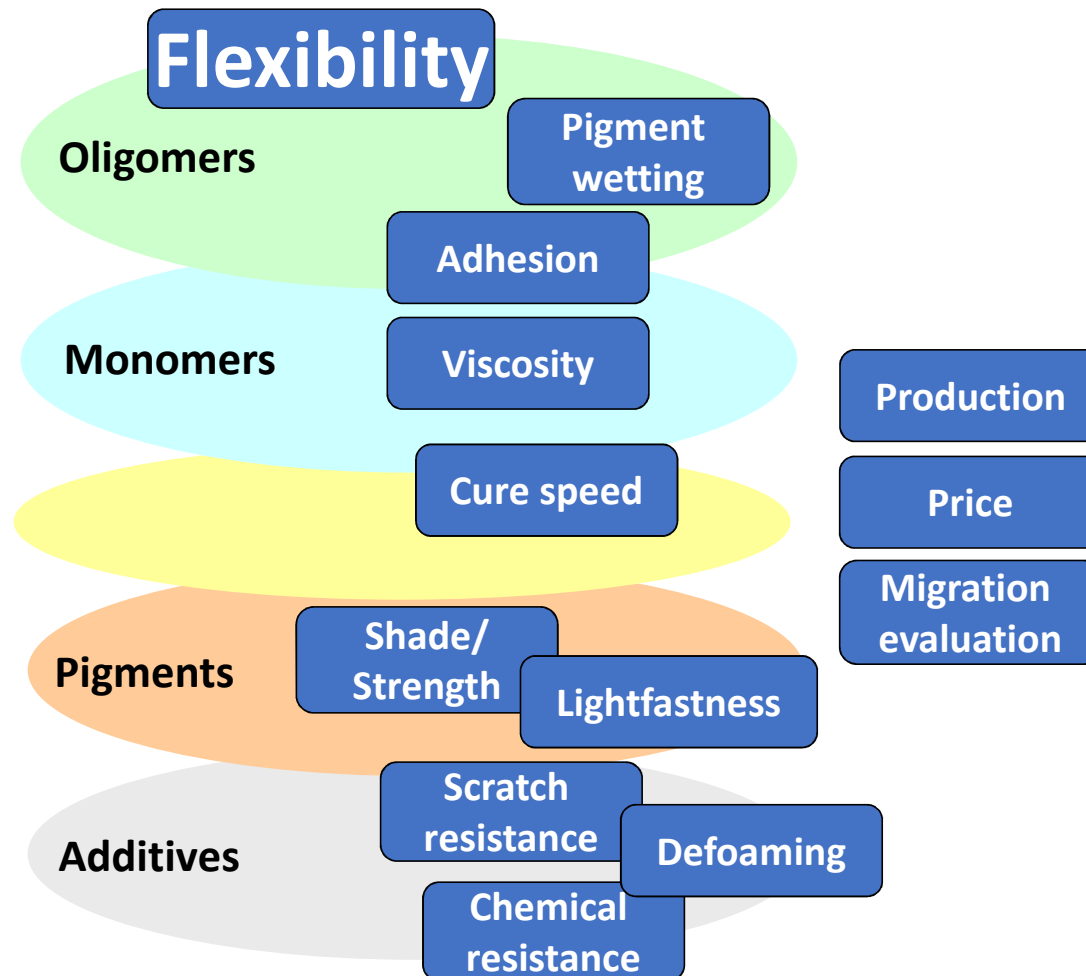
Tips for printing solvent based inks

- Solvents - particularly acetates - damage film, so correct solvent selection is important
- If too much solvent remains in the film, over time, shrink performance can be affected, so the right viscosity in combination with proper drying (air temperature and velocity and “clean” air) – reduce levels of retained solvents
- OPS Film is particularly sensitive to solvent attack – try dropping ethyl acetate onto OPS shrink film! Common problems – “whitening” & shrinking after print

Deep dive into UV inks: designing a Low Migration UV flexo ink



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Designing Low Migration UV flexo inks

