

# fibers and filaments

the experts' magazine

issue 16 - august 2013

## Megatrends

### **What future will bring for the manmade fiber industry**

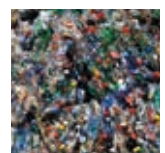
Global challenges and chances



## Recycling

### **New yarns from old bottles**

Recycling trends and technologies in yarn manufacturing



"We master the entire value chain for the manmade fibers production."

Ugur Baş,  
Oerlikon Manmade Fibers



# From Melt to Yarn

It all starts with a few chemicals. But transforming these into smart clothing, technical textiles or tire cord requires great ideas, outstanding equipment and sophisticated processes.

Oerlikon Manmade Fibers engineers support you in ensuring that your entire project is a total success. We will accompany you on your journey from chemical product to manmade fibers. From jointly developed innovative ideas and outstanding equipment to sophisticated processes. From engineering and polycondensation to spinning, texturing and nonwoven production. From melt to yarn.



For further information visit us at  
[www.oerlikon.com/manmade-fibers](http://www.oerlikon.com/manmade-fibers)

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## Editorial



Dear Customers, dear Readers,

Sustainability – the main topic of the current edition of 'Fibers & Filaments' – is nothing new. We at Oerlikon have been dedicated to sustainability for many years now. Nevertheless, it remains an ever-current topic with lots of scope for discussion. The climate change debate, recycling technologies, carbon footprint calculations – and, of course, the central question: can sustainability be profitable? Can people and companies also earn money by assuming responsibility for our planet and future generations?

It is with a clear conscience that I can answer that question with a confident 'yes'. Each and every day, our engineers work on developing and implementing corresponding solutions. Our machines and systems prove this time and time again. Whether energy-efficient spinning equipment, raw material-saving BCF systems, recycled yarn-processing texturing machines – all our equipment and systems are developed with the objective of offering our customers both sustainable and profitable solutions.

We would also like to capture your imagination with contributions on the challenges of the future, trends and technologies in the areas of polyester recycling and energy-efficient industrial yarn concepts. An excerpt from the renowned 'The Fiber Year' market study will provide you with an objective overview of the manmade fiber market. Corporate and product news will round off this bundled information package for you.

And one final thing on Oerlikon: this first edition in the new design also marks the beginning of a new chapter for us. So much has happened in our Manmade Fibers segment over the past few months. Oerlikon Barmag and Oerlikon Neumag have now grown even closer. Together, we will be able to provide you with even better support and advice. The objectives of our magazine are to present you with current topics, provide you with industry-relevant information and to ultimately remain in contact with you beyond the confines of our day-to-day business. We hope that we will continue to achieve these aims and look forward to receiving your feedback, which you can send to [fibers.filaments@oerlikon.com](mailto:fibers.filaments@oerlikon.com).

I very much hope you enjoy reading this edition of 'Fibers & Filaments'.

With best regards,

Stefan Kroß, Head of Oerlikon Manmade Fibers





# Meegada trends

for the manmade fiber industry

We live in an age of accelerating change and exponential growth. The requirements of the rising world population demand ever more efficient solutions. The increasing industrialization of emerging nations and developing countries requires clean technologies if we are to leave our children with a sustainable world.

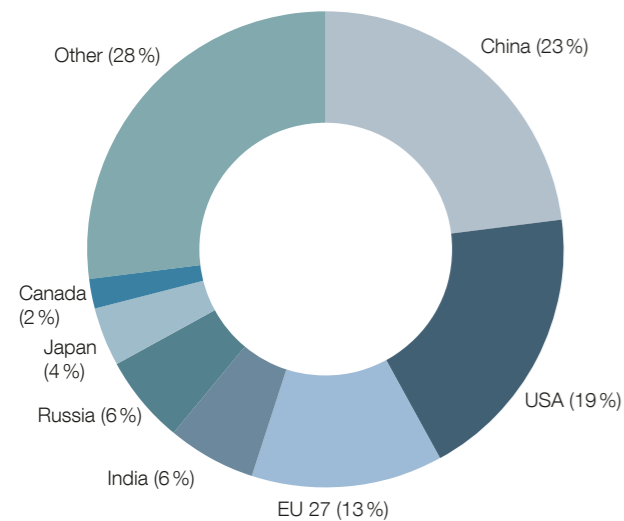
Huge opportunities meet equally huge risks. Even if the specifics of future developments cannot be forecast, we are most definitely facing significant change driven by megatrends. Future researchers have identified more than 100 of these megatrends. For Oerlikon Manmade Fibers, we have taken a closer look at four which we believe are relevant to us.

### Environmental pollution and climate change

Speaking on the occasion of this year's publication of the 'Report 2025', on which in excess of 30 scientist and economics experts worked, the Secretary General of the Club of Rome, Ian Johnson stated: "Climate change will dramatically increase in the second half of this century, causing lots of suffering in the process. [...] Each year, we emit twice as much greenhouse gases as the forests and seas can absorb."

How do we deal with this, how do we adapt our processes to the given conditions?

#### Global CO<sub>2</sub> emission from fossil fuel combustion by country in 2008



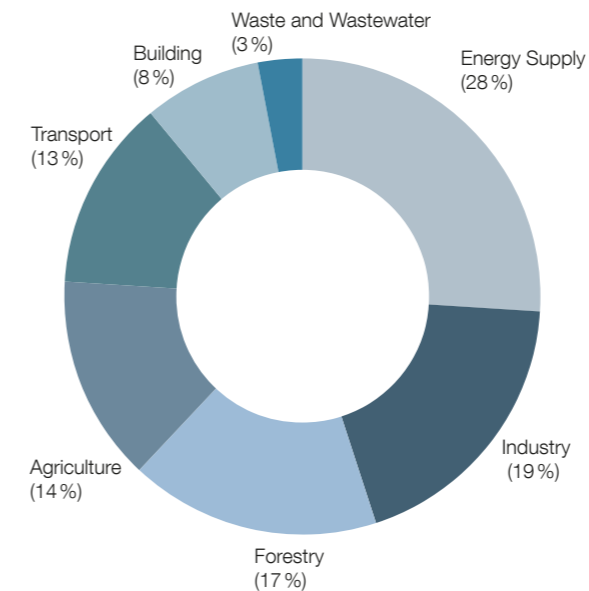
Source: EPA (United States Environmental Protection Agency)

The environmental pollution megatrend is resulting in higher CO<sub>2</sub> emissions and growing environmental problems particularly in developing countries. In the future, those causing these will be taken more to task. To this end, countries such as the USA and China – as the world's largest consumers of coal and generators of greenhouse gases – will have to focus on reducing their CO<sub>2</sub> emissions. And we must also anticipate corresponding regulatory measures within the fiber- and yarn-manufacturing industry, designed to reduce CO<sub>2</sub> emissions. This can, for example, be achieved by using specific filters or the expert disposal of industrial waste.



19 percent of CO<sub>2</sub> emissions are generated by industrial companies. And this figure does not include those emissions caused by generating electricity. Most emissions produced by industry are the result of onsite burning of fossil fuels.

#### Global greenhouse gas emission by source in 2004



Source: EPA (United States Environmental Protection Agency)

Manufacturing companies will have to face up to their responsibilities. To this end, environmental factors become important criteria when selecting the sites for new production facilities and similar corporate decisions such as observed in the case of Chinese BCF yarn manufacturers.

#### 'Going green' as a competitive edge

And we must not dismiss the emotional aspects of the issue: 'Sustainable' products are perceived positively by the consumer, which in turn has a positive impact on the brand itself. In 2012, Interbrand, the world's largest management consultancy for brands, initiated the 'Best Global Green Brands' awards. Decisive for nominations and receiving awards were companies' performance with regards to sustainability and the perception of these efforts among the public. According to Interbrand, every sustainably-operating company can positively influence its image and hence strengthen its brand value. Corresponding labeling within the manmade fiber sector – such as the Oerlikon e-save label – has proven successful in this regard.

#### Worlds most valuable green brands



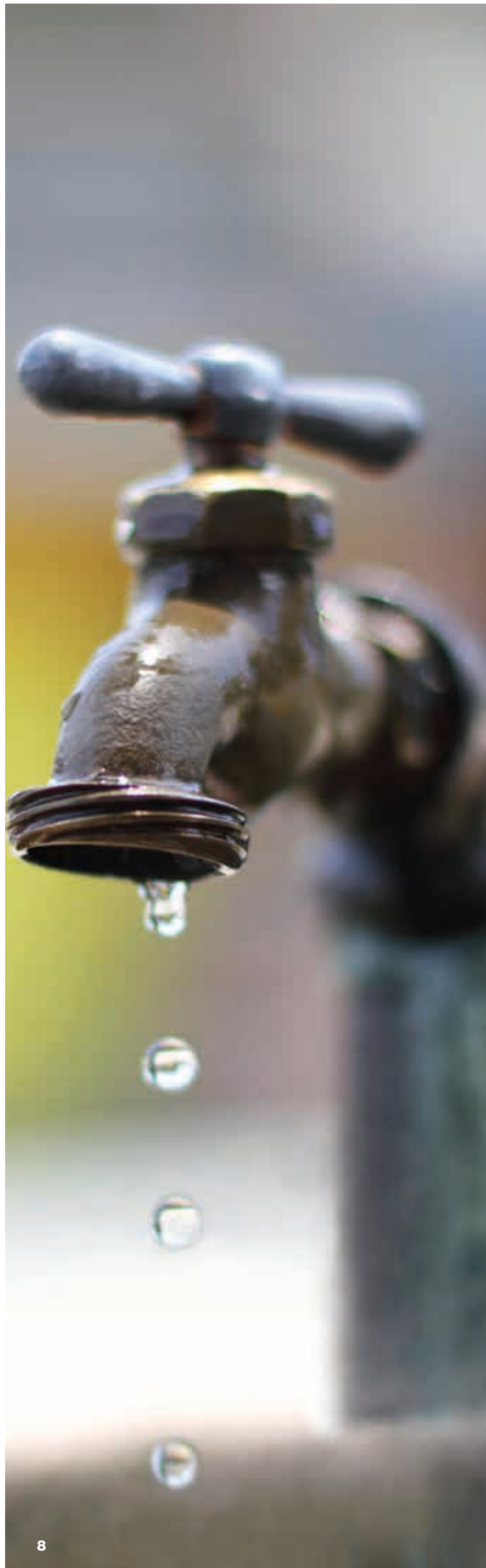
##### Top brands in 2013

1. Toyota
2. Ford
3. Honda
4. Panasonic
5. Nissan
6. Johnson & Johnson
7. Volkswagen
8. Danone
9. Nokia
10. Dell

Source: Interbrand

To support such efforts by yarn manufacturers and to enable transparent ecological assessment, CO<sub>2</sub> 'balance sheets' have been calculated for Oerlikon Manmade Fibers machines and systems. Furthermore, the Oerlikon Neumag BCF division has become a cooperation partner of the EU-financed 'EcoMeTex' research project, whose aim is to design an – in terms of its environmental and cost efficiency – optimized carpet.



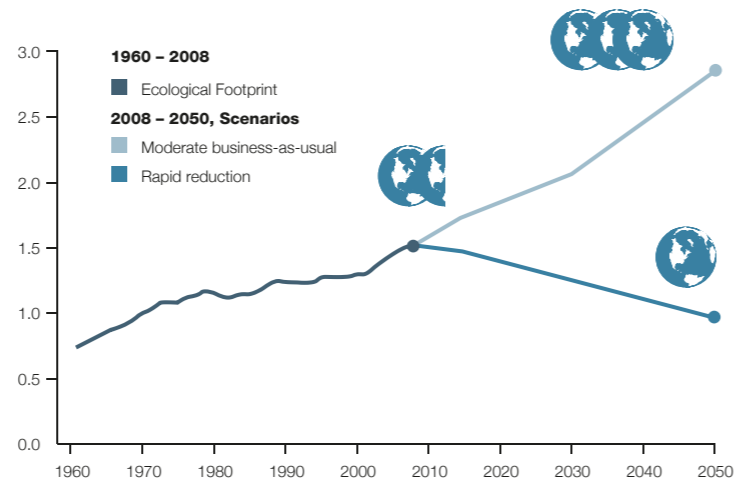


## Shortages of resources

Natural resources are becoming increasingly scarce. Here, the solution lies in closed loop recycling management. Recycling instead of throwing away. Closed loop recycling management is based on four principles:

- Products must be designed with a view on the entire lifecycle
- Extend product lifecycle
- Recycling of materials instead of disposal
- Reutilization of materials in other industries and value-added chains

According to calculations from the international 'Global Footprint Network' think tank "Today humanity uses the equivalent of 1.5 planets to provide the resources we use and absorb our waste. This means it now takes the Earth one year and six months to regenerate what we use in a year." Moderate UN scenarios anticipate consumption equating to two earths in 2030, if the current population growth trend and consumption habits continue.



Source: Global footprint network

Rising commodity prices reflect this ecological excess: over the past ten years, commodity prices have tripled and, in part, quadrupled.



