NEEDS OF THE TEXTILE INDUSTRY

DEVELOPMENTS - INNOVATIONS

AN OVERALL APPROACH TO THE NEEDS OF TEXTILE INDUSTRY DEMANDING FOR **CHANGING PRODUCTION STRATEGIES**

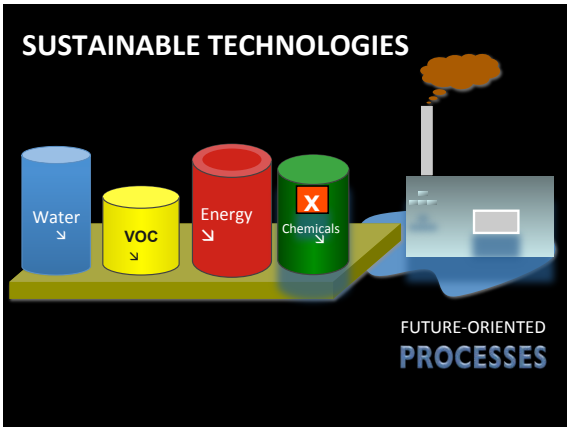
Strengthening competitiveness

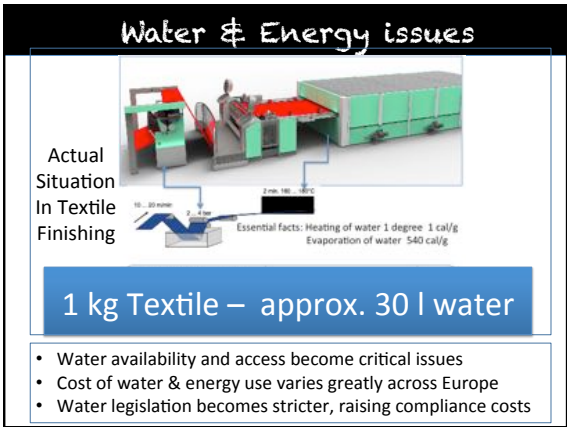
- FLEXIBLE, VERSATILE PRODUCTION
- SHORTER RUN LENGTHS (OFTEN < 100 m)
- INTEGRATION OF MANUFACTURING PROCESSES – NEW BUSINESS MODELS
- CHEAPER COSTS (TOTAL COST)
- REDUCED STOCKS
- CLASSIFICATION & TRACEABILITY

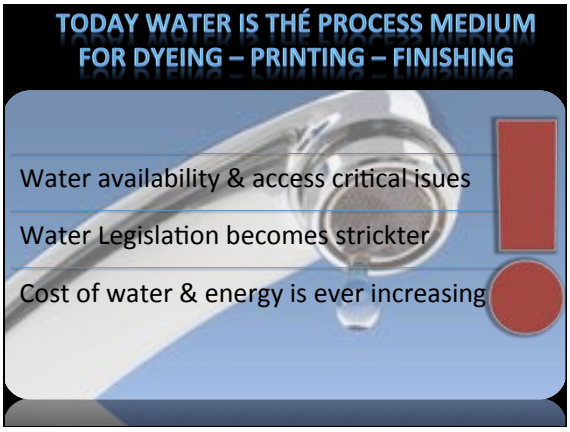
Cost Efficient

Flexibility - Versatility

GROWING DEMAND FOR TEXTILE PRODUCED USING **SUSTAINABLE OPERATIONS** AND FOR **PRODUCING PRODUCTS CLOSER** TO THE MARKET







Sustainability approaches

Raw Material Management

- Reach-proof – less hazardous chemicals
- High solid resin & auxiliaries from renewable resources…

Eco-Technologies

- SC-CO_2 dyeing
- Magnetron Sputtering
- 100% coating
  - Hotmelt
  - UV technology
- Plasma (vacuum – atmospheric)
- Digital Technologies
- Others: Ozone – Laser (UV and CO_2) - microwave

