

Trends in industrial polymer research|Trends in der industriellen Polymerforschung

Schenk-H-U

Der Weltpolymermarkt hat einen Umfang von 203 Mio. Tonnen, davon sind 28 Mio. Tonnen Chemiefasern. Im Jahr 2005 wird in Westeuropa ein Pro-Kopf- Verbrauch an Kunststoffen von 84 kg vorhergesagt, in Nordamerika von 95, in Lateinamerika von 16, in Japan von 87 und in Südostasien von 14. Die Weltfaserproduktion wird getrennt nach Chemiefasern, Baumwolle und Wolle, Cellulosefasern und Seide grafisch dargestellt. Zu den Hochleistungspolymeren zählen LCP, PEEK, PPS, PAR und PES. Sie hatten 1998 einen Anteil von 12 %. Die Produkteigenschaften von Polypropylen können durch Metallocene verbessert werden. Die Polymerstrukturen von Polypropylen mit Ziegler-Natta-Katalysator und Metallocen-Katalysator werden verglichen. Durch die verbesserte Kontrolle der Polymerstruktur kann eine erhöhte Steifigkeit erreicht werden. Polyethylen und Polyamid-66 werden mit Stahl verglichen. Die mechanischen Eigenschaften von Naturseide, Spinnenseide, hochfestem Viskoseregeneratfilamentgarn und hochfestem Nylon werden miteinander verglichen. Bei Polymeren können durch eine kontrollierte anionische Polymerisation maßgeschneiderte Eigenschaften erreicht werden. Die Polymerforschung konzentriert sich auf die Untersuchung von Struktur-Eigenschaften-Beziehungen, Katalysatoren sowie supermolekulare Systeme.

Environment versus safety: Flame retardant fibre and textile protective challenges and solutions in Europe|Umwelt versus Sicherheit: Flammhemmende Fasern und Herausforderungen für den textilen Schutz sowie deren Lösungen in Europa

Horrocks-R

The present range of available flame retarded textiles is based on science developed since the 1950s when the emphasis lay mainly on providing durable ignition resistance at an affordable cost. For protective textiles a range of flame retardant and heat resistant fibres and fabrics are available with performances, which depend largely on price. While the majority of the flame retardant workwear is satisfied by flame retardant cotton (and blends), higher levels of performance demanded by civil emergency, defence and other similar markets are satisfied by the group of non-thermoplastic, inherently fire resistant fibres and fabrics typified by the polyaramids, polyaramide-arimides, polybenzimidazoles and oxidised acrylics. More recently, however, questions are being posed regarding the toxicological and ecotoxicological properties of flame-retardants generally and these are tending to counterbalance the need for improved safety by certain environmental and consumer groups. In addition, questions of environmental sustainability are arising regarding the sustainability of inherently fire resistant fibres. The former has been addressed by the publication of the recent US National Research Council Committee (of which the author was a member) report, which has risk, assessed 16 flame retardants used in flame retarding conventional fibres and fabrics. Of the 16, 8 are deemed to be of acceptably low risk. If the available technical solutions are coupled with environmental acceptability and an affordable cost, then the markets for fire resistant textiles must surely increase across current markets as well as developing opportunities into new areas.

Flammability issues for home furnishing textiles in the United States: Regulations, standards and treatment options|Brandergebnisse bei Heimtextilien in den Vereinigten Staaten: Gesetzliche Bestimmungen und Lösungsmöglichkeiten

Adair-P-K|Rearick-W-A|Wakelyn-P-J

In the United States, according to the U.S. Consumer Product Safety Commission (CPSC), mattresses and upholstered furniture are the leading cause of textile related fire fatalities and injuries. CPSC, the agency in the U.S. that develops and enforces textile flammability standards, has potential regulatory actions underway for open flame ignition of upholstered furniture and mattresses. There are already standards for carpets and rugs (16 CFR 1630 and 1631) and cigarette ignition of mattresses (16 CFR 1632). Current and potential U.S. flammability regulations as well as voluntary standards activities (ISO, CEN, ASTM; NFPA) will be discussed. Currently available durable and non-durable fire retardant options for home furnishing textiles and future trends/needs will also be reviewed. Reducing the number and severity of residential fires depends on many factors including changes in consumer behaviour, the presence and condition of smoke detectors and fire suppression systems, and the flammability characteristics of consumer products in the home, including smoking products and other ignition sources. For home textiles, the primary flammability focus is protection from cigarettes or small open flame sources, such as matches, candles and lighters, since these ignition sources appear to be the important factors involved in fires where these products are the first items ignited. More flammability regulations for textiles, both mandatory and voluntary, are anticipated. There is a need for improved cheaper, easier to apply and more efficient fire retardant chemical systems to impart flame resistance to home furnishing textiles. Some of the specific research needs include cheaper, durable chemicals that impart flame resistance without loss of appreciable strength or reduced abrasion resistance; evaluation of intumescent coating systems; improvements in backcoatings; and improved ecotoxicology.

Neuentwicklungen mit Trevira CS für Heim- und Haustextilien|New developments with Trevira CS for home furnishing textiles

Zimmermann-H

Trevira CS hat sich in den letzten Jahren zu einer der wichtigsten Fasern für schwer entflammare Heimtextilien entwickelt. Dadurch wurden auch Entwicklungen in Bereichen initiiert, für die entweder

keine Vorschriften für schwer entflammbare Textilien bestehen oder bei denen die Erreichung der Normen technisch anspruchsvolle Vorgaben beinhalten. Im ersten Teil wird über Neuentwicklungen mit Trevira CS bei Tisch- und Bettwäsche berichtet, bei denen einerseits der Komfort eine große Rolle spielt, andererseits aber die nötigen Pflegeeigenschaften gegeben sein müssen. Tischdecken aus Trevira CS haben eine höhere Lebensdauer im Vergleich zu Qualitäten aus Naturfasern, sind bei 60 Grad C waschbar und haben einen sehr geringen Waschschrumpf. Auch die Entwicklung für Teppichböden im Flugzeugbereich stößt auf großes Interesse; da diese gegenüber den bis jetzt verwendeten Wollteppichen deutliche Vorteile aufweisen. Dies sind hohe Abriebfestigkeit, lange Haltbarkeit, permanente Schwerentflammbarkeit, ausgezeichnetes Reinigungsverhalten, kurze Trockenzeiten usw. Im zweiten Teil wird über vergleichende Untersuchungen des Pill- und Scheuervorhaltens berichtet, die zeigen sollten, wie weit Laborergebnisse mit dem Martindale-Gerät und Praxisdaten bei der Prüfung von Möbelstoffen korrelieren. Von Interesse ist auch das Brennverhalten von Möbelstoffen, wenn sie in Kombination mit Polstermaterialien geprüft werden. Hier wird über eine Prüfreihe von Schaumstoffen in Kombination mit Trevira CS berichtet, die dem Stuhlhersteller oder dem Innenarchitekten Hinweise für die richtige Verarbeitung geben sollen.

Prüfung und Beurteilung des Brandverhaltens von textilen Ausstattungsmaterialien nach neuen europäischen Normen

Bauer-H

Das Brennverhalten von Ausstattungsmaterialien unterliegt in fast allen Ländern behördlichen Bestimmungen zur Erhöhung des Schutzes vor Auswirkungen infolge eines Brandgeschehens. Im Zuge der Angleichung der Rechts- und Verwaltungsvorschriften der EU-Staaten ist man bestrebt, einerseits die Prüfmethode und andererseits die Klassifizierungskriterien für alle Produkte der Innenausstattung zu vereinheitlichen. Das Prinzip der Vereinheitlichung basiert darauf, dass das jeweilige Material der Innenausstattung solche Merkmale aufweisen muss, dass für den Einsatzbereich, für den es verwendet wird bei ordnungsgemäßer Instandhaltung, zweckentsprechender Verwendung, angemessener Nutzungsdauer und Berücksichtigung der Wirtschaftlichkeit gebrauchstauglich ist und wesentliche Gebrauchseigenschaften erfüllt sind. Generell wird bei der Neuordnung der europäischen Brandschutzrichtlinien für Materialien der Innenausstattung unterschieden zwischen Materialien, die einer Rechtsvorschrift unterliegen und solchen, die keiner Nachweispflicht unterliegen. Da die europäische Normung zum Teil wesentlich von den bisher national üblichen Prüf- und Klassifizierungsverfahren abweicht, ist es notwendig, die Rechtsdokumente so anzupassen, dass sie unmittelbar in die neuen europäischen Klassifizierungssysteme übertragbar sind. Die Geschwindigkeit der Umsetzung klassischer nationaler Brandprüfung und Brandschutzklassifizierung hängt vor allem von der Bereitschaft der Industrie ab, möglichst rasch einheitliche europäische Normen für die Prüfung und Klassifizierung zu schaffen. Die Umsetzung in den nationalen Normenausschüssen und Brandschutzgremien erfolgt dann zügig, wenn bereits im Vorfeld der europäischen Normung parallel Harmonisierungsdokumente ausgearbeitet werden.

The Italian market of flame retardant textiles|Der italienische Markt für flammhemmende Textilien

Tempesti-A

The increasing consumption of FR textiles is mainly due to the introduction of new regulations and to a different approach of final consumers towards fire risk even when specific rules don't exist. The most important final sectors for FR textiles products are: furnishings, clothing, transports as well as different other uses in civil engineering and industry in general. These are the sectors where regulations for fire safety at national or international level are being under development or already exist. The first regulations in Italy concerning fire behaviour of textiles date back to 1984 for uses in places of public assembly like cinemas, discotheques theatres etc. Then restrictions for schools, fairs and hotels followed. Besides specific requirements referring to international sector regulations are in force for transports and protective clothing where harmonised European rules began to be applied some years ago. Regulations for hospitals and open-to-public places are to be issued in the near future. AITA, the Italian flame-retardant textiles association, carries out a periodical market research concerning FR product consumption. In 1999 7690 tons of FR yarns have been produced, 3550 of which have been exported. As for fabric production, part of domestic yarn production has been used and part imported. To this amount, 2000 tons of FR chemical treated fabrics must be added. The total production of fabrics has, therefore, been: 7865 tons, 1762 of which exported. There has also been about 700 tons of FR nonwovens and FR waddings. The amount of consumption in 1999 confirms the positive trend of the FR sector as also indicated by the continuous increasing in FR yarn production passed from 2360 tons in 1990 to 7690 tons in 1999.

Corporate Fashion. Eine Gratwanderung zwischen Mode und Funktion|Corporate fashion - a balancing act between fashion and function

Kospe-N

Der Vortrag klärt den Begriff Corporate Fashion und die damit verbundene junge Historie. Ebenso werden die Einsatzgebiete dieser Bekleidungsart an Hand von Beispielen erläutert. Eines der führenden Unternehmen, das in hohem Maße Corporate Fashion einsetzt, ist die Deutsche Post. Neben den wirtschaftlichen wie organisatorischen Anforderungen, die damit auf ein Unternehmen zukommen, werden auch die nötigen Entwicklungsprozesse von der ersten Modellkollektion bis zur heute verwendeten Kollektion aufgezeigt. Die Gratwanderung zwischen Mode und Funktion wird bei jeder neuen Modellentwicklung auf ein Neues bestritten. Die Corporate Fashion bei der Post entstand aus den Ergebnissen einer Umfrage, durch Erfahrungswerte von Lieferanten sowie durch Erfahrungswerte beim Einkauf von Uniformen und Dienstbekleidungen. Das Gesamtsystem besteht aus Anorak, Blouson, Outdoor- Weste, Sommer- und Winterhose, Sommerhosenrock, Bermuda-Short, Jeans, Blusen/Hemden für Sommer und Winter, Pullover, Sommer- und Wintermütze, Stirnband, Tuchset und Krawattenset, Schal, Gürtel sowie Namensschilder. Der Einkauf hat 3 Millionen Bekleidungsstücke am Weltmarkt beschafft. Die Jacken sind mit Wetterschutzmembranen ausgestattet. Retroreflektierendes Material dient zur Verkehrssicherheit. Für Radfahrer wurden die Beinabschlüsse mit Klettverschluss versehen.

Requirements for personal protective equipment (PPE) related to industrial washing procedures|Pflegeanforderungen an persönliche Schutzbekleidung in Bezug auf die industrielle Wiederaufbereitung

Körber-H-O

In commercial laundries different types of textiles from private garments, work wear as well as personal protective garments or medical products are treated. The objective to treat garments in commercial laundry is to recover the used textiles in hygienic cleanliness conditions without destroying the properties of the garments especially the properties of protective garments, e.g. flame protection, chemical repellency etc. To test the protective properties after washing the European standard ISO 6330 Textiles-Domestic washing and drying procedures for textile testing is often cited. Due to difference between washing of household textiles in comparison to commercial laundering - regarding the strain of garments - an industrial standard for testing textiles is necessary. This standard will be approved in the near future. To develop an industrial standard on one hand is a very important instrument. But regarding our responsibility towards the end user a closer co-operation of all members of the textile chain, involving the laundry as well as the detergent manufacturer is very important. In respect to maintain the protective properties of personal protective garments in commercial laundries, the requirements concerning mechanical action, temperature, pH as well as disinfection in comparison to household washing procedures will be explained.

