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Functional and protective clothing markets and applications

Dr. Rainer Gebhardt

**Sächsisches Textilforschungsinstitut e.V.
(Saxon Textile Research Institute)
Chemnitz / Germany**

Sächsisches Textilforschungsinstitut e.V. (STFI)

an der Technischen Universität Chemnitz

Saxon Textile Research Institute at the Chemnitz University of Technology

Annaberger Straße 240
09125 Chemnitz
Germany

Managing Director:
Dipl.-Ing.-Ök. Andreas Berthel

Phone: +49 3 71 52 74-0
Fax: +49 3 71 52 74-1 53

E-Mail: stfi@stfi.de
Internet: www.stfi.de



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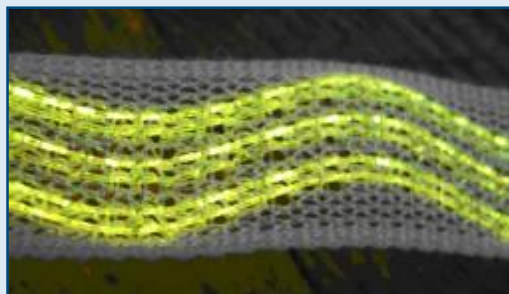
Profile of STFI



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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

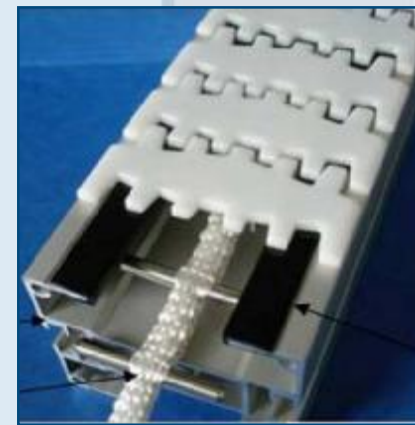
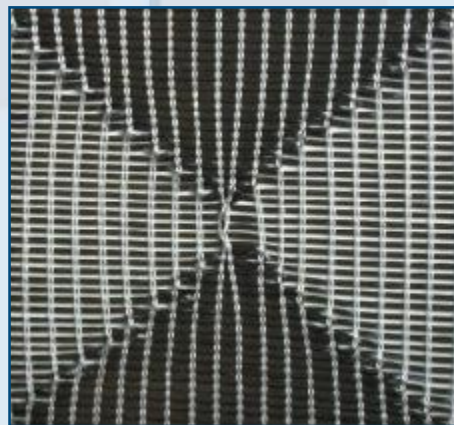
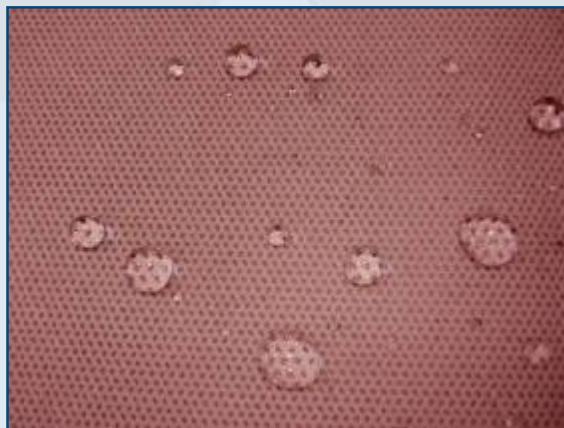


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- Textile Recycling
- Vegetable Fibres
- Technical Nets and Ropes
- Textile Materials Research



Services of STFI

Center of Excellence in Nonwovens

offers the research partners and customers a concentration of equipment and know-how which is unique in the German and European research landscape.



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Member of EDANA



Center of Excellence in Nonwovens

Services

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



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Center of Excellence in Nonwovens

Main fields of excellence

Web forming

Web bonding

After-treatment

Customer-oriented
product development

Testing and Certification

Recycling



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Services of STFI

Accredited Test Laboratory

accredited according to
DIN EN ISO/IEC 17025

test laboratory for the
Öko-Tex Standard 100 in Germany

accredited according to
DIN EN ISO/IEC 17025
concerning PPE following the
Council Directive 89/686/EEC



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www.textilpruefung.de

Services of STFI



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Certification Department for PPE

Certifying Center according to DIN EN 45 011
and DIN EN 45 012 concerning
Personal Protective Equipment (PPE) following
the Council Directive 89/686/EEC
Notified Body 0516

Testing and certifying services for customers
to achieve CE-qualification for protective textiles
test lab for testing protective clothing for
racing car drivers according FIA-Standard
No. 8856-2000



Services of STFI

Transfer Centre of Textile Technology

- Technology transfer
- Databases, networks, internet presentations and platforms
- National and international project work
- Information transfer
- Organisation of workshops, meetings, training courses
- Marketing (press relations, fairs, exhibitions, presentations)



www.textil-server.de



www.seetal.eu



www.intechtex.org



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Institut für Technische Textilien GmbH (ITT)

- Execution of application-related orders placed by the industrial customer as well as individual orders or small series
- Approved Inspection and Certification Body for Geosynthetics in accordance with the CPD (Construction Products Directive) 89/106/EEC Notified Body 0991

