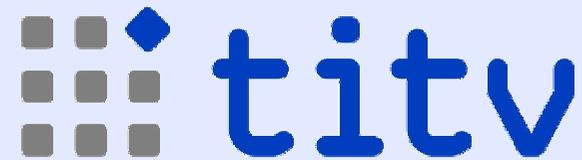
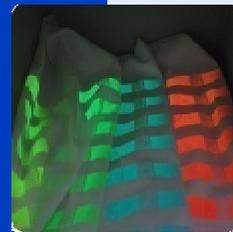


The Institute for Special Textiles
and Flexible Materials



Technical Textiles for Automotive Applications

Dr. Uwe Möhring

23.Textiles Days

Seoul, 11. November 2009

Content

- 1. Introduction of TITV Greiz**
- 2. Textiles in automotive applications**
 - **Tire-cord**
 - **Filter**
 - **Airbags**
 - **Safety belts**
 - **Seats**
- 3. Requirements on Interior**
- 4. Outlook - Summary**

TITV Greiz

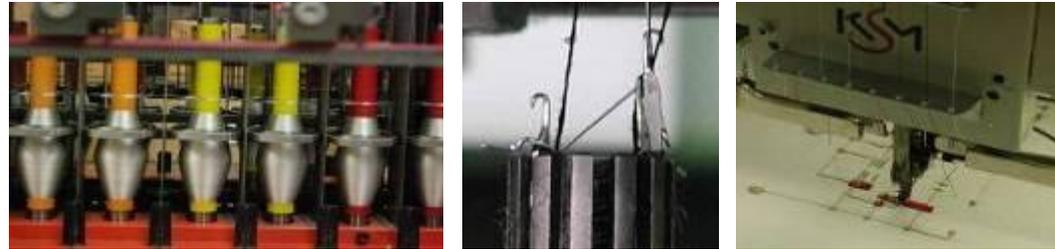
The Institute for Special Textiles and Flexible Materials



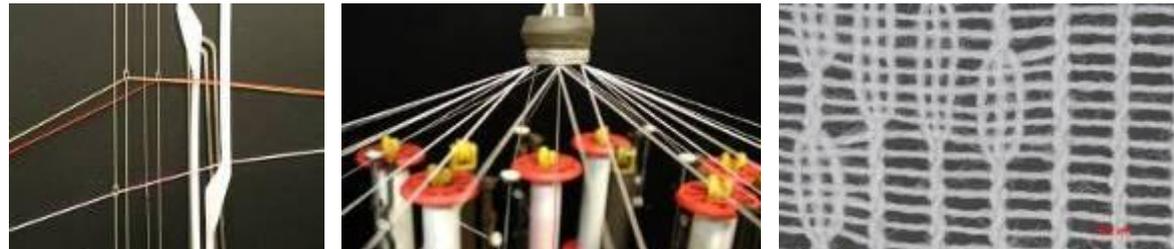
Founded:	1992 in Greiz (Germany)
Employees :	56 (about 30 engineers and scientists)
Turnover :	3,5 Mio. € (2005)
Projects:	over 30 p.a. granted by BMBF, BMWA, AiF, EU ...
Patents:	54

