T-Pot Workshop INNOVATIONS 21-23 September 2009 – Zagreb (HR)

Developments in Technical Textiles – Market and Trends

Romy Naumann
Saxon Textile Research Institute
Overview

1. Introduction: Definitions – Statistics
2. Technical textiles - Fields of application
   2.1 Industrial textiles
   2.2 Mobile textiles
   2.3 Functional textiles (protective, sports & medical textiles)
   2.4 Textiles for packaging
   2.5 Agrotex
   2.6 Geotextiles & ecological applications
   2.7 Textiles for building and civil engineering
3. R&D activities in technical textiles at STFI – Examples
4. R&D activities for technical textiles at national level – growth cores
5. R&D activities for technical textiles at European level – ETP
6. Summary/Trends

1. Definitions

Definition: Technical Textiles

Technical approach: Technical textiles are textile materials and products mainly produced for their technical function and performance; their aesthetic or decorative properties are of secondary importance.

Market approach: Technical textiles offer solutions for the manifold technical challenges existing in our society (environmental protection, personal safety, general safety, health & well-being).

Source: EURATEX Working group „Technical textiles“
1. Definitions

Classification (Techtextil Fair Frankfurt)

- Agrotech
- Buildtech
- Clothtech
- Geotech
- Hometech
- Indutech
- Medtech
- Mobiltech
- Oekotech
- Packtech
- Protech
- Sporttech

1. Statistics

Worldwide consumption of technical textiles

1. Statistics

### Worldwide consumption of technical textiles

- **Graph**: The graph shows the consumption of technical textiles worldwide from 1995 to 2010, divided into regions: North and South America, Europe, Asia, and Other. The y-axis represents the consumption in 1000 Tonnen, ranging from 0 to 12,000.

- **Source**: World Market Forecast to 2010 / David Rigby 2002

### Growth rates of end-use consumption (worldwide)

<table>
<thead>
<tr>
<th>Application areas</th>
<th>2000 – 2005 % per year</th>
<th>2005 – 2010 % per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geotech</td>
<td>4.6</td>
<td>5.3</td>
</tr>
<tr>
<td>Buildtech</td>
<td>4.3</td>
<td>5.0</td>
</tr>
<tr>
<td>Indutech</td>
<td>3.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Medtech</td>
<td>4.6</td>
<td>4.3</td>
</tr>
<tr>
<td>Protech</td>
<td>3.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Agrotech</td>
<td>3.2</td>
<td>3.9</td>
</tr>
<tr>
<td>Packtech</td>
<td>3.2</td>
<td>3.8</td>
</tr>
<tr>
<td>Sporttech</td>
<td>3.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Mobiltech</td>
<td>2.7</td>
<td>3.4</td>
</tr>
<tr>
<td>Clothtech</td>
<td>2.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Hometech</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Total</td>
<td>3.3</td>
<td>3.8</td>
</tr>
</tbody>
</table>

**Source**: World Market Forecast to 2010 / David Rigby 2002
1. Statistics

End-use consumption in Western Europe

![Graph showing end-use consumption in Western Europe from 2000 to 2010 for various countries.](source: World Market Forecast to 2010 / David Rigby 2002)

1. Statistics

End-use consumption in Eastern Europe

![Graph showing end-use consumption in Eastern Europe from 2000 to 2010 for various countries.](source: World Market Forecast to 2010 / David Rigby 2002)
### 2. Technical Textiles - Application fields 1/15

<table>
<thead>
<tr>
<th>Application</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrotech</td>
<td>Textiles for agriculture, horticulture, forestry and fishing</td>
</tr>
<tr>
<td>Buildtech</td>
<td>Textile reinforcement, light-weight materials, textile roofing, membranes</td>
</tr>
<tr>
<td>Clothtech</td>
<td>Components for the clothing and footwear industry</td>
</tr>
<tr>
<td>Geotech</td>
<td>Soil sealing, drainage, textiles for civil and hydraulic engineering</td>
</tr>
<tr>
<td>Hometech</td>
<td>Components for furniture, interior textiles and floor covering</td>
</tr>
<tr>
<td>Indutech</td>
<td>Filtration, textile reinforcement, sound insulation, means of conveyance</td>
</tr>
</tbody>
</table>