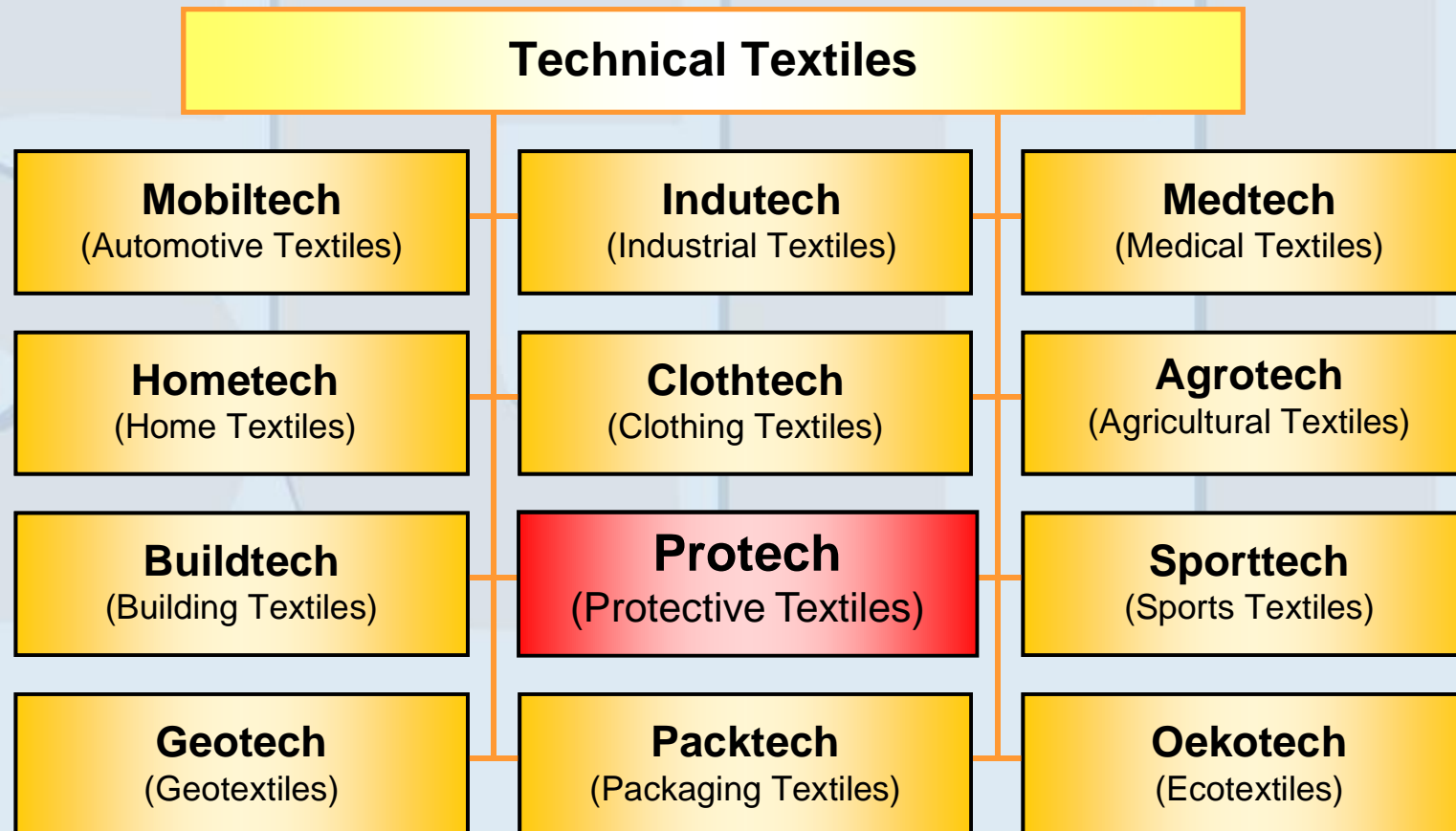


www.geokunststoffe.com

Market-specific aspects...



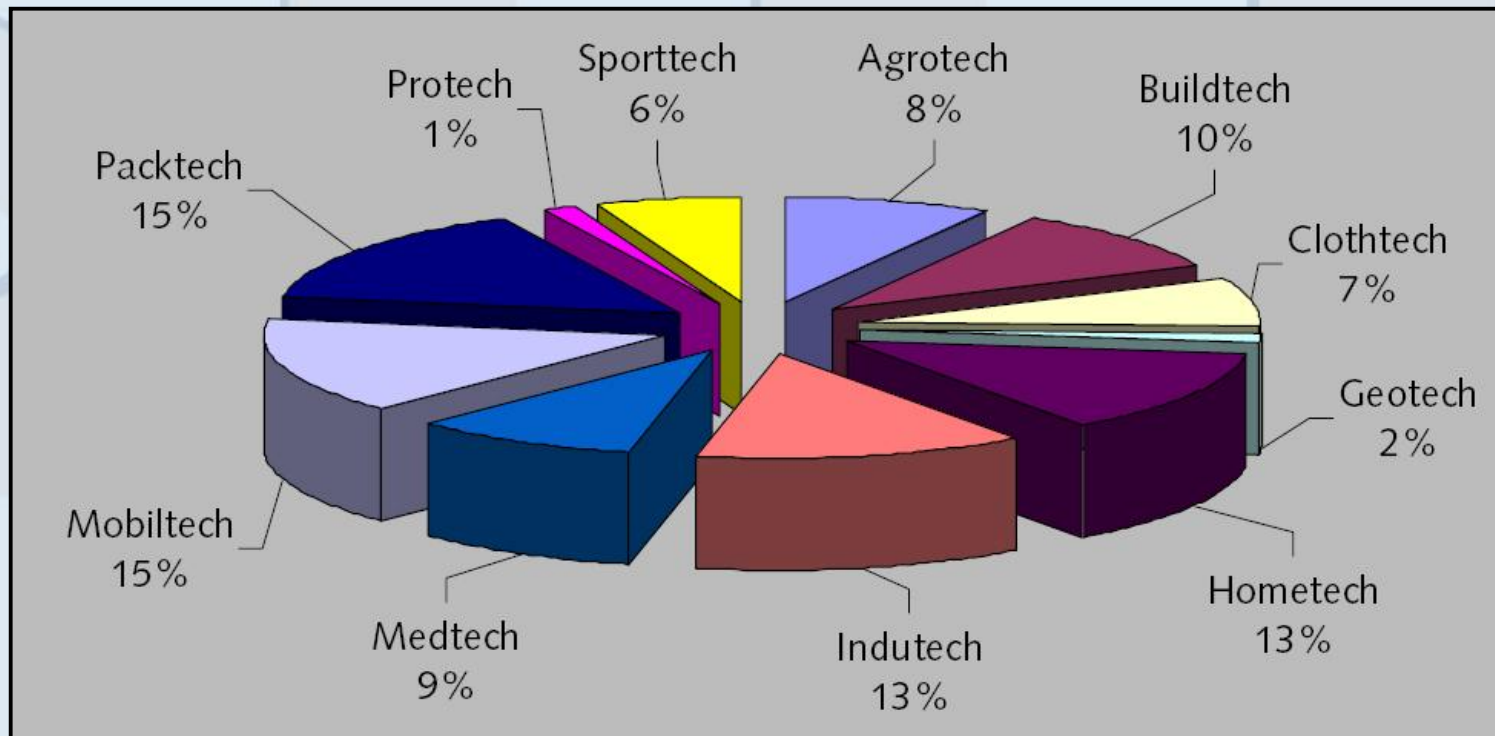
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Quelle: DRA 2004

Market-specific aspects...