The Textile Production Chain at TITV Greiz

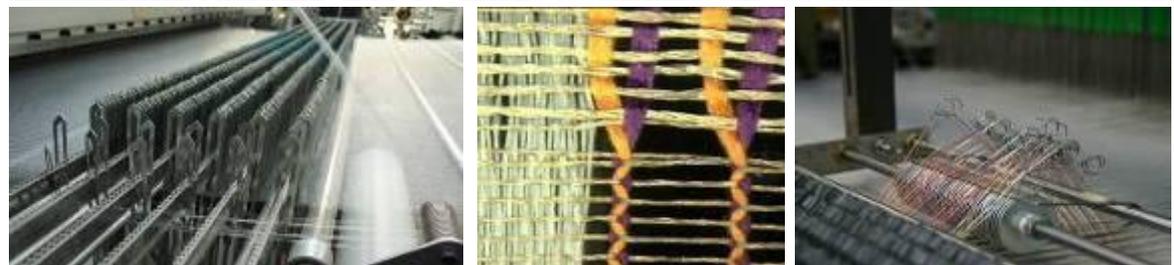
Thread creation



Braiding



Fabrics



Narrow Fabrics

Warp Knitting



The Textile Production Chain at TITV Greiz

Dyeing, Finishing, Printing



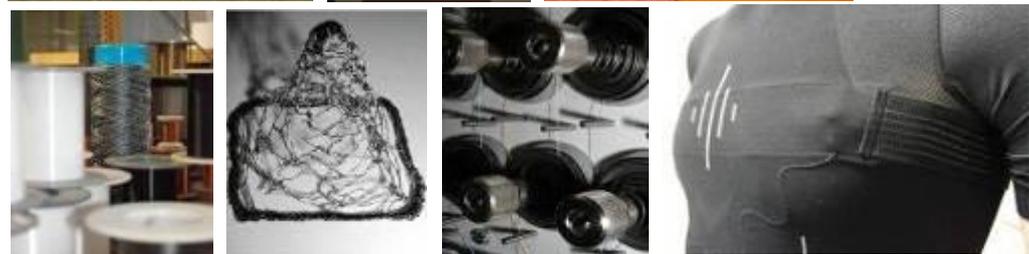
Galvanics



Embroidery



Ready-to-Wear



Certificated Test Laboratory

*Accredited with
DIN EN ISO/IEC 17025:2005*

Physical and chemical tests for textiles

- Tests of Fibres, threads, fabrics
- Colour fastnesses

Chemical analysis

- Material testing
- Environmental analysis



Smart Textiles at TITV Greiz

- **Medical Applications**

- Electrodes for EEG, TENS
- Muscle stimulation



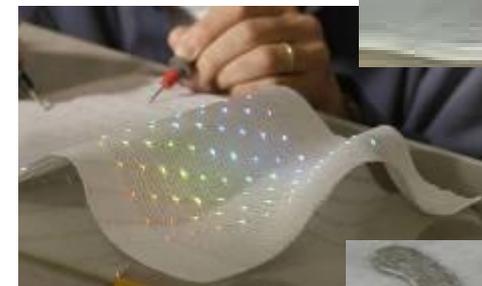
- **Clothing / Automotive**

- Heating textiles
- Illuminating textiles



- **Communication**

- Glove
- RFID-Label



Topics in Research and Development

Textile Microsystems Technique / Smart Textiles

energy harvesting, textile based micro systems and components, integration in flexible substrates, positioning and connection on flexible substrates, embroidery, sewing, thread technology

Surface Modification

coating, nano, sol gel, hot melt, rolls, coating knife, galvanisation of thread and fabrics finishing, dyeing, printing

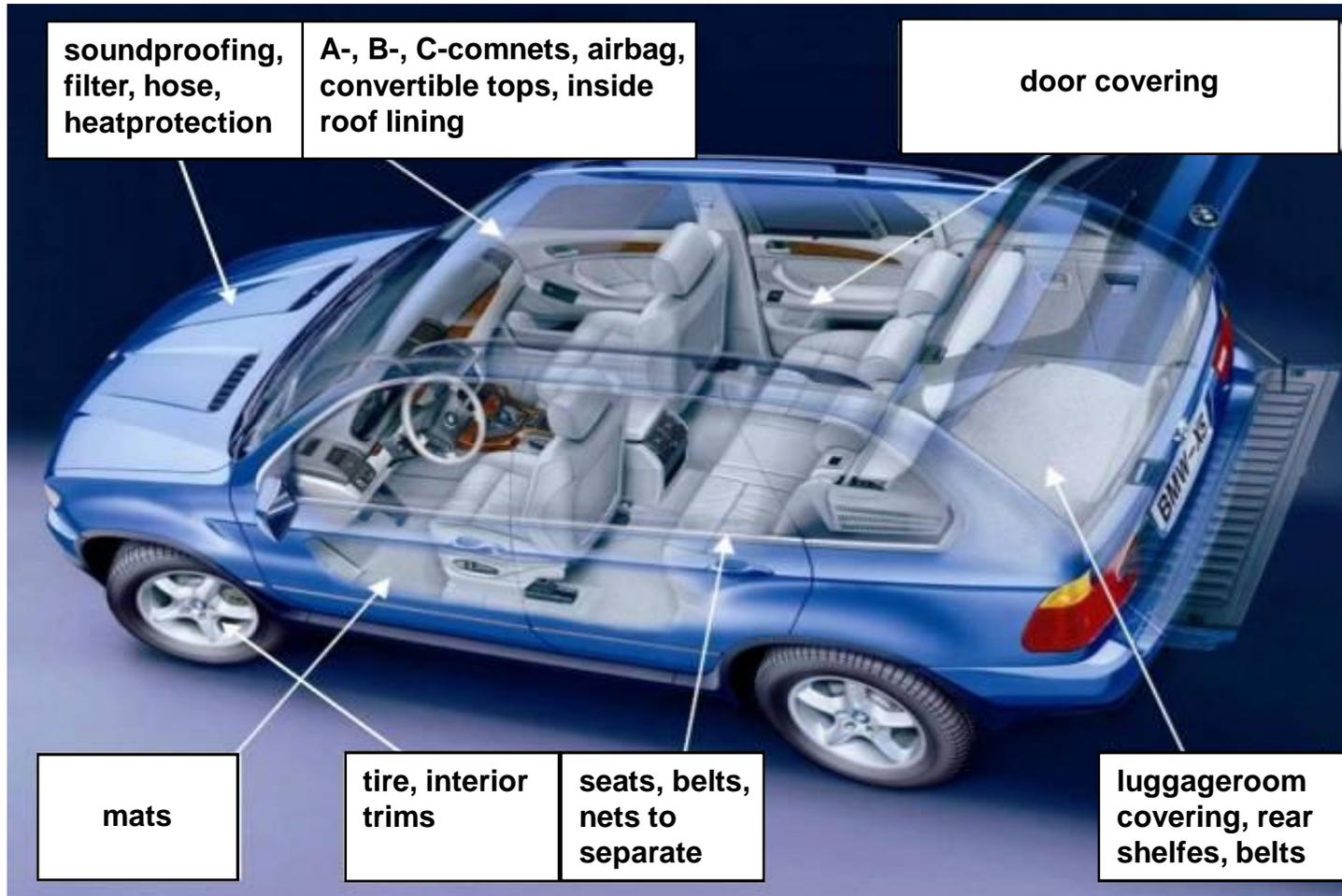
Flexible Materials / Special Textiles

jacquard and shedding weaving technique, leno technology, rapier and air weft insertion, narrow fabrics, warp knitting, spacer fabrics, braiding

