RESEARCH HIGHLIGHTS

DEUTSCHE INSTITUTE FÜR TEXTIL- UND FASERFORSCHUNG DENKENDORF

DITF REPORT

November 2024 – No. 2

New: Denkendorf Fiber Chart

Indispensable reference work comprehensively revised

Whether for study or practical use: With the Denkendorf Fiber Chart, you have all the important characteristic values of textile raw materials at a glance. The overview shows all important fibers, whether of natural or synthetic origin. It describes their chemical properties with key characteristic values such as specific strength, elongation or hysteresis. Relevant brand names complete the picture and provide practitioners with reliable guidance when selecting materials for their products. The Denkendorf Fiber Chart has a long tradition and has been a household name in the textile world for decades. With their many years of testing experience, participation in standards committees and many industry contacts, the Denkendorf laboratory managers and scientists had already compiled a comprehensive overview in the 1970s in close cooperation with manufacturers and users. A second edition was produced in 1986. The Denkendorf Fiber Chart is now in its third edition and, with its many features and functions, meets all the requirements of a digital information medium:

40 fibers with 80 properties each
> as poster
> on the online platform

On the approx. 140 x 120 cm poster, you will find an SEM, microscope and fiber array image as well as a force-elongation diagram for each fiber. All variants are clearly illustrated.
The online platform offers a search function for fiber properties. Individual fibers and their properties can be compared. Data sheets and high-resolution images complete the offer.

DITF webshop launches in 2025
From January, you can order the Denkendorf Fiber Chart as a poster or digitally via the new DITF webshop. With the offer in the store, the textile research center will ensure knowledge transfer in the future. Here you will not only find the proven classic in the latest edition, but also publications on the research results and tickets for specialist events.
Click in and have a look around.

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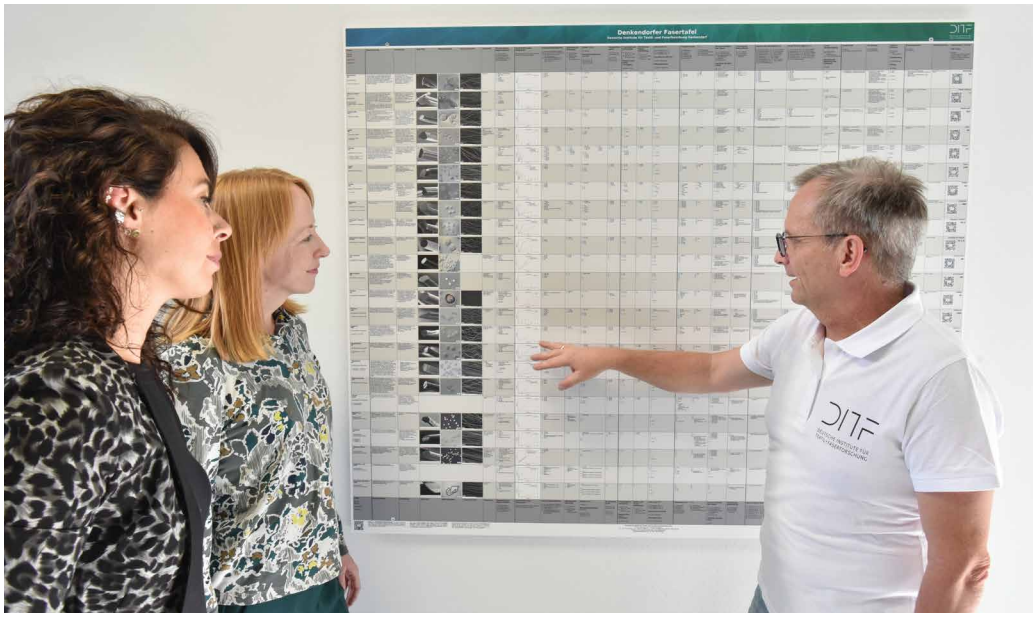

All about fibers: Guido Grau explains what the revised Denkendorf fiber chart offers

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Cleanzone Award 2024 for the DITF

Evi Held-Föhn and Gabriele Schmeer-Lioe from the DITF and the project partners from the Dastex Group received the Cleanzone Award at Cleanzone, the trade fair for cleanroom and cleanliness technology, hygiene and contamination control. The award was given for the development of a test method for cleanroom garment textiles, the so-called ReBa² test method.
With the realistic bacterial barrier test method, the DITF offer a new biological method for determining the bacterial penetration through cleanroom garment textiles. This allows an essential criterion for assessing the barrier function of cleanroom garments to be evaluated realistically. The test provides information on how many bacteria from the skin flora migrate through the cleanroom garments when worn. The test method was developed at the DITF in collaboration with Dastex Group GmbH.