PROTECH represents the smallest area (1,4 % of the total consumption of technical textiles) **BUT** the turnover (5,2 bn US\$) is greater than GEOTECH and PACKTECH...



PROTECH - textiles for personal and property protection



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Protech encompasses all those textile materials and products used in the production of protective clothing of various types. The term 'protective clothing' covers garments and accessories intended to protect people against the elements, dangerous or hazardous materials, processes or events encountered either during the course of their work or during leisure activities. It also encompasses garments intended to protect products, the workplace or environment against people (as in the case of clean room garments), as well as people against people (as in the case of security and defence applications).

Application areas	2000 – 2005 % per year	2005 – 2010 % per year
Protech	3,3	4,0



PROTECH - textiles for personal and property protection



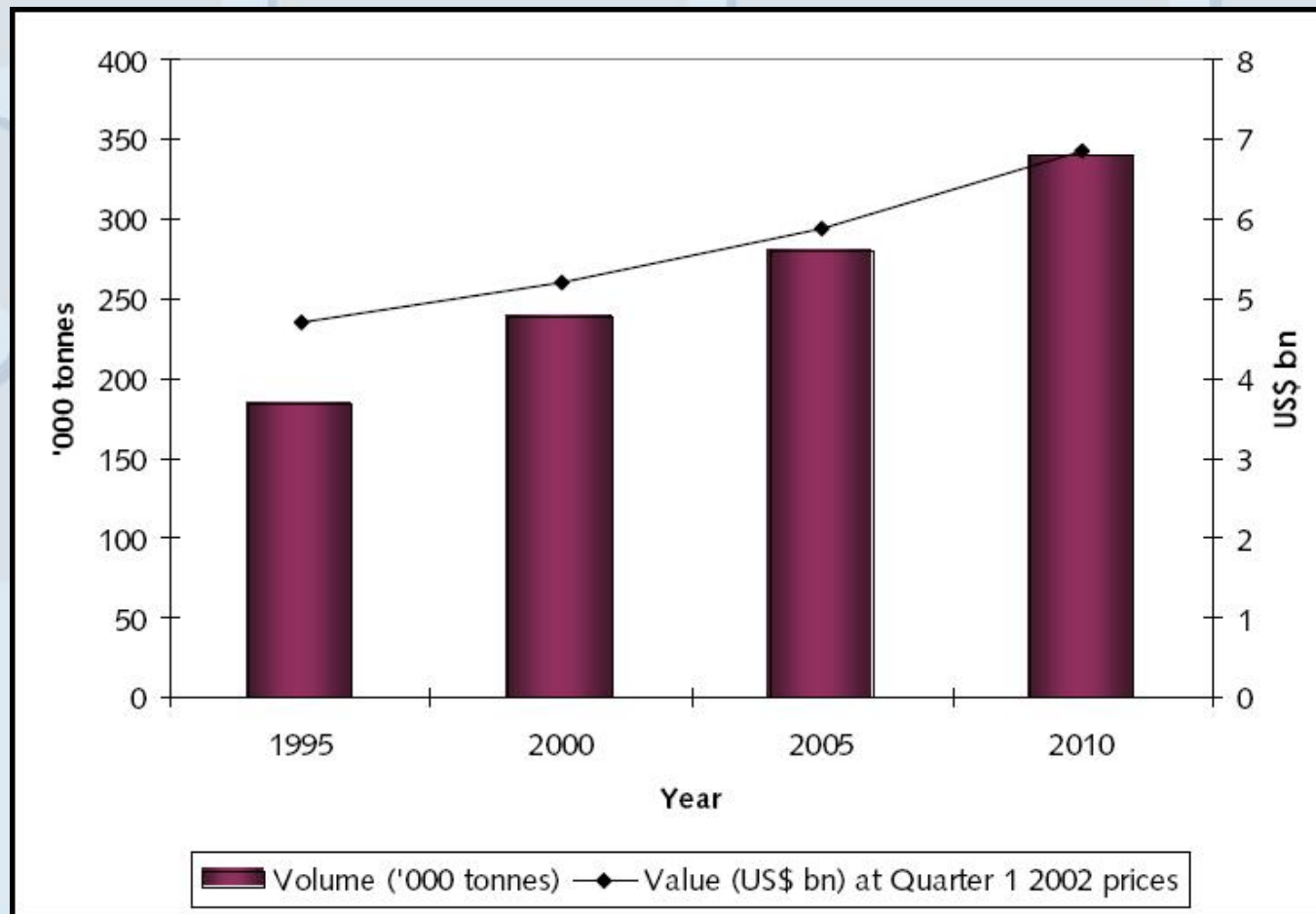
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- Protective clothing
- Heat protection clothing
- Weatherproof + winterproof clothing
- Chemical protection equipment
- Coldstore clothing / low-temperature clothing
- Fire protection equipment
- Person-protection equipment
- Equipment (security services / military)
- Other Protech



Market-specific aspects...

The high turnover share by lowest consumption expresses concentration on products with higher added value...



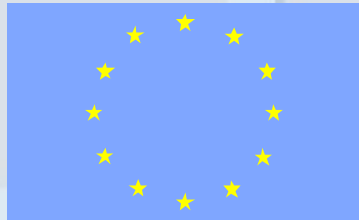
Market-specific aspects...



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- The protective clothing market is one of the most interesting fields for technical textiles with **high-tech character** and millions of potential customers worldwide
- Especially **costumer-oriented** and **application-specific** protective textile developments open niches for textiles and garments with an interesting more-added-value
- Increasing demands for **workers health and safety** responsibility and insurance liability create needs and markets for well-adapted protective clothing
- The ongoing research and development on **new materials** and material combinations or **finishing technologies** but also for new and **innovative testing standards** offer nearly endless possibilities for a wide range of textile protection products

Market-specific aspects...



- 60 Mill. employees in Europe use working and protective clothing
- 18 Mill. end user in Germany
- 320 Mill. pieces/a are sold in the European home market
- Total turnover of 4,0 Bill. €/a with working and protective clothing

CE 0516



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Market-specific aspects...