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Textiles in Automotive Applications

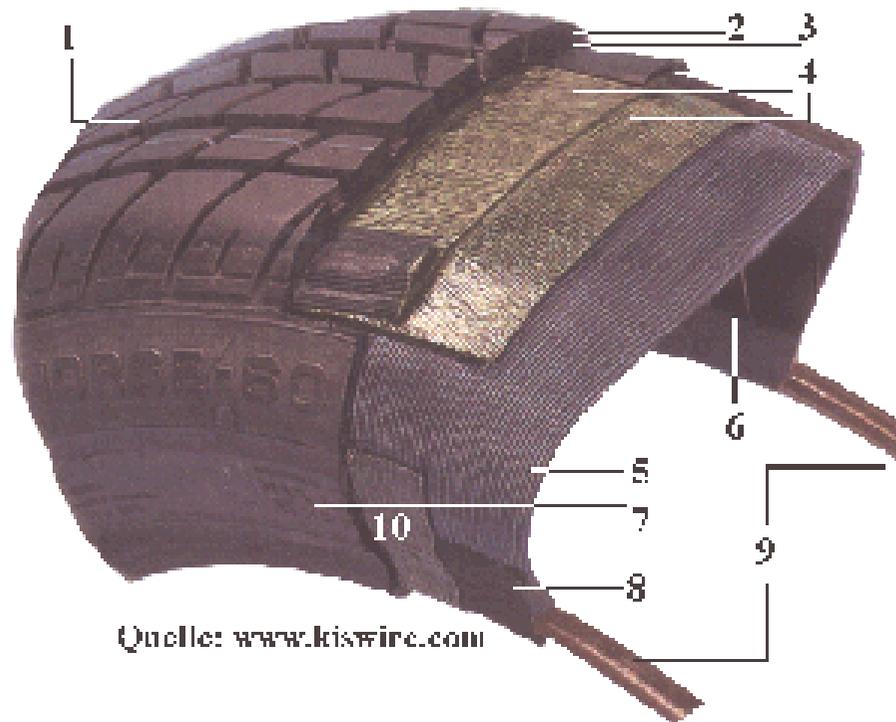


Tire-cord

Automobile tire:

about 11 rubber compositions and more than 30 components

- 1 tread
- 2 underrubber
- 3 bandage
- 4 steel cord belt
- 5 carcass
- 6 inner layer
- 7 side
- 8 bead
- 9 core
- 10 bead stripe

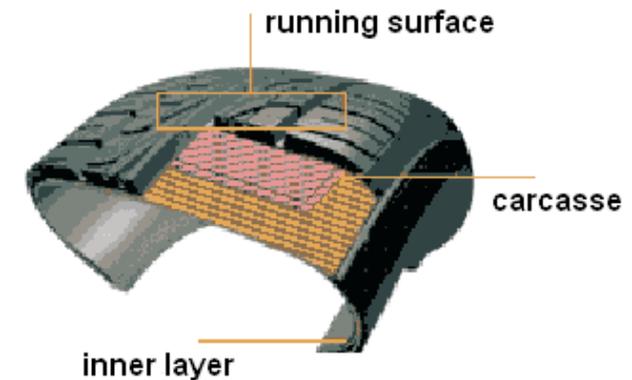


Quelle: www.kiswire.com

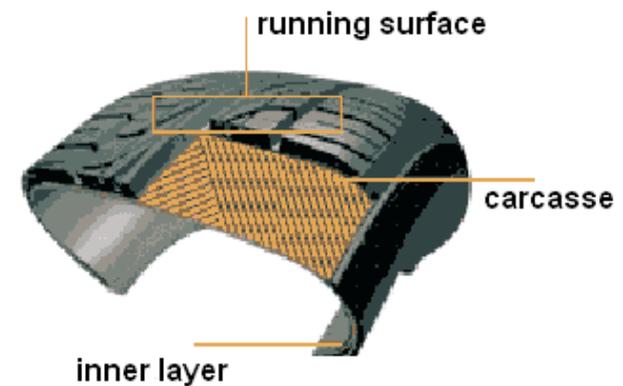
Carcass

- The carcass is the skeleton of the tire. It is the decisive reinforcement and is completing with belt and treads.
- The carcass consists of 1 or 2 fabrics sheets, which embedded in rubber.
- The fabric obtained of synthetic fibres, rayon and steel cord (in radial tires).

radial ply tire



cross-ply tire



source: www.reifen.de

Filter – Why?

- **Motor air- filter**

High-performance engines needs clear air to develop their highest performance.

The ambient air comprises naturally (pollen, dust, sand) and industrially (abrasion, rurs, emissions) contaminations, these impair the smoothly combustion process and get to breakdown. In addition the sensory will be damaged.

- **Air filter**

The inmates breath the unfiltered pollutants without an air-filter.