BioFibreLoop has been launched

Towards a circular and sustainable textile industry in Europe

The DITF are coordinating the BioFibreLoop research project, which is funded as part of the European Union's Horizon Europe research and innovation program. The aim of BioFibreLoop is to develop recyclable outdoor and work clothing made from renewable bio-based materials. The kick-off event took place in Denkendorf on June 26 and 27, 2024.

The textile industry is facing two challenges: on the one hand, production must become more sustainable and environmentally friendly and, on the other, consumers expect more and more smart functions from clothing. In addition, the production of functional textiles often involves the use of chemicals that are harmful to the environment and health and make subsequent recycling more difficult.

Intelligent innovations must therefore ensure that harmful chemicals are replaced, water is saved, more durable, recyclable bio-based materials are used and the usually considerable CO_2 footprint of textile products is reduced. Digitalized processes should ensure greater efficiency and a closed cycle.

Partner at the BioFibreLoop launch event

For example, the BioFibreLoop project uses laser technology to imitate natural structures in order to produce garments with water and oil-repellent, self-cleaning and antibacterial properties. The end result of the research work is affordable, resource- and environmentally friendly, yet high-performance and durable fibers and textiles made from renewable sources such as lignin, cellulose and polylactic acid. All processes are aimed at a circular economy with comprehensive recycling and virtually waste-free functionalization based on nature's example. In this way, greenhouse gas emissions could be reduced by 20 percent by 2035.

The technology for the functionalization and recycling of bio-based materials is being developed in three industrial demonstration projects in Austria, the Czech Republic and Germany. At the end of the project, a patented circular, sustainable and reliable process for the production of recyclable functional textiles will be developed.

The BioFibreLoop project will run for 42 months and has a total budget of almost 7 million euros. 1.5 million will go to the coordinator DITF.

The consortium consists of 13 partners from nine countries who contribute expertise and resources from science and industry.

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Recycling disused wind turbine blades

DITF are partners in the REWIND project

On May 15 and 16, 2024, the kick-off meeting of the REWIND project took place in Valencia. The DITF are one of 14 partners from seven countries. REWIND deals with composite waste in the wind energy sector. It is funded by Horizon Europe and CINEA (European Climate, Infrastructure and Environment Executive Agency).

REWIND stands for Efficient Decommissioning, Repurposing and Recycling to increase the Circularity of end-of-life Wind Energy Systems. The project deals with the recycling of wind turbine blades when they have reached the end of their service life. The project partners are developing basic technologies for dismantling the composite material and methods with which the material can be broken down and evaluated. In the next step, recycling processes and options for reusing the composite materials will be developed. The aim is to make the wind turbine blades recyclable instead of landfilling or incinerating them.


REWIND project: Kick-off meeting with all project partners in Valencia

At the kick-off meeting, the research consortium agreed on the objectives of the research project and the procedure. The DITF's task is to develop a yarn and a fabric for new components or for repair kits for wind turbines from the glass and carbon fibers recycled by the project partners.

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Graywater treatment with 3D textiles

Sustainable, flexible, space-saving

The demand for water in Germany is increasing and used water is not being used sufficiently. Graywater in particular, i. e. wastewater from showers, bathtubs and hand basins, offers great potential for further use. It can be brought to service water quality on site and reused for example for flushing toilets or watering gardens.

Around 50 to 80 percent of all domestic wastewater is graywater. In order to treat it and return it to the cycle, large containers and tanks have been needed up to now, which take up a lot of space in the building. Together with its project partner ARIS, the DITF have developed a new biological, textile-based system that can perform this task in a very small space. It is based on a 3D spacer fabric made of highly durable polypropylene. Its advantage is that it can be installed flat and is therefore extremely space-saving. Thanks to its special system geometry, it can be installed in places that would otherwise remain unused – for example under the floor of a new underground garage, on a flat roof or in the garden. It can be modularly adapted to the water requirements and structural conditions in the respective buildings. Even vertical solutions on façades can be realized.

3D spacer textile for recycling graywater

The system developed by the project partners requires little maintenance and is therefore particularly cost-effective. Compared to previous solutions, it is characterized by a long service life. ARIS plans to launch the new textile-based graywater treatment system on the market in 2024.