Personal protective equipment. Overview and state of art in standardisation and certification works|Personenschutzrüstung: Überblick und gegenwärtiger Stand der Arbeiten im Bereich Normung und Zertifizierung

Valentin-N

Two European Directives concern the placing on the market and the using of personal protective equipment (PPE): 89/686 EEC for conception of PPE and 89/656 EEC for the users obligations. The conception directive (89-686) gives only the essential requirements, but does not describe the tools necessary to verify them. The European Commission has asked for CEN (European Standardisation Commission) to produce harmonised standards, which are considered to give presumption of conformity to the essential requirements. Many standards have been produced taken into account all the risks, which can be encountered by the user and to ensure a better, level of protection as far as possible (for example protection against heat and flame and chemical products, protection against cold and foul weather, protection against mechanical impacts and non visibility risks). Two different types of standards have been produced: standard describing test methods and standard given levels of performance. This work, which has been made in short time, is not perfect and it is now necessary to improve these tools to make them more appropriate to the verification of conformity of PPE to the essential requirements.

Protective materials based on electrospun nanofibers|Schutztextilien mit Electrospun Nanofasern

Schreuder-Gibson-H|Gibson-P|Senecal-K|Sennett-M|Walker-J|Yeomans-W|Ziegler-D|Tsai-P-P

Fine nanofibres of polymer can be produced by a process called electrospinning. By charging a solution of high molecular weight polymer to approx. 10000 volts, fine jets of fibre can be produced from the solution surface and collected on a grounded or oppositely charged substrate. The solutions may contain liquid or solid additives in addition to the fibre-forming component. Thus, it is possible to design multifunctional materials that serve as protective fibrous layers in a textile System. The electrospun layer can possess the consistency of typical microporous membranes. Pore sizes are small enough to filter submicron particles. Average fibre size is on the order of 100-500 nm. These nanofibers impart high surface characteristics to the membrane, enabling the immobilisation of absorptive and reactive materials within the fibrous structure. Significant improvements in protective characteristics have been realised with electrospun nanofiber membranes. These electrospun membranes have been characterised with regard to breathability and air flow resistance, and compared to commercial membranes, films and fabrics which are in use or under evaluation for use, in fabric laminate systems for military and sport clothing. Moisture vapour diffusion measurements, and air flow-through capacity of textile materials can be conveniently tested using an apparatus developed at the Natick Soldier Centre. Electrospun Estane is much more vapour transmissive than a film of the same material. When electrospun, Estane exhibits a comparable resistance to diffusion as uncoated PTFE membrane. Air convection through the membranes can also be determined as a function of humidity. Electrospun Estane is as wind resistant as PTFE membrane. Electrospinning enables control of membrane thickness by direct spray time. The excellent airflow resistance of electrospun membranes suggests that they are potentially good barriers to airborne particle penetration. Current manufacturing techniques are already being developed which may some day enable us to produce multifunctional liner materials of man-made fibres.

Membranmaterials in 3-layer-laminates as wetweather-clothing in military use|Membranmaterialien in Drei-Lagenlaminaten als Wetterschutzbekleidung in der militärischen Nutzung

Kraemer-U-G

Acting soldiers frequently complain about water permeability and the reduced protection against rain of the German Bundeswehr wet-weather suit manufactured of laminate materials containing membrane layers such as polytetrafluorethylene or polyester foils. The main reason for these complaints are cracks caused by mechanical load during use. Very often also soil and sand sticking to the surface of the rainsuit cause damages - under pressure especially in the area of the knees and elbows grains of sand penetrate the laminate and cause damages in the membrane layers. Now and again

the membranes show micro-cracks with water penetration and no clear explanation can be given what has caused them. Presumably strong folding during handling and washing processes are probably the reason of these cracks. For confirmation purposes samples of the two membrane systems were taken from new unworn Bundeswehr wet-weather suits and analysed; samples were also washed and folded under laboratory and realistic conditions and examined. As suspected the micro-cracks with water penetration were caused by strong folding. Already during the process of manufacturing cracks appear in membrane layers and the adhesive in areas of folds. Frequent washing increases the number of micro cracks. The results will be demonstrated by means of REM-pictures.

Ballistischer Körperschutz bei der deutschen Polizei|Body protection against ballistic impacts at the German Police Force

Damm-H-R

Seit 1979 gibt es eine Technische Richtlinie der deutschen Polizeien für Schutzwesten. Die 4 Schutzklassen, Schutz gegen normale Faustfeuerwaffen, alle Faustfeuerwaffen, Langwaffen mit Weichkern- und Langwaffen mit Hartkerngeschossen, sind bis heute im Prinzip unverändert. Der Umfang der Ausstattung ist in den einzelnen Bundesländern unterschiedlich, teilweise dürfen Westen auch privat beschafft und genutzt werden. 1999 gab es erhebliche Irritationen bei den Nutzern, diese waren weitgehend gegenstandslos; durch ein Überarbeiten der Technischen Richtlinien wurde (hoffentlich) mehr Eindeutigkeit geschaffen. Schutzwesten der Klasse 1 werden aus para-Aramid oder hochfestem Polyethylen hergestellt, ab Klasse 11 sind Metall- oder Keramik-Einschübe erforderlich. An Aramid-Westen wurde mehrfach das Langzeitverhalten untersucht, es gab über mehr als 10 Jahre keine signifikante Abnahme der Haltbarkeit. In mehreren Fällen haben auch in der Bundesrepublik Schutzwesten verhindert, dass Beamte bei Angriffen mit Schusswaffen oder Messern schwer verletzt oder getötet wurden. Mittelfristig sollen laufende und angedachte Forschungsprojekte gefördert oder neue Projekte initiiert werden, um den Schutz der Beamten zu verbessern. Es ist bekannt, dass die Industrie intensiv die Faser für das ballistische T-Shirt sucht.

Twaron in ballistic personal protective clothing|Twaron in der ballistischen Körperschutzbekleidung

Daum-V

The central tasks of ballistic protection are the absorption and the dissipation of energy caused by a ballistic impact. In addition to that protective clothing needs to be comfortable and wearable over longer periods of time depending on the duty of the wearer. Only few materials are capable to offer all the features needed for the design of functional and wearable personal protection. Through the use of modern high performance fibres like the para-Aramid fibre Twaron, bullet resistant body armour became a common piece of equipment for police and law enforcement forces as well as for military personnel. Para-Aramid offers a unique combination of properties as high tenacity at low weight, high impact resistance, high modulus, high heat resistance, good chemical resistance, no brittleness and no corrosion, all in one material. The fibre is ideally suited for the design of textiles used in the manufacture of bullet resistant protective clothing. The fibre is produced in a wet spinning process after dissolving the PPTA polymer in concentrated sulphuric acid. A special feature of Twaron Aramid fibres used for ballistic applications is the patented microfilament structure. Typical Twaron yarns for ballistic protection have a fineness of 930, 1100, 1680 or 3360 dtex. Military protective vests used to be designed to resist secondary fragments emitted by explosions in the near vicinity of the wearer. Concealable vests that should be wearable during a full shift of duty protect police officers. Twaron SRM consists of microfilament fabric coated with an abrasive material through a special matrix. Stabbing trials in special designed test equipment revealed that through the abrasive coating the blades are dulled and caught by the underlying Twaron fabric.

Fire fighter injuries and deaths influence of textiles for structural fire fighting; the U.S. experience|Verletzungen und Todesfälle bei der Feuerwehr: Einfluss der Textilien bei Feuerwehreinsätzen - Erfahrungen aus den USA

Teele-B-W

In the United States since the year 1985, there has been a major change in the fabrics used for protective clothing for fire fighters who are assigned to structural fire fighting operations. With new U.S. regulations and for fire fighting protective clothing and consensus standards for the performance of this protective clothing, the textile industry developed new fibres and fabrics to reduce the weight and stress factors while increasing the protection from the extremely hostile environment of structural fire fighting. A review of fire fighter death and injury data shows a favourable change but many factors impact on the causes of fire fighter injury and death and all are interrelated. Much progress has been made but there are still issues to better understand and resolve. A current point of view about fire fighting protective clothing is that it allows fire fighters to over extend themselves, thus getting into positions that are more likely to cause injury. Regardless of the level of protection afforded by any protective clothing, anything except bare skin can allow fire fighters to over extend, further enforcing the position that all operations must be managed by the incident command system and that fire fighters only operate under direct supervision within that system. Another current viewpoint is that the thermal insulation of the protective clothing causes more injuries, due to heat stress, than lighter weight but less protective garments. Heat stress cannot be addressed only by the garment materials but must be approached from several factors that equally affected it. Simply put, the problem is protecting fire fighters from a very hostile environment, in which thermal insulation is required, and attempting to reduce heat stress to as low a level as possible. For garments to be protective from the hostile thermal environment, thermal insulation is needed. The entire spectrum of heat stress and stress related problems must be fully addressed by the fire department.

Erfahrungen aus dem Einsatz von Feuerwehrschtzbeleidung|Experience in using fire fighters protective clothing

Leistner-H-R

In Hessen wurde nach einem Brand mit zwei schwerverletzten Feuerwehrleuten nach Möglichkeiten eines besseren Körperschutzes für die Angehörigen der Feuerwehren gesucht. Als Ergebnis wurden 1995 etwa 17000 Überjacken Modell Hessen - finanziert durch das Land Hessen - an die Feuerwehren in Hessen ausgeliefert. Die gesamte Schutzkleidung besteht aus Feuerwehrüberjacke, Feuerwehrhose, Feuerwehrjacke, Feuerwehrüberhose und Feuerweherschutzhandschuhe. Dies war mit der Startschuss für die Entwicklung der HuPF (Herstellungs- und Prüfungsbeschreibung für eine universelle Feuerweherschutzbekleidung), nach der Feuerschutzbekleidung hergestellt und geprüft wird. Bundesweit wird die HuPF von fast allen Ländern angewendet und Schutzkleidung nach HuPF wird in vielen Bundesländern bei der Beschaffung bezuschusst. Die Entwicklung der Schutzkleidung ist seit der Entstehung der HuPF nicht stehengeblieben und so wurde auch die HuPF weiterentwickelt. Ideen und Anregungen auch aus den Feuerwehren werden immer wieder aufgegriffen und in verschiedenen Arbeitskreisen diskutiert. Um ein Eindringen von Hitzeabstrahlung nach Innen zu vermeiden, muss ein entsprechender Materialaufbau gewählt werden. Der Wärmetransport von Innen nach Außen ist problematischer. Dies führt zu verstärktem Schwitzen und damit zu einem starken Nässegefühl. In der HuPF wurde die Masse auf 2,3 kg für die Überjacke festgesetzt. Mit neuen Konzepten können Masseinsparungen von mehreren 100 Gramm erreicht werden. Die Erfahrungen mit der HuPF-Einsatzkleidung sind durchwegs positiv. Auch die Ausbildung mit der jeweiligen Schutzkleidung spielt eine immer wichtigere Rolle.

Interaction between protection and physiological parameters in firefighter's protective clothing|Wechselwirkung zwischen Schutz- und physiologischen Parametern bei Feuerweherschutzbekleidung

Rossi-R

In order to fulfil the protective functions, fire fighters' protective clothing is usually bulky and hinders the thermal and moisture transfer from the body to the environment. In addition to the mostly strenuous work conditions, this equipment also means a load for the body. The clothing offers a sufficient protection against external heat sources but at the same time reduces the release of body heat to the atmosphere. This leads to an increase of the core temperature, which will impede the human body during work. As there was so far no test apparatus that simulated the human body during different heat loads, such situations have often been analysed by means of tests with human subjects. Apart from certain ethical considerations, one of the biggest problems of such studies is the sometimes weak reproducibility between the single measurements. Meaningful results can only be achieved through a large number of measurements that are time-consuming and expensive. On the other hand, standardised test methods are reproducible but have sometimes only a very weak link to the practice and neglect the interactions between protection and comfort parameters. In this work, material properties of clothing combinations during simultaneous action of several parameters like heat, moisture or released body heat are studied. The analysis of the processes in the physical processes in the textile layers gives information about the range of applications and possible weaknesses of fire fighters' protective clothing.

Neue Entwicklungen auf dem Gebiet der Hitze- und Feuerschutztextilien mittels intelligenter Lösungen|New developments in heat and fire-protective textiles using intelligent solutions

Fuchs-H|Vogel-C|Haase-J

Intelligente Textilien und Funktionstextilien stellen eine neuartige Entwicklungsrichtung mit einer breiten und noch nicht überschaubaren Leistungsfähigkeit dar. Sie realisieren völlig neue Wirkprinzipien und werden auch für den Bereich Schutztextilien neue Möglichkeiten eröffnen, indem sie die jeweiligen Schutzfunktionen wesentlich erweitern und das höchste Gut des Menschen seine Gesundheit - noch besser schützen. Im Vortrag werden aus eigenen Arbeiten aktuelle Entwicklungstrends sowie Visionen für Hitze- und Feuerwehertextilien mit intelligenten Lösungen vorgestellt. Hierbei detektieren im Textil implementierte Sensoren der verschiedensten Arten Umgebungs- und Personensignale (z.B. Temperatur, Mikroklima, Atmung, Puls, elektromagnetische Felder) und erzeugen bei Überschreitung eines festgelegten Gefahrenpotentials entsprechende Warnsignale. Weiterhin können Defekte des Schutzzanzugs lokalisiert und Wärmegradienten im Einsatzfall berechnet werden. Der Feuerwehrmann selbst kann optische und/oder akustische Warnsignale wahrnehmen, wobei die Einsatzzentrale drahtlos die aktuellen Positions- und Bekleidungsdaten sowie personengebundene Belastungszustände empfängt und bei Bedarf entsprechend handeln kann. Insbesondere durch die Verknüpfung von textilen Hochleistungsfasern mit elektronischen Bauelementen und mikromechanischen Komponenten zu einem Materialsystem werden bisher noch nicht nutzbare funktionelle Eigenschaften erschlossen. Diese Schutztextilien verhalten sich nicht mehr nur nach einer fest eingebauten Charakteristik, sondern beginnen aktiv auf ihre Umwelt zu reagieren, indem sie mit ihr über die eingebauten Sensoren kommunizieren. Somit wird das Textil zu einem aktiven Element, welches sich selbst kontrollieren und autark reagieren kann.