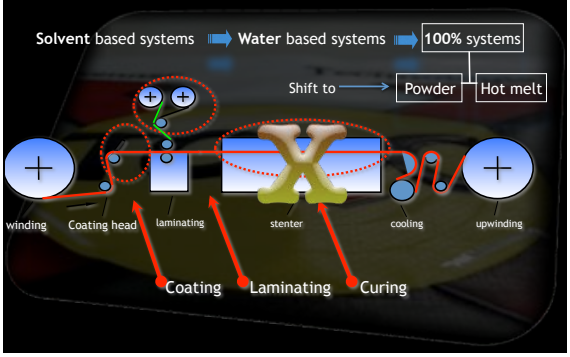
NEW COATING TECHNOLOGIES:

turning major wet coating processes into dry and energy-efficient processes

Recent – Future Coating Technologies

Dry Technologies	Hotmelt Coating, incl. UV- hotmelt coating	
Plasma Coating	Vacuum	
	Atmospheric	
UV-EB coating		
Digital Coating	Piëzo	
	Valve-jet	
Others:	Magnetron Sputtering	
	Plasma - Microwave	

The change from Wet to Dry



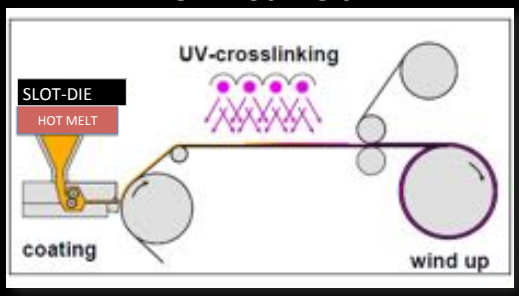
HOT MELT Technology

Compound	Method			Application level/speed
Powder	Scatter coating		- Easy technology - Especially for applying glues - Quick change powders - Dust formation possible	5-500 g/m2 10-50 m/min
Hot melts	Slot die		- Indirect method - Thin coatings possible - Investment high - Maintenance	15-80 g/m2 80-240 m/min
	Reverse roll		- Relative cheap method - 'Simple' system - Limited production speed	40-1000 g/m2 50 m/min
	Spray		- Different possibilities (dots, lines, ...) - Relatively high cost	5-100 g/m2 10 - 170 m/min
	Screen		- Design coating possible - Dot coating - Expensive technique	15-25 m/min

HOT MELT Technology

100% SYSTEMS	THERMOPLATIC HOTMELTS (EVA, TPU…)	
	MELTED IN AN APPROPRIATE MELTER	
	OPEN OR FULL COATING SYSTEMS	
	CONTINU, INTERMITTENT, STRIPES	
	REACTIEVE HOTMELTS	REACTION WITH MOISTURE
		REACTION WITH UV

UV-Hot Melt



- Physical + Chemical Adhesion
- High Solvent & T-resistance

Why choosing Hot Melt-Technology?

Production of full recyclable products (waste reduction)

Substantial lower need for "floorspace"-> compact units

Shorter changeover times (attractive for small production runs < 1000 m)

High production speeds, resulting on additional cost reduction (energy) Limited "Capex" (no need for thermal oven & afterburner)

Possibility for incorporation Functionalities

Hot Melt-Technology ?

Challenges Limitations

For most companies "unknown" Technology

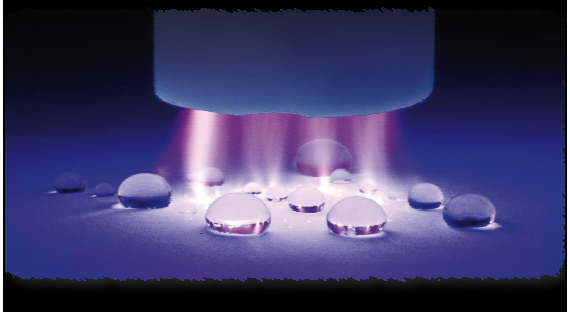
Wetting and adhesion problems

Supplier-driven Technology

In general limited to back coating

Limited choice of Functional Hotmelts

2. Plasma technology



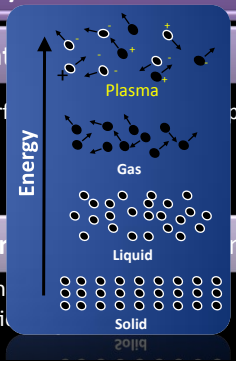
Atmospheric / Vacuum Plasma Deposition

Pretreatmen

- Increasing Surf… …reading, adhesion)
- Smart primer

Posttreatmer… …nomer)