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Synthetic leather made from bio-based PBS

Basis for industrial recycling concept

A new type of pure synthetic leather meets the high requirements of the European Ecodesign Regulation. Made from a bio-based plastic, it is biodegradable and meets the requirements for a closed recycling process.

Many artificial leathers consist of a textile carrier material to which a polymer layer is applied. The textile carrier and the coating are usually completely different materials. Woven, knitted or non-woven fabrics made of PET, PET/cotton or polyamide are often used as the textile carrier. PVC and various polyurethanes are usually used for the coatings.

The use of these established composite materials does not meet today's sustainability criteria. Recycling them by type is very costly or even impossible. They are not biodegradable. The search for alternative materials for the production of artificial leather is therefore urgent. Not least because, since the adoption of the Green Deal 2022 and the Ecodesign Regulation contained therein, textile and product design and product development must include the closing of the loop and the "end-of-life" case.

In an AiF project carried out in close cooperation between the DITF and the Freiberg Institute (FILK), it has now been possible to develop a synthetic leather in which both the fiber material and the coating polymer are identical. The varietal purity is a prerequisite for an industrial recycling concept.

The aliphatic polyester polybutylene succinate (PBS) was recommended as the base material due to its properties. PBS can be produced from biogenic sources and is now available on the market in several qualities and large quantities. Its biodegradability has been proven in tests. The material can be processed thermoplastically. Subsequent product recycling is simplified by the thermoplastic properties.

Pure PBS artificial leather

In order to realize a successful primary spinning process and to obtain PBS filaments with good textile-mechanical properties, process engineering adjustments had to be made in the cooling shaft at the DITF. This ultimately allowed POY yarns to be spun at relatively high speeds of up to 3,000 m/min, which had a stretched strength of just under 30 cN/tex. Fabrics produced from these yarns were used at FILK as a basic substrate for the subsequent extrusion coating with PBS as a thermoplastic.

With optimized production steps, PBS composite materials with the typical structure of artificial leather could be produced.

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Antibacterial fibers and finish

Fewer hospital infections through the use of AGXX particles

In Germany, 400,000 to 600,000 patients contract hospital-acquired infections every year, some of which can be prevented or influenced. Against this background, the use of antimicrobial functionalized clothing by hospital or nursing staff makes a significant contribution to minimizing the spread of bacteria and viruses.

Taking up this topic, the DITF and the company Heraeus are investigating the innovative antimicrobial technology AGXX. The mechanism of action of AGXX is based on a catalytic redox reaction in which moisture and oxygen are converted into reactive oxygen species (ROS), which ultimately kill the microorganisms. The effectiveness of AGXX has already been proven by the developers of AGXX particles against more than 130 different microorganisms, including germs with multiple resistance to antibiotics. As the catalytic AGXX technology is not based on the leaching of metal ions, as is the case with conventional silver technologies, nor on the release of environmentally harmful substances, it is not consumed over time and has a long-lasting effect.

Minimizing hospital infections with innovative, antimicrobial hospital clothing

In a joint project, the DITF and Heraeus are working on the integration of AGXX in medical textiles in the form of additives in fibre production and surface functionalization. The tests show that AGXX particles in fibers and textile finishes – depending on parameters such as concentration and polymer type – can have an excellent antimicrobial effect. Extensive developments and laboratory tests are currently being carried out on the effect, resistance and usage properties.

The economic viability aims to establish and expand the use of AGXX particles in everyday, professional and medical applications. In addition to the application envisaged here for the treatment of work clothing for nursing and care staff, the potential for adaptation for other applications is considered to be very high.

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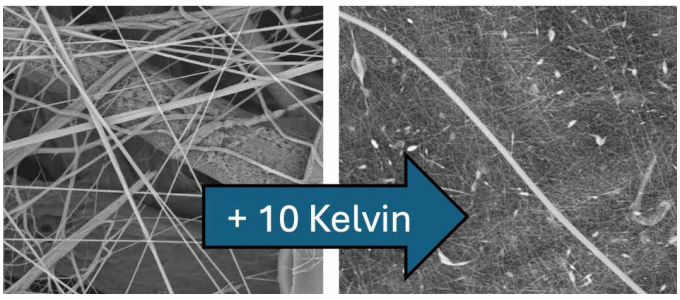
A step towards a cleaner future

Fluorine-free humidifier membranes for PEM fuel cells

The DITF's Competence Center for Man-Made Fibers and Nonwovens is working on the development of ultra-fine fiber nonwovens with fiber diameters in the sub-micrometer and nanometer range. A contribution is also being made to the BMWK's "hydrogen technology offensive" in this field of work through the ongoing "FLUID" project. Together with the companies FUMATECH BWT, BASF and Spiraltec and colleagues from the Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB), the DITF have set themselves the goal of developing and validating both new types of fluorine-free flat membranes and a new type of module design for membrane humidifiers for use in PEM fuel cells.