Kermel: Entering the world of performance|Kermel: Einstieg in die Welt der Hochleistungstextilien

Sitar-J-M

Kermel, specialist in aramid fibres within Rhodia Performance Fibres, develops the fire-resistant fiber Kermel used to manufacture extremely fire and heat-resistant protective clothing. The fiber has been adopted throughout the world by companies making garments for personnel exposed to risks such as heat, flames, chemicals and electric arcs. So it is mainly dedicated to protective clothing for fire fighters, military forces, police and for staff working in offshore, gas and electrical industries. Inherently non-flammable and thermostable and offering exceptional thermal insulation, the Kermel fiber also gives very good mechanical and chemical resistance properties. It can easily be combined with other fibres and therefore used to manufacture a large range of fabrics for end-users. Kermel HTA is used to manufacture turnout gear for fire fighters and any other application where extreme protection is required. It offers outstanding thermostability and high residual mechanical strength after exposure to heat or UV radiation. The Kermel/FR Viscose blend is used for fabrics to make permanent wear garments that ensure both comfort and protection against potential exposure to fire and heat. Designed

for use in protective garments, these fabrics are manufactured in various weights in order to be useful to different weather conditions as well as to match the required level of performance. A Kermel/wool blend is particularly suitable for pullovers and uniforms. Fabrics have good FR properties and the wool is treated to further increase characteristics. The antistatic properties and high moisture regain of wool vies excellent thermal comfort and drape, in addition to easy care qualities.

Fire fighting and flame protective apparel with Basofil fiber|Feuerwehr- und Flammenschutzkleidung mit Basofil

Eichhorn-H-D

Basofil, BASF's melamine fiber (MF), exhibits high temperature and flame resistance and good heat insulating properties due to its chemical structure and fiber configuration. Major applications for this fiber are in woven and nonwoven fabrics for fire fighting and flame protective apparel with high wear comfort and excellent protective characteristics against risks derived from flames, heat and molten metal splashes. In woven fabrics, Basofil is blended with meta- and para-aramid fibres or with cellulose fibres based on ring or core-spun yarns. They are used as outer shell or face cloth fabrics for fire fighting and industrial flame protective apparel. Heat and flame resistant fleeces, with Basofil as the dominating component, are used as thermal liner and moisture barrier substrates. They are produced by water jet nonwoven technology in blend with m- and p-aramid fibres. The use of this melamine fiber in woven and nonwoven fabrics allows the design of lighter protective systems with improved wear comfort addressing the demand for better heat stress prevention. A typical fire fighter coat consists of the outer shell, the moisture barrier and the thermal liner. Moisture barriers offer as lightweight launderable and dry cleanable high insulation support for semi-permeable membranes such as Goretex, Sympatex or Comfort Zone. A suitable Basofil lining fabric consists of a fibre blend of equal parts Basofil and Viscose FR and having a basis weight of about 130 g/sqm. A two layer Basofil thermal liner system maintains the TPP (thermal protective performance) rating to the PBI system with a 15 % reduction in thickness. The good heat and flame blocking properties of the Basofil components for fire fighter clothing are also evident in flashfire simulations involving instrumented manikins.

Sympatex protection wear: Membrane garments for professionals|Sympatex-Protection Wear: Membranbekleidung für Professionals

Guttenberger-T

Clothing has always had several functions: first, it offers protection against the influences of the environment (e.g. weather, violence, accidental hazards), and on the other hand, it serves as ornamentation or the expression of power. And of course, this statement still applies nowadays, especially in the world of work. The much-cited career, workwear and corporate fashion market is at present experiencing a rapid development. No longer is clothing in demand that is just appropriate for its use; it also has to be appropriate for its user. For a long time now, the pure fine points of design and cut have been left behind; these have all been covered thoroughly. What is important now is the optimisation of the materials and the ingredients. For this reason, it is not surprising that more and more high-tech-functional materials are finding their way into the sector of work clothing, too. 15 years ago, there were only a few waterproof, windproof and breathing-active membrane types with a few variations available, but now, on the market there are a great number of membranes and their variants and modifications, these also being combined with other functions and technologies. This is the logical consequence resulting from the development of the research and evaluation of the physiological aspects of garments together with other requirements made of (work) clothing. These requirements continue to increase in number, and are becoming more precisely specifiable and quantifiable. In the case of Sympatex the transport of the water vapour molecules functions via hydrophile building blocks in the membrane. The molecules which push from the inside push those in the membrane outside. Sympatex still offers optimum protection against bad weather and a high level of comfort due to regulated body-moisture management. The addition of further functions via the membrane is possible. The performance of the wearer is assured over a long period, based on simple care and a comprehensive quality assurance system during production.

High tech clothing for the construction industry|High-Tech Bekleidungssysteme für die Bauindustrie

Hardarson-S

Construction workers are not exactly known for their high tech clothing, but this could be about to change. The requirements for functionality are clear enough; hard work on hot days suggests moisture management functionality is required, rough working conditions suggests that durability is required and so on. The obstacles are also clear; high-tech clothing is expensive and must justify itself in terms of financial return. Underwear is an often-overlooked factor in functional clothing. Apart from next-to-skin comfort, the underwear of a construction worker must contribute to warmth in winter, and to UV protection and moisture management in summer. One technical solution was to use Thermastat underwear for cold conditions and Coolmax underwear and T-shirt for UV protection and moisture management. Mid layer is primarily an isolation layer in cold conditions, but the garments had to be designed in such a way that they could be used without an outer shell during spring and fall. The technical solution was to use a Polartech fleece jacket as mid layer garment. In order not to negate the functionality of the moisture management under wear membrane technology was used as rain protection. The technical solution was to use only Cordura fabrics in the outer shell for their durability and to use Gore-Tex membrane for rain and wind protection. Once the garment system had been created and fully designed, came the challenge of demonstrating that such a system could contribute to the concerns of management on construction site efficiency, and meet the requirement of construction workers day in, day out. The field trial demonstrates clearly that the high tech clothing system offers very significant advantages over customary clothing.

Measuring the performance of fabric systems to protect against the thermal effects of electric arcs|Die Messung der Leistung eines Gewebesystems gegenüber der

thermischen Wirkung von elektrischen Lichtbögen

Lavery-G

There has recently been much progress in understanding the nature of electric arc accidents and their potential impact on nearby workers. Many thousands of industrial workers throughout Europe are potentially at risk, including those who work in chemical plants and oil refineries, as well those who work more obviously with electricity in utilities etc. The damaging effect of radiant and convective heat on human skin is well documented and threshold levels to second degree burns have been established. Calorimeter sensors have been developed to represent the response of human skin to heat exposure, enabling measurements to be made during the reproduction of both flash fires and electric arcs under controlled laboratory conditions. With knowledge of the conditions (current, voltage, duration, etc.) of a potential electric arc event, the total incident heat energy may be estimated. Arc testing tools are available to quantify the Arc Thermal Performance Value (ATPV) of a proposed fabric system for PPE. The level of protection must match the size of the hazard and, in addition to this essential characteristic of thermal protection, the chosen PPE system must also be comfortable and durable, in order to meet the demands of the discerning wearer. Garments made from DuPont Nomex aramid fibres offer a solution to these end-user requirements. DuPont's offering of Nomex aramid fibres is an ideal candidate for making fabrics and garments, which have inherent flame resistance, which do not ignite, melt or continue to burn in the event of an arc accident, which resist break-open and which insulate the wearer from the incident heat energy. By offering the correct level of arc thermal protection balanced with comfort and durability, Nomex is a very interesting option for the employer who is choosing to protect his workers against the thermal effects of electric arc events.

Photo-thermal and electro-conductive acrylic fiber 'Thermocatch-W'|Die Photothermische und elektrisch leitfähige Acrylfaser 'Thermocatch-W'

Hosokawa-H|Takeuchi-S

Mitsubishi Rayon has developed and industrialised the colourless photo-thermal/electro-conductive acrylic fibre Thermocatch-W by applying the sheath-core conjugate spinning. The core of this new acrylic fibre contains fine semi-conductive particles, which function as a converter of light to heat. The blended yarn containing over 3 % Thermocatch-W processes an electrostatic property independent of humidity, and satisfies the safety guideline (the electric charge less than 7 pC/m²) recommended by MITI Industrial Safety Institute to be used for working clothes in the gas stations in Japan. The blended yarn containing over 10 % Thermocatch-W generates heat and increases temperature by 2-10 degrees C when exposed to light. Thermocatch-W is a colourless fibre of 3.3 dtex, and thus is suitable for the apparel and interior use. Thermocatch-W can be dyed clearly in the same way as the regular acrylic fibre. As antistaticity is easily obtained by blending in a small amount, multi-functional fibre goods can be produced by combining with other functional fibres like water absorption, anti-pilling, anti-bacterial, and deodorant fibres. In a similar way, permanent anti-static products except acrylic fibre, for example, almost 100 % wool products can be applied. Main end-uses are wearing clothes like sweaters, inner wears, socks, men's wears, women's wears, skirts and shirts, and interior goods like blankets, sheets, carpets and curtains.

Schnellspinnen Viscose Filament. Die wirklichen Grenzen|Highspeed viscose filament production - The real frontiers

Nywt-M

Viskosefilamentgarne für technische sowie textile Anwendungen sind in den hochwertigen Marktsegmenten fest etabliert. Die aktuelle Schnellspinn-technologie von Enka, die bis zur Produktionsreife optimiert ist, wird vorgestellt. Dabei wird auch der Kontext zu Markt- und Produkterfordernissen hergestellt. Enka investierte mit hohem Entwicklungsaufwand in die Schnellspinn-technologie von Viskosefilament, um für die Herausforderungen in dem zyklischen Textilmarkt gerüstet zu sein. Der kontinuierliche Viskoseprozess nach dem Enka-Fadenscharverfahren kann mit einer Geschwindigkeit von 500 m/min betrieben werden. Dabei erfolgt eine gleichmäßige Garnherstellung durch parallelen Fadenlauf in allen Stufen mit bis zu 200 Fäden pro Spinnmaschine. Die Betriebssicherheit der Technologie ist zufriedenstellend, die Produkteigenschaften sind in allen Aspekten auf hohem Niveau. Die Gleichmäßigkeit, speziell hinsichtlich der Anfärbung ist hervorragend, so dass das Produkt in den wichtigsten Marktsegmenten problemlos eingesetzt werden kann. Es zeigte sich dabei erneut, dass bei den Kontinuerverfahren dem Fadenscharprinzip aus Gründen der hohen Produktequalität der Vorzug gegenüber dem Nelson-Prinzip einzuräumen ist. Die Grenze für eine weitere Steigerung der Spinn-geschwindigkeit liegen in der Limitierung durch den Stofftransport in der Fadenbildung und Waschstufen. Beim Waschprozess kann der Stoffaustausch beschleunigt werden, wenn mit der Aufbringung des Waschmediums das Filamentbündel geöffnet wird. Mit einem Kontakttrockner sind bei sorgfältiger Steuerung der Trommeltemperaturen hohe Wärmeübergänge erreichbar, ohne die Cellulose thermisch zu schädigen. Eine weitere Geschwindigkeitserhöhung ist möglich, würde aber nach bisherigen Kenntnissen keinen wirtschaftlichen Vorteil bringen.

New SXS-technology. An innovation for the viscose fibre process by Lenzing Technik|Neue SXS-Technologie - eine Innovation im Viskosefaserherstellungsverfahren

Weber-H

Except for a very few viscose fibre producers, most of the viscose staple fibre plants in operation are searching for new process innovations and technologies at present. They are also looking for signs of new and improved equipment which will enable producers to attain better margins by reducing production costs, which is important in a market that is only improving slowly and which still has a low price level. With a new spinning technology for the staple fibre process, called SXS spinning Lenzing Technik is ready to serve the market in terms of this demand with a new kind of equipment. The focus of the new system is on a higher specific production capacity, and improvements in quality parameters, environmental considerations, productivity and production costs. Both, existing production

lines, which require renovation and modification, and investments in new and additional capacities, including green-field plants, will benefit from the advantages of this new system. The SXS- spinning technology comprises a complete modular spinning unit consisting of a few spinning positions with individual spinning troughs, including a take-off element for the fibre tow, stretching and an individual cutter for each modular unit. The SXS-spinning system has individual single drives to cope with a wide range of spinning speeds and stretching ratios, and is controlled by a PLC-system in order to achieve high performance and the high product quality of HT fibres with fine titres. The spinning head can cover spinneret eyes with a total of more than 150000 holes, which is required to cope with a larger capacity demand in the future. The capacity is 20 tons/day and the spinning speed is 30 to 80 m/min. From the initial feedback from the market Lenzing Technik is absolutely certain that they are on the right track to provide the market with the latest and best technology to satisfy the demand for innovative yet economical equipment.