- Extra Function…
- AM – Antistati…



Atmospheric Plasma Deposition Precursor/Monomer Assisted

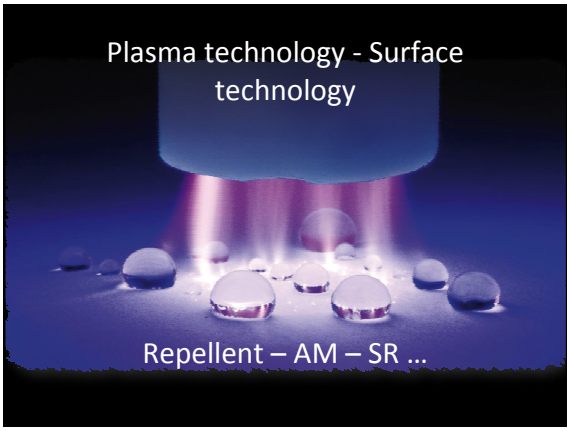
Corona-based

SBDB-based
(Surface Dielectric Barrier Discharge)

Activation energy :
Plastics: 8-12 kJ/m², Textile: 60-240 kJ/m²

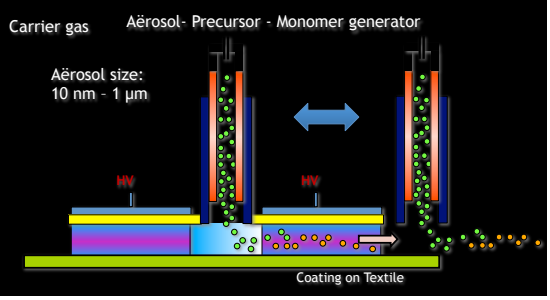
Textile demands higher energy density

Plasma technology - Surface technology



Plasmatex

Precursor Assisted Plasma Deposition



Vacuum Plasma Environmental comparison

- Comparison of classical treatment (traditional DWR) and plasma treatment
- Annual production of 2 000 000 running meters

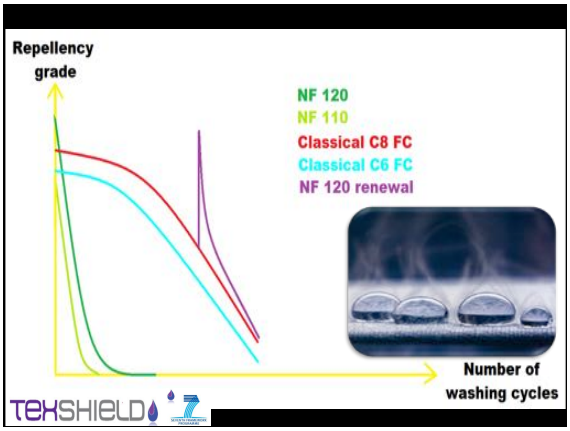
Annual production of 2 000 000 running meters	Traditional DWR	Plasma DWR	Difference
Fluorochemicals	19 685 kg	3 733 kg	15 952 kg
Electricity consumption	1 066 667 kWh	508 393 kWh	588 274 kWh
Water consumption	437 445 l	0	437 445 l