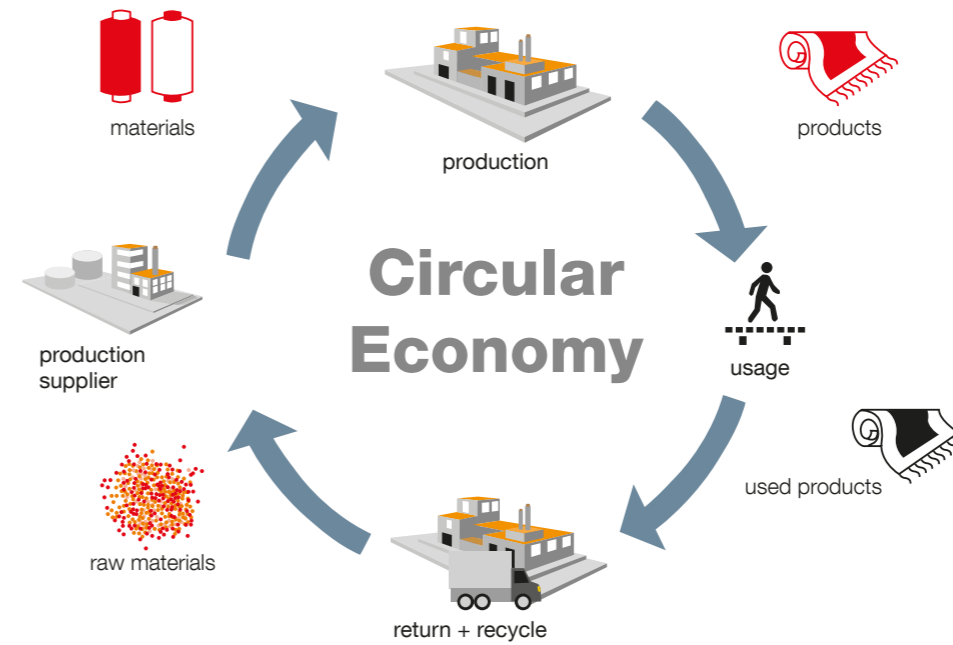
Index: 100 = years 1999 - 2001

Source: McKinsey Global Institute Commodity Price Index

Raw materials are the major cost and quality factor in the manmade fiber industry. By establishing closed loop recycling management, yarn manufacturers can counter the effects of volatile prices and soften interruptions to the material supply. Concepts for maintaining, reutilizing, treating and recycling are correspondingly promising for the future.

Consumers will return their used carpets and clothing to the manufacturers, who will break them down into their individual components. Fibers and filaments will be melted, regranulated, re-extruded and spun into new textile, industrial or carpet yarns, and fibers.

A process that is already widely-used is the recycling of polyester bottles. However, access both to virgin polymer and high-quality, recycled bottle material will become expensive in the future, so that the ownership and control of the material flows will become increasingly important.



Such controlled material flows exist in BCF yarn manufacturing. One Oerlikon Neumag customer very successfully recycles polyamide carpets into new polyamide BCF yarn. The Sytec One and the new generation S+ from Oerlikon Neumag are BCF machines suitable for the processing of recycled polyester and have been delivered to the US carpet market. However, processing of recycled polymers – usually polyester – is also perfectly possible using other Oerlikon Manmade Fibers filament and staple fiber systems. Several systems are already successfully producing recycled fibers and filaments throughout the world.



## Environmental policy requirements ensure modern production facilities

'Green production facilities' can be the result of both the above-mentioned cost pressures and regulatory measures. In the future, companies will have to develop new processes and launch products whereby energy efficiency is the primary focus. Like other political instruments, regulatory measures are very difficult to forecast. The political measures introduced over the past years clearly show the importance that the topics of the environment, climate change, energy efficiency and the conservation of resources have throughout the world. Emissions regulations and bonus incentives for sustainable products and processes already feature prominently on the political agendas in Europe and in many other industrial countries. Political stipulations, cost pressure and consumer preference for sustainable products are the general conditions under which the innovative products of the future are developed.

With its e-save sustainability program, Oerlikon Manmade Fibers has been pursuing this objective for many years now. The company is able to offer products that make a very considerable contribution towards energy efficiency in all processes. To this end, the BCF RoTac tangling unit consumes around 66 percent less pressure air than its predecessor model leading to a 25 percent saving of energy consumption over the entire machine. Using the EvoQuench quenching system, which can be deployed for the POY, FDY and industrial yarn processes, saves around 80 percent energy compared to cross-flow quenching. Each Oerlikon Barmag HF godet saves up to 5 kW compared to competitor products. The WINGS winding unit was also developed with energy considerations in mind: an FDY process with WINGS requires around 30 percent less.



Oerlikon Neumag's BCF carpet yarn machine S+ also processes recycling polyester. In addition, the e-save certified machine consumes at 1850 dtex for example 17% less energy than its predecessor machine S5.

## Uncertainty with regard to talent and workers

The qualification of employees is a major success factor and is decisive for competitiveness particularly for high-tech companies. In a survey conducted by the Manpower Group in 2011, 26 percent of employers in Europe, the Middle East and Africa (EMEA) interviewed stated that they had difficulties filling qualified positions above all in technical areas. 80 percent of the Japanese companies surveyed reported the same problem. In the same year, a survey conducted among 2000 American companies revealed that positions were left vacant for longer than six months in 30 percent of all enterprises and in 40 percent of manufacturing companies despite the fact that unemployment in the USA was more than 9 percent that year.

The McKinsey management consultancy forecasts that there will be a global shortage of highly-qualified workers and a potential oversupply of less-qualified workers in the future. To this end, McKinsey predicts a shortage of both engineers and scientists as well as technicians and machine operators in China and India before 2030. Three out of five of the jobs most difficult to fill in 2011 – technicians, qualified sales personnel and engineers – are directly relevant to the textile sector.

A further aspect is the aging of the workforce. In the future, the working population will fall as a result of the age pyramid and the low birth rates in the industrialized countries. In the United States, 60-70 percent of employees working in the agriculture, chemicals, ceramics, metal, aerospace, machine construction, turbine construction and precision tool construction sectors is over the age of 55. For this reason, the manufacturing industry is at huge risk of suffering brain-drain over the coming decades as the result of retirement regulations and laws.

Automation can also counteract this trend in the textile industry. In all textile processes, user-friendliness, ergonomics and automation are important criteria for the Oerlikon Manmade Fibers engineers in the development of new technologies. This has resulted in WINGS for the POY and the FDY processes, the state-of-the-art Oerlikon Barmag texturing machines and new generations of staple fiber and BCF systems.

These four megatrends relevant to the textile sector are regarded as the handbook for Oerlikon Manmade Fibers machines, systems and industrial solutions. They provide the corresponding impulses for our innovations and ensure that we find and develop solutions that benefit, and suit, our customers.(cma)



### What are megatrends?

Megatrends are long-term and overarching transformation processes. They are a powerful influencing variable that shape the markets of the future. They are distinct from conventional trends in 3 respects:

- They cover a period of decades. There are already unambiguous quantitative indicators in the present which are very probably projectable over the coming 15 years. Megatrends can mutually influence each other.
- Megatrends impact all regions of the world. They initiate change within society and its subsidiary systems – politically, socially and economically.
- Megatrends affect all players throughout the world – governments and their politics, individuals and their consumption behavior and companies and their strategies. They change our daily lives, our values and our overall behavior.



# New yarns from old bottles

Recycling trends and technologies in yarn manufacturing.



Today, the utilization of recycled materials is matter-of-fact, although in virtually no other sector is it quite as advanced as it is in the case of the manufacture of manmade fibers. Compared to using new plastics, utilizing recycled materials can lead to a significant reduction in energy consumption and CO<sub>2</sub> emissions. Furthermore, valuable raw material resources such as oil are preserved and the amount of waste at dumps is reduced.

**T**he demand potential associated with growing environmental awareness has long been identified. In China, for example, recycling of yarn is an important part of the current five-year economic plan. The still predominant, technically rather simple applications are increasingly being replaced by more sophisticated products. And there is a clear trend towards differentiated recycling products with high value added.

## The market

When the industrial manufacture of fibers using diverse plastic waste began around 20 years ago, its composition was mixed and the methods for processing the waste were not fully matured. For these reasons, the application was restricted to simple mass products, particularly low quality staple fibers. These were, for instance, utilized as fillers for soft toys and pillows. As plastic waste was at the time virtually free, manufacturers were able to achieve excellent returns with such products.

In principle, the most varied plastic waste can be used as the basis for recycling. However, PET bottles are today by far the most common starting material for fiber production. They are available in large quantities, and the plastic used to manufacture them is of a particular quality and includes only few additives. Recycling bottles into bottles is extremely demanding, as contact with foodstuffs is subject to very stringent regulations. For this reason, the more significant application – with 72 percent of all recycled bottles worldwide – is therefore fiber manufacturing. Well in excess of half of all PET bottles collected worldwide are processed in China. The age of excess in cheap PET waste has long gone; prices almost doubled between 2009 and 2013. The consequence of this development is that providers of the predominant, technically rather simple, applications are faced with both strong competition and considerably lower profit margins.

Many companies have therefore decided to concentrate on complex, high-quality products made from recycled PET and are now manufacturing corresponding new fibers, some of which were exhibited as one of the important new trends at the last Yarn Expo in China. Oerlikon Barmag and Oerlikon Neumag are able to draw on quite some experience in this sector and can supply systems that are especially designed for the production and the processing of yarns manufactured from recycled PET.

## The recycling process – the basis for further processing

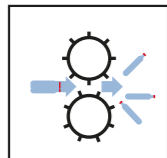
Expert processing of waste is the decisive prerequisite for manufacturing high-end recycled yarns. It enables the utilization of recycled materials in place of new material with merely a small change to the processing method. To this end, there are two different processing approaches, described as chemical or mechanical recycling.

In the case of chemical recycling, the old plastic is broken down into its original monomers by means of glycolysis, hydrolysis or methanolysis. These monomers are then used to manufacture new plastic granulate through polymerization. To this end, the quality of the recycled product is very close to that of new materials and it can be used to spin high-end yarn.

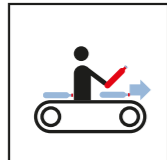
Compared to mechanical recycling, the chemical procedure requires greater energy consumption. Add to this the fact that – due to the high capital investment requirements – this option is only available to large-scale manufacturers, as cost efficiency can only be achieved from annual capacities of 50,000 tons and more.

For this reason, mechanical recycling has been the clearly predominant recycling method to date. Here, plastic waste is melted directly without any chemical decomposition. The melt can then be either processed directly into the end product or first granulated into chips. There is a current trend towards systems for in-house recycling of production waste in the form of chips. Recycling systems available on the market can process various forms of waste, including solid start-up lumps, for instance. To this end, the waste is shredded, melted and regranulated. Processed in this way, it can then be simply reintroduced to the production cycle.

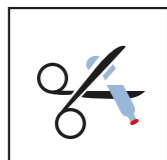




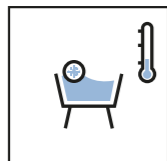
1 De-baling



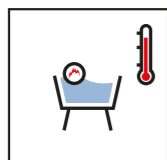
2 Sorting



3 Grinding



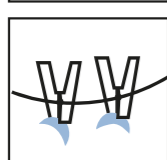
4 Cold Washing



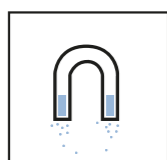
5 Hot Washing



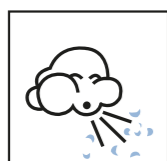
6 PO/PET Separation



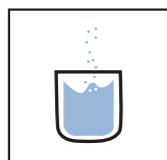
7 Drying



8 Metal Separation



9 Wind Sifting



10 Big Bag/Silo Filling

### Recycling bottles

In the case of mechanical recycling, the trend is very much veering towards bottle flakes without any additional regranulation. Here, the primary advantage is that the recycled material only needs to be melted once and considerable amounts of energy can be saved compared to the regranulation process. The disadvantages compared to the chemical recycling process include the limited quality resulting from the unavoidable reduction of viscosity and molecular weight and the increased ratio of oligomers compared to new material.

#### Collection

The collected bottles are sorted according to color and compacted into bales. The quality of the bottles varies considerably depending on their region of origin. There is considerably less contamination wherever there are deposit systems with returns to the manufacturer in place than where collection does not take place until the bottles have arrived at the waste disposal site.

#### Preparation

The preparation is then carried out at specialized facilities or directly by large-scale yarn manufacturers. First, the bottles are coarsely cleaned and tops and rings that are made from different types of plastic are removed. The paper or film labels are also removed at this stage. The second step comprises the grinding of the bottles and the thorough cleaning of the resulting flakes, whereby current cleaning processes require rather low volumes of water. The flakes should be small and be as even in size as possible. The high bulk density achieved in this way means that the storage silos can be kept small. Furthermore, this reduces the bridging tendency, which simplifies the feeding of the raw product into the extruder. Dust accumulation should be kept to a minimum during flake manufacturing as this binds an undesirable amount of moisture.