Ultra-fine fiber nonwovens are used as "super-thin" support structures for the project partners' membranes and consist of sophisticated high-performance polymers such as PSU, PESU, PPS or PEEK. Some of these polymers can only be processed from the melt at temperatures of over 400 °C using the established meltblow process (MB) or alternatively using the centrifuge electrospinning process (CES) from solvents to produce ultra-fine fiber nonwovens. In the latter case, the project is also investigating the influence of increasing the process enthalpy by introducing hot air on successful fiber formation.



SEM images at 1,000x magnification of the fiber formation of PESU in the centrifuge electrospinning process (CES) – 10 Kelvin temperature difference makes the difference to the nanofiber

The illustration uses the example of PESU fibers spun from a green solvent to show the difference in the final fiber diameter that just a few Kelvin temperature difference can lead to. These ultra-fine fiber nonwovens can also be subsequently bonded and stabilized using thermobonding or ultrasonic calendering. The first prototypes have already been successfully produced and will be optimized as the project progresses.

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Research tax allowance for companies

What is funded and how? Who can benefit?

The Research and Development Tax Allowance (FZul) has been a nationwide funding instrument since January 1, 2020. R&D projects in the categories of basic research, industrial research or experimental development are eligible. Companies of all sizes and from all sectors can benefit.
With the economic stimulus package to overcome the Corona crisis, the maximum amount of subsidized expenses was doubled to 4 million euros for a limited period until mid-2026, so that a tax advantage of up to 1 million euros per year can be realized at a subsidy rate of 25 percent. The amount of the research allowance depends on the eligible personnel expenses for the specific project. Contract research, e.g. at universities and research institutions, has now also been included. When research contracts are awarded, 15 percent of the contract value is funded.
By offsetting the research allowance against the tax liability, it can also be paid out as a tax refund (tax credit). This also makes the funding attractive for companies that are in a loss-making phase and therefore pay little or no taxes, and for start-ups in the initial phase.

Peter Steiger, member of the DITF Board of Directors, on the research and development tax allowance

NEW since 28.03.2024
The amendments to the Research Allowances Act (FZulG) came into force on March 28, 2024, whereby the individual substantive provisions themselves contain application dates that must be observed in some cases.
The Research Allowances Act was amended as follows:

> Increase in the maximum assessment basis to EUR 10 million
> Extension of funding to material costs or depreciable movable fixed assets
> Increase in the proportion of eligible costs for contract research from 60 % to 70 %
> Increase in the flat hourly rate for sole traders from EUR 40 to EUR 70
> On request: Increase in the research allowance by 10 percentage points from 25 % to 35 % for small and medium-sized enterprises
> Earlier payment of the research allowance through integration into the tax prepayment procedure

Who benefits and how:

Start-ups
The research allowance can be paid out as a tax credit if a refund claim exists. It does not matter if the company has not yet generated any turnover. An application is also possible in the event of a loss.

Small and medium-sized businesses
As the client is the beneficiary in the case of contract research, this particularly benefits SMEs that cannot maintain their own research and development department. The research allowance can be applied for before and during the project or even afterwards.

Large companies
Up to now, there has been virtually no funding available for open-technology development projects that need to be implemented quickly. The research tax allowance now closes this gap, as it can be applied for regardless of the size of the company.

Fall-back alternative to project funding
Companies that are not successful in the competitive process for project funding can claim tax incentives for research.
The DITF External Funding Department will be happy to provide further information.

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Ideas Camp 2024 of the BioMedTech Association

A first prize and an award for the DITF

BioMedTech e.V.

At the BioMedTech Association's IdeenCamp 2024, the DITF team of Sabrina Svinjar, Carsten Linti and Dr. Andreas Scherrieble won first prize for their project "Placeholder for planned callus distraction". Together with their clinical partner from the BG Clinic in Tübingen, Dr. Heiko Baumgartner, the team developed the idea of a structurally flexible implant that can be adapted to the respective bone (e.g. tibia). The special feature: The implant consists of a resorbable membrane from additive manufacturing and does not have to be explanted.
A second DITF team with Louisa Bonten and Carsten Linti also impressed the jury with their project idea "Optimization of rotator cuff repair" and received an award. The ideas were the result of around three months of project work with a kick-off at BMT 2024.