Filter

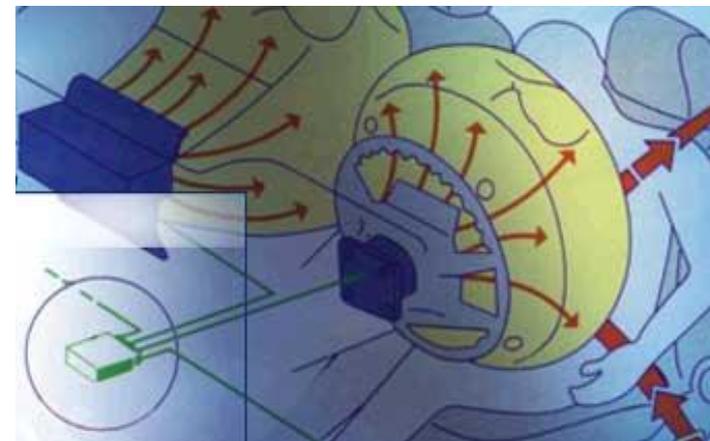
- **Dust Bag**
 - air conditioning and ventilation systems
 - supply and exhaust air arrangements
- **Materials**
 - Polyester
 - Viscose
 - Polyamide
 - Polypropylene
- **Trends**
 - electrical conductivity



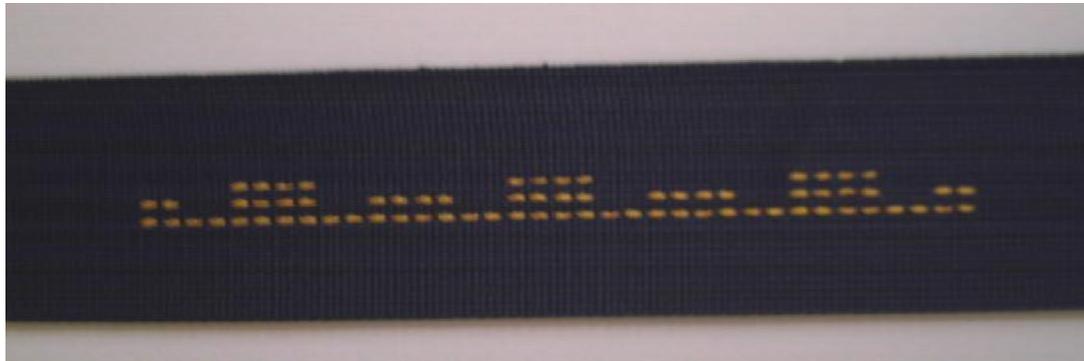
Airbag

In a car are up to 7 airbag systems, which defeats highest protection-regulations.

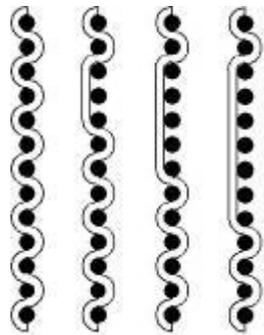
Trend: Welded seams



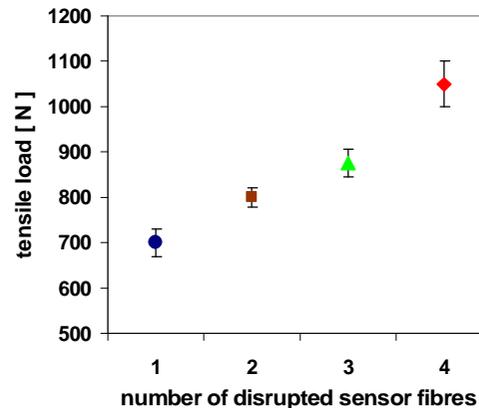
Safety Belts - Sensor Fibres Indicating Overstress by Rupture



Woven belt with coloured sensor threads for visual inspection to display overstress