#### Separation and drying

This is followed by a separation process which removes other plastics and other contaminants. Melttable contaminants, such as PE, PP or adhesives in particular, must be carefully removed. So-called wet separation processes for flakes take place in sink-float tanks or require the use of hydro-centrifuges.

As residual moisture in the polymer results in a reduction in the molecular weight and lower viscosity, the subsequent drying process is of particular importance. This can be carried out by means of hot, dry air or using a vacuum system integrated into the extruder. To this end, the drying process is carried out until the product has a residual moisture of 30-50 ppm. Any decrease in the molecular weight, which could considerably restrict the spinnability, can also be prevented by adding stabilization agents.



### Fiber production – from the flake to the fiber

The dried flakes are subsequently packed into so-called 'Big Bags' and sent to yarn manufacturers. The bottles contain a substantial ratio of amorphous components, which is why the flakes should be crystallized before they are spun into yarn. The remaining residual surface moisture is removed in the same process step.

#### Extrusion

The dried flakes are subsequently melted in an extruder. Flakes with a residual moisture lower than approx. 50 ppm can be processed using a single-screw extruder. Depending on the bulk density of the flakes, specific screw geometries may be necessary for processing the flakes. Today, both extruders with a screw length that is 30 times the respective screw diameter and barrier screw concepts are used. Single-screw extruders with diameters ranging from 60 mm up to 300 mm can achieve throughputs of between 100 kg/h and more than 3 t/h.

The double-screw extruder with vacuum degassing is a second extrusion system for processing flakes with an initial moisture content of up to 3000 ppm. Degassing the melt can reverse the hydrolytically-initiated chain degradation and hence achieve moderate overall viscosity reduction using the extruder. However, the systems are more complex compared to single-screw extruders and require additional material metering, vacuum pumps and melt pressure booster pumps.

#### Filtration

Flakes generally contain a considerably higher ratio of foreign particles compared to new granulate and are therefore a particularly big challenge for the filter systems deployed. Depending on the level of contamination and application, either screen changers or large-surface filters are used. Screen changers are always used in the case of higher levels of contamination. A combination of both filter types is also prudent for some applications. For commercial reasons, it must be possible to change the filter without halting production (non-stop filters). In the case of screen changers, the filter surfaces range from under 0.5 m<sup>2</sup> through to 40 m<sup>2</sup> for large-surface filters with filter candles. The typical filter fineness ranges from between 15 µm and 40 µm. To this end, filtration has a decisive impact on the product quality and productivity (number of spinning breaks, durability of the spin packs).

The melt purity achieved is decisive for the further processing method. The higher the level of contamination, the more the properties of the end product will fluctuate (for example, molecular weight, mechanical strength and color) and the lower the reproducibility of the manufacturing process (processing temperatures, crystallization speed) will be.



## Technologies and applications

The processing of the melt from recycled material can in principle be carried out in the same way as in the case of utilizing new granulate. The filaments are cooled, drawn, textured and wound following melting and spinning. Fundamentally, recycling applications in yarn manufacturing include: staple fibers, carpet and textile filaments as well as nonwovens. As examples, the number of 2-liter PET bottles required for specific applications is roughly as follows: 5 for a T-shirt, 20 for the filling of a winter jacket, 20 for a sweater, 35 for a sleeping bag and 40 for 1 m<sup>2</sup> of carpeting.

The overall trend is moving away from simple fillers to more differentiated products with higher value added. These include, for example, spun-dyed FDY filaments.

BCF applications – for which the deployment of recycled PET is already widespread – are extremely interesting. Recycled PET is frequently used in regranulated form and incorporated in different ratios. However, applications with 100 percent input of flakes are currently possible using Oerlikon Neumag technology. It is particularly in this sector that there is currently strong growth, with an increase of 13,000 tons per annum in 2013 and a further 27,000 tons per annum by 2015.

In the case of staple fibers, the trend is currently very much on the deployment of bi-component technology. Here, separate extruders with individually temperature-controllable melt pipes and special spinning units are utilized, with either different polymers or the same polymers with various viscosities being used. The spinning beam is connected to the temperature regulating system of the higher-melting polymer. Short dwell times in the spinning beam prevent the lower-melting polymer experiencing thermal damage. The spin pack for bi-component fibers physically separates both melts right up to the capillary that actually creates the filament. Pre-spinneret and spinneret subsequently allow the two components to be arranged in different ways.

Both round and trilobal cross-sections are possible in the case of fibers with mantle and core. One possible combination for the components is recycled PET for the core, with a mantle made from the respective virgin material or a copolymer. To this end, the ratio of core and mantle can be variably adjusted, so that – despite the deployment of predominantly recycled plastic – the thin mantle layer ensures a perfect surface.

And recycled material is also used for manufacturing filament yarn. Here, melt-dyed FDY yarns, which can be produced directly from flakes without preparation, are a growing area. To this end, some companies are – thanks to Oerlikon Barmag machines – already successfully marketing recycled FDY, for example. As minor contaminants can result in more frequent yarn breaks, utilizing the very latest spinning technology is particularly important. POY and DTY from recycled raw materials usually have coarser titers to compensate for weaknesses caused by contaminants (70-150 den).

China recently introduced three official standards for filaments made from recycled materials: R-POY, R-DTY and R-FDY. These categories, with fixed logos, technical requirements and testing methods have created uniform standards.

In the future, greater deployment of recycling is quite conceivable within the industrial yarns sector. In the Ford Focus, a large proportion of the seat covers today are made from recycled polyester fibers. Here, around 22 plastic bottles are recycled for use in each vehicle. The manufacture of tire cord however is even more problematic and is only possible using chemical recycling. Residual contamination is still too high in the case of mechanical processes.

### Summary

The savings made by utilizing low-cost raw materials for recycled products are usually completely eaten up by complex collection and preparation processes. Nevertheless, recycling can still generate attractive profits, as customers are increasingly willing to pay higher prices for sustainable and environmentally-friendly products. The growing interest in ecological yarns has been driving the creation of new and highly-respected certificates. To be issued these coveted labels, manufacturers must provide evidence of sustainable production for 100 percent of their recycled material. For this reason, ever more companies are demanding energy-saving machines for manufacturing high-end recycled yarns. Oerlikon Barmag and Oerlikon Neumag have the innovative technologies to cater to this expanding market segment with the right machine concepts. (mba)



## did you know

- 60 million plastic water bottles are used each day in the US alone, 30 Million in Europe, more than 100 million world wide every day.
- Plastic bottles are a petroleum product and use 151 billion litres of oil to produce each year. That's enough to run 500,000 cars per year.
- The AMRF in 2002 found 6 kilos of plastic for every kilo of plankton near the surface. This can be as much as 30-60 times in some places.

The American yarn manufacturer Unifi has great success in the market with its recycled polyester REPREVE®. The material, which is among other things used in electric vehicles from Ford, is textured on an Oerlikon Barmag eAFK.



# status quo

Total polyester production in 2012 was estimated by the PCI Consulting Group at 65 million tons, with fibers accounting for 44 million tons, PET resin 18 million tons and film at 3 million tons with global growth rates in the 5 – 6% per annum range for the remainder of this decade.



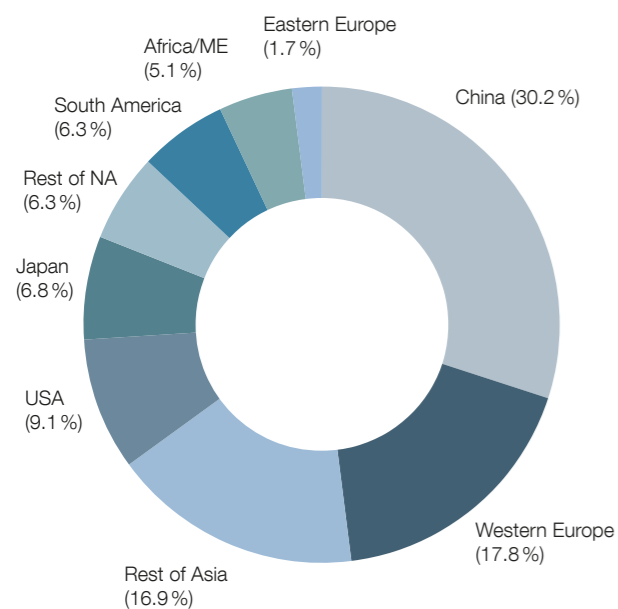




### Collection

The most important number for the recycling sector is the PET resin volume as virtually all of this is in single use applications (mainly bottles) where the container is disposed of after use. This provides a significant volume of PET that is potentially available for recycling. The actual volume that is recycled is dependent on the recycling efficiency of end users, and this varies greatly globally. We see Chinese PET bottle collection rates at over 80%, Western Europe at 48%, and USA at 29%, leading to a global recycling rate of just under 50% of available bottles. In 2012 this totalled 8.2 million tons and collection volumes are shown in the chart below.

### Global Collection 2012

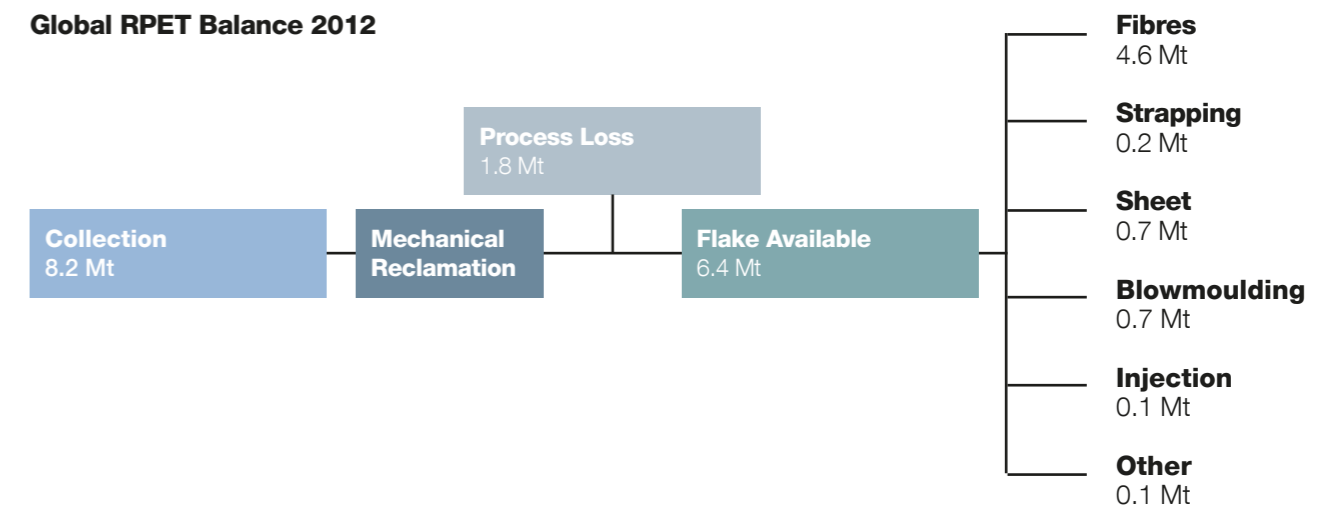


In addition to being the single largest collection country by volume, China is also the leading importer of bottles for recycling with an estimated 1.9 million tons of bottles or flake imported in 2012. This resulted in China processing 53% of the worlds collected bottles in 2012.

The process of bottle collecting is followed by sorting and washing and a mechanical reclamation process which produces RPET flake. Depending on the quality of bottles collected there can be quite a significant process loss in moving from bottles to clean washed flake – in the flow diagram below we estimate losses of 22%. The flake can be further processed into pellets or can be used directly into one of a number of end products. Approximately 72% of the globally produced RPET flake goes into fiber applications as shown in chart 2. Note, this chart focuses on the collection chain and applications for RPET from bottles (post consumer).

A major addition to the volumes of recycled feed used in fibers is from waste yarn and other waste generated in the production of virgin PET, this would be classified as Post Industrial waste. This post industrial waste could add as much as one and a half million tons worldwide to the overall figure for all forms of recyclate going into fibers.