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Around 2,000 guests at the open day

On a journey of discovery through the world of textile research

At the Open Day on July 14, 2024, the DITF were able to convince the public that applied research on textile products and their raw materials makes a decisive contribution to improving our living conditions. At 29 research stations and with a comprehensive lecture program, the DITF gave the public an insight into their laboratories and pilot plants and provided information on current research topics. Around 2,000 visitors took the opportunity to take a look behind the scenes.

High-performance fibers for the future: the High-Performance Fiber Center

Fibers and textiles are used in many everyday products and also provide valuable services as technical textiles in almost all industrial sectors. Products, new processes, testing techniques and laboratory experiments – 29 stations provided an impressive insight into the topics on which the researchers in Denkendorf are currently working. Textile research reflects our entire everyday life and addresses all relevant future topics such as medicine, mobility, architecture, the environment and energy – this was clearly demonstrated by the wide range of topics covered at the event.

Spacer textiles collect water from the air: this fog catcher supplies people in dry areas with drinking water

In addition to the research stations, which could be explored in tours, the researchers presented the results of their work to the public in 13 lectures on selected research topics. The focus of all the presentations: The practical relevance to everyday life. After all, research at the DITF is applied and should always deliver results that can be put into practice. The speakers on topics such as bionics, fiber composites and sustainable fiber production proved that this is possible.

As a further highlight, hands-on stations offered the opportunity to carry out experiments and understand scientific correlations. Families tried their hand at chemistry experiments, used plant fleeces for sowing experiments and independently explored textile materials with a stereomicroscope.

The many positive responses and the high number of visitors confirm that the open day was well received by the visitors. A good reason for the DITF to repeat the open day in a few years' time. Then with new research topics, because the textile world is constantly evolving.

The DITF Board of Directors was delighted with the large number of visitors (from left): Peter Steiger, Professor Michael R. Buchmeiser, Professor Götz T. Gresser

ITMF International Cooperation Award 2024

DITF and RBX Créations receive award for hemp-based pulp

At the "ITMF & IAF Conference 2024", which took place from September 8-10, 2024 in Smarkand, Uzbekistan, the DITF together with the French company RBX Créations received the ITMF Award 2024 in the category "ITMF International Cooperation Award 2024". The award was presented for the introduction of a newly developed, hemp-based pulp and its further processing into filament-spun cellulose fibers.

The DITF and RBX Créations presented a complete textile production chain to the expert audience at the ITMF & IAF Conference and the jury – from the raw material hemp to its processing, the spinning technology and the realization of textile products. This development, which has already won several awards, was also convincing here. The cooperation project impressively demonstrates how sustainability in textile production can lead to new and marketable products. The yarns and textile materials are marketed by RBX Créations under the name Iroony™. Textile knitted and woven fabrics have already been produced. The possible uses of hemp-based materials are broad and have great development potential in the clothing sector as well as for technical applications.

Presentation of the ITMF Award to Dr. Marc Vocht (DITF) and Anne Reboux (RBX Créations) at the ITMF Conference in Samarkand, Uzbekistan

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Aachen – Dresden – Denkendorf International Textile Conference

The renowned industry get-together is taking place in Stuttgart again this year

The ADD-ITC is one of the most important textile conferences in Europe and a platform for exchange between research and industry. Since 2016, the DITF, the ITM in Dresden and the DWI in Aachen have been among the organizers of the conference. Each year, one of the three renowned textile research institutions takes over the organization. This year, the DITF are hosting the conference and inviting guests to the Liederhalle in Stuttgart on November 21 and 22.

The two-day programme with lectures from science and industry is aimed at experts from the fields of materials, textile chemistry, finishing and functionalization, textile machine construction, processes and composites. As part of a foyer exhibition, 23 well-known companies and institutes will present their products and developments. An extensive exhibition with over 100 scientific posters provides an overview of current R&D projects.