For the European textile and clothing industry the orientation on **protective textiles** means:

- Ø Concentration on a **world-wide increasing market** for professional and private use
- Ø Saving market position by **continuously innovations** in an area of high-tech textiles
- Ø Utilization of **product and location advantages** compared to textile mass productions
- Ø Extension and consequentially use of networks for **sales-, marketing- and customer-oriented product development**



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What does functionality mean ?



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**Functionality refers to the capabilities
or behaviors of a clothing.**

*Roughly, functionality can be described as
"the things it can do".*

History of functional clothing



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1875

Captain Helly Juell Hansens sailors paint her cotton clothing with oil paint for a better wind and rain protection

This inspired Helly Hansen to developed likely the first rainwear clothing....

A successful story began...

First year of business: 2.000 items were sold

After 5 years: 10.000 items were sold



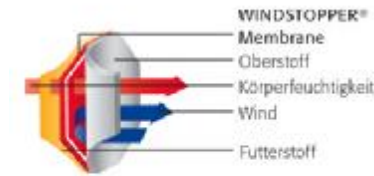
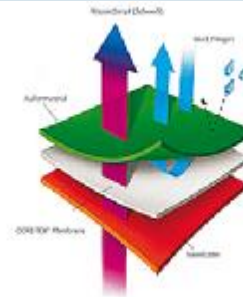
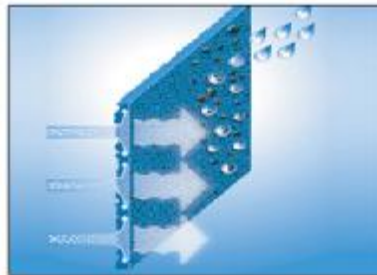
EXPO Paris 1887

Helly Hansen achieved the „Diploma for Excellence“ for his clothing...

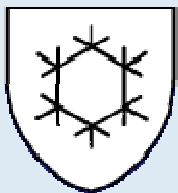
Functional clothing today



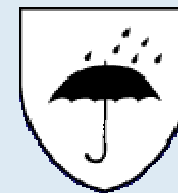
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- The meaning of „functional clothing“ is changing
- Functionality is always connected to textile innovations



**Function offers benefits
and with it an excellent sales argument**

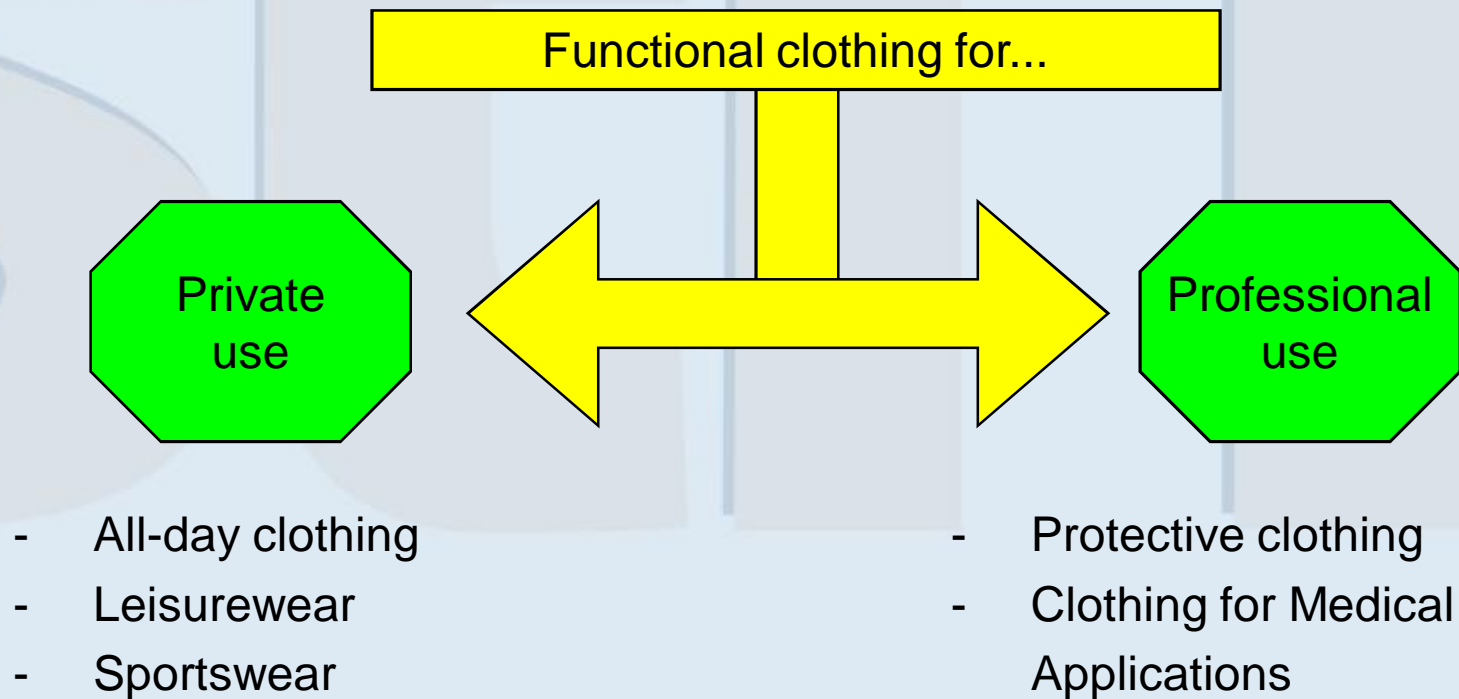


All images: www.schoeffel.de

The market of functional clothing



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The market of functional clothing for sports and leisure



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European market
for sporting equipment

35 Billion €



German sports retail sector

8 Billion €



Turnover for outdoor segment

2 Billion €

The market of functional clothing for sports and leisure



INTERSPORT e.G. is the biggest European retail partner group for sports equipment

General facts:

- 1.390 Sales partners / members
- 1.716 Shops
- Turnover of the group (2003): 2,21 Billion € (+1,2%)



**Around 7% (140 Mill. €) of the turnover earned with
functional all-seasons and winter jackets**



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Why does functional clothing fascinate the users ?