### Global RPET Balance 2012



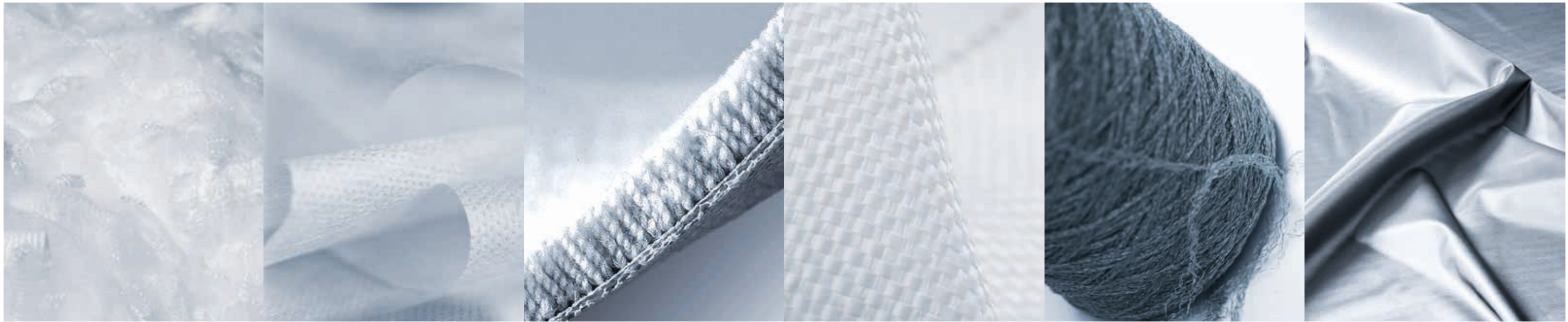
### RPET Fibers

The use of RPET in the production of polyester fibers was primarily a cost driven decision as recycled flake was typically only 50 – 60% of the cost of virgin polymer in the mid-1990s through to the mid-2000s. Most of the RPET fiber was staple and going into filling applications where quality requirements were less demanding than spinning fibers or filament yarns. In some filling applications, where color is not critical, it is possible to use flake that is not white (from green or brown bottles) and this further increases the price advantage.

However more recently the cost relationship has closed so that RPET is in the 70 – 80% range of the cost of virgin polymer and this has encouraged the development of RPET into higher value fiber types such as staple for spinning fiber and non wovens as well as in some filament products.

This move to higher value products has led to a more creative approach to using recyclate in some applications. We are seeing increased use of RPET being mixed with virgin feed to reach required quality and performance standards. In China the fiber applications have moved from mainly filling fibers to now include both staple for spinning and also textile filament yarns.

It is very difficult to determine actual volumes in this market sector as the blending with virgin, the blending of post industrial with post consumer and the opportunistic decisions to switch from recycled to virgin and vice versa depending on prices all lead to an ever changing volume picture. As a general estimate PCI Fibres believes a typical production volume of polyester fiber in China from all



types of recycled feed (post consumer and post industrial) would be approximately 4.5 million tons per year with approximately 95% into staple fiber and a small amount into textile filament. It is estimated that in the Chinese market spinning fiber is the largest end use application, followed by fiberfill and nonwovens.

Currently the Chinese market is undergoing some disruption due to an increased customs activity in checking import shipments of all waste, and a number of PET bottle shipments have been refused entry at Chinese customs. In excess of 40% of China's consumption of PET bottles is supplied by imports so any lengthy disruption is going to result in a shortage of RPET from bottles within China which will result in higher prices, while exporting countries struggle to find alternative uses. The customs initiative is known as "The Green Fence".

The European market has a very strong RPET element to its domestic polyester staple production with in excess of 80% of all polyester staple capacity being supplied by recycled feed. In contrast the domestic European polyester filament production from recycle is less than 5% of total filament production. The staple business is aimed at the fill market, nonwovens and a small amount into carpet, and in most of these markets there is little premium for the fact the product is from RPET. In contrast the small volumes that go into textile filament are generally branded and are marketed at a premium price compared to that for virgin filament.

In the USA the use of RPET covers a wide range of applications with staple going into fillings and nonwovens as well as spinning fiber for carpets; filament end uses are in apparel, home textiles and also into carpet as BCF (bulked continuous filament). Staple applications tend to be driven more by price than by an eco brand initiative and the RPET feed varies between bottle flake and post industrial waste which varies from low grade extrusion waste to yarn waste. The RPET textile filament is branded as a premium product, most notably by Unifi with its Repreve brand. The

textile filament (POY to DTY) is produced from both post consumer and post industrial RPET sources. The product is branded and a tracer provides a fingerprint to confirm that it is of Unifi origin. There have recently been some high profile successes and of particular note is the fact that Ford is using Repreve in its new model Fusion vehicle.

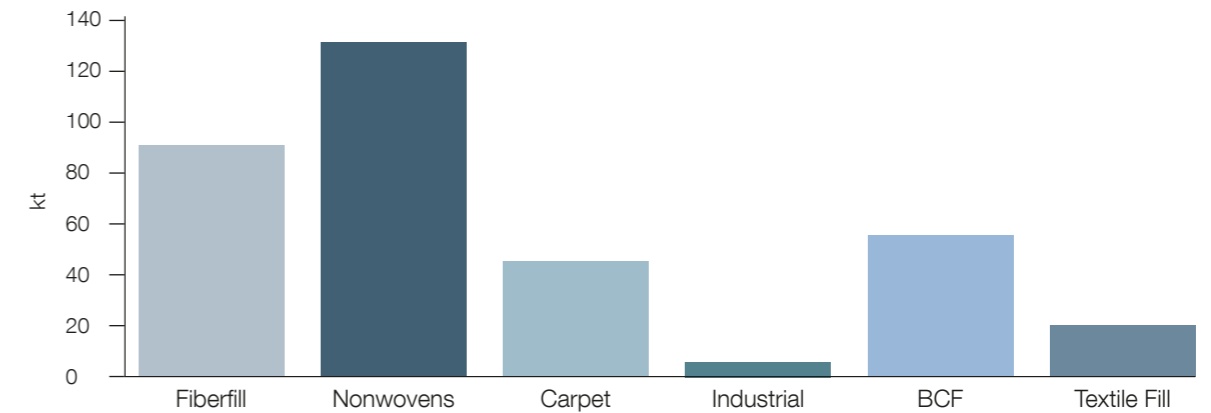
RPET has been used in carpet manufacturing for many years in the US, and Mohawk a major carpet producer, was the largest reclaimer of bottles in the USA with a capacity to use 3 billion bottles per year. The fiber produced was primarily staple and in recent years the use of polyester staple in US carpet has been declining as different carpet styles became more popular and as polyester BCF started on a remarkable growth path. Initially the BCF production was with virgin raw materials, but the use of RPET has been steadily increasing. It has been used primarily to be blended in with virgin raw materials and a ratio of 30% RPET and 70% virgin has been established to produce a satisfactory product. During Q2 of 2013 a new installation of PET BCF equipment is being installed with the intention of using 100% RPET from bottles as the feed.

**Conclusions**

We expect the demand for recycled polyester products to continue to grow as long as the price of bottle flake has an attractive enough discount to the price of virgin raw materials in order to feed the price sensitive high volume spinning fiber, fiberfill and nonwoven applications. The filament end uses in USA and Europe are generally carrying an eco message to the consumer whether in auto upholstery, carpet or apparel applications that would suggest that these end uses are less sensitive to a price discount to virgin raw materials, however many of the users will not be prepared to pay price premiums to virgin.

Therefore the challenge facing the industry is to ensure that countries such as the USA improve their recycling rates at least to the same level of Western Europe to ensure an economically attractive supply of PET bottles for recycling. (aca)

**Estimated US Capacity of Fiber from RPET (2013)**



PCI Fibres is a specialist consultancy to the fibres and related industries. Its services include multi-client and single-client studies. The company provides monthly, quarterly and annual reports covering the major manufactured fibres and raw materials for acrylic, nylon, polyester and viscose as well as related products.

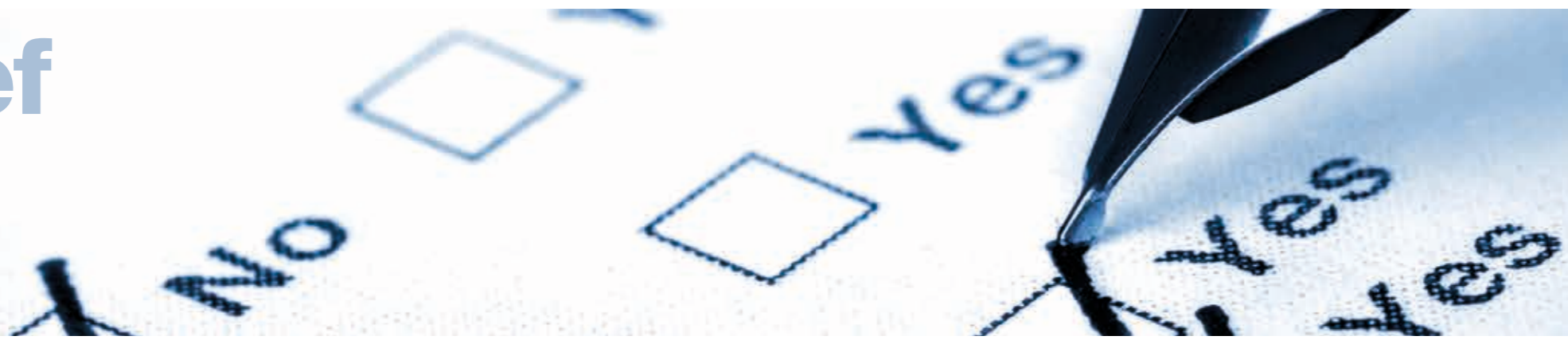
For further information contact [info@pcifibres.com](mailto:info@pcifibres.com)



or [info@pcipackages.com](mailto:info@pcipackages.com)







## S+ carpet yarn system conquers Saudi Arabia

The long-established company Al Abdullatif Industrial Investment Co. in Saudi Arabia has placed an order for manmade fiber carpet yarn production equipment from market leader Oerlikon Neumag. The order comprises five BCF (bulked continuous filament) S+ plants that will produce around 13,000 tons of carpet yarn per year with significant efficiency and productivity gains. The recently-signed contract includes three S+ BCF systems for mono-color polypropylene and two further systems for polyester. The systems are scheduled to be commissioned and to start production at the beginning of 2014. "Ultimately, I was convinced by the combination of sophisticated technology and outstanding quality while simultaneously providing unbeatable profitability", reasons Al Abdullatif, CEO of Al Abdullatif Industrial Investment, commenting on the decision to purchase the systems.

With an efficiency of 99 percent, the three-end S+ BCF systems provide significant cost savings for raw materials. The most important success factors of the new standard Oerlikon Neumag machine include the improved winder design and the optimized yarn path. Furthermore, the system, which has also been available for polyester processing since last year, convinces with its improved productivity of up to 25 percent and its outstanding user-friendliness.

The Al Abdullatif Industrial Investment Company is one of the world's largest manufacturers of high-end tufted and woven carpets. The company, headquartered in Riyadh, Saudi Arabia, is vertically integrated and masters the entire process – from extrusion and spinning plant all the way through to finished carpets. With a production capacity of 125 tons of carpet yarn per day and a global network, the company services the international market. "With this additional equipment from Oerlikon Neumag, we will further strengthen our market position in the growing carpet yarn market", stated Al Abdullatif Al Abdullatif.

Manmade fiber yarns account for nearly 90 percent of the carpet market. Here, BCF yarns have become the industry standard substituting staple fiber yarns over the past decades, above all due to the fact they are less expensive to manufacture. Furthermore, carpets made from filament yarns are particularly low maintenance, robust and hypoallergenic. (bey)

## BCF Roadshow in Dalton, USA

### Oerlikon Neumag's S+ inspires American BCF Producers

On 17 and 18 April 2013, under the motto "Innovative Solutions for your eyes only", Oerlikon Neumag invited interested BCF producers to a Virtual Reality Show in Dalton, USA. During the well-attended event, the plant manufacturer informed the visitors on their latest technologies and the actual, worldwide market situation.

The presentation of the BCF plant S+ in a Virtual Reality Show was the focus of the event. The visitors found themselves in a 3-dimensional room in the middle of the BCF plant. The pursuit of the yarn from its creation right up to the complete bobbin, real time cutting planes and the animation of components like the wing traversing unit of the winder, enabled the visitors to, in detail, experience the market-leading technology.

With Virtual Reality, Oerlikon Neumag has broken innovative ground on the German machine and plant engineering market to make production processes conceivable. "It is a challenge for us to realize our technology. Virtual Reality is the ideal instrument for this and went down very well with our visitors" summed up Michael Rübenhagen, Sales Director at Oerlikon Neumag, with regard to the success of the event.

(bey)



## The ITM with 'interim cycle'

Once again, the Turkish city welcomed large numbers of visitors to the ITM.

The trade fair opened its gates in Istanbul for the fourth time in succession between May 29 and June 1, 2013. Oerlikon Manmade Fibers – with its Oerlikon Barmag and Oerlikon Neumag brands – presented itself to the international trade audience at the trade fair stand of its long-standing representative, Tekstil Servis. One key focus of the discussions surrounding filaments was spun-dyed yarns (POY and FDY), with Oerlikon Barmag's eFK texturing machine another core area. The company was able to sign project contracts covering both spinning systems and texturing machines. The primary focus of Turkish yarn manufacturers was on yarns with fine polyamide 6 and 6.6 titers. In contrast to the otherwise three-yearly cycle, the ITM took place both in 2012 and this year. The reason for the shift was the fact that the next ITM would be held very close to the ITMA 2015. The Texpro yarn trade fair, which was held in parallel to this year's ITM and at which many yarn manufacturers exhibited their merchandise, took place in the neighboring exhibition halls. These two factors ensured rather more reserved resonance from the audience. Nevertheless, over 1,000 exhibitors from more than 40 different countries were able to welcome in excess of 40,000 local and international visitors.