### 2. Technical Textiles - Application fields 2/15

<table>
<thead>
<tr>
<th>Application</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medtech</td>
<td>Medical and hygienic textiles, textiles for medical devices</td>
</tr>
<tr>
<td>Mobiltech</td>
<td>Textiles for transportation (automotive, aerospace, shipbuilding and railway vehicle industries)</td>
</tr>
<tr>
<td>Oekotech</td>
<td>Textiles for environmental protection</td>
</tr>
<tr>
<td>Protech</td>
<td>Textiles for personal and property protection (workwear, fire protection..)</td>
</tr>
<tr>
<td>Packtech</td>
<td>Industrial and consumer packaging</td>
</tr>
<tr>
<td>Sporttech</td>
<td>Textiles for sporting and leisure applications, textile-reinforced sporting equipment</td>
</tr>
</tbody>
</table>
2. Technical Textiles - Application fields  3/15

Production Technologies

Weaving
Knitting
  warp knitting
  weft knitting
  stitch bonding
Nonwovens
Laid scrims
Braiding
Rope-making etc.

2. Technical Textiles - Application fields  4/15

Raw Material

Use of classic fibres:
  Natural and synthetic fibres
Use of special fibres:
  Hollow fibres
  Highly oriented polymer fibres
  Carbon fibres, metal fibres
  Basalt fibres
  Ceramic fibres, glass fibres
2.1 Industrial textiles - Indutech

Textile filter tube
Insulation material
Conveyor belts
textile reinforced parts, backing material, tubes, hoses, sealings

2.2 Mobile textiles – Mobiltech

Land - Air - Water:
Road vehicles, rail vehicles
Aircrafts, space travel
Shipbuilding
safety systems, airbags, tires, car elements, upholstery, car interior, carpets, heat insulation, sound insulation, filters, cable insulation, tarpaulins, protective covers for land crafts, boats, aircrafts, sailcloth, inflatable boats, special equipment for military vehicles, envelopes of balloons etc.
### 2.2 Mobile textiles – Mobiltech

**Innovative trend in aeronautics – use of fibre reinforced synthetics**

Percentage of carbon fiber-reinforced polymer (CFRP)

Near future: A380: 20-25%, Boeing 747 ca. 50%

**Advantages:**
- high tenacity
- stiffness
- dynamic strength
- corrosion resistance
- low density & weight

**But:** high costs for R&D, testing and certification

### 2.3 Functional textiles

**Warning clothing**
- Protective clothing for firefighters

**Protective clothing – Protech**
- Protective clothing for welders
- Protective gloves

**Sports textiles - Sporttech**
- Protective clothing for racing drivers
- Functional protective clothing
2.3 Functional textiles

Medical textiles - Medtech
dressing material, textile goods for hospitals, textile material in protheses, ortheses textiles for surgery, rescue services etc.

2.4 Packaging textiles - Packtech

packaging material and nets, sacks and big bags, protective cover systems, tarpaulins
2.5 Agrotexiles - Agrotech

soil covering material horticulture + agriculture, textile drainage systems, textile irrigation systems, woven fabrics + knitted fabrics for providing shade, greenhouse equipment, sealing sheets, tarpaulins (Agrotexiles), temporary agricultural buildings

Nets for root balls
Mats for animals
Shading textiles

2.6 Geotexiles - Geotech

GREAT VARIETY OF APPLICATIONS

reservoirs, dams
liquid waste
solid waste
canals
roads
railways
foundations, retaining walls
erosion-control systems
tunnel construction
drainage systems
2.6 Geotextiles - Geotech

Functions of Geosynthetics

- Drainage
- Filtration
- Separation
- Reinforcement
- Barrier
- Packaging
- Protection
- Surface erosion control

subsoil reinforcement, landscaping, earthmoving and road building, river-bank + coast reinforcement, water engineering, soil sealing, drainage systems

T-Pot Workshop INNOVATIONS 21-23 September 2009 – Zagreb (HR)
2.7 Textiles for building – Buildtech

Textile reinforcement, lightweight construction materials, pipes, insulations (cold, heat, sound), textile roofings, textile membranes, loadbearing structures, sunscreen Textiles, textile heating systems, textile-reinforced structural components, mouldings, tents

- Textile membrane
- Textile drainage
- Textile roof-greening

3. R&D in technical textiles at STFI

The institute is located in the Free State of Saxony.
General situation in the Federal State of Saxony:

- After reunification most of the textile and clothing companies in Eastern Germany were closed and the number of employees in T/B was drastically reduced:

<table>
<thead>
<tr>
<th>Year</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>318,000</td>
</tr>
<tr>
<td>1992</td>
<td>less than 50,000</td>
</tr>
<tr>
<td>2008</td>
<td>12,600</td>
</tr>
</tbody>
</table>

- For those companies which "survived", a re-orientation was necessary:
  - Find new growth markets such as technical textiles
  - Diversification from conventional technologies and products into technical application fields (for instance from narrow braiding to conveyor belts and packaging material or from clothing to protective clothing)
  - Close cooperation between researchers, producer and end-users
3. R&D in technical textiles at STFI