Principle: Sensor fibres with varying types of weave



Tensile load of the sensor fibres



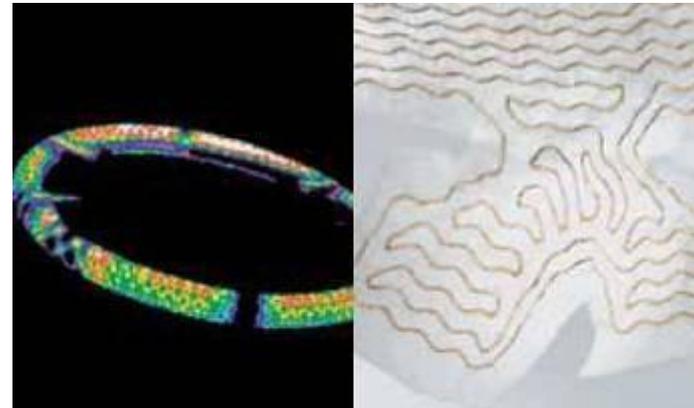
Seat belt

Seats – Active Air-Conditioning



Active Heat Management – Automotive

- Car seat heating elements

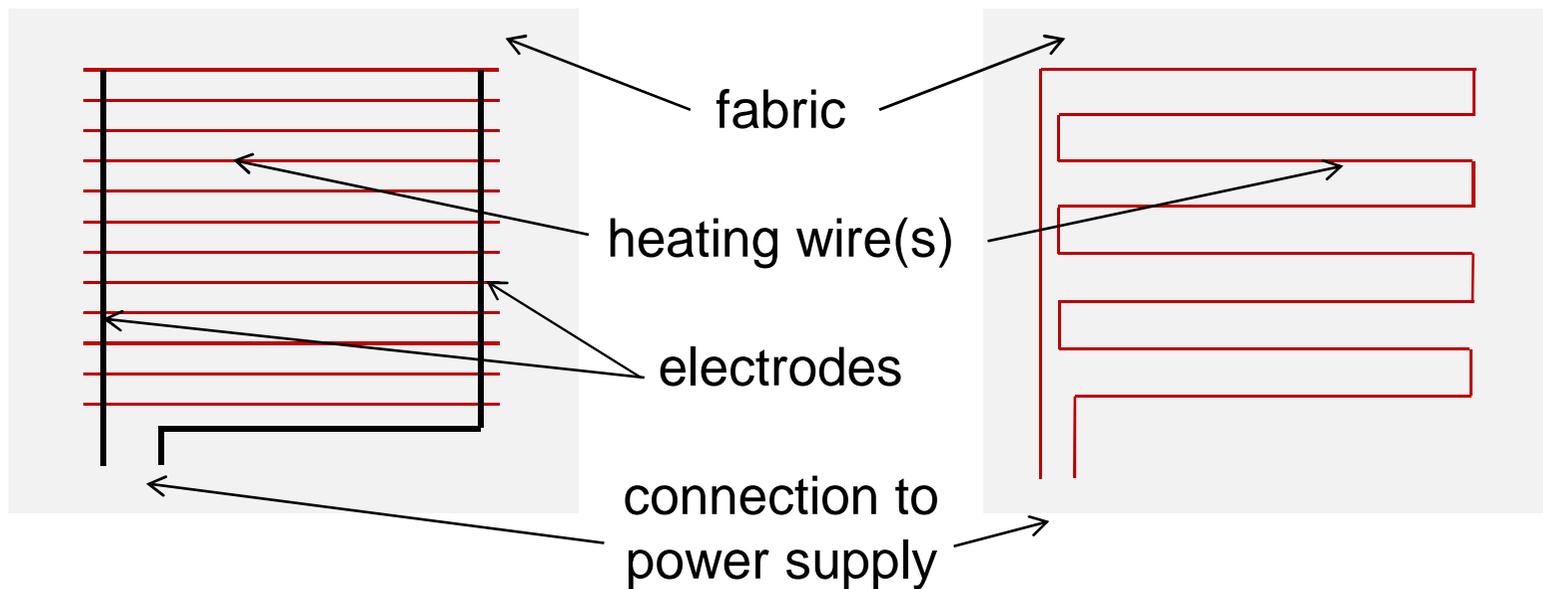


source: W.E.T. automotive

Textile Heating Systems

2 principle setups of heating systems

parallel Heating element in series
order



TITV Greiz solutions

- Heating system for children seat



Using embroidery or weaving technology for development of heating fabrics as inlay

Active Heat Management – Automotive

Active Heat and Cooling Systems

- Defined lanes in a spacer fabric
- Forced air circulation systems
- Forced fluid circulation by application of tubes
- Active heating and cooling

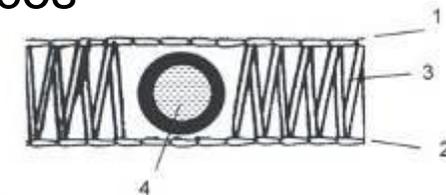


Our partner:
Kröhnert Chilling & Heating



Spacer fabric with integrated tubes:

- 1,2: knitted surfaces
- 3: pile yarns
- 4: tube



Silk in Seat Covers

Features

- New optical characteristic
- New haptics
- Integration of climate functions
- High-grade Silk Image



SILK MADE IN GERMANY

CarTrim

Silk in Seat Covers

**Silk meets the most specifications
of the car manufacturers**

Burning speed of different silk fabrics:
0...55 mm/min

DIN 75200 (≤ 80)

Martindale: 50 000

DIN EN ISO 12947-2 (12kPa)



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Regulation of heat and moisture transport

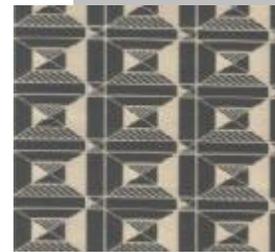
Physiological seat comfort:

- Breathable through good air and water vapour permeability
- Comfort even when sweating through good moisture absorption and buffering
- Comfortable thermal sensation through textile seat cover and optimal thermal transport behaviour

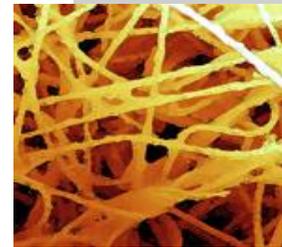
Regulation of heat and moisture transport

Interacting components:

Seat cover



Lamination, lining fabric

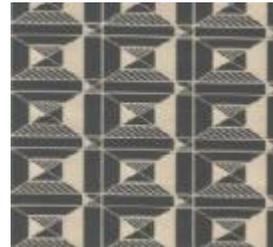


Layout of seat / Design



Innovation from TITV Greiz

Seat cover
textile fabric



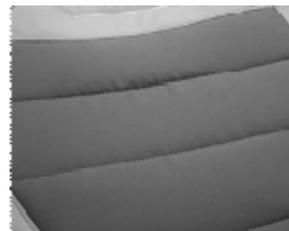
Textile seat cover fabric
Development and test