Cellulosic microfibrils from a synthetic matrix|Zellulose-Mikrofasern aus synthetischer Matrix

Riedel-B|Taeger-E|Riediger-W

The spinning of matrix fibril fibres with subsequent removal of the matrix is a proven way of manufacturing microfibrils with a titer < 0.3 dtex for synthetic fibre materials. Finding two suitable matrix systems the opportunity was opened to develop matrix-cellulose-fibril-fibres by combining the dry-wet Lyocell process with the melt spinning process, which would result in cellulose microfibrils with the finest titres. A polystyrene composition spinnable already at 90 degrees C was proven to be a particularly suitable matrix-component. At a temperature of about 100 degrees C it will be mixed with the cellulose-NMMNO-solution in a static mixer to obtain a liquid two-phase fibril-system. Subsequently it will be spun under high draft in a spinneret with following air gap in a cold- water bath to polystyrene-cellulose fibres. Surprisingly the NMMNO could be completely washed out of the cellulosic fibrils despite its being embedded into the polystyrene matrix. The MFF thus obtained can be processed to spun-laced nonwovens and can be reinforced with PUR-DMF or NBR-Latex. By dissolving the polystyrene matrix the rigid MFF-nonwovens can be changed into soft, leather-like materials.

The solution state of cellulose in N-methylmorpholine-N-oxide|Lösungszustand von Zellulose im NMMO

Röder-T|Morgenstern-B|Glatter-O

Solutions of cellulose in N-methylmorpholine-N-oxide-monohydrate (NMMO), which we characterised in the studies, are used to produce the new Lyocell fibres. Static light scattering (SLS), dynamic light scattering (DLS), and small angle x-ray scattering (SAXS) experiments were performed. Already in diluted solutions of cellulose, aggregates consisting of up to 1000 chains were proved. An activation of cellulose with water or ammonia results in a smaller aggregation number. Much lower aggregation numbers were found for cellulose 0.85 and 2.5 acetate. The surface-volume coefficient estimated by SAXS experiments increased with the cellulose concentration. In concentrated solutions with more than 5 wt% cellulose a comprehensive network of aggregates with non-ergodic properties was determined by DLS experiments. The supramolecular structures of cellulose in NMMO can be described with a fringed micelle model where parts of the chains are laterally aligned in a core. Disordered regions surround the core. Under the given conditions, NMMO is not able to dissolve the cellulose molecularly dispersed. Aggregates consisting of more than 1000 cellulose chains were found. The fringed micelle resembles a rolled-up hedgehog with soft spines. While cotton linters showed a very similar solution structure, the differences among the pulp samples were larger due to their provenience and their different chemical history.

A study on the swelling property of Lyocell staple fiber|Eine Studie des Quellverhaltens von Lyocell-Stapelfasern

Yao-M|Zhang-J|Shi-M|Lai-K

The swelling property of Lyocell staple fibres is studied in detail. As a result the remarkable structure with skin-core of Lyocell staple fibre is found and the structural model is also founded in this paper. Optical microscope photos and scanning electron microscope photos of every kind of damaged Lyocell staple fibre after being processed with mechanical force and dyed with Congo-red dyestuff, assisted with X-ray diffraction technology and other methods, are shown. At the same time, skin-core structure and property differences between skin and core layers were discussed in detail on the basis of recent processing technology and structural theories of manmade fibre. In addition, advantages and disadvantages of the skin-core structure of Lyocell staple fibres in textile process were studied and analysed in brief. The structure with skin-core gives Lyocell staple fibre many unique performances, the most remarkable of which is fibrillation. According to the structure with skin- core model it was found that connections between macrofibrils in the core are relatively weaker especially when in wet state. The bundle up function plays an important part in the stability of the fibre. Once the skin is damaged severely, the fibre will become unstable. But fibrillation occurs only when Lyocell fibres thoroughly saturated in water or alkali solution. To produce fibrillation of certain degree on Lyocell fabric will lead to specific aesthetic effects. If fabrics of pure Lyocell fibres are sufficiently acted by mechanical force when thoroughly saturated in NaOH solution, complete fibrillation will take place.

Structural changes occurring during processing of Tencel woven fabrics|Strukturelle Änderungen während der Herstellung von Tencel-Webware

Wilding-M-A

The paper describes a study of the influence on physical characteristics, of processing plain-woven, standard Tencel and Tencel A100 (non- fibrillating variant) fabrics into finished dyed cloth. Viscose and cotton fabrics were also examined for comparison. The key processing stages employed were scouring, dyeing, softening and tumble-drying. For standard Tencel, additional pre-fibrillation and

enzyme cleaning steps were included. Samples removed after each stage were assessed by a combination of scanning electron microscopy and physical/mechanical measurements, including handle, using a Kawabata Evaluation System (KES-F). The crystallinity of Tencel is significantly higher than viscose, which is typically between 20 and 30 %. The highly oriented fibrillar structure of Lyocell is both strength and a weakness. It is well known that mechanical action, particularly in hot-wet conditions, causes axial splitting (fibrillation). To optimise the fibrillation effects for peach-skin fabrics, two additional stages are used. The first pre-fibrillation subjects the fabric to wet abrasive action at a temperature between 50 and 70 degrees C. Pre-fibrillation encourages splitting of the fibres. Some of the fibrills remain bound to the surface and contribute to the peach-skin effect. Others separate from the fibres, and may form pills and hairs on the fabric. The removal of this debris is accomplished by means of enzyme cleaning. Fibres taken from the warp-yarns of the loom-state Tencel fabric show clear surface features. Despite the addition of chemical cross-links into the fibre structure to reduce fibrillation, the fabric handle of Tencel A 100 is as good as that of standard Tencel. The fabric handle is likely to be controlled more by the fabric structure than by the way in which the fibres themselves perform.

New economical technologies for the production of textile PES filament yarns|Neue wirtschaftliche Technologien zur Herstellung von textilen PES- Filamentgarnen

Schäfer-K

The growth rate predicted for global filament consumption in the next years is principally based on the dynamic growth of polyester filament yarns. Until 2005, an average annual growth rate of 7.8 % is to be expected. Productivity and cost-effectiveness in today's spinning lines can only be improved if winding speed is increased and the number of spinning positions expanded. The latest winder technologies permit chick lengths up to 1500 mm giving 10 and more threadlines per spinning position with adequate package weights. In addition, attempts are being made to increase the speed for the production of polyester POY and to 5000 m/min through physical or chemical modification of the polyester polymer. As an alternative to polymer modification, the innovative EVOSpeed spinning technology, a collaborative development between DuPont and Barmag AG; is another means of increasing the speed in POY production up to 5000 m/min without the need for polymer modification. The new EVOSpeed technology raises the production speed by up to 50 % depending on the titer and number of filaments. The EVOSpeed POY line can be offered as parallel configuration of spinning box and winder as well as with a conventional turned path. The Maxflex system allows mixing of master batches, mixing of different additives per spinning position, economical production of small batches even in large-scale lines and product development in production lines. Between quenching system and winder, there are eight pairs of small godets (SMART Rolls), allowing a reduction of winding yarn tension to ensure an optimum package formation. Another important component for filament production is the winder. The Barmag ACW-winder has a reduced length, an encapsulated inverter integrated in the traverse housing, a larger winder height, up to five times the former parking time, short yarn transfer periods etc.

Compact spinning plants for polypropylene|Kompaktspinnanlagen für Polypropylen

Haider-Bj/Moser-C

In 1995 the first generation of the Austrofil multifilament spinning line was transferred by Starlinger & Co. GmbH to SML, an affiliated company to its site in Lenzing/Austria for further technical development and sale. Consequently this line has been further developed to such a high standard, that it is now possible to produce not only PP FDY yarns but also PP POY and PP BCF-filaments. After 5 years we can now say that this line has been fully accepted by the textile industry, above all in special market niches, due to its compactness and user-friendliness. Continuous improvements in quality and processability of polypropylene have increased both attractivity and application of this raw material. Resulting from these improvements new fields of application, i.e. in the automotive as well as in the clothing industry, have been developed in addition to various technical applications. PP is characterised by low raw material price, lowest energy consumption during production, low density, lower processing temperatures, no water absorption etc. SML offers 3 different FDY lines and 2 different BCF lines. To ensure good melt quality a 75 mm barrier screw is used in the extrusion unit. After extrusion the melt is pressed through a filter, in order to prevent any particles from entering into the spinning pump. The spinning pump provides the meltstream with constant and sufficient pressure through the electrically heated spinning beam to the spinnerets. Spinfinish applicators are located below the quenching zone. The now cooled, pre-oriented yarns are pulled over feeding rolls to the stretching sections located sideways on both sides of the spinning section.

Schmelzspinnen von Spandexgarnen|Melt spinning plants for the production of spandex yarn

Fourne-R

Elastangarne werden eingesetzt, um Textilien elastische Eigenschaften zu verleihen. Die Varianten und Anwendungsbereiche für Elastangarne nehmen zu. Auf Basis der erweiterten Produktpalette werden die Anforderungen an die Garneigenschaften bestimmt. Bisher wird die überwiegende Menge an Elastanfasern nach dem Trockenspinnverfahren hergestellt. Dieses Verfahren ist komplex und kostenintensiv. Neuerdings werden auch schmelzgesponnene Elastanfasern hergestellt. Anlagen hierfür wurden während der vergangenen 7 Jahre von der Firma Fourne Polymertechnik entwickelt. Das Schmelzspinnverfahren von Elastanfasern bietet folgende Vorteile: niedrige Investitions- und Betriebskosten, vereinfachter Produktionsbetrieb, keine Umweltbelastung, da kein Lösungsmittel, Flexibilität in der Herstellungspalette, neue Einsatzgebiete für trockengesponnene Elastanfasern, Einstellbarkeit der Fasereigenschaften sowie weniger Probleme bei der Lagerung der Elastanfasern. In der Zwischenzeit wurde der Schmelzspinnprozess weiterentwickelt. Es stehen inzwischen Anlagen in unterschiedlicher Größe für die neue Polymergeneration zur Verfügung. Das kompakte Schmelzspinnverfahren kommt ohne Spinnasrückgewinnung und ohne Destillation aus. Des weiteren entfallen im Schmelzspinnprozess die teils mehr als 10 m langen Trockenspinnschächte, die mantelbeheizt sein müssen. Daher ist der Energieeinsatz pro Tonne Elastangarn vergleichsweise gering. Eine Wasserkühlung wird nur für die Extruder-Einzugszone und das Temperieren der Blasluft

mittels Wärmetauscher benötigt und das Kühlwasser kann somit im Kreislaufsystem wiederverwendet werden. Der Schmelzspinnprozess benötigt jedoch einen Vorwärmofen für Düsenpakete und eine Reinigungsanlage für Düsenpakete, Spinndüsen, Pumpen usw.

Cost reduction through early failure detection in fiber production|Kostenreduzierung durch frühzeitige Fehlererkennung in der Faserproduktion

Riedl-M

Improving quality standards and lowering costs: these are the requirements chemical fibre producers have been facing for many years. Such demands are especially strong when it comes to safety-related devices such as airbags, components for the aviation and aerospace industries etc. But such applications can also be considered as fibres for the garment industry: materials must be suitable to provide functional protection, and at the same time should be pleasant to wear and easy to clean. Nevertheless, cost competitiveness even beyond the decimal point is required. To cope with such requirements, information about the manufacturing process is needed. Multiple parameters in a fibre production line should be available immediately and continuously, hence on-line. Enka tecnica is pleased to present the state-of-the-art of on-line technology in the presentation: cost reduction through early recognition of faults in fibre production. Online measurement is more effective when more parameters are monitored, when more spinning positions are controlled. Variations of yarn denier are basically variations in mass. Enka tecnica Yarnscan solution is a single sided, embedded condensator with the yarn passing the field lines. The presence of the yarn mass in the electric field over the sensor changes the signal and variations in yarn mass lead to variations in the resulting signal. By means of Yarnscan quantity and quality of nodes can also be detected. Enka tecnica applies an optical method for an online detection of broken filaments. The Fraytec is the proven online technology in thousands of cases. Two infrared diodes emit infrared light over and under the yarn at a fixed spacing. Receivers on the opposite side register a constant light intensity. If a broken filament sticks out of the yarn, it will briefly interrupt a part of the light beam. All these sensors are available as at-line devices as well.

Integrated filament production control - Today and tomorrow|Integrierte Filament-Produktionskontrolle - heute und morgen

Santi-C|Schneider-H

Efficient production control is traditionally characterised mainly by the choice of the crucial properties to be tested and the speed and accuracy of their measurement. The speed and efficiency of the corresponding feed back into the production which is determined to a large extent by the way of integration within the specific production environment is still often underestimated and can be optimised decisively. Besides experience shows that there are further items to be considered, like objective and reproducible, preferably automatic result interpretation or required manpower resources. The above key requirements resulted in the development of the Lenzing-Instruments-Concept providing determined and efficient filament quality and production control and therewith the tool for highest quality competitiveness. The concept of an integrated production control for the filament production as a most efficient concept through the next five years, compare it to present and future measurement technologies and concepts is discussed. We will design several implementation levels in terms of automation and efficiency, will discuss the impact on the production process and its logistics, present pay-back calculations for the different concepts, show how efficient production control for a filament production with high quality demands can look like. Laboratory will always be needed for reference, special customer requests and for less frequent and special measurements. Inline technology is very useful for product development, testing new equipment and set-ups.