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Customer opinion polls mention the following key aspects regarding functional outdoor jackets:

- Good and trendy image
- Fashionable style
- Versatile using possibilities
- High quality and good value for money



All images: www.schoeffel.de

Application fields – Future developments



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Health and wellness

- Body climate regulation
- drug release
- vital parameter monitoring

Next generation of functional clothing

Communication

- generators
- transponder
- data logging
- data transmission

Leisure and entertainment

- heatable outdoor clothing
- integrated audio and video

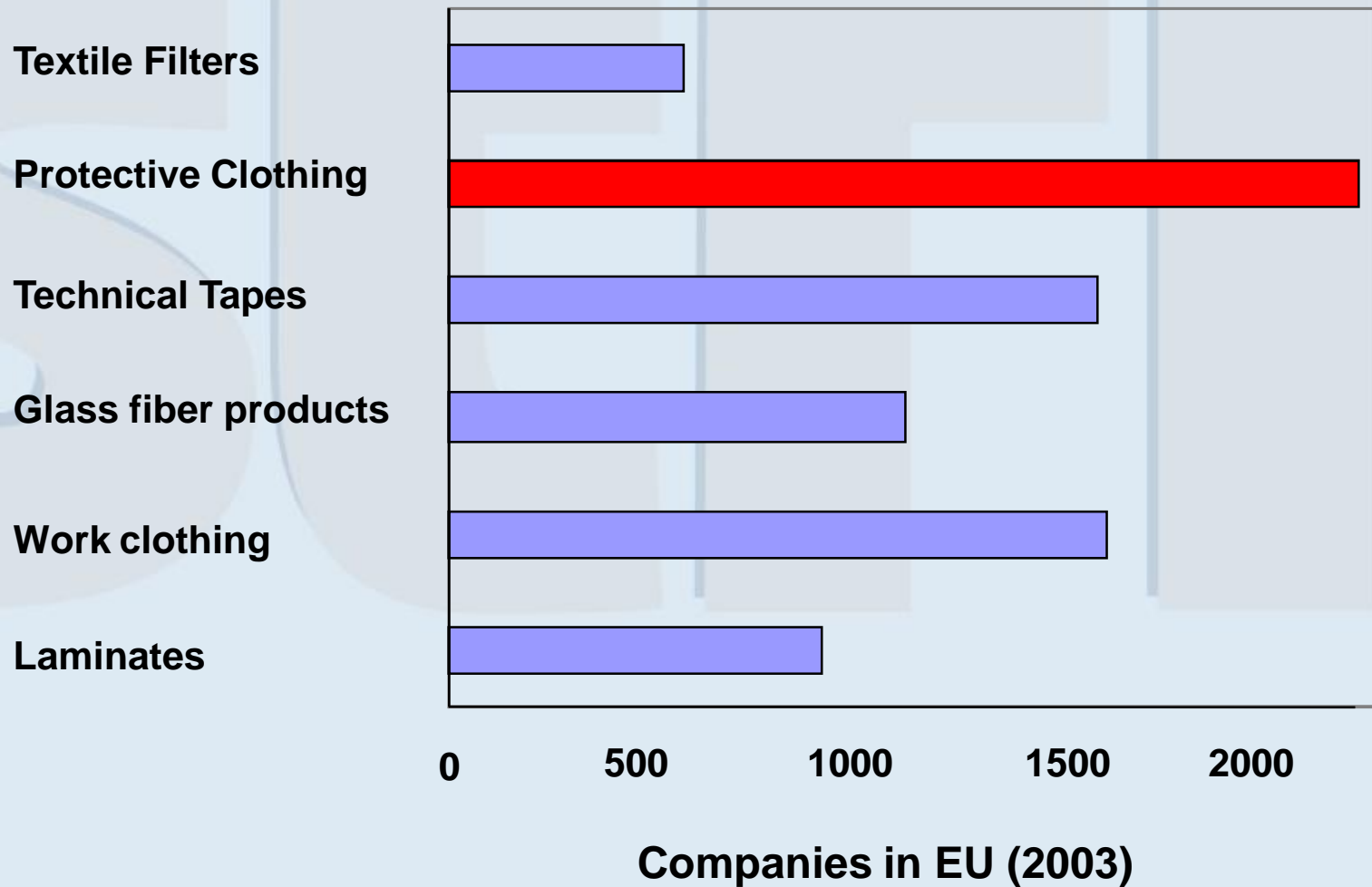
Safety

- SAR supporting clothing
- protection and warning

The Protective Clothing Market



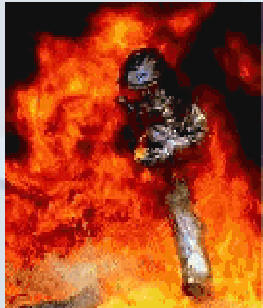
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The Protective Clothing Market



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- Protective clothing represents the top product group of technical textiles – with more than 2000 manufacturer in the EC
- Protective and safety textiles are technical textiles with high-tech character
- Until 2010 a total average increase of 4% of material consumption or the production of protective textiles is expected



The Protective Clothing Market



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Lifejackets

100 Mio. € per year

Body protection for sports

100 Mio. € per year

Protective gloves

500 Mio. € per year

Protective clothing for professional use

2.000 Mio. € per year

Types of protective clothing



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- protective clothing against heat and flame
- firemen's protective clothing
- protective clothing against cold
- protective clothing against rain
- protective clothing against chemical substances (gases, liquids, particles)
- electrostatic dissipative protective clothing
- high visible warning clothing
- ballistic protection
- protective gloves against mechanical and thermal hazards
-

