Institute of Textile Technology and Process Engineering

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Digital Functionalisation - New processes for localised functionalisation of textiles in lowest quantities with digital technologies for individualised wearables

Director: Prof. Dr.-Ing. Götz T. Gresser

Europe’s largest Textile Research Center

German Institutes of Textile and Fiber Research Denkendorf (DITF)

Institute of Textile Chemistry and Chemical Fibers
Institute of Textile Technology and Process Engineering
Center for Management Research
ITV Denkendorf Produktservice GmbH
German Institutes of Textile and Fiber Research Denkendorf (DITF)

- Founded in 1921, foundation under public law
- 307 employees
- Revenue 31.0 million €, SME percentage 60%
- Industry: 30% regional, 45% national, 25% international
- 25,000 m² of research and production space
- Application-oriented research with pilot plants
- Focus on Technical Textiles and Life Science
- Connected to the University of Stuttgart and Reutlingen University
Research Projects and Revenues 2014

Forms of Revenues DITF

Research Projects at the DITF (%)

- Health and Medicine 21
- Mobility and Transport 19
- Environment and Energy 23
- Communication and Information 10
- Building and Functionality 12
- Textile Technological Processes 15

polymer  fiber and yarn  fabric  function  product
State-of-the-art finishing is mass manufacturing

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Images: Knopf'sSohn GmbH
Certain people and products require individual needs (customization)

- Health care textile with individually adapted functions.

- High level segment products for sport cloth and sports goods.

- Clothing for disabled people

- Exclusive products for discerning customers.

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Images: www.fashionable-project.eu/
Development of new technologies for the flexible (...) production of customized healthy clothing, (...) and orthotics for consumers with highly individualised needs, in terms of fit, function, and fashion

“There are over 100 million Europeans for which personalization IS NOT JUST AN ADDED-VALUE BUT A REAL NEED affecting their QUALITY OF LIFE because ready-to-wear and mass-customized offer do not meet their MORPHOLOGICAL or FUNCTIONAL DIVERSITY.”

Images: www.fashionable-project.eu/
FP7 project 284871
14 partner from 6 countries
3 years (Nov 2011 – Oct 2014)
4.9 Mill. Euro budget

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<td>Spain</td>
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<td>IConverter</td>
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Need for localized functionalization

- Currently, localized functionalization is mainly achieved by textile construction

- Localized finishing can add to the product functionality
  - Water repellence
  - Anti soiling
  - Anti microbial
  - Softness
  - Friction
  - Abrasion
  - ...
Airless spray (Rotating plate): single-sided

(pro: Ahlbrandt System GmbH)

same textile:
right side hydrophobic

left side hydrophilic
Spray (air gun): single sided & localized

hydrophobic  hydrophilic
Dispersion viscosity strongly determines the localizing effect.
Characteristics of spray finishing

Advantages
- Low consumption of dispersion
- Low water pick-up
  - low energy consumption
- Multi functional finishing
- Flexibility (function, on-off, ...)

Disadvantages
- Aerosol generation (overspray, ...)
- Low resolution
- Shear forces
- Control over amount and pick-up
Digital finishing – from colour to function

CHROMOJET 800 LS1200T (ZIMMER AUSTRIA)

- Cyan water repellent
- Magenta antimicrobial
- Yellow antistatic
- Black softener
Challenges for printable dispersion

- Multiple parameter optimization

Rheology
Stability
Dispersion („ink“)
Reactivity
Concentration
Surface tension

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Input file for local digital functionalisation

CAD → Marker (PDF) → Filled marker → Encoded functionalisation

PCX file → Contour printing → Areas for local functionalisation
Fabrication steps:

1. Exchange of structure data
2. Simplification to color map
3. Attribution of functional agents
4. Spray finishing and drying
Localized digital finishing of orthetic textile

- Anti soiling
- Anti microbial
- Water/-oil repellent

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Demonstration of localized hydrophobicity

Brighter regions: wetted by water spray,
Darker regions: hydrophobic or dry.
(no contrast without water)
Conclusion

Digital functionalization

- Function where it is needed
- Localization
- Resource efficiency
- Multi functionality
- Flexibility
- Customization
- On demand
- Small lot
- Production when it is needed
- Individual product if it is needed
- Process sequence that is needed
- Functions that are needed
- Amount what is needed

Lot 1 if it is needed
Outlook

- Digital colour printing of textiles showed the way

- Digital functionalization of textiles is ready to follow

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Thanks to the European Commission
the fashionable project partners

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And

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