(ama)



## Professors among themselves

At the initiative of Oerlikon Manmade Fibers, a first meeting between the fashion design faculties of the universities of Shanghai, Mönchengladbach and Aachen has taken place. Following the Fibers and Yarns Award 2013 ceremony and the creations under the WenSiBo label, the Deputy Dean of the Fashion Institute at Donghua University, Liu Xiaogang, and his two professorial colleagues, Li Jun and Cao Xiaojie, visited Germany in June with the objective of continuing and intensifying the Oerlikon project. At the same time, they planned to forge new partnerships with German universities. Both Professor Dr. Haug, Dean of the University of Mönchengladbach, and Dr. Bernhard Schmenk from the Institute for Textile Technology (Institut für Textiltechnik – ITA) at the Rhenish-Westphalian Technical University (Rheinisch-Westfälische Technische Hochschule – RWTH) in Aachen were hugely interested in the discussions with their colleagues from China. Oerlikon is absolutely certain that this will be continued.

(aw)





Thrilled by the gesture: Wolfgang Hundt (TWD) with Ronald Sanden, Sabine Kuhlmann and André Wissenberg (from left to right)



German chancellor Angela Merkel congratulates Oerlikon CEO Jürg Fedier after the conclusion of sale of Oerlikon's natural fiber business.



A fantastic troupe: sales colleagues from all over the world met up for the first time in Switzerland.

## Oerlikon Manmade Fibers supports flood victims in Deggendorf

The German Federal Institute for Hydrology (Bundesanstalt für Gewässerkunde – BfG) in Koblenz and the German Weather Service (Deutscher Wetterdienst) in Offenbach described the recent flooding of the rivers Elbe and Danube as a once-in-a-century phenomenon. And some employees at Oerlikon Barmag's customer TWD (Textilwerke Deggendorf) also lost everything in the catastrophe. In view of the tremendous damage caused by the flooding, Oerlikon Manmade Fibers decided to provide some support for the flood victims in Deggendorf, with TWD Spinning Division Manager Wolfgang Hundt accepting a check for € 5,000 in Remscheid on July 8, money which is destined to go to the affected employees. *(ama)*

## Onsite maintenance workshop in Silvassa opened

A further onsite maintenance workshop was opened at Indian corporation Reliance Industries Ltd. at the beginning of August. Following in the footsteps of the plants in Hazira and Patalganga, Oerlikon Barmag's service employees are now on location with a workshop in Silvassa. Here, the predominant focus of maintenance work is on WINGS POY winders. With onsite maintenance workshops, components requiring repair and maintenance no longer need to be transported to central Barmag service stations, but can be dealt with onsite without any time-consuming and expensive logistics. For the yarn manufacturer, this means its components are back in operation sooner, less time is required for maintenance and investment for replacement components is minimized. *(bey)*

## Oerlikon concludes the sale of its natural fiber business

Oerlikon has completed the sale of its natural fiber business to the Chinese Jinsheng Group. In future, Oerlikon will concentrate exclusively on the manmade fiber sector and has renamed the remaining Textile segment, which is now called Manmade Fibers. Under the Oerlikon Barmag and Oerlikon Neumag brands, Oerlikon Manmade Fibers offers total solutions for the manufacture of filament yarns, nonwovens, carpet yarns and synthetic staple fibers and is the global market and technology leader in this sector. With immediate effect, 57-year-old Stefan Kross has been appointed as the CEO of the renamed business. The new Manmade Fibers segment will continue the successful development of the manmade fiber business with a systematic focus on innovation, customer satisfaction and value added. *(ama)*

## China Service with comprehensive offerings

The Oerlikon Manmade Fibers After Sales Service has restructured itself at its Chinese sites and hence further-optimized its offerings for customers. The merging of Oerlikon Barmag and Oerlikon Neumag offers synergies above all in the service segments. In addition to being closer to local contact partners for Sales, After Sales, Original Parts and Project Management, a comprehensive spare parts warehouse in Suzhou also guarantees fast provision of original parts for machines and systems of both product brands. Furthermore, maintenance and repair services for machines, systems and components of both brands are carried out in the local workshops, hence ensuring that the downtimes are kept as short as possible. *(bey)*

## Focus on customer requirements

To be able to even better cater to customer requirements, 50 sales and distribution employees from Oerlikon Manmade Fibers in China, India, the USA, Neumünster, Remscheid and Chemnitz met up in Switzerland between May 24 and 27, 2013. The focus of the meeting was to exchange ideas and experience on the markets, new technologies and customer requirements. Presentations by internal and external experts and a visit to Oerlikon's sponsorship partner Sauber in Hinwil rounded off the packed program. *(bey)*



## WINGS success

The launch of Oerlikon Barmag's Winder Integrated Godet System WINGS POY and WINGS FDY was, and remains, a complete and utter success. In excess of 12,000 POY winders have been installed since 2007, while the WINGS FDY – which was launched three years later – has now been sold almost 3,200 times. *(aw)*

## Next BCF Symposium ahead

For the eighth time in succession, Oerlikon will be hosting its BCF Symposium in Neumünster in 2014, an event which has meanwhile established itself as the international carpet yarn manufacturers' industry meet. Directly following the Domotex in Hanover, guests will be taken by bus to the evening event in Neumünster on January 14, 2014. The following day includes interesting presentations on current market, application and technology topics as well as a tour of the Neumünster production site. The return journey to Hamburg airport or train station is planned for the afternoon of January 15, 2014. Anybody interested can now register to attend by writing to: [bcf-symposium2014@oerlikon.com](mailto:bcf-symposium2014@oerlikon.com) *(aw)*

## Events

### FloorTek

September 10-12, Dalton GA, USA  
[www.floor-tek.com](http://www.floor-tek.com)

### Qualitative Anforderungen an Textilien

September 19, Hamburg, Germany  
[www.chemical-fibers.com](http://www.chemical-fibers.com)

### Techtextil India

October 03-05, Mumbai, India  
[www.techtextil-india.co.in](http://www.techtextil-india.co.in)

### 1st Asia Pacific Symposium

October 22, Shanghai, China  
[www.nonwovens-symposium.com](http://www.nonwovens-symposium.com)

### FILTECH 2013

October 22-24, Wiesbaden, Germany  
[www.filtech.de](http://www.filtech.de)

### SINCE

October 23-25, Shanghai, China  
[www.since13.com](http://www.since13.com)

### The PCI FIBRES Conference 2013

November 07-08, JW Marriott Hotel, Pacific Place, Hong Kong  
[www.pcifibres.com](http://www.pcifibres.com)

### Domotex Middle East

November 07-10, Istanbul, Turkey  
[www.domotex-middle-east.com](http://www.domotex-middle-east.com)

### FILTRATION

International Conference & Exposition  
November 12-14, Chicago, IL, USA  
[www.inda.org](http://www.inda.org)





## Polyester **H**igh **M**odulus **L**ow **S**hrinkage with EvoQuench **"Green"** Tire Cord

The most important application for HMLS (high-modulus low-shrinkage) polyester yarn is tire cord. The material is predominantly used in high-speed tires, which – as a result of the high speeds achieved – are subjected to particularly high loads. Here, strong polyester tire cord has almost completely replaced viscose fiber rayon for ecological reasons. The decisive benefit of HMLS yarns compared to alternative polyester yarns is the extreme dimensional stability of the high-performance yarn.

**A**s a result of contact with the road, tires are subjected to a constant friction, which heats up the tires and consequently increases the internal air pressure. Therefore, the higher the speed, the higher the tire temperature and the pressure within the tire. And this is precisely where high-modulus polyester comes into its own: reinforcing tires with dimensionally-stable HMLS also permits high speeds with a high degree of safety. In other words, tires made from HMLS yarn remain dimensionally stable even under loads and at high temperatures.

### Process-technology challenge

The HMLS yarn acquires its unique properties in the spinning process. High speeds in the production process guarantee a stable arrangement of the molecules within the polymer, which forms the actual filament. The internal structure of the molecule chain is in turn decisive for the dimensional stability of the subsequent yarn.

Manufacturing this challenging material in an economical manner therefore requires stable process technology and high-quality components. These determine the requirements for the spinning plant, the godets and the winders. The higher the spinning and winding speeds, the more sensitively the filaments react to even the smallest irregularities in the polymer melt, which can then quickly result in breaks in the filament. As in the case of all filament yarns, each yarn break impacts on the quality and the sale price of the yarn packages. Here, the solution lies in designing the spinning plant components in a way that balances out the unavoidable contamination in the melt. Oerlikon Barmag HMLS systems therefore now work with the EvoQuench quenching system, which has already proven itself in the textile processes. Filament bundles with up to 600 individual filaments are evenly spun, cooled and spin-finished and in this way allow homogenous threads of between 1000 and 2000 denier to be manufactured.

The thick titers are gently and evenly drawn on up to six godet duos. The – compared to conventional industrial yarns – more intensive and longer yarn heat-treatment time guarantees the required low shrinkage values. Subsequently, the yarn is wound using latest-generation ACW high-speed winders at speeds of up to 7,000 meters per minute.

### Green technology

Using the EvoQuench system for manufacturing industrial yarn is also setting new standards in terms of energy savings. As in the case of textile processes, the e-save certified EvoQuench system dramatically lowers the energy consumption. Depending on the titer and the dpf, the consumption of the compressed air so decisive for the energy consumption in quenching is reduced by up to 80 percent compared to a cross-flow quenching system. For a standard system size with four ends and an assumed electricity price of US\$ 0.10 per kilowatt hour, the system operator saves around US\$ 30,000 per year and position in terms of energy costs by just using the EvoQuench alone. Correspondingly, carbon footprint calculations for a four-position polyester HMLS system with EvoQuench quenching have revealed annual savings of just under 152 tons of CO<sub>2</sub>e compared to the alternative with cross-flow quenching. And a pleasant side effect: due to the considerably lower air consumption, the air-conditioning systems can be correspondingly smaller in scale, which in turn reduces investment costs for air-conditioning by more than 50 percent.

Compared to alternative system concepts available on the market, the Oerlikon Barmag HMLS concept scores highly above all as a result of its proven high-frequency godets. As a result of the resonance frequency-operated induction heater, the godets alone provide hourly savings of up to 8 kW per position.

One of the first new-generation HMLS systems will be commissioned at a Chinese tire cord manufacturer in September.  
*(en, bey)*



**The Process:**  
4 or 2 ends

Denier Range:  
up to  
4 X 1,500 den  
or  
2 X 3,000 den

Winder Type:  
ACW71Y-1200/4





# “Nylon is our business !”

**Interview with Mr. Tuncay Uzun owner of Anadolu Iplik**

"Nylon is our business" states Tuncay Uzun, owner of the Turkish nylon specialist Anadolu Iplik not without a trace of pride and self-confidence. And he is very justified in being so – the company, headquartered in Çerkezköy, approximately 80 kilometers east of Istanbul, is able to look back on decades of experience in the textile sector, initially as a yarn trader and, for some years now, also as a manufacturing and texturing enterprise of high-end nylon 6 yarns. Furthermore, Anadolu Iplik is the only company in Turkey that manufactures PA6 granulate using its own poly-condensation plant. We had the opportunity to meet up with Tuncay Uzun.

Mr. Uzun, you have specialized in the manufacture and texturing of nylon. What were your reasons for this?

„Anadolu Iplik has been active in the textile business for a long time and has a very profound understanding of the market for PA 6 yarns. To this end, it was simply a logical step for us to invest in the manufacture of this product. Our detailed experience of the nylon market enables us to correspond to the requirements of our most demanding customers and to develop innovative products. “

Originally, you have started out as a texturing company. Meanwhile, you have integrated deeply along the entire value-added chain with your new poly-condensation plant and the spinning plant. How did this transpired?

With approximately 450 employees, around 200 of whom work in our cotton division, we manufacture 1,200 tons of nylon yarns every month. Of this, around three-quarters goes to our texturing division, while the rest is further processed as FDY yarns. It was a cost-profitability estimation – in which the experts at Oerlikon Barmag provided us with considerable support – that showed us that purchasing POY and FDY yarns from Europe would not pay off in the long term. We wanted to be able to run our business independent of the respective prices in the upstream production stages, which is why we decided to initiate “backward integration”. And we can also guarantee the high quality of our yarns, because everything comes from a single source.

The same also applies to the investment in our poly-condensation plant, which will start producing next month. With an output of 65 tons per day, this systems enables us to cover both our own requirements of PA6 granulate and also to sell the excess on the open market. That makes us extremely independent!

What are your primary markets and how do you anticipate their development?