Lamination and lining fabric
hygroscopic



Heat and moisture transport
with spacer fabrics

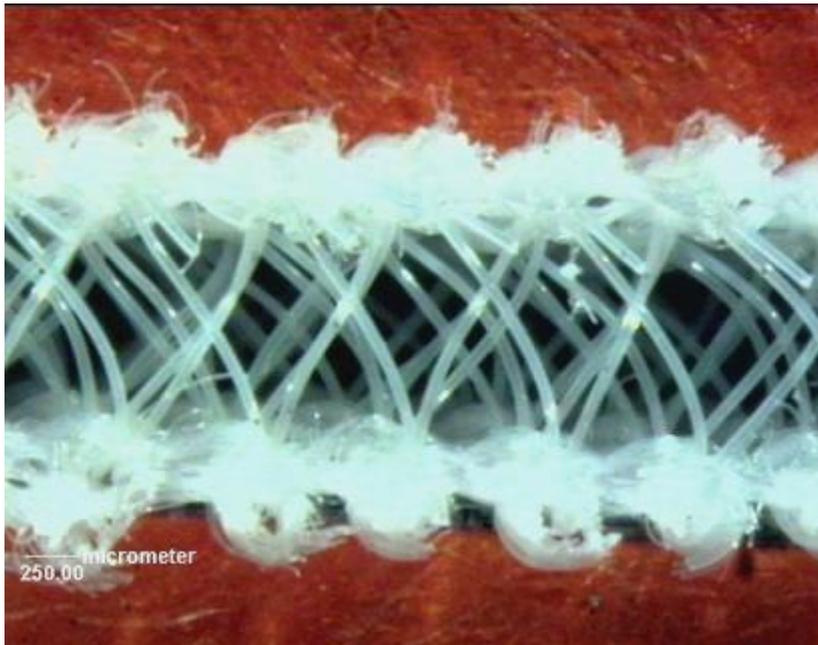
Layout of seat / Design
Ventilation und additional
buffers



Layout of seat / Design
Ready-made solutions and
adjustment of all components
for passive or active climate
seat

Innovation from TITV Greiz

Climate effect with the use of three-dimensional spacer fabrics



Spacer fabrics are:

- breathable
- pressure distributing
- thermo-regulating
- the direction of moisture transport can be controlled by the choice of material

Antistatic Behaviour

The avoidance of electrostatic electrostatic discharge

Problem:

- If the surfaces of materials rub against each other, static charges are produced as a result of charge separation
- Electrostatic discharges when getting out of a car are caused by friction between clothing and seat cover of car seat
- Seat cover of car seat must be electrostatic dissipative to avoid electrostatic discharges
- Electrostatic dissipative fabrics have a surface resistance between $1 \cdot 10^5$ and $1 \cdot 10^{11}$ ohm
- The surface resistance according to standard DIN 54345-1 is determined with a special ring electrode and a high-resistance measuring instrument



Solutions and Services of TITV Greiz

- Design of electrostatic dissipative fabrics
- Application of organic polymers on woven fabric for achieving electrical conductivity for conducting charges
- Measurement of the surface resistivity in accordance with standard DIN 54345-1 for the evaluation of electrostatic properties on woven fabrics



Resistance measurement in the climatic exposure test cabinet



Ring electrode and a high-resistance measurement device

Soil Release / Easy Cleaning

Water-repellence through finishing

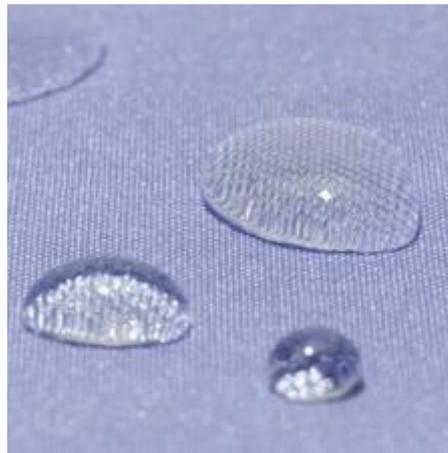
- Paraffin wax emulsion
- Fat-modified compounds
- Silicone
- Fluor chemicals



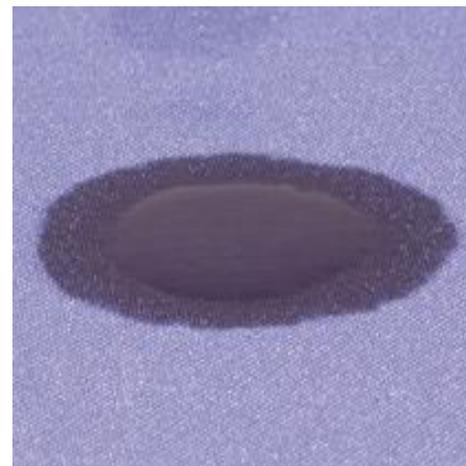
Soil Release / Easy Cleaning

Hydrophobic / Oleophobic finishing

Spreading of an oil drop on:



Fluorine-carbon finishing (FC)



Silicone finishing (HC)

FC - finishing - water and oil-repellent

HC – finishing water repellent only

Soil Release / Easy Cleaning

Test of soiling behavior

Suitable test substances for technical textiles are:

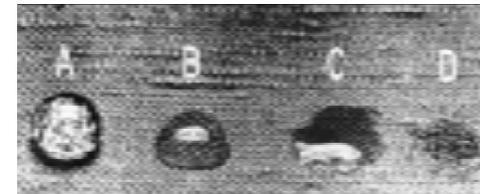
Water

Spray test (according to DIN EN 24920)



Oil

Oil note (according to AATCC 118 or DIN EN ISO 14419)



Standard soiling

AATCC 123 Standard soili

09 W-2 Synthetic standard carpet soiling + vaseline

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Textile a Lightweight Material

actually: part of textiles in cars
20 kg

outlook to 2015: part of textiles
will increase up to 30 kg

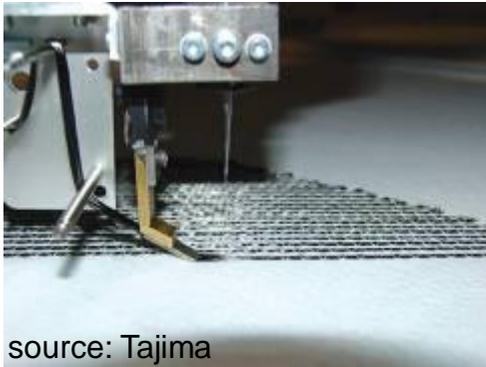
The fuel consumption sink
amount to 0,5 l /100 km per
100 kg weight saving.



Innovations of the future

- Ü Functional textile composites
- Ü Reinforcement of the Interior and the car body parts
- Ü Safety-related extensions

Tailored Fibre Placement

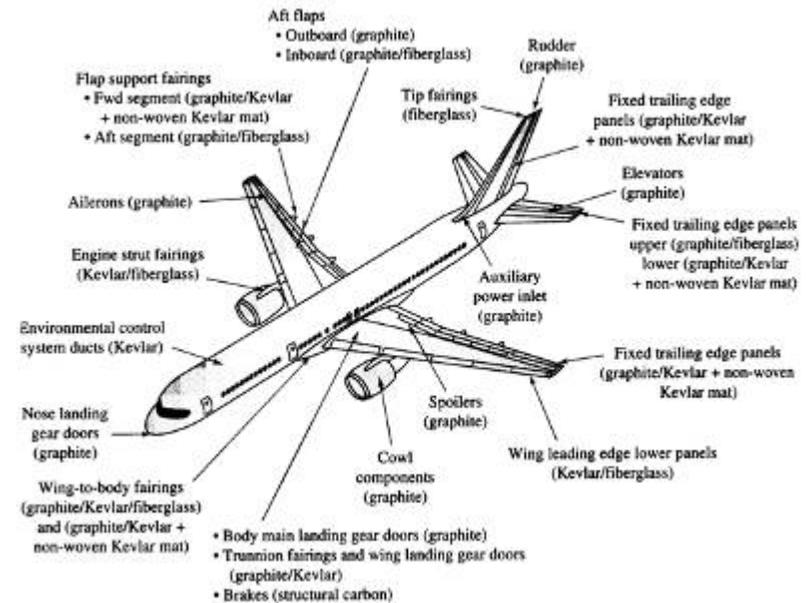


source: Tajima



www.7-forum.com

cowling
 Mirror caps
 laterally air intakes at the front skirt
 Gurney at the boot lid and rear bumper



Composite in the main structure of the boeing 757-200 aircraft. (Source: Boeing commercial Airplane company)

Outlook – Smart Textiles

The comfort is to carry out with the integration of electronic functions in textile decorative and reinforcing elements with simultaneous weight reduction, reduced depth and improved flexibility.



Conductive Materials for Textile Application

TITV's product development
ELITEX[®] Thread

ELITEX[®] threads are

- High-conductive,
- Textile processable
polyamide thread materials
- With a coating made of pure silver



Product Information of ELITEX[®] Threads

Material	Polyamide
Coating	99,9 % silver
Basic yarn count:	234 dtex / f 34
Yarn count with silver layer:	450 ± 50 dtex
Electrical Resistance:	20 Ω m ⁻¹
Melting point:	259 °C
Force-tension behavior	
Tensile strength:	>750 cN
Tensile strength tension:	> 10 %
Processing temperature:	max.180 °C, 5 minutes