In the plenary lectures, speakers – including those from this year's partner countries Belgium, Luxembourg and the Netherlands – will present visions, trends and innovations from research and development on a wide range of topics:

Kultur & Kongresszentrum Liederhalle Stuttgart: venue for the ADD International Textile Conference 2024

Parallel sessions:

- Textile Mechanical Engineering
- Biobased Fibers
- High Performance Fibers
- Fiber Composites and Lightweight Construction
- Circular Economy and Recycling
- Medicine and Health
- Functionalization and Finishing
- Transfer Session "From Idea to Practice"

Presentations from science, industry and associations will be given by Brückner, Centexbel (Belgium), Empa (Switzerland), ETP – European Technology Platform for the Future of Textiles & Fashion (Belgium), Heraeus, Lindauer Dornier, Murata (Japan), ReHubs (EU – Belgium), Rieter (Switzerland), Saurer, Siemens, Teijin Aramid (Netherlands), Trützschler, TU Delft (Netherlands), Valmet (Finland) and Volocopter/DLR, among others.

Special focal points in the plenary and in many of the sessions this year are the topics of circular economy and recycling. In cooperation with the Forschungskuratorium Textil e.V., the transfer session will present successes from the IGF-ZIM program.

The conference dinner on November 21 will take place in the atmospheric "Alte Reithalle" right next to the Liederhalle Congress Center.

Program, information & registration

www.aachen-dresden-denkendorf.de/itc

For last-minute participants, registration is still possible until November 20.

We look forward to seeing you there!

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Sponsors:

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Congratulations on your service anniversary

There have been no fewer than nine anniversaries at the DITF in recent months – including three 40-year anniversaries.

We warmly congratulate all those celebrating their anniversaries and thank them for their many years of tireless commitment to the DITF.

40th anniversary
Andreas Gassmann, Bernd Clauß, Silvia Johannhörster

25th anniversary
Bernd Janisch, Hans Helge Böttcher, Peter Steiger, Martin Hoss, Theo Grün, Tom Hager

New head of the Center of Management Research

Dr.-Ing. Thomas V. Fischer has taken over the management of the Center of Management Research at the DITF on an interim basis. He succeeds Professor Dr. Meike Tilebein, who headed the Center of Management Research for 13 years. She is leaving the DITF at the end of this year at her own request to work on new interdisciplinary research areas at the University of Stuttgart, where she heads the Institute for Diversity Studies in Engineering.

Dr. Thomas Fischer, DITF MR

Thomas Fischer completed his doctorate in 2000 on cooperative innovation management in the textile value chain; his research work was funded by the DITF with an EU scholarship. He then worked as a research assistant at the Center of Management and was appointed deputy director in 2017.

His research focuses on innovation management, innovation methodology, knowledge-based systems, digitalization, Industry 4.0, sustainability and the circular economy. A trained mediator, he has designed and carried out numerous national and European research projects.

Strategy workshop on the washability of electronic textiles

Textiles are becoming increasingly intelligent and textile sensor technology is becoming part of everyday life. But how do I wash the shirt that records my vital functions while jogging? DIN and DKE organized a strategy workshop on the washability of smart and electronic textiles on 9 July 2024. It was based on the work of the "Joint Working Committee on Textile Standards/DKE, Coordination Committee for Smart and Electronic Textiles".

An overview of future standardization topics for the washability of smart textiles was developed. These include the function-preserving washing process and functionality testing. The aim of the workshop was to close gaps in the existing body of standards and initiate new standardization projects.

At the workshop, DITF scientist Sandra Blocher gave an overview of the legal requirements for smart textiles when used as a medical device and as personal protective equipment (PPE), which must be met after washing.

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Fairs & Events

	2024
November 06 – 07	37th Hofer Vliesstofftage, Hof – DITF lectures
November 11 – 14	Medica/Compamed, Düsseldorf – DITF booth together with ITVP
November 12	GoTex 2024 Hochschule Reutlingen – DITF stand
November 19 – 21	E-Textiles 2024, Berlin – DITF lectures
November 21 – 22	Aachen-Dresden-Denkendorf International Textiles Conference, Stuttgart – DITF organization, stand and presentations
	2025
January 30	Forum Functionalization, Denkendorf – DITF in cooperation with Hohenstein and AFBW
February 13 – 15	TecStyle Visions, Stuttgart
February 19	Carbon Recycling Congress, Stuttgart – Organization DITF, CU, AFBW
February 20	DITF Innovation Day 2025, Denkendorf
March 04 – 06	JEC World, Paris – DITF at the bw-i joint stand
March 17 – 20	DAS & DAGA, 51st Annual Meeting, Copenhagen – DITF lectures
March/April	ESMA Academy – Digital Printing on Textiles, Denkendorf – DITF Workshop
March 26 – 27	User Forum SMART TEXTILES, Stuttgart – DITF in cooperation with TITV and FKT
April 03	Girl's Day, Denkendorf
May 24	Day of Science, University of Stuttgart – DITF booth

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