Our yarns are deployed in the manufacture of hosiery, underwear, high-end sports apparel, ladies' outerwear and other fabrics. 85 percent of our production is sold locally within Turkey itself, while the rest is exported. However, I am extremely confident that the export ratio will increase to approximately 35 percent by 2014.

You chose Oerlikon Barmag as the partner for your business model. Can you please tell us why?

Once we had decided to start a new business field with our nylon production facility, we went in search of an expert with the experience in every single step of the textile chain. And this is precisely what we found in Oerlikon Barmag. As a “solutions provider”, Oerlikon Barmag competently accompanied us practically from the planning phase of the granulate unloading station all the way through to the finished textured package.

Thank you.

The interview was led by Oliver Lemke (ole)



Originally being a texturing company Tuncay Uzun's Anadolu Iplik integrated backwards with a polycondensation plant and spinning plant.



# Hidden Champions

the **right products**  
at the **right time**  
for the **right markets**

What are the objectives of product management within the manmade fiber machine and systems construction sector?

Well, they are very clear: they ensure that products are managed – from the market launch all the way through to the removal of the item from the product portfolio. So far, so good. But what customer benefit does product management offer the business-to-business world of industrial goods?

The world is spinning ever faster. This rings true for the manmade fiber industry as well, which has also had to overcome the occasional crisis. Internationally-active companies must be prepared to be able to correctly react to this cyclical nature of the markets and to increasingly intensive competition.

In other words, capacities must be carefully utilized to ensure the right products are developed, manufactured and sold for the right markets. Initially, this sounds quite simple – however, the manmade fiber industry is active in an extremely-difficult market environment. And what will the right products be in the future and for which markets will they actually be destined?

And this is precisely the focus and primary remit of the Oerlikon Manmade Fibers Product Management division, which was set up in early 2013: the main focus is not on our own products, but on those of our own customers. This extremely broad understanding of product management ultimately also helps combat the longer development times so common within the high-tech segment. Correspondingly, the organization of this division is also split into the Apparel, Technical Textiles, Floor Coverings, Disposable Non-wovens and Plant Engineering segments. It is only when you look at the user markets that you can draw the conclusions for correctly managing your own technologies. "The focus on the markets of our customers is designed to provide an even better understanding of the requirements of technologies and processes, so that they can be included in the development of our systems and process solutions at an even earlier point in time. The objective is to create a product portfolio that guarantees optimum provision for our customers", explains Rainer Straub, Head of Product Management at Oerlikon Manmade Fibers, commenting on the underlying idea.

Here, comprehensive information and profound knowledge of the various further processing procedures and methods that follow fiber and yarn production is very helpful. "This is how we understand the requirements that our customers' customers have for their products and are able to better support our customers with the right products", believes Markus Reichwein, Productmanager Apparel. "Needless to say, these also include collaborations and the intensive exchange of experience with suppliers within the textile machine construction sector, such as in the case of knitting machines or dyeing works technology, for example." For this, the team travels the world visiting customers and their customers, researching and learning with the objective of ultimately being able to provide the respectively suitable solutions for the Oerlikon Manmade Fibers international clientele.

To place all this on sound and, above all, objective foundations, a further focus of product management lies on the topic of market research. Here, profound knowledge relating to the yarn and raw materials markets, along with market volumes and ratios, helps to classify the demand for new technologies and to correlate them macro-economically.

"Machine and systems construction has always been characterized, and defined, by market cycles. To be better prepared for these, we must be extremely familiar with our target markets. For this, our market researchers collate and analyze the corresponding data. In principle, both economic and technological trends are researched across the entire sector, with the objective of making the right decisions for the benefit of our customers", summarizes Rainer Straub. (bey)

**"In principle, both economic and technological trends are researched across the entire sector, with the objective of making the right decisions for the benefit of our customers."**



The product management team, led by Rainer Straub (above right), has market and technology trends in mind. Above from left to right: Mathias Gröner-Rothermel, Münevver Alkis, Dr. Ingo Mählmann; below from left to right: Rainer Schneider, Markus Reichwein and Janina Huljus.



## Techtextil Frankfurt 2013 – a Review

The Techtextil Frankfurt 2013 – which was held between June 11 and 13 – was a huge success for Oerlikon Manmade Fibers. This year, the focus of the trade fair stand was clearly placed on the new industrial nonwoven products. Firstly, Oerlikon Neumag showcased its newly-released spunbond production systems for manufacturing

- Bitumen roofing substrate,
- Roofing underlayment and
- Geotextiles.

The open and welcoming layout of the trade fair stand was supported by the sophisticated 3D virtual reality presentation room in the background, providing customers with a space for technical and sales discussions.



Presenting solutions for the production of construction textiles and geotextiles with Oerlikon Neumag's new spunbond technology was clearly in line with a strong, contemporary trend.

Both the sales and technical staff were in constant demand with interested customers. Various discussions were held – starting from the very strategic plans of customers looking for new application fields to broaden their product portfolio all the way through to concrete requests for quotations for these new lines – and all accompanied by refreshing beverages.

Spunbonds are increasingly being used as cost-efficient alternatives for technical applications including roofing and geotextiles, but also for many other technical applications. In addition to the classical major markets for geotextiles and construction textiles, promising growth rates are expected particularly in emerging economies and emerging industrial countries due to numerous required general construction and civil engineering measures. Oerlikon Neumag's spunbond plants for technical applications are veritable space miracles and excel with a significantly higher throughput for comparable operating widths.

### Huge interest in specialty yarns

The constantly-rising demand for high-tenacity specialty yarns – such as aramid fibers, UHMWPE and carbon fibers, for example – was also reflected in the discussions at the trade fair stand. At the same time, topics including energy consumption, space requirements and efficiency were discussed. Here, the Oerlikon Barmag WinOro winder was the focus of interest.

Depending on the design, the automatic precision take-up head for specialty yarns winds – at a speed of up to 1,000 m/min – baler twine of up to 25,000 denier, PVC-coated multifilament yarn for various industrial applications and also textured artificial turf filaments.

Energy efficiency and productivity are the outstanding properties of the WinOro 2-cop winder. With the energy consumption reduced by up to 45 percent compared to automatic single-cop winders, the 2-cop winding system WinOro-S 2-cop distinguishes itself markedly from comparable products available on the market. Furthermore, the space required for the system is reduced by approximately 50 percent compared to the single-cop variant.

The manufacture of carbon fibers was also a focus of trade fair discussions. Carbon fiber-reinforced plastics are deployed in the aerospace industry, in wind power systems, in the automobile sector, in safety technology and also in high-end sports equipment such as racing bicycles, tennis rackets, skis and boats among other areas.

With the WinTrax, Oerlikon Barmag has developed a winder especially for the manufacture of carbon fibers. The two-end winder unites the economic production of carbon fibers of the very highest quality with a simultaneously perfect package build and identical running length.

### Focus on safety

And information on the so-called 'industrial textiles' for deployment in safety clothing, seat belts and airbags in the automotive sector, in sails and fishing nets and in belts, conveyor belts, hoses, ropes and geotextiles also proved very popular among trade fair visitors.

Oerlikon Barmag's industrial yarn systems are designed and manufactured in accordance with the yarn quality, efficiency, process requirements and conversion costs criteria. Depending on the requirements of the respective yarn manufacturer, industrial yarn systems with between 6- and 16-ends are deployed today, while systems with between 16- and 24-ends are used in the low titer range.

High-tenacity yarns with heavy titers are used in conveyor belts, for example, or – as an application with huge potential – in geotextiles. The properties required for geotextiles – such as high tenacity, high modulus and low creep characteristics – are absolutely decisive for keeping textile-reinforced floors and stone in place.

Sales and distribution expert Manuela Friedrich looks back at the trade fair with satisfaction: "The quality of the contacts was truly exceptionally good." And nonwovens specialist Dr. Ingo Mählmann also emphasizes the huge customer interest: "We conducted a whole series of interesting discussions." (wa)

# Know How What When

## The Fiber Year 2012



### Summary

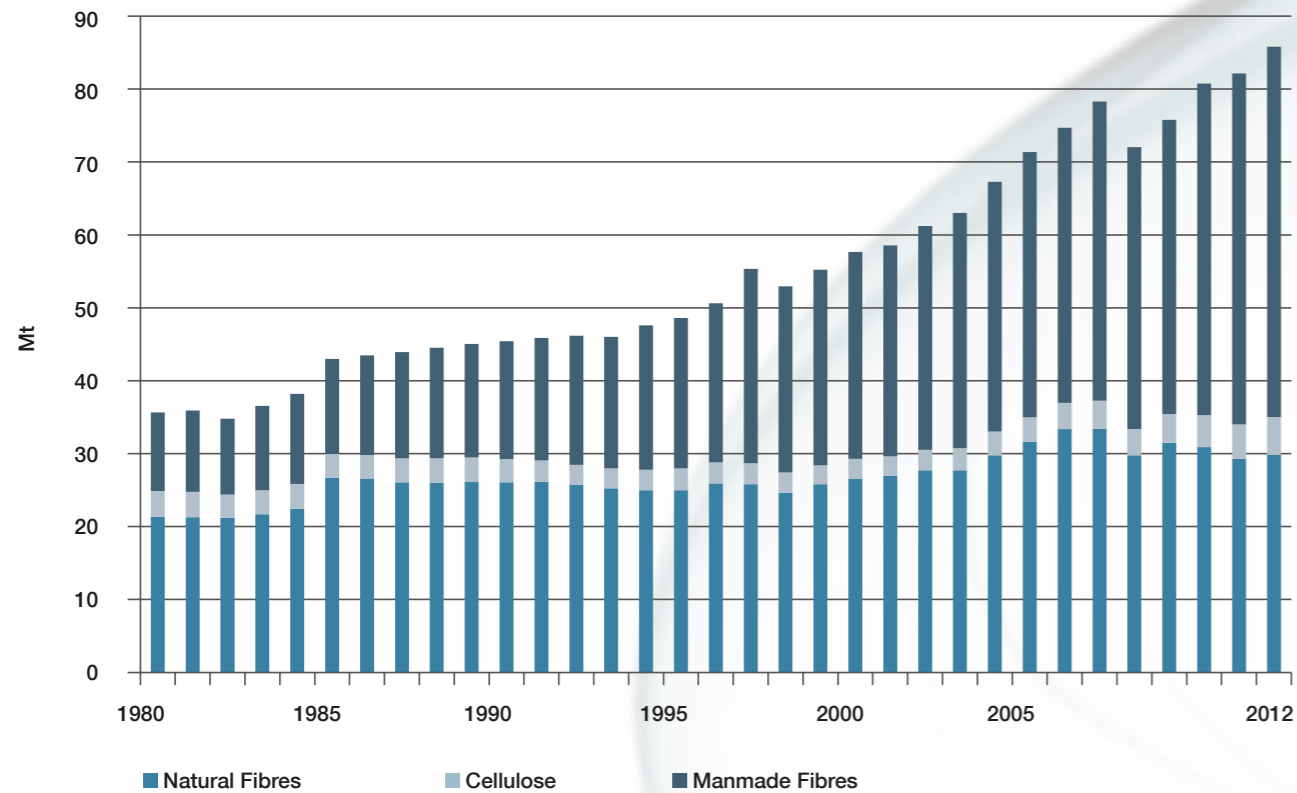
In 2012, the production volume of the worldwide textile industry increased by 1.9 percent to 88.5 million tons. This is made up of an increase in manmade fibers of 6 percent to 56.0 million tons, whereas the production of natural fibers fell by 4.3 percent to 32.5 million tons.

However, the consumption is of greater importance for further processing of fibers and yarns. While manmade fibers can fundamentally be manufactured on a requirements-oriented basis, natural fibers are subject to climatic conditions and other natural uncertainties. For these reasons, production and consumption are usually not coupled. This leads, in particular in the case of cotton, to deviations, which can amount to several million tons over a year. The International Cotton Advisory Committee (ICAC) continually updates this kind of data on a worldwide basis. An almost balanced relationship is assumed for all other natural fibers.

On the basis of this, the consumption of fibers and yarns rose by 4.5 percent to 85.8 million tons last year. This represents a considerably more dynamic result than was the case in 2011, where growth of 1.7 percent was registered. This volume corresponds to an average per-capita consumption of 12.2 kg.



## Worldwide Fiber Demand



The considerable drop in cotton prices has led to numerous countries reducing their cultivation areas. As a consequence of this, investment in spinning plants has tangibly decreased; according to information provided by the International Textile Manufacturers Federation (ITMF), installations of both short-staple spindles and rotors have each fallen by more than 20 percent.

The lower consumption demand within the EU and the USA, in conjunction with lower prices, has resulted in an historical low in wool production. Surprisingly, the sale of long-staple spindles has increased by almost 30 percent. The worldwide production of cellulose fibers once again reached a record high in their more than one-hundred-year history. Global production rose by 10.2 percent to almost 5.2 million tons. These fibers therefore impressively confirm their position as the veritable growth star. Since 2000, they have demonstrated an average annual growth of 5.4 percent.