CORTERRA staple fibre for spinning|CORTERRA Stapelfaser zum Spinnen - Eine attraktive neue Faser für Bekleidung und Technische Textilien

Piccolini-A|Ferre-J|Liebster-M

Starting from Corterra, the ultimate PTT polymer generation has been developed into a fully new generation of staple fibres and spun yarns. PTT is made by polycondensation of 1,3-propanediol and terephthalic acid. The advanced state of the development and the first productions in industrial conditions, confirmed exciting and innovative intrinsic characteristics: very high breaking elongation (up to 100 % on fibre and 50 % on spun yarn), young modulus of 100 % Corterra spun yarns similar to or less than core spun elastan yarns and elastic recovery not less than 98 % (after 24 hours of static elongation loads). The whole textile chain has today, after 25 years, received a totally new and innovative material. Corterra is provided as staple fibre, cotton type 1,5 dtex, 38 mm and high tenacity staple fibre 1,5 dtex and 38 mm. An unique characteristic of Corterra fibre is that the mechanical performances of the spun yarns, in terms of tenacity and elongation, does not change applying at the yarns a very different twist factor. In the apparel sector the fibre may be used for underwear for active sport, for single jersey and interlock, for outdoor knitted fabrics, for woven fabrics and for sports socks. Technical fields of applications are synthetic leather, high-density woven fabrics for air filtration and velvet fabrics for automotive. The main features of the final textile products are natural soft touch, crease resistance, elastic recovery, air perspiration and easy seat drying etc.

New synthetic fiber 'Kuralon K-II'|Die neue synthetische Faser Kurakalon K-II

Sakuragi-I

Kuraray Co., Ltd. commenced the production of Kuralon K-II, new PVA (polyvinyl alcohol) fibre, in 1998. Due to the new spinning technology, which is a wet-cooled gel, spinning method using organic solvents, various PVA polymers are available to be spun and the fibre has a uniformed fibre structure. Several unique properties such as high tenacity, water solubility and splittability are obtained through these elements. In order to get the best properties of PVA fibre at the initial stage of R&D, the effects of solvents for PVS solutions and of molecular weight of PVA were studied. Consequently,

using the so-called gel spinning method, we obtained super high tenacity fibres having 2.9 GPa with ultra high molecular PVA. At the commercial stage the cooled gel spinning method and DIVISO as solvent were adopted in order to have varieties of PVA polymer resulting in unique fibres. The advantages of this spinning method are: a variety of raw materials (PVA, PAN, etc), uniform fibre structure for high tenacity, high production ability and better spinnability for water-soluble fibre. Thank to its excellent properties, the biggest application of PVA fibre is the substitute for asbestos in fibre-reinforced cement. Kuralon K-II EQ5-R type shows the highest physical property. Super ductile cement composite reinforced by PVA fibre, named PVA-ECC, has been developed. When it is bent, PVA-ECC panel shows large flexural deformation (over 3 %) like metal. The water-soluble type of Kuralon K-II can be used for apparel applications. The fibre is blended (10-30 %) in spinning, the spun yarns is woven or knitted. A washing process enables the removal of the water-soluble fibres. The advantages of this fabric are lightweight, soft touch, bulkiness, comfortable stretchability and rich drape. Since the splittable Kuralon K-II is bi-component fibre, the fibre is easily split into microfibrils in rubber milling. The high reinforcing performance could be applied to some industrial products such as tires, belts, vibration isolators etc.

Alkali-soluble polymer and its fiber application|Alkalilösliches Polymer und seine Anwendung bei Fasern

Katsuma-K

Alkali-soluble polyester is generally manufactured in the same way as batch-wise polymerisation. But the cost of this polymer is high and the spinning operability is not good because of the instability of the polymer properties. As a plan to solve these problems, Kanebo Gohsen Ltd., began an examination to adopt a direct and continuous polymerisation process and has recently established the manufacturing technique. As a result, the property of manufactured polymer was stable and the spinning operability improved. Moreover, a cost in polymer production has been reduced by 60 % compared with that of polymer by batch-wise polymerisation. There are various series' in the fibres made of this polymer. One is a fibre, which can be perfectly solved by alkali solution, and another one is a microfiber, which is split into multi-segments after an alkali-dissolution. Especially for the microfiber, there were various commercialised series' and it was possible to produce these efficiently by the stabilisation of the polymer properties. In the lecture, various series' of fibres and products made by this alkali-soluble polymer in the way of direct and continuous polymerisation process will be introduced. The applications of the alkali-soluble PET especially as bi-component yarn are discussed. Alkali-soluble PET was allotted to the core segment, and semi-dull PET was allotted to the sheath segment. After alkali treatment the hollow ratio was more than 30 %. The yarn is called Kilatt and was best for the use for blouses. Cosmo-alpha is produced by high-speed spinning, spinning and drawing and the conventional method. Moss- alpha is supplied as POY. Furthermore, the yarn types Piccina and Monlayve are presented.

Optical effects with novel synthetic filament yarns|Optische Effekte mit neuen synthetischen Filamentgarnen

Kaufmann-S|Feustel-M

The textile and fashion industries have been interested in optical effects for a long time. This paper deals with the production of novel filament yarns in the textile titer range from 80 dtex f 12 to 80 dtex f 3 with high fluorescence and brilliance for applications as signal or labelling threads. Furthermore, the development of novel filament yarns in textile titer ranges with high fluorescence and retroreflection is outlined. The high fluorescence and reflection are realised by extraordinary heat-stable dyestuffs (maxima in the reflection spectra from 440-630 nm). Different profiling of the cross section of the fibres causes the gloss and the retroreflection. The main application fields of the novel filaments and multi-component signal threads manufactured from them are in the embroidery, tape, braiding and carpet industries. They want and need to realise various optical effects and safety labels in their products. In the paper we will outline the processing principles, application fields and design opportunities in more details with product examples.

NatureWorks PLA: A sustainable performance fiber|NatureWorks PLA: Eine dauerhafte, leistungsfähige Faser

Dartee-M|Lunt-J|Shafer-A

Cargill Dow announced in January its Nature Works technology and the construction of a large-scale facility to manufacture its Nature Works Poly Lactic Acid (PLA). The technology currently allows the use of agricultural resources containing starch to be transformed into a family of PLA polymers and fibres providing performance benefits for a range of applications. Key performance features that distinguish these PLA fibres from other materials, particularly PET fibres, are fuelling the interest in the use of PLA in several fibre and nonwoven applications. Specific inherent properties include better moisture management properties than incumbent materials, excellent hand, drape & feel and good resilience. A range of crystalline melting temperatures from 120-175 degrees C is available leading to controllable thermal bonding temperatures. Last but not least PLA has inherent low flammability and low smoke generation. The primary interests in PLA fibres have been in the applications areas: apparel, nonwoven, carpets and furnishing. Commercial applications have been launched in Japan and are being prepared in the rest of the world. Each market segment values a particular combination of certain performance characteristics. Besides unique novel performance characteristics, Nature Works PLA is derived from annual renewable resources and yet is a melt-spinnable polymer. This combination positions Nature Works between natural fibres such as wool, cotton and silk, and man-made fibres such as PET or acrylics. Like natural fibres it is 100 % degradable under composting conditions. It uses CO₂ from the atmosphere and energy directly from the sun to build its carbon source. The combination of new performance characteristics with its environmental credentials makes Nature Works PLA an innovative sustainable performance fibre.

A vision for fibres at the dawn of the new millennium|Faservisionen an der Schwelle zum neuen Jahrtausend

Aneja-A-P|O-Brien-J-P

The 21st century promises to provide an expansive new era of technical advances that will dramatically influence the world of fibres, fabrics and textiles. Today's fibre science and textile technology provides fabrics that utilise, and in some cases, improve upon the best qualities of natural fibres. In this century, textiles will not only offer the best functional features of natural and synthetic fibres, but will be highly engineered systems targeted to provide complex functionalities for aerospace, electronics, medicine, construction and home furnishings' applications. Biotechnology, fibre engineering and materials science will be key technologies driving the development of these next generation textile systems and exciting new opportunities will arise at the interfaces between these divergent disciplines. Paralleling advances in science and engineering, future business strategies will be integrated along the entire value chain and offer significantly enhanced stakeholder value. This will be manifested through product portfolios that are more specifically tailored to application requirements, highly efficient manufacturing processes which have minimal environmental impact, flexible manufacturing facilities and raw materials which are increasingly derived from renewable sources. We will continuously seek to express a desired property and high molecule or a material. Whatever are the composition and the structure and develop strategies towards building precise molecules with desired properties and functions. This will finally result in smart textile materials with attributes of selectivity, sensitivity, shapeability, self-recovery, self-repair, self-diagnosis, self-tuning and switchability.

PA6 /PA 66, fibres with modified cross section|Polyamid 6 und 66: Garne mit modifizierten Querschnitten

Minetti-S|Staiano-B

Polyamide yarns with modified cross section are one of the most important items for research in the field of the synthetic fibres especially for the development of specialities. The interest in spinning this kind of product resides in the particular feeling of touch, covering power and dullness due to the different physical (filament section, capillarity) and mechanical (modulus) proprieties. Of course, it is possible to test several type of cross section and during the last years a lot of work was done in order to choose the most interesting capillary design and to optimise the filament cross section shape and uniformity, the process conditions and the properties of the yarn. After that, a lot of tests were carried out in application (hosiery, circular knitting, warp knitting and weaving) in order to evaluate yarn performance in downstream treatment as well as dyeing uniformity. The positive results reached in terms of fabric softness and appearance allowed us to scale-up some innovative capillary shapes, other trials with new ideas are still under development. Micro fibres and special section yarns, are allowing polyamide fibre to leave the common label that characterised these products until the beginning of the 90-s and to move towards new horizons. This is due to their specific properties, which are different to classic yarns. Such products, even if for example their diameter is lower than the thinnest silk, were not created to be competitive with natural fibre, but also to be used in mix for develop more sophisticated fabrics. In weaving, warp or weft knitting, hosiery and circular knitting applications polyamide 6 and 66 micro fibre and modified cross sections are exalted and are produced by Nylstar to offer a precious tool for fantasy and quality pursuing to the customer.

New developments in 'ESPA' elastane yarn|Neue Entwicklungen bei 'ESPA'-Elastangarnen

Kotani-T

More than 35 years have passed since Toyobo's polyurethane elastane yarn ESPA was commercialised in the textile markets. Now an important contribution was made to the development of stretch clothing by using ESPA. The lecture describes the fibre properties and applications of T-765 and ESPA-M by Toyobo. T-765 is a dry-spun polyurethane elastane yarn with very good heat-stability and resistance to gas, sunlight and fatigue under the cyclic load. The advantages of T-765 such as high resistance against yellowing, and degradation, high resistance against repeated expansion and contraction as well as against dyeing and heat and clear optics with high transparency. Newly commercialised, ESPA-K is a melt-spun polyurethane elastane yarn with excellent heat-setability. Using ESPA-M, it is possible to realise new stretch clothing that is lightweight, soft to touch, and dimensionally stable. In addition, the dry-spinning simulation of polyurethane elastane yarn and its applications will be introduced, and studies on the fibre structure of polyurethane elastane yarn. Lower heat- setting temperatures allow ESPA-M to be kind to other material. Stretch material is used being mixed with other types of materials. ESPA-M is easily combined with acrylic, wool and promix fibres. It is proven that circular knitted fabrics using ESPA-M are soft and light.

Outlast - Thermal regulation were it is needed|Outlast Faser - Wärmeregulierung wo erforderlich

Cox-R

New technologies that provide significant improvements in consumer comfort occur very occasionally. One could argue that the last time that this happened was with the breathable fabrics from Goretex. The concept of thermal regulation pioneered by Outlast in partnership with strategic partners is rapidly gaining a similar status to breathable fabrics. Outlast garments provide for the first time the ability to regulate the temperature of the microclimate that occurs between the surface of the skin and the first few layers of clothing. It is this microclimate that is responsible for comfort. Breathable fabrics manage moisture and Outlast fabrics manage heat. The benefits of this new technology are endless. Outlast fibre contains microencapsulated PCM's that are able to interact or respond to changes in the skin and external temperature, thereby helping to buffer against temperature change. The way in which these PCM's respond to changes in temperature fully justifies the use of the term smart fibres. PCM materials can absorb, store and release large amounts of latent heat. Outlast fibres made under licence by Acordis are only available from a selected group of licensed spinners and nonwoven producers. The main products are worsted yarns, ring spun yarns, Dref spun yarns, fleece fabrics as well as nonwoven fabrics and blankets. At the moment, Outlast has chosen to develop markets such

as hosiery, home furnishings and sports apparel. Typical microcapsules used in fibres will have an enthalpy value of around 30 calories/gram. This value is used to calculate the addition level of the microcapsules in fibre, which allows Acordis to produce fibres with enthalpy or heat capacities of between 1 and 2 calories/gram. The efforts of Outlast and Acordis over the next few years will be to consolidate the performance of the current product, build capacity and market demand and to introduce new microcapsules that are designed for melt spinning process.

How effective are phase change materials? Erfahrungen aus Labormessungen und kontrollierten Praxisversuchen|Wie wirksam sind PCM Materialien? Erfahrungen aus Labormessungen und kontrollierten Praxisversuchen

Weder-M|Hering-A

The phase change materials (PCM) are used in many different forms and combinations today. There is hardly any possible field of application in which such products are not being sold. Often these small phase-change spheres are used without much testing in the expected temperature range of use, therefore no or only very small improvements in comfort can be expected. In fact it is not unusual that an incorrect application can even cause a reduction in the wearing comfort. Often great improvements promised in advertisements are not full-filled in practice. However when the application is chosen correctly, such materials can produce a noticeable improvement in comfort. Over the last 1 to 2 years EMPA has simultaneously undertaken much intensive laboratory research of PCM materials and extensive, controlled practice tests. The findings of the EMPA will be presented and possible prospects and risks will be pointed to. The application of PCM in motorcycle safety helmets and heat-protective clothing is explained. PCM is not just a material that one inserts anywhere in a clothing combination and already improves the comfort. All too often, a small quantity of PCM is packed somewhere in the clothing system and the results prove to be rather disappointing. One should remember that the quantity of energy, which can be stored and dissipated again, is by no means large and, in comparison with the endogenous PCM (perspiration), is very modest. By the comparative measurements with the test subjects, where PCM materials were investigated with other, apparently the same specimen but without PCM, there were very great differences in some cases, which cannot explained alone by the PCM effect. Nevertheless, with proper application and moderate use these PCM have a place among the series of so-called intelligent materials.