Textile Switches



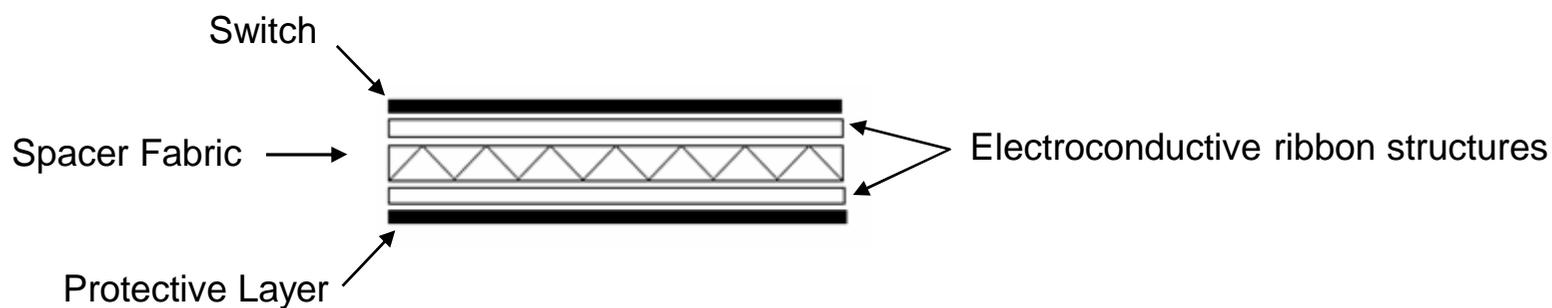
1. Generation



2. Generation
(with pressure point)



Testing equipment for
Long-time loading



Textile Switches – Applications

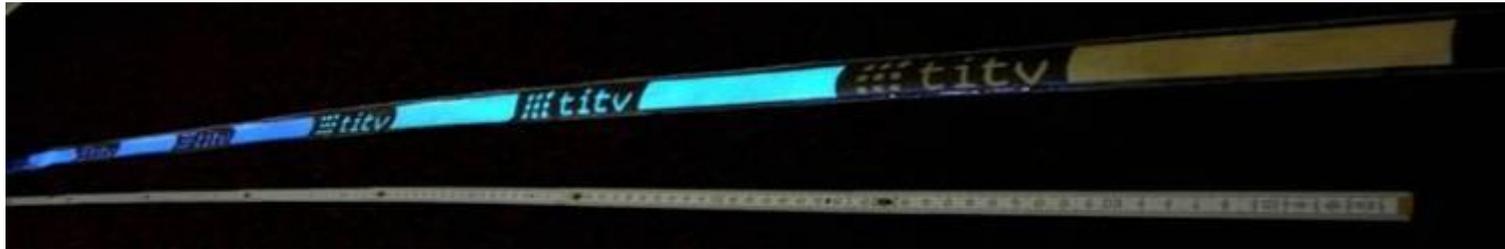


- Integration in seats, arm rests, side linings, clothing
- Soften switch
- Easy handling
- No reduction of comfort
- Flat - very low height



Our partner: Car Trim, Plauen

Illumination with Textile Light Sources



Ambient light at the backside of the head-rest



Screenprint (30 cm x 40 cm, 4 colours)

Electroluminescent Textiles

- EL Textil integrated in a door panel



Luminescent Textiles



LED on woven fabric



Trends

Requirements for customer satisfaction

- Quality
 - Velcro resistance
 - Rub off resistance
- Comfort
 - Regulation of heat and moisture transport
- Functionality
 - Antistatic
 - Soil release / easy cleaning
- Elegance / good haptic
- Odor

Visionary Concepts

- BMW “GINA” project



The cars of tomorrow . . .



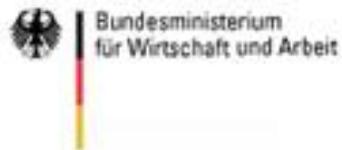
. . . textile cars ?

Acknowledgement

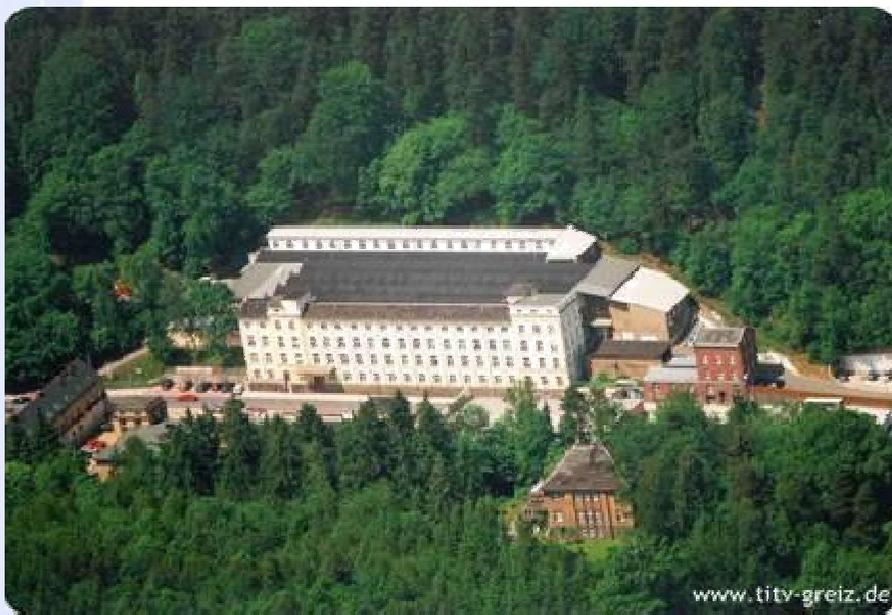
Team of TITV Greiz

Partners in Industry

Financial Support



Thank You for Your Attention!



Textile Research Institute Thuringia-Vogtland e. V.

Zeulenrodaer Straße 42

07973 Greiz

Phone : +49 (0) 3661 – 611 0

Fax : +49 (0) 3661 – 611 222

mail@titv-greiz.de

www.titv-greiz.de

Dr. Uwe Möhring

Phone: +49 3661 611 202

Email: u.moehring@titv-greiz.de

The Institute for Special Textiles and Flexible Materials