And the synthetic fibers segment also recorded a new record, with more than 50 million tons being manufactured for the first time in its history. The rise over the past year totaled 5.6 percent, increasing to 50.8 million tons. Staple fibers rose only below average, with an increase of merely 1.9 percent to 17.5 million tons. The dynamic within the filament yarn market – which has been noticeable for several years now – continued, with output increasing by 7.6 percent to 33.3 million tons. The overall segment was primarily carried by growth in the demand for polyester, whose manufacture exceeded 41 million tons. Polyamide and polypropylene also increased slightly, whereas three years of growth for acrylic fibers finally came to an end with global production falling by almost 3 percent.

### Selected raw materials for manmade fibers

Above-average investment in cellulose continued, with the result that the worldwide capacity experienced potentially record-breaking growth of 21.6 percent to 6 million tons. A considerable proportion of this is attributable to systems that can produce both cellulose for manufacturing paper and manmade cellulose for the manufacture of fibers. And these expansions of capacities are expected to continue over the coming years.

Paraxylene, terephthalic acid and ethylene glycol are the most important raw materials used in the production of polyester fibers. While capacities for paraxylene were massively expanded in 2008 and 2010, investment has substantially cooled over the past two years. In 2012, growth in capacities totaled just under 3 percent. This is expected to improve again in view of various projects in Asia and the Middle East. In contrast, expansions in terephthalic acid capacities were dynamically driven forward, particularly in Asia and – specifically – in the People's Republic of China. The ethylene glycol segment stagnated at a low investment level, with just two new facilities being opened in the People's Republic of China. In view of the dynamic development of terephthalic acid and the downstream polyester capacities, quite high capacity utilization rates will be unavoidable before a series of new plants commence commercial production over the next few years.

Caprolactam, the basis for around two-thirds of the polyamide market, is characterized by investment in the People's Republic of China. The aim of the capacity expansion is predominantly to substitute for foreign imports. In view of the less dynamic outlook in the downstream fiber sector, this raises the question as to the commercially-viable utilization of existing systems and plants. Consequently, established providers have already carried out adjustments or have at least announced that they are planning to do so.

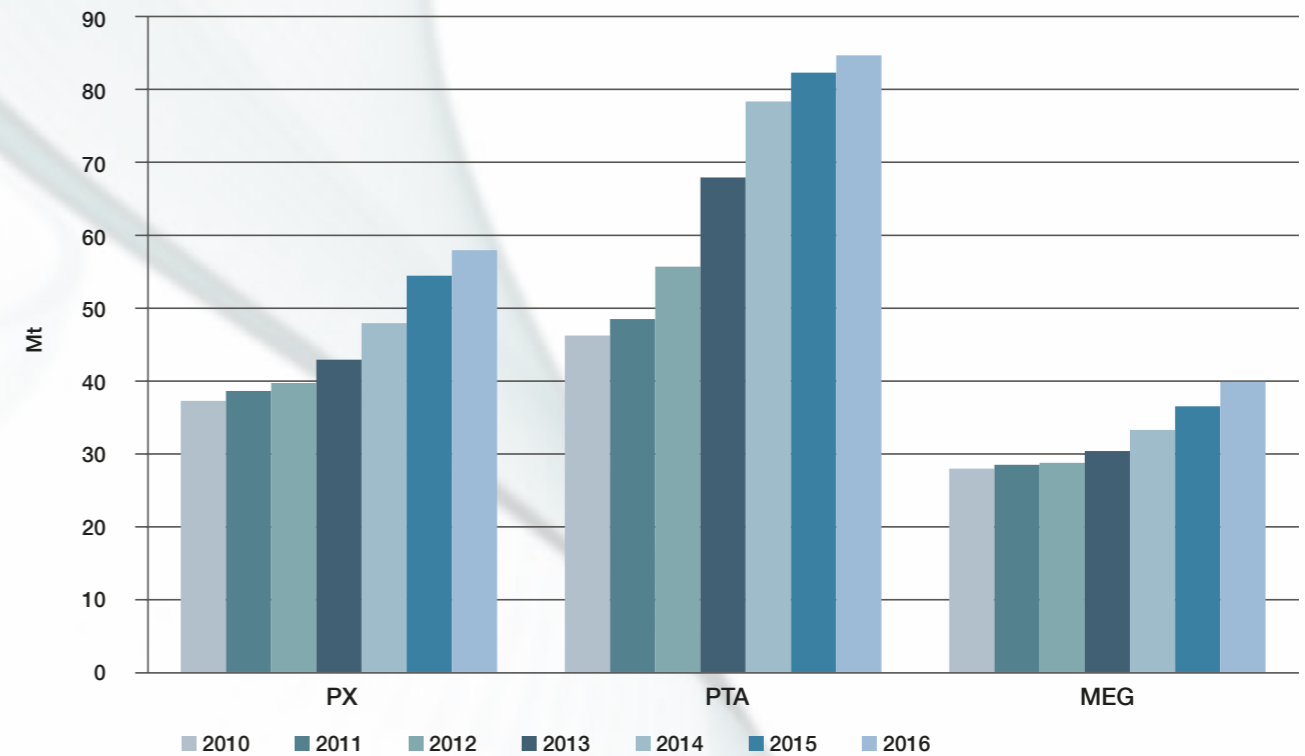
The graph above summarizes the development of the described raw materials.

### Staple fibers

The global market for staple fibers has risen by 2.6 percent to 52.1 million tons. The large-scale segments of natural and synthetic fibers each increased by just under 2 percent, while cellulose fibers shot up by 10.8 percent. The production of viscose fibers rose by a remarkable 13 percent, whereas acetate fibers – predominantly for use in cigarette filters – increased by 3.1 percent to almost one million tons. The greatest growth – at 13 percent – was registered in Asia, although Europe was also able to increase production by 3.9 percent. In the USA and Latin America, output rose by 2.7 percent.

Synthetic staple fibers also reached a new record high, although – at just 1.9 percent – last year's increase was considerably smaller than the long-term growth rate for these fibers of 3.4 percent. All regions contributed towards an increase to 17.5 million tons. Growth was higher in both America and Europe than it was in Asia, which manufactures around 80 percent of all synthetic staple fibers.

## Development of Selected Polyester Raw Materials



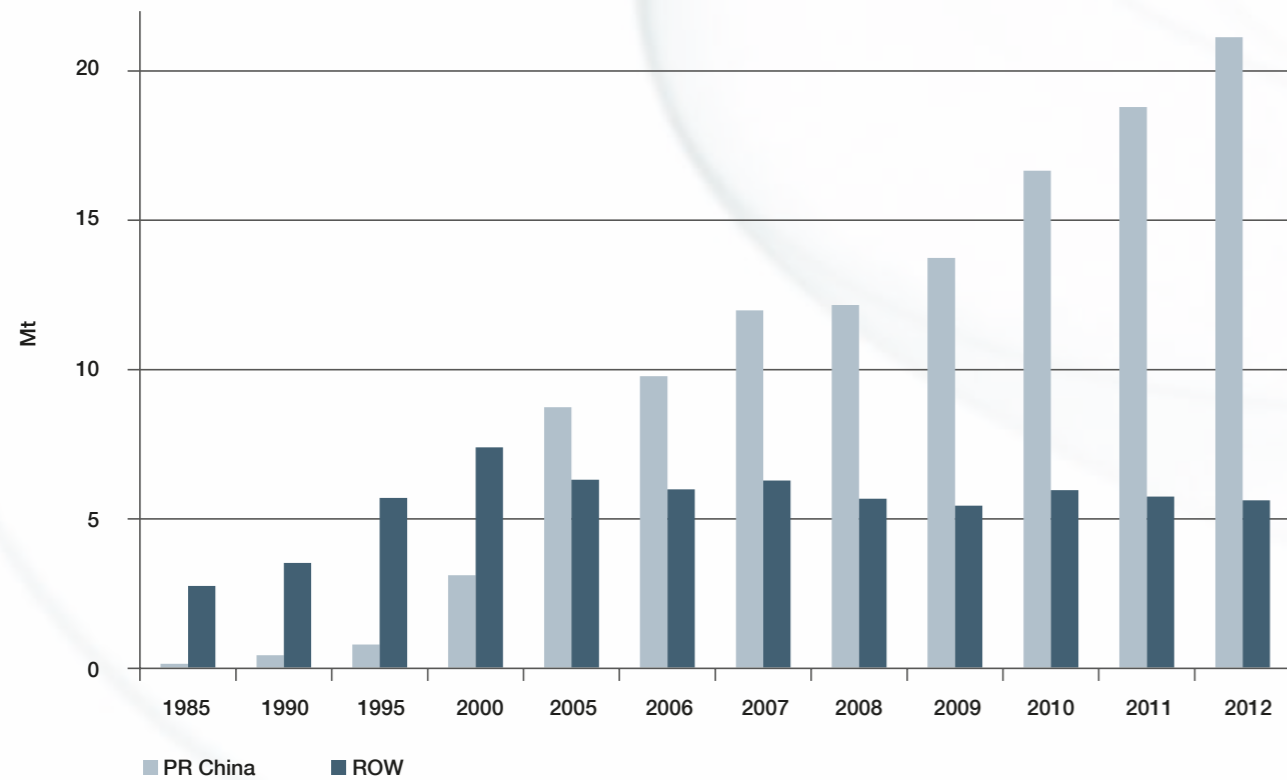


### Filament yarns

This segment grew by 7.6 percent to 33.7 million tons over the year. Here, polyester yarns are the dominant product. Last year, they rose by 9.1 percent to 27.3 million tons. The second-largest segment of polyamide yarns experienced weak growth of 0.5 percent, rising to 3.7 million tons. All other filament yarns also increased slightly in volume. An examination of the various yarn types shows that the largest segment of textile yarns grew by an above-average degree in 2012. The manufacture of textile yarns rose by 8.9 percent to 28.4 million tons. In contrast, industrial yarns grew by around 1 percent to 3.2 million tons, while carpet yarns remained almost unchanged at just over 2.1 million tons.

The market-dominating position of the People's Republic of China is the result of their 70-percent share of global production followed by the USA and India each with a 5-percent share. The shifting of spinning capacities to Asia is illustrated clearly in the following figure, with the focus on Chinese production in comparison to the rest of the world. (ae)

### Polyester Filament Production



The 13th edition of the textile annual – 'The Fiber Year 2013' – was unveiled in front of an international trade audience within the context of a press conference held at the Industrievereinigung Chemiefaser e.V. (Manmade Fiber Industry Association – IVC) in Frankfurt at the end of April. The 173-page electronic report looks at natural and manmade fibers, important raw materials – along with an outlook through to 2016 – and non-wovens. Furthermore, twenty country profiles for leading manufacturing and consuming countries provide a global overview of the current developments within the textile industry. Finally, a comprehensive statistical attachment supplies the most important information at a glance. As in previous years, the annual is supplemented with a whole series of articles by industry experts.

More detailed information on the annual can be found by going to:  
[www.thefiberyear.com](http://www.thefiberyear.com)





# The most important factors are hidden

## Ceramics in manmade fiber production

Handle with care – this also applies to the manufacture of manmade fibers. Yarns and fibers have to be handled carefully if they are to comply with the industry's increasingly high quality standards. The friction to which the filament bundle or the yarn is subjected during the production process should be minimal and, above all, even to guarantee good yarn quality. Within the filament process, ceramic surfaces are found in the various yarn guides, friction discs, yarn-oiling systems and on some plasma-coated godets, for example.

### What really counts!

In the case of all ceramic components that come into contact with the delicate threads, both the geometry of the component and the hardness and microstructure of the ceramic deployed are decisive. To this end, laboratory tests and research on standard U guides akin to those used in the WINGS FDY have revealed that – despite the same or similar external appearance of the parts – they harbor huge differences. An excessively soft ceramic with a noticeably coarse structure subjects the thread to extreme friction and negatively impacts on the yarn quality. The yarn-break ratio increases disproportionately, so that the process reliability is no longer guaranteed. Furthermore, the softer the ceramic deployed, the sooner the components wear out. Hence, the savings made for their initial purchase are soon absorbed by higher follow-up costs. (bey)



## New service initiative of Oerlikon Manmade Fibers:

# Partnering for Performance

Oerlikon Manmade Fibers extends its new service initiative “partnering for performance” for its product brands Oerlikon Barmag and Oerlikon Neumag step by step.

In textile machine construction, progress is being made at break-neck speed and the production processes are getting ever better. However, they are also becoming more complex, requiring reliable steering and monitoring so as to avoid costly machine downtimes. Those dispensing with optimum services in this area are taking huge risks: if the technology or the service proves not to be future-proof and performance-appropriate, investments can quickly become worthless.

Oerlikon Manmade Fibers offers their customers a strong service partnership. It is for this reason that Oerlikon's motto and claim is ‘Partnering for Performance’. This stands for a service initiative that benefits all those customers who want more than just service. The service offerings explicitly help to increase the value of your Oerlikon Barmag and Oerlikon Neumag hardware. With the service partner initiative, customers are making a wise decision – for future-proof investments, for a technological edge and for production certainty in your day-to-day business.