Sweat management - Optimum moisture and heat transport properties of textile layers|Schweiss-Management - Optimale Feuchte- und Wärmetransporteigenschaften von Textilschichten

Rossi-R

The goal of this project was the analysis of the thermo-physiological parameters of textile layers in order to develop winter clothing with an optimal wearing comfort. For this purpose, the thermal and moisture transfer through several clothing combinations (with 3 or 4 layers) was studied among others, with the sweating torso. This test apparatus consists of a cylinder of the size of a human trunk that is heated up to skin temperature (35 degrees C) and releases moisture in liquid form (to simulate liquid sweating). The interactions between the single layers of the clothing combinations were analysed thoroughly. The study has shown that the thermal insulation of hygroscopic material such as cotton was more reduced in a wet state than others. Nevertheless, the increase of thermal conductivity could not be correlated with the fibre type, as it is determinant where the moisture is stored. This is dependent on the capillaries in the fabric and thus on the yarn type and surface construction. The measurements with the sweating torso showed that the cooling strongly depended on the hydrophilicity of the materials. This property is especially important when the moisture release occurs in liquid form. In most cases, the post exercise chill was also linked to the hydrophilicity of the materials as these can evaporate more humidity during the active phase and therefore was less wet during the rest phase. It is still not exactly known the textile layers behave, when it comes to condensation in an outer layer. The measurements described were made mostly with sweating torso. There were no air layers between the individual materials and convection was therefore prevented. In a further phase of this project, the air circulation between the layers will have to be considered as well.

Biologische Wirkung von UV-Strahlung auf die Haut|Biological effects of UV radiation on the skin

Breitbart-E-W|Greinert-R|Volkmer-B

Ohne Sonneneinstrahlung wäre ein Leben auf der Erde nicht möglich. Allerdings enthält das Spektrum ultraviolette Strahlung (UV-Strahlung: 100 - 400 nm), die sich durchaus negativ auf unsere Haut auswirken kann. Während die kurzwellige UV-C-Strahlung vollständig von der stratosphärischen Ozonschicht absorbiert wird, können UV-B und UV-A teilweise oder vollständig in die Haut eindringen und dort zu zellulären Veränderungen führen. Es können akute und Langzeitschäden induziert werden. Zu den ersteren gehört z.B. das Erythem, während bei den Langzeitschäden besonders das Auftreten von Hautkrebs von Bedeutung ist. Allein in Deutschland kommt es jährlich zu etwa 100000 Neuerkrankungen, wobei etwa 10 % auf das maligne Melanom (MM) entfallen und der Rest sich aus den nichtmelanozytären Arten des Hautkrebses, dem Basalzellkarzinom (BCC) und dem Plattenepithelkarzinom (SCC) zusammensetzt. Dem Hautkrebs kann schon heute mit gezielten Maßnahmen der primären und sekundären Prävention entgegengetreten werden. Die UV-Strahlung des Sonnenlichtes kann von der Erbinformation tragenden Desoxyribonukleinsäure (DANN) der Hautzellen absorbiert werden und sie dadurch schädigen. Als akute Folge einer intensiven Sonneneinstrahlung können auch Hornhautentzündungen (Photokeratitis) und Bindehautentzündungen (Photokonjunktivitis) im Auge auftreten. Die Kanzerogenese ist ein mehrstufiger Prozess, in dessen Verlauf es zu genetischen Veränderungen in der Zelle kommt, die insbesondere Tumorsuppressorgene und Proto-Onkogene betreffen. Neben dem Umgang der Bevölkerung mit natürlicher und künstlicher Besonnung und der daraus resultierenden erhöhten UV-Exposition, die das Hautkrebsrisiko ansteigen lässt, muss in Zukunft die Bedeutung einer Reduktion der schützenden atmosphärischen Ozonschicht als Einflussgröße für das Auftreten von Hautkrebs berücksichtigt werden.

Wissenschaftliche und praktische Bewertung des UV-Schutzes|Scientific and practical assessment of UV-protection

Rieker-J|Guschlbauer-T|Rusmich-S

Um negative Wirkungen der natürlichen UV-Strahlung auf die Gesundheit zu vermeiden, sind Präventionsmaßnahmen unverzichtbar. Zum einen muss die Sonnenexposition an den Hauttyp angepasst werden, zum anderen sollte man sich mit geeigneter Kleidung schützen. Fälschlicherweise wird jedoch häufig angenommen, dass jede Bekleidung ausreichend gut und lang vor UV-Strahlung schützt. Dies ist aber nicht der Fall. Auch kann man Kleidung nicht ansehen, ob sie für UV-Strahlung durchlässig ist, also wenig Schutz bietet, oder undurchlässig, also einen hohen Schutz aufweist. Zur Beantwortung dieser Frage ist eine Messung unerlässlich. Als Messmethode war bis vor kurzem lediglich der Australisch/Neuseeländische Standard AS/NZS 4399:1996 bekannt. Dieser hat jedoch den Nachteil, dass die Prüfung im Neuzustand der Bekleidung und des Textilstoffs erfolgt. Es wird nicht berücksichtigt, dass beim Gebrauch Textilien und Bekleidung vielen Beanspruchungen (Verschleiß durch Scheuern und Pflegeprozesse) unterliegen, die den UV-Schutz vermindern. Auch durch die Tragebedingungen (Dehnung, Feuchtigkeitsgehalt) kann der UV-Schutz abnehmen. So wird dem Träger eine falsche (zu hohe) Sicherheit vorgetäuscht. Es wird der UV-Standard 801 vorgestellt, der bei der Bewertung des UV-Schutzes die Gebrauchsbeanspruchungen und Tragebedingungen berücksichtigt. Die Werte fallen dadurch niedriger aus, geben aber ein realitätsgetreues Bild über den tatsächlichen UV-Schutz.

UV-Schutz durch eingesponnene Pigmente|UV-protection by incorporated pigments

Gutmann-R

Mit der Entwicklung und industriellen Fertigung von Mikropartikeln aus Titandioxid, die bereits großtechnisch in ausreichenden Mengen zur Verfügung stehen, wird eine Möglichkeit eröffnet, diese Pigmente in üblichen Konzentrationen auch in textilen Synthefasergarnen einzusetzen. Der Nutzen dieser feinkörnigen Pigmente liegt in deren hohem UV-Absorptionsvermögen, das im Falle eines Einsetzens in Bekleidungstextilien die darunter liegenden Hautpartien vor dem Einfluss des UV-Anteils im Sonnenlicht zu schützen vermag. Was die Herstellung derartiger Textilien bzw. Garne angeht, so besteht eine wesentliche Schwierigkeit darin, die Feinheit der Teilchen im Polyester-Syntheseprozess zu erhalten. Dieses Problem konnte in Zusammenarbeit von Pigment- und Polymerhersteller gelöst werden. Die Verarbeitung entsprechend dotierter Polyestermaterialien zu Filamentgarnen, welche am ICF (Institut für Chemiefasern) nach einem POY-Prozess ausgesponnen wurden, war ebenso einfach möglich wie der anschließende Verstreckprozess zu Filamentgarnen vom Titer 76 dtex f32. Dieses Verfahren ist nach entsprechender Anpassung auch bei anderen Faserherstellungsverfahren anwendbar. Hinsichtlich der Spinnbarkeit und der erzielbaren mechanischen Eigenschaften sind bei diesen Garnen keine negativen Einflüsse durch das Mikro-Titandioxid zu verzeichnen. Bezüglich des Pigmenteinsatzes wird eine Optimierung der Polyestergerne in der Form durchgeführt, dass ein maximaler UV-Schutz, gemessen als UPF = UV-Protection Factor, erzielt wird. Die Prüfung des UV-Schutzes ist dabei so ausgelegt, dass realitätsgetreu nach simulierten Gebrauchsbeanspruchungen (Scherwirkung, Waschen, Chemischreinigung) und Tragebeanspruchungen (Dehnung, Feuchtigkeit) geprüft wird. Ferner wird das färberische Verhalten und das Alterungsverhalten gegenüber Lichteinwirkung geprüft.

The application of ultraviolet absorbers for sun protective fabrics|Die Applikation von UV-Absorbieren für den textilen Sonnenschutz

Haerri-H-P|Haenzi-D|Donze-J-J

The present range of UV absorbers can permanently improve the ultraviolet protection factors (UPF) of textiles of cotton, viscose, Lyocell, polyamide, polyester and their various blends. The different products can be applied by exhaust, pad-thermosol or print application. For garments, which did not undergo such treatment, a possibility to increase the UPF in the home laundry has been developed recently. Textiles are the preferred protection of the skin against an over-dose of ultraviolet radiation. Clothing is perceived as a good means of sun protection, but not all apparel is sufficiently protective against UV rays. UV-protection by fabrics has been a topic for some years, however given the complexity of the issue it is difficult to impart to the consumer and even to the textile industry to sufficiently understand the details. Unlike skin protection by means of cosmetic products, skin protection by textiles and its improvement have only recently become a focus of scientific investigation. The UPF of a textile fabric is determined firstly by the chemical structure of its constituent fibres and, secondly, by its structural characteristics. Aromatic fibres like polyester provide a good filter to UV B-rays, however the UPF can be improved markedly with a specific UV absorber, which also screens in the area of the UV A-rays. The application of a newly developed fibre reactive UV absorber can boost the UPF of CO, CV, PA and PA/EL fabrics in particular, especially if these are dyed or printed in pale shades, provided they are close textured (i.e. have low porosity). The different ways of application on various fibres are explained.

Antibakterielle und antimykotische Eigenschaften von Textilien aus medizinischer Sicht|Antimicrobial and antifungal properties of textiles from the medical point of view

Swerev-M

In den letzten Jahren haben die hygienischen Ansprüche an textile Produkte stark zugenommen. Dies trifft vor allem auf Textilien, die in Krankenhäusern eingesetzt werden und auf Sportbekleidung für den Freizeitbereich zu. Diese Anforderungen werden in jüngster Zeit auf den Märkten durch ein steigendes Angebot an Produkten, die antimikrobielle Eigenschaften besitzen, befriedigt. Die entsprechenden Textilien können nach drei verschiedenen Prinzipien ausgerüstet werden: (1) fertige Produkte werden nachträglich ausgerüstet, (2) die antimikrobielle Substanz wird der Spinnmasse zugegeben und (3) das Polymer des Textils wird chemisch modifiziert (z.B. kovalente Bindung über Spacer und Wirksubstanz). Bei Textilien mit absolut permanenter Ausrüstung sind keine Probleme bei

der Pflege zu erwarten, zumindest nicht hinsichtlich der Waschbarkeit und der thermischen Beständigkeit. Nachteile können sich ergeben durch nachträgliche Ausrüstungen, die die Wirksubstanz überdecken oder inaktivieren. Bei diffusiven Ausrüstungen werden die Wirkstoffe ausgewaschen und müssen nachgerüstet werden oder es ist ein Verlust der antimikrobiellen Aktivität zu erwarten. Bei Ausrüstungen, die darauf beruhen, dass Wirkstoffe freigesetzt werden, werden die Wirkstoffe ausgewaschen und müssen nachgerüstet werden oder das Textil verliert seine Wirksamkeit. Es ist notwendig, die Wirksamkeit von antimikrobiell ausgerüsteten Textilien vor und nach der Pflege mit dem richtigen Test, bezogen auf das Wirkprinzip, zu untersuchen und auch die Frage zu stellen, für welchen Zweck diese antimikrobielle Aktivität gedacht ist. Die Auswahl der Ausrüstung muss sich dann nach der Anwendung und den erforderlichen Pflegeeigenschaften richten.

Terital saniwear: A new polyester fibre with antibacterial activity|Terital Saniwear: Eine neue Polyesterfaser mit antibakteriellen Eigenschaften

Salvio-G

Several kinds of microorganisms exist around us and, multiplying rapidly, they can interfere with hygienic living. Demand for high standards of hygienic freshness has involved also various textiles. By using antibacterial fibres it is possible to control deposition and multiplication of microorganism preserving textiles from colouring, discoloration, bad odours and promoting a reduction of the number of germs that can be transmitted from textile surfaces. Montefibre has developed a new polyester staple fibre named Terital-Saniwear, with intrinsic antibacterial characteristics. An antimicrobial inorganic agent is added prior to spinning and immobilised into the fibre so that Terital-Saniwear mainly works by contact. The low diffusion rate of the antibacterial agent allows a lasting effect. It can be used in the conventional transformation processes like normal polyester since the physical-mechanical characteristics of the fibre are similar to those of standard polyester. Antimicrobial effect was monitored in pure and in blends and its permanence was tested after repeated washings. Terital-Saniwear uses a safe antimicrobial additive, FIFRA registered and approved by the EPA and the fibre has obtained Oeko-Tex certification. The mechanical performances are very similar to those of the regular Terital and the durability of the antibacterial effect is ensured by the additive activity mechanism joined to the manufacture technology of the modified fibre. Saniwear can be used at a blending ration suited to the application fields and to the requested level of antibacterial activity (bacterio-static/cidal).