DWR = durable water repellent Source: Europlasma

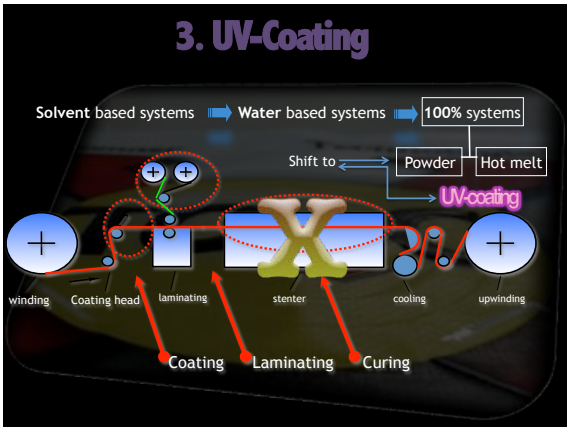
Vacuum Plasma Technology

By using only 1 kg of chemical you save the world from:

- 5 kg of DWR coating-chemicals;
- more than 115 liters of waste water;
- almost 80 kg of CO_2
- crosslinking agents, chlorides, formaldehyde and other toxic products used in wet-chemical DWR



3. UV-Coating

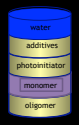


Basic Components

Basic Components		
	UV-formulations	100%
		Waterborne
	Radiation source	Ga-, Fe- Hg doped bulbs
		LED
		EB
	Radiation conditions	Exposure Time
		Distance to textile …

UV-Coating

Liquid UV-coatings



100% UV-formulation

Waterborne UV-formulation

2-systems

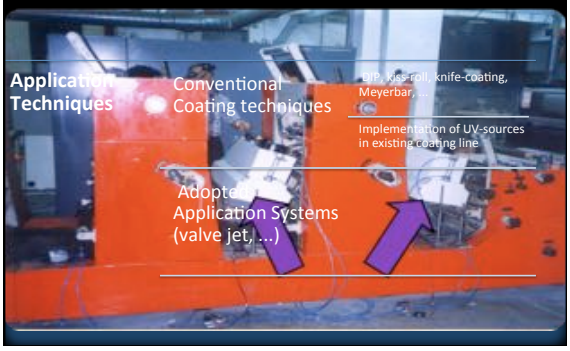
100 % UV-system

- Most important group
- Monomer diluent
- Liquid
- No solvent/water (no drying)
- Formulation (oligomer …)
- UV-LED Fixation

Waterborne UV-system

- Waterborne dispersion
- Mainly without monomer
- Thickener (Important !)
- Water evaporation - (IR) drying
- UV-LED fixation

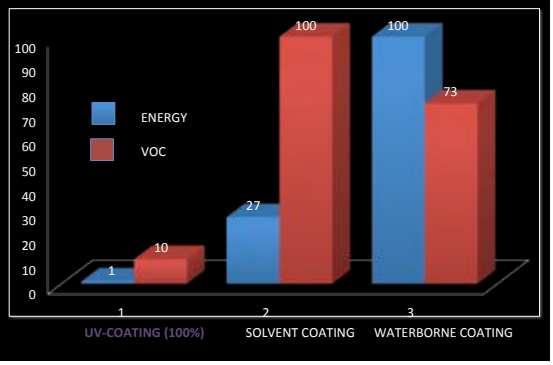
UV-Coating



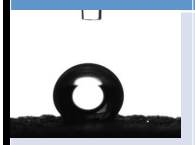
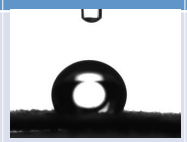
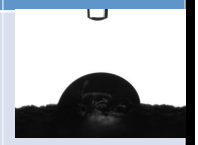
CONCLUSION: WHY UV?

Advantages	Disadvantages
No solvent = inflammable	Relatively expensive chemicals
Little energy required	Monomers/oligomers
Fast drying/curing No drying untill UV exposed	UV can cause burns - avoid skin contact
High production speeds	Ozone generation
Thermosensitive Fibres	(low flexibility)
Little space required	Unknown Technology (for most)
Relatively low equipment cost - Less space requirements - Modular - implementation in existing coating line	Adhesion problems on some substrates (but can be solved using corona pretreatment)

UV versus Solventborne & Waterborne Coatings on level of Energy Consumption and VOC's