Complex requirements - protective functions



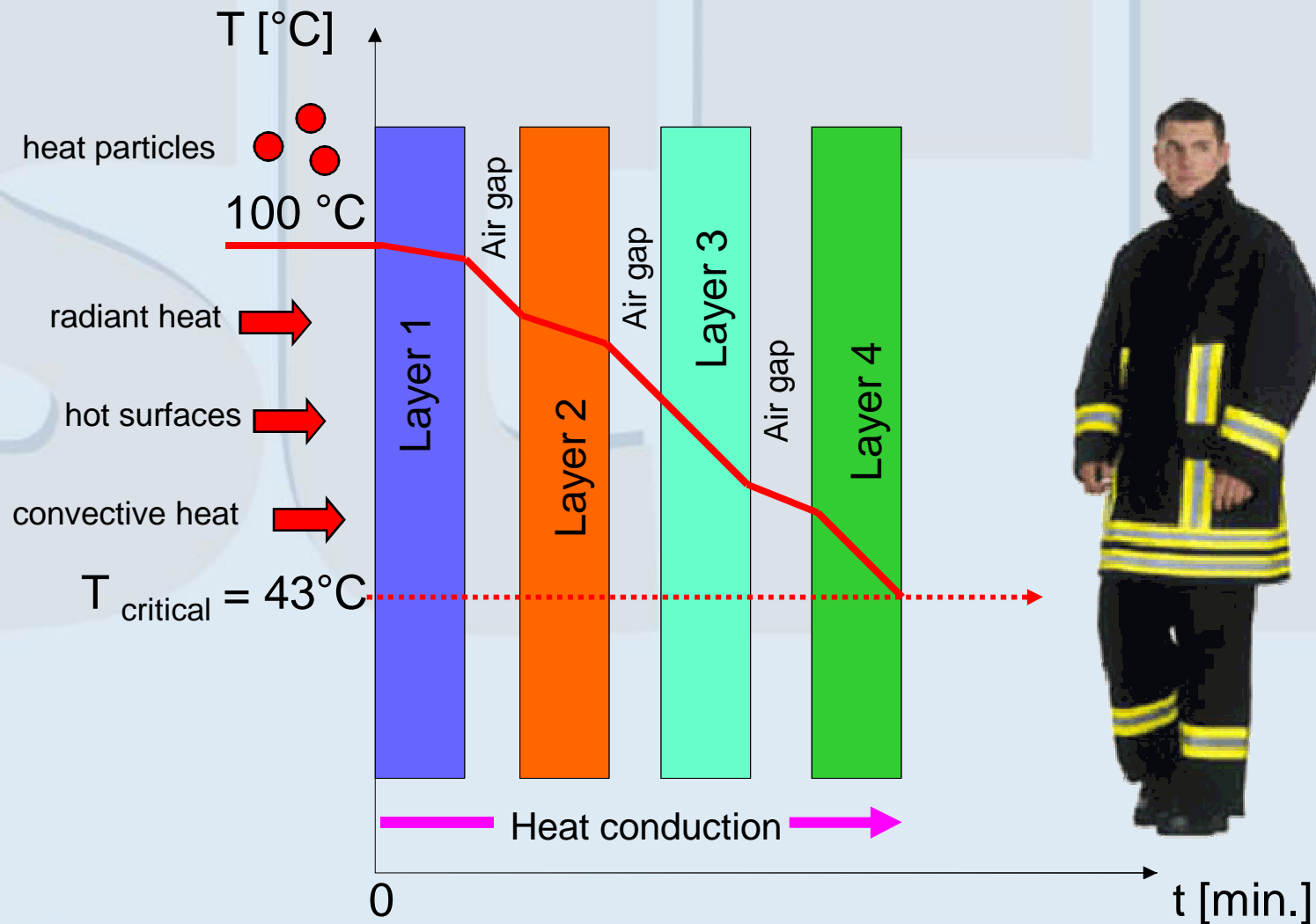
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- thermal protection (fire, heat, electrical arcs, extreme cold)
- mechanical protection (cut, abrasion, ballistic and impact resistance)
- chemical protection (liquid, gas, dust)
- microbiological protection (biological and nuclear protection)
- protection against electrostatic charges
- absorbent (UV, energized radiation)
- electrically insulating
- moisture-absorbent / swelling / moisture-repellent
- vibration-reducing
- filtering

Applications of multi-functional protective clothing...



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Applications of multi-functional protective clothing...



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NAPCO® technology

Outer material:

e.g. Kermel HTA, Nomex III,
Nomex Comfort, PBI Gold,...

Moisture barrier:

Water vapour permeable laminate
(PU, PES, or PTFE)

Innermost lining:

e.g. flame retardant woven fabric

Substitution by NAPCO®

The thermo-insulation layer is substituted by a novel 3D needle-punched spacer nonwoven made from heat resistant fibres.

Applications of multi-functional protective clothing...



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Metallised nonwovens sputtered with aluminium or copper

Applications:

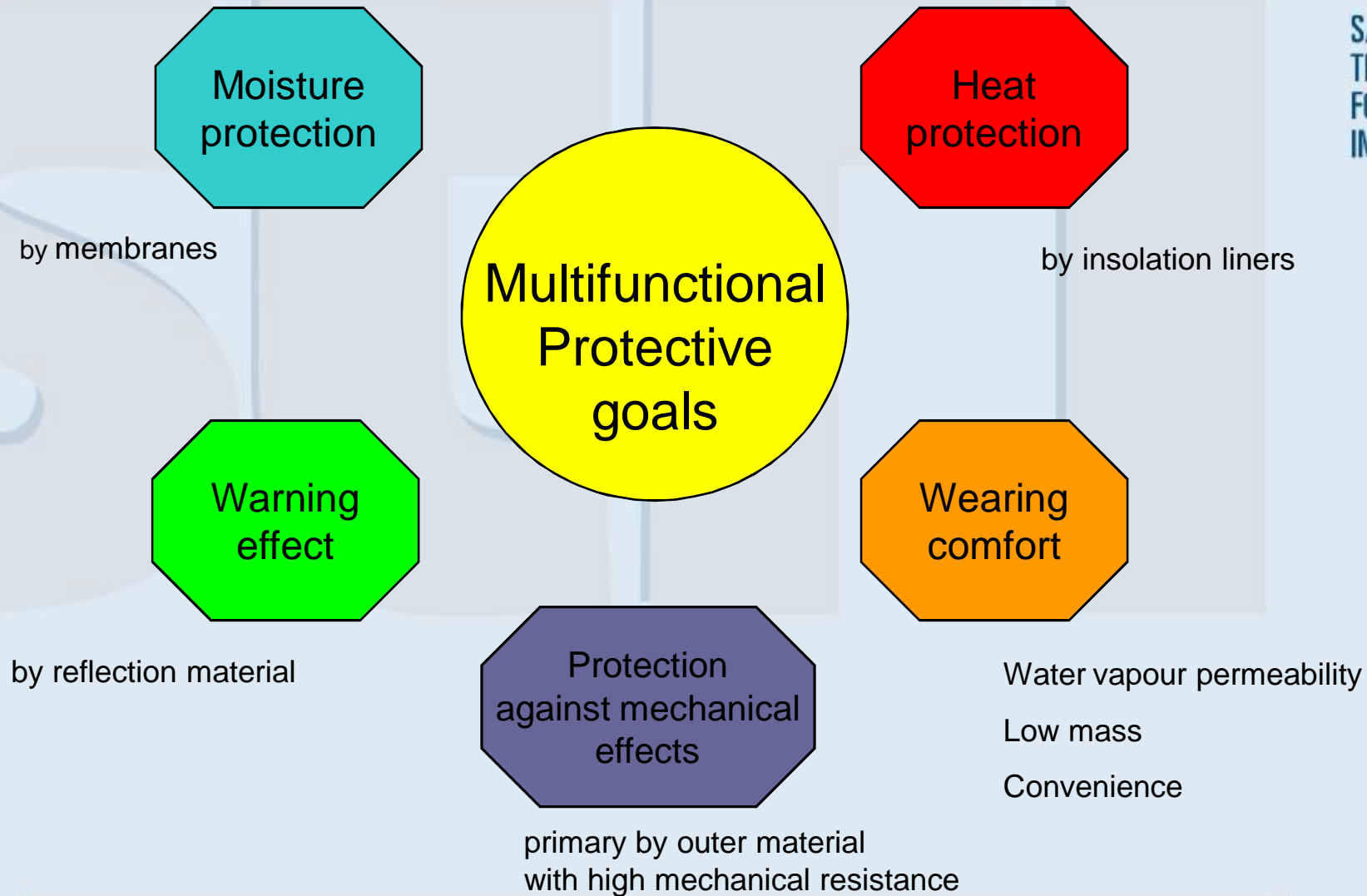
- sun protection materials
- cable sheaths
- seals
- filter
- shielding of cables and electronic components
- car interior
- electromagnetic shielding of rooms and buildings
- adhesive plaster