Durable antimicrobial treatment for textiles|Dauerhafte antimikrobielle Behandlung von Textilien

Mao-J|Lindemann-B|Murphy-L

For antimicrobial textile products, one of the most important requirements is the durability against repeated laundering. Conventional finishing technology can be used to apply antimicrobials to a variety of products. But there are certain difficulties in achieving high washing durability with such a technology. An alternative approach to achieve durable antimicrobial efficacy is to incorporate selected agents into the fibres during spinning process. Amicor polyacrylic fibres developed by Acordis is very good example. The use of such an incorporation technology, however, seems to be focused on selected types on man-made fibres, notably, those that are made with wet spinning. For polyester and polyamide fibres, incorporation of organic based antimicrobial substances during fibre spinning is often difficult to achieve due to various reasons. Ciba Specialty Chemicals has developed another technology whereby antimicrobial agents are used as colourless disperse dyes in an exhaustion dyeing process for providing durable antimicrobial efficacy to fabrics made of polyester, polyamide fibres and/or blends with other fibres such as cotton and wool. Fabrics treated with Ciba AM 100 and AM 110 antimicrobials have shown to possess excellent and durable antimicrobial efficacy. Additional advantages with this technology include minimised processing cost. We believe there are enormous potentials with the application of antimicrobials to textiles that bring new effects and benefits to the consumer, and we are committed to work together with the industries to explore such potentials and to help add value to many innovative new textile products.

Die Pflege von antimikrobiell ausgerüsteten Textilien|The effectiveness of antimicrobially treated textiles after care

Swerev-M

In den letzten Jahren haben die hygienischen Ansprüche an textile Produkte stark zugenommen. Dies trifft vor allem auf Textilien, die in Krankenhäusern eingesetzt werden und auf Sportbekleidung für den Freizeitbereich zu. Diese Anforderungen werden in jüngster Zeit auf den Märkten durch ein steigendes Angebot an Produkten, die antimikrobielle Eigenschaften besitzen, befriedigt. Die entsprechenden Textilien können nach drei verschiedenen Prinzipien ausgerüstet werden: (1) fertige Produkte werden nachträglich ausgerüstet, (2) die antimikrobielle Substanz wird der Spinnmasse zugegeben und (3) das Polymer des Textils wird chemisch modifiziert (z.B. kovalente Bindung über Spacer und Wirksubstanz). Bei Textilien mit absolut permanenter Ausrüstung sind keine Probleme bei der Pflege zu erwarten, zumindest nicht hinsichtlich der Waschbarkeit und der thermischen Beständigkeit. Nachteile können sich ergeben durch nachträgliche Ausrüstungen, die die Wirksubstanz überdecken oder inaktivieren. Bei diffusiven Ausrüstungen werden die Wirkstoffe ausgewaschen und müssen nachgerüstet werden oder es ist ein Verlust der antimikrobiellen Aktivität zu erwarten. Bei Ausrüstungen, die darauf beruhen, dass Wirkstoffe freigesetzt werden, werden die Wirkstoffe ausgewaschen und müssen nachgerüstet werden oder das Textil verliert seine Wirksamkeit. Es ist notwendig, die Wirksamkeit von antimikrobiell ausgerüsteten Textilien vor und nach der Pflege mit dem richtigen Test, bezogen auf das Wirkprinzip, zu untersuchen und auch die Frage zu stellen, für welchen Zweck diese antimikrobielle Aktivität gedacht ist. Die Auswahl der Ausrüstung muss sich dann nach der Anwendung und den erforderlichen Pflegeeigenschaften richten.

Ricem BC, a specially designed fibre for bituminous composites|Ricem BC, eine spezielle Faser für Bitumenverbundstoffe

Goes-W-J-van-der|Tedesco-R

Ricem BC is the latest branch of the successful homopolymer acrylic fibre family marketed by Montefibre S.p.a. of Italy. Ricem stands for 100 % polyacrylonitrile of a high molecular weight polymer from which a fibre with high molecular orientation and compactness is spun. Ricem is mainly used for reinforcement of composites and for hot fumes filtration because of its known inertia to aggressive chemical and physical attacks (such as acids, alkalis, solvents, UV radiation, heat, etc.) and intense molecular adhesion to the surrounding matrix due to its particular surface. Ricem BC is specially designed for bitumen to improve its rheological properties; to eliminate the formation and growth of micro-cracks; to reduce the sensitivity of the bitumen-elasticity to temperature changes and, finally, to increase the life-time of the composite. Ricem fibres are believed to exhibit an overall performance, which is superior to that of other commercially available fibre products such as glass, cellulose, polyester, standard acrylic etc. Developments in the products and in their employment techniques may also be envisaged in the continuous effort of proposing new solutions to meet the ever-increasing quality requirements of road pavements.

Composite fibers for industrial uses|Compositfasern für industrielle Anwendungen

Kawakami-D

Composite spinning technologies have been making a great contribution to give various functional effects to fibres. By means of the high performance of manufactured goods, these technologies are widely applied to producing fibres especially for apparels. Whereas the adoption of these technologies are quite specified in case of manufacturing fibres for industrial uses in spite of many demands for making them more functional. We have investigated and enriched these composite spinning technologies, and found great possibilities of applying it into fibres not only for apparel but also for industrial uses. In this paper, the PET/PA6.6 bi- component fibres that are useful for rubber reinforcement such as tires, belts, and hoses will be introduced and the High Specific Gravity Fibres (HSG fibre) without lead that is harmful material for the environment is discussed. The composite spinning technology provides fibres with a new touch and with new functions. The mechanical properties of the PET/PA6.6 (P/N fibre) fibre are similar to that of PET. Dry heat shrinkage is slightly higher, the adhesive property is similar to Polyamide6.6, the P/N fibre has good anti-corrosion properties and the PET component of P/N fibre has higher orientation than regular PET. The P/N fibre is good fir rubber reinforcement.

New industrial application of polyester yarns|Neue industrielle Anwendung von Polyestergerarnen

Mori-H

Polyester fibre is mainly used in the field of industrial textile application, which needs superior physical property, functionality and durability. Three different textile products using polyester fibres (Teijin Tetoron) will be introduced. Aeroshelter is a lightweight and inflatable tent, which uses high strength polyester fibres. It can be set up very quickly in 5 minutes by inflation and is very bright and colourful inside. After folding, its package is very small. Kinglight is a windbreak and snow protection net, which has mesh construction using high strength polyester fibres. This net is lightweight and a good windbreaker. Due to these properties it was used for the Jump Hill of Nagano Olympic games in 1998. The fence can reduce the wind speed to about 20 % of the original speed. Kinglight can be used not only as windbreak fence but also as snow protection fence. TW1 5 is a polyester fabric coated with polyester elastomer resin. It can be used for replacement of PVC coated fabric from environmental issues. It is a highly efficient fabric for sheeting and can be printed very clearly without special coating on the surface of sheet because polyester elastomer resin contains no plasticizer. It has also good weather resistance and flame-retardant properties.

The Raschel-warp-knitting technology as a manufacturing process for practical 3D-textiles to be used in medical engineering and in textile- reinforced concrete components|Die Rascheltechnologie zur Herstellung anwendungsgerechter 3D-Textilien für die medizinische Technik und textilbewehrte Betonbauteile

Berndt-E|Stockmann-P|Wulfhorst-B

With the help of the modern Raschel technology at the ITA (Institute for Textile Technology Aachen) different products for the areas medical textiles and building technology are manufactured. One principal purpose of the development of warp-knitted technical textiles is to produce new biocompatible implants from resorbable and non-resorbable polymers, which are either available or newly developed. Using textile production methods these polymers are processed to two- or three-dimensional structures with defined strength and elongation. The structure of the surfaces is very important for the interfacial biocompatibility. It is possible to obtain an improved cell migration and an improved cell growth because of the direction of the fibres and their large surfaces. Using the Raschel technology with integrated orthogonal threads a variability of textile constructions can be realised for the production of prefabricated concrete elements, the ITA develops three-dimensional warp-knitted fabrics as reinforcing textiles. Thin-walled concrete components for building methods suffered corrosion problems in the past. Today non-metallic short fibres are used as reinforcement for these applications. The use of fibres for the absorption of tensile forces within the area of the fibre reinforced plastic technology was improved clearly over the last years. In GRP (glass fibre reinforced plastics) components a fibre volume of 40 to 60 % is desired. Due to the much higher elastic module of the concrete matrix this volume should be 2 to 4 % in case of textile reinforced concrete components. A newly developed 3D-warp knitting machine is presented. This machine is characterised by a high flexibility of the profiled cross sections. With the help of this manufacturing system an openly structured 3D-Textile can be developed, with good firmness and sufficient return force of rigid pile thread materials.

Simulation of moisture transport in textiles microstructure simulation|Simulation des Feuchtetransports in Textilien - Ein Werkzeug für die Textilindustrie?

Pfreundt-F-J/Steiner-K

Today fibres can be manufactured in many different ways and with a variety of material properties. Companies, which are developing textile structures, are faced with the big problem to choose the right fibre and the right structure. An experimental access to this problem is difficult and costly. The transport of moisture plays an important role in the technical application of textiles as well as for special clothing and determines often the product quality. Examples of this are: multi-layered sports wear, hygiene products, felts for paper machines. The ITWM (Institute for Industrial Mathematics) division Flow in Complex Structures is very active in the field of modelling and simulation of this kind of flow phenomena. In the lecture the simulation of press-felts in paper industry will be discussed and tools, which are used for the simulation of moisture transport in hygiene products, will be presented. Crucial for the innovative development of new products is the ability to compute material properties of materials, which exist only virtually and to use the results to construct and simulate the final product. This talk will present, with the help of computer visualisations, the methods and tools to do this. Material properties, permeability, porosity, capillary pressure and sound adsorption have been measured on nonwovens. A mathematical model is derived. By means of this model an optimisation of the material properties via structural modification is possible.

Meeting the challenge: The European man-made fibres and textile industries at the turn of the millennium|Der Herausforderung begegnen - Die europäische Chemiefaser- und Textilindustrie an der Jahrtausendwende

Purvis-C-M

This paper outlines the challenges facing the European man-made fibres and textiles industries at the start of the 21st century. It examines these challenges, which include the reduction in the West European textile customer base, high costs for labour and some services, the scale disadvantage of some plants, the legacy of state planning in Eastern Europe and a worsening trade balance and how the competitive strengths of the European industry such as innovation, customer service, flexibility, infrastructure, restructuring, investment and synergies in the integrated European market can be used to meet the challenges. The paper goes on to examine, in the light of these factors, the outlook for the European fibre and textile industries, and concludes that, despite a difficult market environment, these industries can successfully meet the challenges, which face them. The man-made fibre industry in Europe has a production volume of 4.8 million tonnes, a sales value of 11.5 billion EURO, an investment volume of 520 million EURO, a R & D expenditures of 300 million EURO and employs 58000 people. European production grew only slowly during the 1990's and the West European production followed the same trend. The Central European production fell sharply in the post-communist period then stabilised. The production in south East Europe has fallen dramatically throughout the 1990's. Turkey is the rising star of European production. The competitive strengths of the European man-made fibre industry such as innovation, customer service, flexibility, infrastructure and restructuring are discussed. The restructuring result in an improved motivation, a better focus, a more competitive cost structure and an increased ability to exploit market opportunities. Europe has a barrier-free home market of 600 million people. The competitive challenges for Europe are reduction in the West European textile consumer base, high costs for labour and some services as well as declining fibres trade surplus.

Future trends in yarn - and textile fabric manufacturing|Garn- und textile Flächenherstellung in der Zukunft

Wulfhorst-B

Within the framework of the investigation Future Development in Textile Processes stages of the textile chain of processes are examined from raw materials to manufacturing of garments. Future trends in the textile manufacturing processes cannot be predicted so easily. In retrospect we can see how progress of development of the textile manufacturing processes has occurred in the past and why promising attempts to solve problems were not successful. From this we can deduce a method for predicting the future. However, we cannot give a period of time for the realisation of possible progress. In this paper only the first stages of the textile chain of processes are dealt with processes and the manufacturing of man-made fibres, of spun yarns, of woven fabrics and of nonwovens. POY yarns were necessary as feed yarn in draw texturing, which made necessary a winding speed of 2800 - 3500 m/min. the production of fully drawn yarns in the processing stage is attempted today with flat yarns. The FDY process will win through in the production of flat yarns. Staple fibres can be produced by the conventional two-stage process and also by the single stage compact spinning process. The future development in staple fibre spinning is discussed, regarding spinning preparation machines, flyer, ring spinning, combing preparation and combing machines, rotor spinning machines, air jet spinning machines and friction spinning machines. In weaving preparation further process optimisation in sizing is expected. In weaving Quick Style Change and automatic setting from the technological viewpoints will improve the productivity and efficiency. New solutions for the shed formation are under development. In nonwovens technology the focus lies on the improvement of the bonding processes such as needle punching, water jet bonding and thermobonding.