Hydrophobic UV-curable Coatings

Reference	Result of 1 wash process	Result of 10 wash processes
		

TEXSHIELD

Environmental friendly and Durable Oil and water repellence finish on Technical Textiles

4. State-of-the-art of Digital Technologies

Some Facts

Potential for DP-printing is 30 billion m^2

- Digital Prining accounts for only 1-2%

60% of all consumption is in EU, China, Japan & USA

> 60% of all production is in India, Bangladesh, Pakistan, Vietnam, Thailand and Indonesia

Source: Dr. Provost - WTIN

Digital Printing

Digital Dyeing

- *Direct dyeing*
- *Sublimation dyeing (only for PES)*

Digital Technologies

- DP bridges creativity and functionality
- Cost-effective production
- Efficient use of resources
- Virtuel stocks
- Shorter delivery times
- M[illegible]l set-up costs
- Personal[illegible]ion – Mass customization
- [illegible]per life cycle textile
- Integra[illegible] production – manufacturing retail

It's all about added Value !

The change is clear: from analog to digital

Digital Technologies

Textile: Fabric - Yarn

Surface engineering

Piezo

Supplier-driven

Waterborne inks

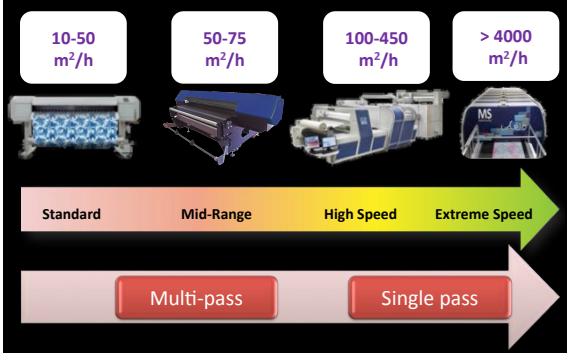
Valve jet

More freedom to operate

UV-curable inks

Waterborne inks

Digital Textile Printer Segments



DP-printers for DP inks

Waterborne inks

Working width: 1,6 – 2,2 – 3,2 m

Solvent printers

Working width up to 5 m

Super width format printer

Printing width: 12 m

WHY DIGITAL Technologies

For Micro-Deposition of Functionalities

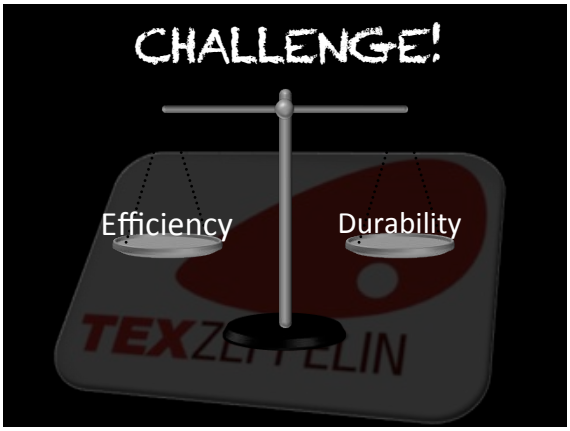
Digital Coating/Finishing

Unknow Technology

NO commercial functional inkjet inks available!

Minimal needed

The minimal amount jetted on the substrate could not be sufficient to obtain the desired, durable effects !



HOW TO COUNTERACT THIS CHALLENGE ?

TEXZEPPELIN

Functional inkjet inks

MINIMUM AMOUNT IS NECCESARY

PRINTHEAD 4PL

1L ink FOR 100 m2

Not Enough !