Applications of multi-functional protective clothing...



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Applications of multi-functional protective clothing...



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Test conditions:

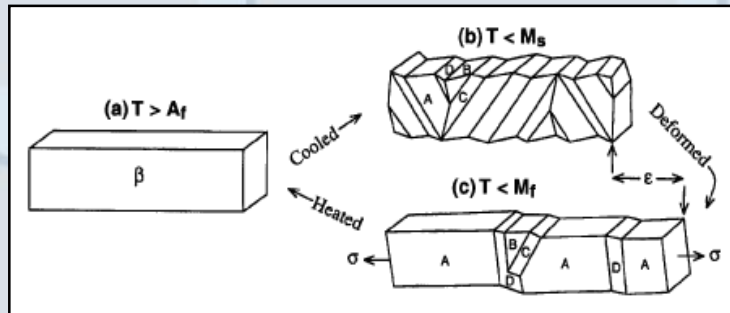
- Electrical parameters (voltage/current): 400 V 4 kA or 7 kA
- Arc duration: 500 ms
- Cu/Al electrodes, round, electrolytic copper, 30 mm gap
- Distance from electrodes to material: 300 mm

Evaluation criteria:

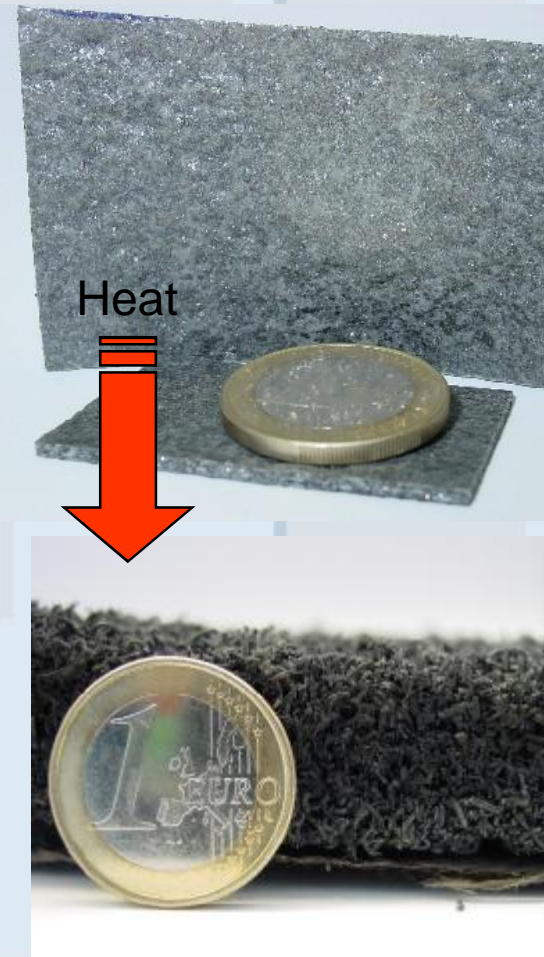
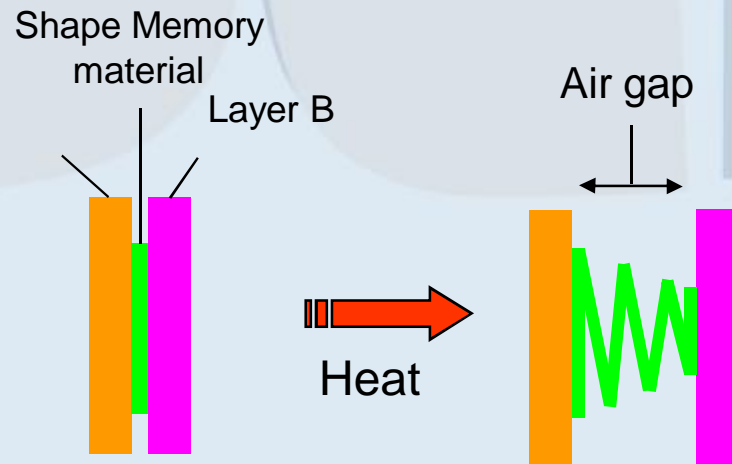
- burning time less or equal to 5 s after exposure
- maximum of 5 mm holes measured in any direction
- no melting to the inside of the garment
- heat flux should not exceed the STOLL-CHIANTA curve