- Less building blocks available
- Excluding low molecular weight monomers prone to migrate
- Legislations and regulatory environment continuously moving
- Increased awareness among local brand owners

Targeting a design window that gets smaller every year

Design window – Standard UV inks

**Design window –
low migration inks**

Challenges with UV curable inks



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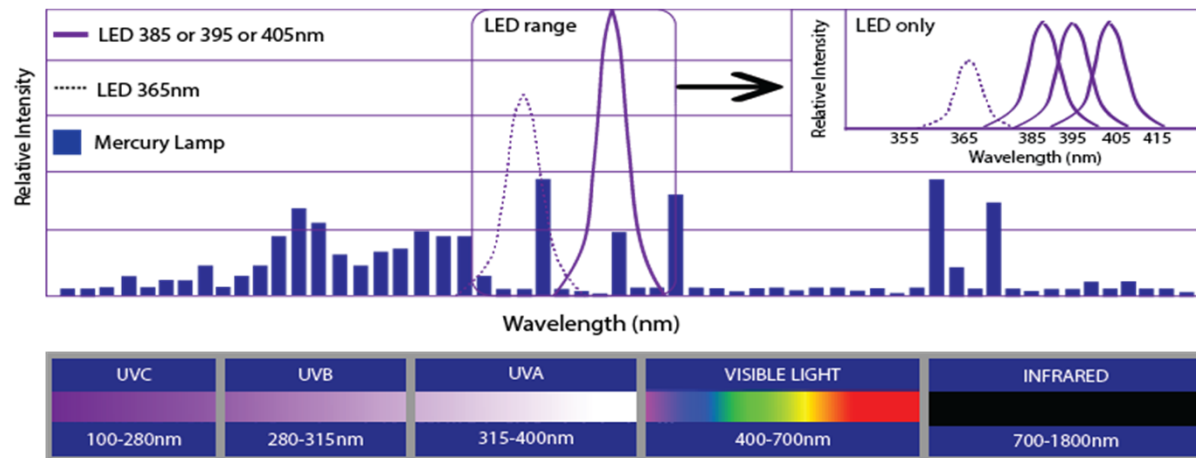
- Heat generation from UV lamps will distort films, especially thin films
- If you don't have the proper ink formulated for "cool UV" systems, then your UV inks may not cure as fast.....
- Often the chill roller is too cool
- All of these challenges can be addressed.....with UV LED curing



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What is UV LED?

- UV LED means UltraViolet Light Emitting Diode
- UV LED is an alternative for the traditional UV Hg lamp systems (different wavelength and intensity compared to conventional UV)
- Different ink chemistries are needed





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Advantages of UV LED curing

Performance

- High color strength with excellent cure
- Reliable and consistent adhesion and printability
- Dual cure

Advanced Capabilities

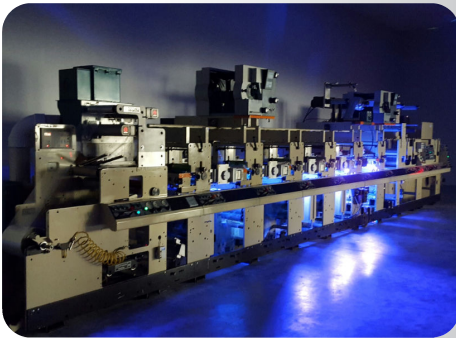
- Useful at sensitive films, thin
- Controlled and controlled curing intensity - consistent curing

Operating Economics

- Higher Productivity
 - Press UPTIME – less equipment faults
 - Faster cure
- Energy Efficient
- Long Lifetime & Low Maintenance
- Solid State: Instant on/off

Health and Environmental

- Mercury & Ozone Free
- Less Heat and Operating Noise



IDEAL for Shrink Sleeves

Summary



- Shrink sleeves allow to make eye catching packaging and labels
- Inks are an important part of the shrink sleeves
- Requirements for the inks for shrink sleeves are quite stringent
- Not all inks will fit.....they must be specially designed and tested to achieve those performance requirements