The Saxon Textile Research Institute provides application-oriented, process-related and product-related research and development in the fields of:

- Technical Textiles
- Nonwovens / Films
- Warp-knitting / Weaving
- Textile Finishing / Ecology
- Textile Recycling
- Vegetable Fibres
- Technical Nets and Ropes
- Textile Materials Research
3. R&D in technical textiles at STFI

Center of Excellence in Nonwovens
- Development of innovative nonwoven products and new production processes
- Industrial company consultancy
- Pilot machinery for sample production
- Investigations in material properties by test laboratory

Accredited Test Laboratory
- accredited according to DIN EN ISO/IEC 17025
- test laboratory for the Öko-Tex Standard 100 in Germany

Industrial textiles: Filter media
- Pile fibre stitch-bonded nonwoven Hycoknit®
  - regeneration of filter elements is possible
  - special finishes (for instance hydrophobic) can be added during production process
- Pocket air filter
- Nonwoven scrim composite Hycofil®
  - for applications up to 250°C
  - high separating and cleaning performance
- Filter cartridge
- Pleated structure
Industrial textiles:
Leight weight conveyor belt with inserted rods or pools

- application in food industry, textile industry or paper industry
- low tension to tight the belt is required
- no sliding of belts by means of lateral guidance

Industrial textiles: Lighting textiles

- based on optical fibres which are inserted in a net-like structure
- application as lighting sails, lighting of emergency areas, ceilings or for decoration
3. R&D in technical textiles at STFI

### Mobile textiles:
Unfilled or filled 3D nonwovens for composite structures

- Two pre-needled nonwovens are combined by a special technology
- Filled with powder or solid substance → pressed into parts

Mobile textiles:
Preforms from carbon filaments

- Application in automotive and aircraft industry
- Cavities
- Curved structures
- Local reinforcement
- Profiles
3. R&D in technical textiles at STFI

**Protective textiles:** Fabric against liquid metal splashes

- material repels liquid splashes of aluminium and magnesium up to at least 100 g
- low mass per unit area (below 400 g/m²)
- good wear behaviour

![Modified Test rig DIN EN 373](image1)

3. R&D in technical textiles at STFI

**Protective textiles:** Explosion-proof textile transport container

Lightweight textile transport container with multifunctional properties:

- protection against fragments from explosion (fragments are absorbed and the energy is accommodated in the textile structure)
- defined pressure reduction
- act as flame barrier
- resistance against high temperatures

![www.fly-bag.net](image2)
3. R&D in technical textiles at STFI  14/23

Protective textiles:
Chemical and flame resistant protective gloves

- Composite from chemical resistant barrier layers by coating with polymers and laminating with hot melt adhesive foils
- Gloves for firefighters

3. R&D in technical textiles at STFI  15/23

Agrotextiles:
Flexible heating and cooling system for horticulture

- Solar heating for green houses and winter gardens
- Heating mats for Plant breeding

T-Pot Workshop INNOVATIONS 21-23 September 2009 – Zagreb (HR)
Agrotextiles: Biologically degradable spunbonds

- for crop earliness
- protection against weed

Geotexiles/Building textiles:
Textile reinforcement for floor panels

- light weight construction for balconies and loggias
- textile reinforcement of alkali-resistant glass and integrated glass-fibre reinforced rods
3. R&D in technical textiles at STFI

Geotexiles/Building textiles: Earthquake-proof masonry

- warp-knitted textile reinforcement made from alkali-resistant filament yarns with integrated rope-like high-performance reinforcement from ductile material
- significant increase in load of masonry
- significant deformation of masonry whereas the cohesion of masonry keeps remained
- prevents total collapse of masonry in earthquake regions

Geotexiles/Building textiles: Plant mats for water cleaning and landscaping

- warp-knitted plant mats (planting without soil)
- different shapes are possible
3. R&D in technical textiles at STFI

Geotexiles/Building textiles:
Sensor-based geotextiles for dike monitoring

- geotextiles with integrated optical sensors
- geotextiles are integrated in the landside dike slope
- in case of deformation a signal is sent to a monitoring centre → reaction in time is possible to prevent dike failure

Geotexiles/Building textiles:
Geogrids for reinforcement of embankments

- reinforcement of the surface soil layer of embankments
- thick rope like structures are inserted
- for storing and draining of water
- erosion protection
3. R&D in technical textiles at STFI

Geotexiles/Building textiles: Greening of railway tracks by means of a moveable textile plant bedding system