Intelligent Protective Clothing – Smart Textiles



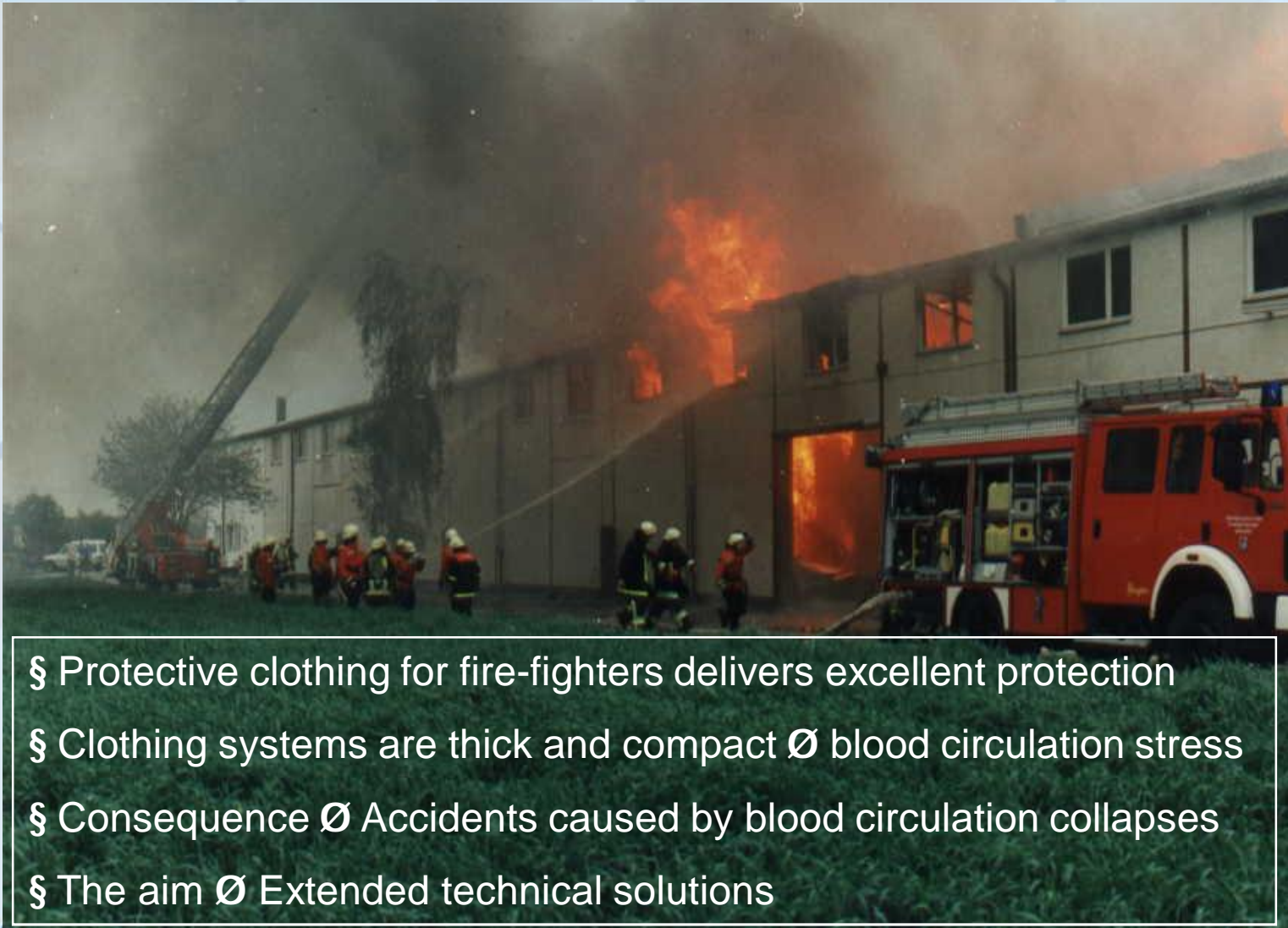
Source: <http://www.sma.inc.com/SMAPaper.html>



Intelligent Protective Clothing – Smart Textiles



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- § Protective clothing for fire-fighters delivers excellent protection
- § Clothing systems are thick and compact Ø blood circulation stress
- § Consequence Ø Accidents caused by blood circulation collapses
- § The aim Ø Extended technical solutions

Intelligent Protective Clothing – Smart Textiles



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Clothing requirements:

- No decreasing of protection levels
- No restriction for the wearer's freedom of action
- No effects to the textile behaviour



End-user requirements:

- Mission control to avoid health dangerous situations
- Warning from critical expositions
- Support of SAR possibilities from outside

Certification of PPC in Germany - Notified Body 0516



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CE – Marking

CE 0516

(Communaute Européenne)

Required for all Kinds of PPE



Material and garments tests according to European standards...



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Technical Textile Symposium 10th November 2009 Seoul Korea

www.stfi.de

Certification of PPE in Germany - Notified Body 0516



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Certification Department for personal protective clothing and gloves according to EC Directive 89/686/EEC and in compliance with DIN EN ISO 17025 and DIN EN 45011

- competent consultancy for companies in all steps of testing and certification
- active work in national and international committees for standardization and knowledge transfer
- immediate use of newly gained knowledge for the assessment of PPC and ongoing improvement of the test equipment



Development-dominating factors...



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Key factors for successful developments in the field of protective textiles and protection of persons:

- Ø application-specific and **customized developments** on a high customer-oriented service level (*mission-specific protection, Corporate-Wear, textile rental service...*)
- Ø **multi-functional protection** against different risk exposures (*thermal, chemical, mechanical, climatic, bacteriological, electrostatic,...*) by multi-functional fibres and/or surfaces
- Ø **increased wearing-comfort** on identical protection level by mass-reduction and better water vapour permeability

Outlook/Future Trends



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- Estimated growth rate of end-use consumption for protective textiles 4% per year (period 2005–2010)
- Use of nonwovens especially for shielding applications against radiation and electro smog \Rightarrow innovative coating technologies (PVD, metallisation)
- Medical nonwovens: antibacterial finish, micro fibre fabrics against neurodermatitis, integration of substances/controlled sustained release, healthcare textiles
- Protective textiles: application of phase change materials (PCM) also for nonwovens, ceramic coatings, multi-layered clothing



Thank you for listening...



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Contact:
rainer.gebhardt@stfi.de