The U.S. manufactured fibre and textile industry: overview and prospects|Die Faser- und Textilindustrie in den Vereinigten Staaten: Überblick und Perspektiven

O-Day-P-T

Although U.S. manufactured fibre industry output has been generally stable in recent years, its textile customer base has been turbulent. Apparel assembly in the U.S. has plummeted as special regional trade pacts have spurred movement of labour-intensive work to Mexico, Central America and the Caribbean region. Fashion changes have brought significant implications for manufactured fibre producers. The burgeoning digital age, the imminent removal of textile import quotas, the entry of China into the WTO, and a steady flow of innovation in the sector all assure a continued mix of turmoil and opportunity in the years just ahead. The US production of manufactured fibre registered a decade-long growth rate of 1.8 % per year. The significance of the import share increase is most readily

seen in the gradual decline in domestic apparel fibre shipments in recent years. The capacity utilisation in the US fell from 87 % in 1997 to 83 % in 1999. Since the enactment of NAFTA Mexican mill capacity has grown apace, providing yarn and fabric for the dramatic expansion of the Mexican sewing industry. At the start of the decade, in the US were nearly 1.8 million jobs in the sector. By the end of 1999 that number had declined by nearly one-third, to just over 1.2 million workers. Polyester remained the dominant fibre throughout the period with a constant 36 % share. Nylon has maintained its 28 % share of total manufactured fibre production since 1990. Olefin has been the big winner, pressing steadily ahead all through the decade, and up 81 % for the period. For Acrylic fibre the market looked promising and grew steadily until 1998, when it dropped sharply. Cellulosic fibre experienced the steepest decline in the manufactured fibre sector, with a drop of nearly 50 %. The North American manufactured fibre industry is looking ahead to the new challenges and opportunities.

The man-made fiber and textile industry in China - great past and bright future|Die Chemiefaser- und Textilindustrie in China - Grosse Vergangenheit und glänzende Zukunft

Ji-Guobiao

There is a rapid development for chemical fibre industry in China. In 1999, the output of chemical fibre has reached 6 million tons. Due to the large population (almost 1.3 billion) in China, and great need from domestic and foreign market, as well as the material support from petroleum chemical development, it is estimated the output of chemical fibre would reach 7.5 million tons in 2005. And the share of chemical fibre in textile materials would increase to 63 % from 58 % currently. In the coming 5 years, the chemical fibre development would be: Enlarging the production of polyester, nylon, polypropylene and acrylic fibre, increasing difference rate from 20 to 30 %. Developing polyurethane fibre, Lyocell. Engineering and industrialising high performance chemical fibre like carbon fibre, super molecular polyethylene and aramid fibre. The policy for development: To optimise the enterprises and set up large-scale companies. Strengthen production capacity by reforming and enlarging the existing enterprises, enlarging scientific and technical renovation and increasing self-construction ability. Further opening up to outside, encourage foreign capital investment and technology. The development of chemical fibre industry has attached great support to China's textile industry. In 1999, the output of cotton yarn has reached 5.67 million tons and garment 20 billion pieces. In the last 3 years, 10 million spindles have been eliminated and 1.2 million people released in textile industry. The future strategy would be the optimisation and re-construction of the enterprises, reform the traditional textile industry with high-tech and improve production quality and efficiency. In 2005, the total processing capacity is estimated to be 13 million tons and annual consumption of fibre/per person is 6.6 kg (export excluded).

Japanese man-made fiber and textile industry towards 21st century - current status and future prospects|Die japanische Chemiefaser- und Textilindustrie im 21. Jahrhundert - Gegenwärtiger Stand und Zukunftsaussichten

Masao-Matsuzaki

Domestic production of the Japanese textile industry has decreased to some 2/5 of the level up to 1985 when it was seriously affected by a sharp appreciation of the yen against the dollar under the Plaza Accord signed by the group of fibre major industrialised nations. The Japanese textile industry holds superiority in the development of new products, especially in high-value-added categories. Compared with other suppliers, however, it has a disadvantage in international competitiveness because of its high-cost structure. The product categories in which the Japanese textile industry is considered to have growth potential in the years ahead are new frontier sectors, including the environment, medical care, welfare, civil engineering, construction, information and telecommunications. Major tasks for the Japanese textile industry to carry out from now onwards include the strengthening of the linkage among its different sectors, the establishment of a joint research system by industrial, academic and governmental circles, and personnel education and training. The strategies for the 21st Century are enhancement of linkage with high-technology industries and the development of human resources with co-operation among industrial, governmental and academic circles are discussed.

Polyester - the view from the Middle East|Polyester aus Sicht des mittleren Osten

Al-Shabnan-S-I

There have been dramatic changes in the climate in which the global polyester business has existed since 1990. In an industry which has promised success by continuous growth - 6 % per year for fibres and filaments and 17 % for PET resin - it is disconcerting to record that profits have gone from bad to worse. The reasons of course have been exuberant building of new capacity, mainly in Asia. In the year 2000, we now stand on the threshold of new opportunities if the problem of over-capacity can be solved. The markets continue to grow, demonstrating the excellent technical qualities of polyester. This year the global market will reach 18 million tons for polyester fibre and filaments and 6.5 million tons for PET packaging resin. The change in global market conditions and the restructuring of much of Western textile markets has important implications for polyester producers in the Middle East and North Africa. We are on the doorstep of East and West Europe, and are already significant exporters of finished textiles - a trade that is likely to grow as the years pass. Yet in fact the investments in the production of polyester are small and mainly designed to fill a gap in the Middle East and make us less dependent on imports. SABIC with its small production of fibres and filaments at 110000 t/year is dedicated to supplying regional markets in the Middle East and North Africa. Demand for PET resin in the region has been so good that we have little for export outside the region for some time ahead.

Production of natural fibers at the turn of the millennium|Naturfasererzeugung an der Jahrtausendwende

Schenek-A

Natural fibres are an important heritage of mankind and still determine textile clothing and fashion styles. Cotton, the most important natural fibre still dominates the production of short staple yarns and jeanswear fashion worldwide. Fine wool, mohair and cashmere are often linked to luxurious garments. Pure silk is still the queen of textiles. In the past 50 years it was possible to increase the worldwide natural fibre production essentially. Cotton production was more than doubled using practically the same acreage of land. But we all know very well that the production of natural fibres cannot be increased without limits and that without chemical fibres it would not be possible to supply the world population sufficiently with textiles. Not wool, a more rare and expensive textile fibre, but especially cotton can be seen in direct competition to food production, at least in regions with large population. In addition, the water consumption reduces the possibilities for further production increase. It's sure that natural fibres will be more rare in the future and therefore will become more expensive textile raw materials. The realistic consumption growth rate of 1 % for cotton per year starting at 2005 would result in 125 to 130 million bales in the year 2030 (27.1 - 28.2 million tons), about 40 % more cotton than today, which could be produced on the same acreage as today, if enough water can be supplied. Growth rates of other natural fibres in the same were as for cotton are more unlikely, mainly because of higher production and processing costs. The production therefore will remain more or less constant; in some cases grow slowly, as for silk or fine animal hair for example. In total, the growing rate of natural fibres is likely to grow slower than that for man-made fibres. A certain saturation of growth of natural fibre production is more probable in the farer future and some more natural fibres will become luxury fibres, which can only be afforded by people in rich countries.

Man-made fibres - the next generation|Chemiefasern - Die nächste Generation

Whitaker-B-F|Gandhi-K-L

The paper attempts to predict future requirements and developments of the global man-made fibre industry of the future in terms of product production machinery, and process technology. By taking into account predictions of population growth coupled with gross domestic product estimates, future patterns of man-made fibre usage are extrapolated after taking into account considered opinions in relation to technological development and natural global effects. Consideration is given to the effects of global warming and the consumption of finite resource with resultant availability for fibre production. Assessments are made following an analysis of patent literature on the global regionalisation of development and production in so far as it affects the man-made fibre industry, and the engineering companies supplying production machinery. The paper concludes with predictions assessing potential demand for man-made fibres in relation to natural fibres, the size and positioning of production units, and the problems that will be faced by the industry, and which will need to be addressed and overcome to meet the requirements of future generations. Currently all major technical developments are focused on reducing the labour input into a given process. One must therefore ask the question of what employment is going to be available over the coming years for the increased population to earn income which proportionately would be spent on textile products, and also to pay taxes necessary for Governments to invest in projects.

The role of engineering companies in the changing man-made fibres and textile industries|Die Rolle des Anlagenbaus in der sich wandelnden Chemiefaser- und Textilindustrie

Martl-M-G

The signs for the global fibre and textile market are still showing growth. Increasing world population and increasing fibre consumption per capita will yield in a demand on fibre of more than 53 million tons in the year 2005. This corresponds to an averaged annual growth rate of about 2-3 %. Considering the synthetic fibres only the growth will be about 4 % per year. However, in particular the synthetic fibre industry is undergoing a tremendous structural change. Those, who were first generation fibre manufacturers are disappearing from the market, for example Hoechst, Akzo Nobel or Rhone Poulenc, others like DuPont are forming a net of joint ventures. New players are moving into the fibre business with the very clear target for cost leadership. Of special interest is the situation in the countries of the Near- and Middle East. Huge capacities will be built up by investments along the value-added chain from crude oil and gas to petrochemicals and fibres. In parallel one can also observe increasing interest in speciality products, certainly triggered by the recent price situation in commodity products. These fundamental changes offer new opportunities for engineering companies. The fibre and textile industry is asking for comprehensive solutions for their business, starting with support during the project development phase by feasibility studies or financial engineering - but also including sales support and after sales service. New aspects for services will emerge by the opportunities of the Internet. But also in future, the basis for success will be laid by innovation combined with reliability of implemented technology.

Electronic Commerce - Evolution oder Revolution in der textilen Wertschöpfungskette|Electronic business - evolution of revolution in the textile supply chain

Fischer-T|Moser-T|Winkler-M

Gegenwärtig wird in vielen Textilunternehmen ernsthaft über den Einstieg in Electronic Business nachgedacht. Häufig führen derartige Überlegungen jedoch noch zu keinem befriedigenden Ergebnis. Der Grund liegt vor allem in der enormen Entwicklungsdynamik von Technologien, Geschäftsmodellen und Anbietern. Bei näherer Betrachtung stellt sich hier die Wahl der geeigneten Strategie und der Partner als äußerst schwierig heraus. Insofern scheint es hilfreich, zunächst die für die Branche revolutionären und evolutionären Elemente von Electronic Business zu analysieren. Dabei können Unternehmen deutliche Einsichten in die Mechanismen des Mediums Internet gewinnen. Auf der Basis dieser Erkenntnisse fällt die Wahl der weiteren Vorgehensweise dann leichter. Danach lassen sich

auch die Auswirkungen von Electronic Business auf die traditionellen Geschäfte und die individuellen Chancen durch den Einsatz von Internet-Technologien besser abschätzen. Der Textilindustrie bietet sich hier mittlerweile ein reichhaltiges, interessantes Spektrum von Einsatzfeldern, deren Nutzung jedoch sorgfältig geplant werden sollte. Geschäftsmodelle beschreiben die Produkt-, Dienstleistungs- und Informationsflüsse einschließlich der beteiligten Akteure und ihrer Rollen, der potentiellen Vorteile für die einzelnen Akteure und der Erlösquellen. Die Felder des E-Commerce sind B2B (Business to Business) und B2C (Business to Consumer). Produkte oder Dienstleistungen können nicht digitalisierbar, nicht digitalisierbar aber mit digitalisierbaren Ergänzungen, sowohl physisch als auch digital verfügbar oder vollständig digital (Informations-Objekte) vorliegen. Das Ziel ist, den Kunden mit möglichst wenig Aufwand zu erreichen. Die Wertschöpfungskette, die aus Eingangslogistik, Produktion, Ausgangslogistik, Marketing und Vertrieb sowie Service besteht wird beschrieben. E-Hubs sind Plattformen für neutrale internet-basierte Intermediäre, die sich auf bestimmte Industrien oder bestimmte Geschäftsprozesse spezialisieren. Ein Portal ist eine Startseite für die Internet-Nutzung, die als Schnittstelle zwischen Kunden und Anbietern dient. Im Rahmen des Projektes Creativ wurde ein Design-Netzwerk zwischen Kunden, Drucker, Designer, Graveur und Colorist aufgebaut.

3D business - A revolutionary Internet technology for cost and time savings in all remote communication processes|Revolution im E-Commerce - Interaktive 3D-Visualisierung im Internet für Kosten- und Zeiteinsparung bei Fernkommunikationsprozessen

Carl-C

3D Business Software optimises Internet business processes. This leads to significant benefits especially in the fields of support, maintenance, product development, technical documentation and sales. For the first time, the Internet is used as a worldwide medium to support online interactions. Thus communication processes are accelerated and error proportions are scaled down. Large cost and timesavings are realised in the production industry. Janet develops and sells software for 3D business and is technically the world market leader in 3D business. 3D business is a combination between 3D and e-business. Different examples are demonstrated. A 3D spare parts catalogue is presented. It runs on standard web browser and no additional software is necessary.

E-commerce - a change in business approach|E-Commerce - Die Änderung in der Geschäftswelt

Hackl-W

Is it a hype or a fundamental change in business? It is both of it. What does it mean for you and your company? It is mainly a thing of strategic positioning and redesigning business processes. Open up your mind and company and let change management take action. Don't buy just a piece of software without a clear business concept. Integration is the most important aspect, which gives you the benefit of being an efficient partner in the pipeline. The Internet technology gives you the chance to go beyond company and regional borders. Complexity is enormous and timing has speeded up. This is the task of consultants and IT-specialists. As all areas of business will be involved top management has to be in the driver seat. The management has to know about the possibilities of e-commerce, to give support to the organisation and to be in the driver seat as all areas of business are involved. There are two business cases: (i) develop and launch a certain product and (ii) production of garments. The traditional pipeline of production is explained. It consists of supplier, producer, distributor and customer. E-Commerce means no company or regional borders, new forms of partnerships or organisations, networked business, integration of resources, redesigning of processes and cost reduction. E-Commerce can help you to increase your competitiveness, to optimise your company and to get a solution provider to the market.