Digital Printing versus Digital Coating

PRINTING	Resolution (greyscale print heads…)
	Image quality
	Colour buildup
	Gamut
	Fastness (rub, wash …) - durablity properties …
COATING	Quantity of functional product
	Full coverage – localised/paterned deposition
	Fastness – durability properties
	Target Functionality

Development of industrial inkjet Piezo Printheads

- The firing frequency is being increasing to speed up printer speed (8 to > 30 kHz)
- New heads required higher viscosity inks (moved from 3 to > 12 mPas)
- Jet volume is increasing (4 pl up to 150 pl)
- Print heads available for UV-curable inks

Functional Ink Challenges

Higher Firing Frequencies

Higher Viscosity

Broader choice of ingredients

More jet volume

Digital Printing & Finishing on same printer

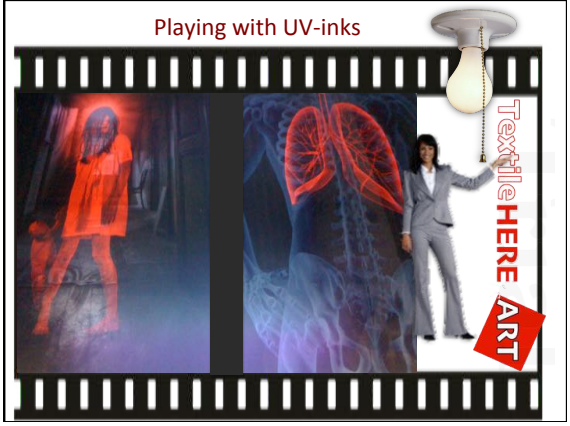
Digital Finishes/Coating

TOPOCHEMICAl Engineering

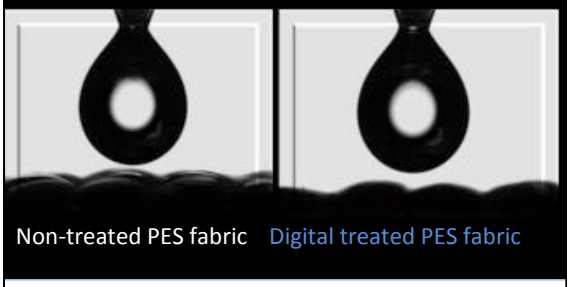
H_20-based	• Hydro/ oleophobic • Chromic sensors • AM • Antistatic …
UV-based	• Layer-on-layer • Transparent layers …

You art the print, we print the art

Playing with UV-inks



New HYDROPH0BIC inkjet inks



Non-treated PES fabric Digital treated PES fabric

TEXSHIELD

DIGITAL Functionalization

DIGITAL COATING

Full coverage

Local - patterning

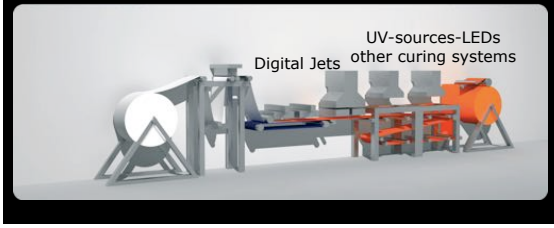
High performance WB inkjet inks :
- DOD (drop on demand) piezo printheads (Seiko, Kyocera)
- Textile substrate: PES and PA
- Water and oil repellent

Example of local deposition of functionalities on hiking shirt

TEXSHIELD

Factory of the Future

Fabric + DP Coating + UV/ LED/EB = Coated Textile



Conclusion

Emerging Technologies

SMART PRODUCTION

SMART PRODUCTS

More SUSTAINABLE Production

MUTUAL Communication & LOGISTIC Alingment in production processes become possible

New BOOST to our Textile and Fashion Industry

Turning major wet textile processes into dry and energy-efficient processes

Business as usual is not an option!

Efficient processes – less use of resources

Lowering ecological footprint

Other business models

'Circular economy' as alternative for 'Take-Make-Dispose' business

More of Less <-> Less of More

Fast Fashion brings production back to Europe

For printers localised to retail source	More business
	Closer to the end consumer
	Reduce transportation – lower ecological footprint
For retailers	Lower stock inventory
	Shorter turnaround
	Super quick production speed from designer to the shop floor

Emerging Technologies

Actual and Future Trends

Access to talent becomes the key driver for competitiveness

Therefore, more smart machinary & technologies are needed to become less dependable of skill


Great minds think alike !
Unitex
is Cool
Prof. Dr. Em. M. Van Parys
Thanks