Main functions of textile vegetation system:
• protection of the gravel bed
• noise reduction
• storage of water

Geotexiles/Building textiles:
Multifunctional irrigation and plant bedding mats

• two layers of nonwovens containing parallel fixed perforated flexible tubes
• greening independent of weather conditions
• optimized water distribution directly into the root area of plants
3. R&D in technical textiles at STFI

Main ways to transfer research results into practice:

1. **Contract research** for industry ➔ Company is the sole user of the research results (and pays for it) and do own marketing

2. **Funded research**: ➔ Protect the results by IPR when possible
   A) **Direct contacting of companies**: find interested companies via presentation at fairs/product shows and transfer results by
      ➔ Licensing or selling IPR
      ➔ Support in establishment of a start-up company producing and distributing the product
   B) **Funded transfer projects**: ➔ Network of researchers, end-users, SMEs
      ➔ Development of a system provider, establishment of demonstration objects, common PR and marketing
   C) **Professional patent exploitation partners** (Transfer IPR to Patent Pool)

4. R&D activities on regional level 1/3

**Joint initiative Technical Textiles**
• initiated by the Saxon Ministry of Economic Affairs and Labour
• main aim is the re-orientation of traditional Saxon companies in textile and clothing industries into innovative growth and application fields
• objectives are to strengthen the market position of technical textiles manufacturers as well as to give support in diversification into innovative technical product lines
• establishment of innovation and company networks ➔ via these networks 84 joint R&D projects with 354 involved companies and research institutions were initiated
4. R&D activities on regional level 2/3

Growth cores initiated by an innovation initiative of Federal Ministry for Education and Research

Malitec®:
- based on the stitch-bonding technology MALIMO®
- established in 2004, focussed on Chemnitz region
- company network of 29 companies aims at achieving further profiling and specialization by know-how development in technical textiles
- find new application fields for stitch-bonded fabrics and web-knitted products in automotive and construction industry, air and water pollution prevention, packaging, cleaning of buildings, home textiles, civil engineering

www.malitec.org

4. R&D activities on regional level 3/3

www.highstick.de

highSTICK®:
- founded in 2007 to open up new market fields for small companies almost established in embroidery to find new applications in technical products → diversification with use of already available technology
- 28 partners from embroidery industry, textile finishing, electronic industry and mechanical engineering as well as R&D institutions
- 9 projects in building textiles (sensor-based textile reinforcement), mobile textiles (embroidered sensors as control elements) and medical textiles (functionalisation of bandages) are carried out
5. R&D activities on European level 1/2

European Technology Platforms (ETPs)

• provide a framework for stakeholders, led by industry, to define research and development priorities, timeframes and action plans on a number of strategically important issues
• play a key role in ensuring an adequate focus of research funding on areas with a high degree of industrial relevance
• address technological challenges that can potentially contribute to a number of key policy objectives which are essential for Europe’s future competitiveness
• 37 individual platforms at the moment on several topics

5. R&D activities on European level 2/2

European Technology Platform for the Future of Textiles and Clothing:

• Platform is an open expert’s network of professionals involved in textile and clothing related research and innovation across Europe
• Research priorities have been identified by 8 Thematic Expert Groups (New speciality fibres and fibre composites, Bio-based materials, New textile products for innovative technical applications)
• Horizontal Task Groups realize cross-cutting themes (innovation and standards, innovation management, innovation financing)
• Joint effort is to map out long term visions and strategic research agenda
• Textile Project Proposal Information Exchange System (TEPPIES)
6. Summary/Trends

Effects influencing the growth in technical textiles:

**Push-effect:**
New material offer new applications

**Pull-effect:**
New applications require new materials

**Economical effects:**
High added value due to specialisation instead of mass production with low added value

**Ecological effects:**
New light-weight materials, biodegradable materials, renewable materials to save resources, material substitution

**Functional effects:**
Products with new functions stimulate the market (RFID, Smart textiles, ...)

**Legislative effects:**
New requirements and standards lead to new innovative products
6. Summary/Trends

Suggestions to be successful in Technical Textiles:

• Cooperation in cross-sectoral networks (suppliers, producers, R&D institutions) and use the potential of conventional/classical technologies
• Participation in joint initiatives to bundle competencies
• Work together with local authorities for regional strategies
• Involvement in European initiatives or Expert groups to be informed on European strategies and policies in T&B
• Involvement in European projects → networking
• Protect “your” products, technologies and ideas → be aware of IPR

Contact:
Romy Naumann
Transfer Centre Textile Technology at STFI
E-mail: romy.naumann@stfi.de