### Think globally and act locally

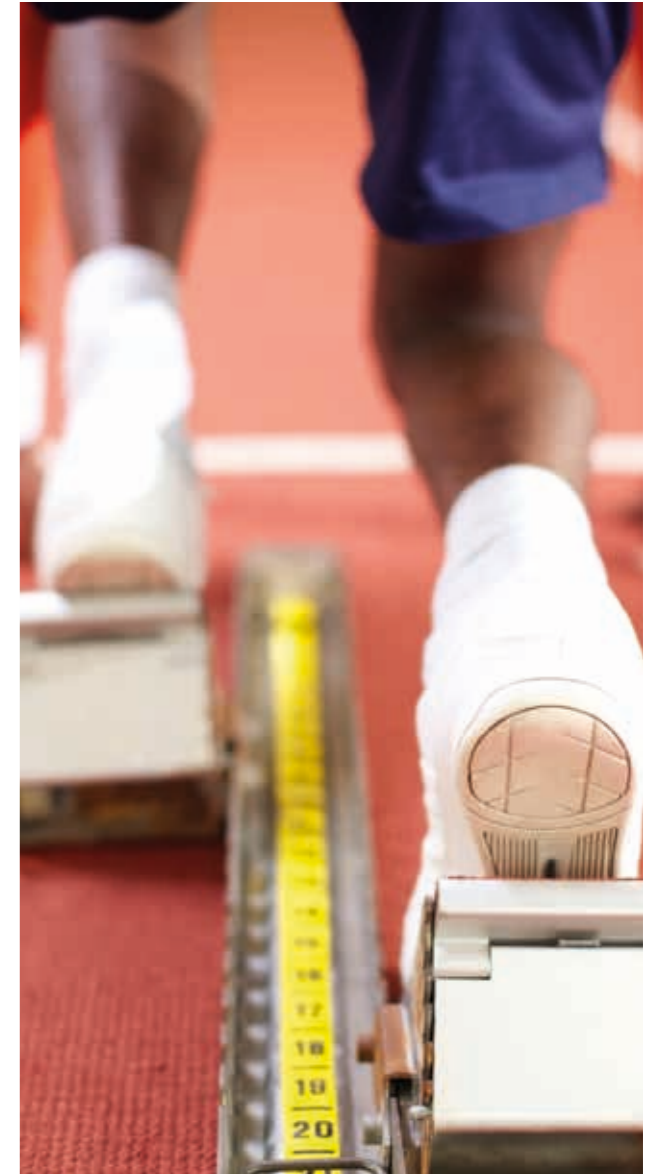
Oerlikon Manmade Fibers Service division offers an opulence of the most diverse products and services that will ensure that customers achieve their goals: faster return-on-investment (ROI), shorter downtimes and optimized processes. Oerlikon Manmade Fibers quickly and efficiently implement customer needs – whenever and wherever required. All this is secured by an experienced team of highly qualified employees at the company's headquarters in Remscheid, Germany, and at the more than 20 service stations that make up Oerlikon Manmade Fibers' global service network.

### We'll get you to the top

With its comprehensive Value Services, the company supports customers from the first business idea through to the operation of the plant. Oerlikon Manmade Fibers is the partner for performance:

- |  |                                   |
|--|-----------------------------------|
| ■ Consulting:                          | Our brains. Your success          |
| ■ R&D Center:                          | Your greenhouse of innovation     |
| ■ Training:                            | Win with a winning team           |
| ■ Installation:                        | It's all about the know-how       |
| ■ myOerlikon.com:                      | Access to Success                 |
| ■ Repair and maintenance:              | Surprises are a thing of the past |
| ■ Original Parts:                      | Nothing compares                  |
| ■ Troubleshooting:                     | Problem? No problem!              |
| ■ Surface and material testing center: | Taking a closer look              |
| ■ Modernization:                       | On the upgrade                    |

(aw)





## Relaunch of the successful myOerlikon.com customer portal

# Saving time using our intelligent online shop



The relaunched myOerlikon.com customer website offers state-of-the-art online services for systems and machine customers by means of PC, tablet and smart device.

Online services also enable considerably more efficient processes relating to maintenance, care, modernization and original parts procurement for machines within the textile industry. To this end, Oerlikon Manmade Fibers has now optimized its global myOerlikon.com website for the products and services of its two Oerlikon Barmag and Oerlikon Neumag brands in a user-friendly manner. Customers can now access tailor-made services even more easily and comfortably – and all this in eleven different languages and around the clock.

It has been live since the end of August: the latest generation of myOerlikon.com. The updated customer website reveals what users can expect just by looking at its new appearance. After logging in via a single sign-on procedure, the Windows 8 interface-style tiles permit fast access to all service modules no longer merely via a PC, but now also using a tablet or a smart device. All registered customers receive access to all information required for operating their product portfolios – precisely tailored to the machinery and the specific requirements of each and every customer.

The core of the website is the machine dashboard, which provides an overview of the customer's own machines with all the relevant service data – including original parts catalog and operating instructions. The media module supplies the user with the most up-to-date publications on the latest machine generations, comprehensive service offerings, training seminars along with technology support. The e-shop offers far, far more than merely 'shopping': users are able to not only place orders, access and view corresponding status information and view prices and stock online, they also have access to all their inquiries and transactions, including all the corresponding documentations such as packing lists, invoices and waybills, over the past four years.

"Even major B2C online shops frequently do not have a function of this kind. For this reason, we also offer our customers innovative, leading solutions in our service segment – and even greater transparency for increasing efficiency. Our website is online worldwide and around the clock and simplifies accurate scheduling of retooling times, the minimization of downtimes as well as optimum cost management with state-of-the-art functions", explains Marcel Bornheim, Head of Customer Support.

This is not least down to the optimized database link. Customers can now link their own data – in Microsoft Excel format, for example – even more easily with the myOerlikon.com ordering function and hence considerably reduce the time and effort required for entering data on the website compared to the previous version of the platform. Further innovations include the provision of information on special campaigns as well as the labeling of special products as hazardous goods. This will speed up any potential formalities when paying duties and importing goods. myOerlikon.com offers its services in eleven different languages. The system was developed over the previous months together with the new Saurer platform and is also available to Saurer customers. (aw)



## The **B2B** sector is growing with **e-services**

E-business will also become a growth market for B2B relationships within the machine construction sector.

Forrester Research forecasts total sales of US\$ 559 billion in the B2B e-commerce market in the USA alone by the end of 2013 – more than twice as much as for the B2C market (US\$ 252 billion). According to estimates, the global B2B market for e-business is worth several trillion US dollars. However, merely 25 percent of B2B marketers utilize e-commerce solutions – this is the summary of a "white paper" published by software maker Oracle in 2012. But the signs are already pointing towards growth: also in 2012, more than 80 percent of the international B2B companies interviewed are investing in e-commerce platforms, according to a 2013 Oracle survey.

And this is a trend that is also impacting on the machine construction sector. Market researchers from PricewaterhouseCoopers have observed that, although electronic solutions are often still merely offerings accompanying traditional sales channels in this classical industry, companies are however increasingly recognizing the opportunities provided by e-business solutions or that they are having to react to the market pressure experienced by major customers such as car manufacturers, for instance, and make corresponding electronic offerings available. In view of growing (customer-oriented) specialization within the machine construction sector, developments are moving away from product modules and more towards customized service modules.

"We have been operating the service platform for about 13 years now and are continually further developing it. We are not aware of any solution that is comparably high-performance within our sector. Utilization is possible at all times and the platform operates at a high level. Today, we process around 60 percent of our spare parts business using the system", explains Sascha Klemm, Senior Sales Manager Customer Support at Oerlikon Barmag. The platform has more than 1,000 users: Oerlikon Barmag and Oerlikon Neumag customers. In the first six months of 2013, the system was accessed 12,700 times, which included 1,200 orders and 1,300 inquiries.

All data are collated in an automated manner – insofar as the customer wishes, emphasizes Sascha Klemm: "Generally, we now merely check the data. This saves both the customer and us lots of time and costs, also because of the fact that time differences no longer play a role in global business here. It is for this reason that our main customer group in Asia loves using the platform." An important prerequisite for the future of the platform, as China is the world's largest machine construction market. (aw)

To learn more about Oerlikon Manmade Fibers' e-commerce solutions feel free to visit [www.myoerlikon.com](http://www.myoerlikon.com)





# A step in the “green” direction

## Carbon footprint analysis



Climate change is a verifiable truth and climate protection has evolved into a key competitive factor. Carbon footprint analysis is the cardinal step towards the more effective use of resources and energy – and, of course, towards greater profitability and success. Evidently, commerce and industry have had a big role to play in contributing to an alarming, worldwide problem – global warming. Oerlikon is aware of its emissions and is in the vanguard of those calculating, reporting and reducing their carbon emissions. Every industry is to some extent culpable for the exorbitant rise in greenhouse gases. Oerlikon is already beginning to recognize the need to engineer their energy use as strategically as possible with the objective of reducing the adverse impact. Oerlikon embarked on this green journey with its massive e-save program and its carbon footprint calculation.

A carbon footprint is defined as the measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product. Oerlikon Manmade fibers measures the total consumption and footprint for all three of its locations – Remscheid, Neumünster and Chemnitz – as we believe that “you can’t reduce what you aren’t measuring”.

**“Let’s be a part of the solution, and not the pollution”**

Oerlikon also regularly updates its product carbon footprint. Oerlikon’s biggest competitor for benchmarking in green products is none other than Oerlikon itself. The constant and new innovations are measured to show that the latest technologies are not only more efficient, but also greener and cleaner.

The benefits of taking action on managing environmental impact extend far beyond just being benevolent. Facilitating business to manage risk, harvest new areas of cost saving and escalate revenues – in stark contrast to conventional beliefs by many financial experts – has a positive and lasting impact on the corporate balance sheet. And carbon data is just as important as the financial data, as they improve both employee and stakeholder commitment.

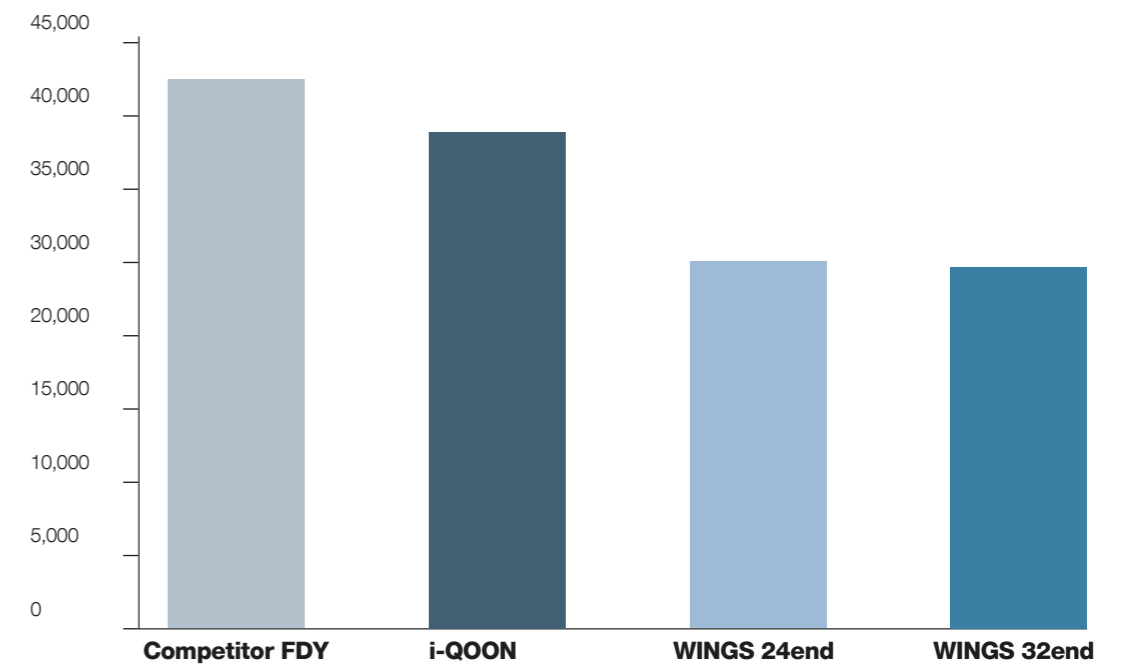
Oerlikon as a corporation is making considerable headway into going green. The Oerlikon Sustainability Team (OST) conducts workshops and presentations, aimed at educating the management on the importance and urgency of sustainability. The OST believes that the first step towards reduction

and measuring is to understand. Oerlikon Drive Systems in India is all set to embark on a pioneering activity to establish a new plant in accordance with the internationally-acclaimed LEED Gold certification. Oerlikon realizes that the rise in energy prices, the pending introduction of mandatory carbon reporting (MCR) within the next few years and the impact of extreme weather events are resulting in inevitable global complications.

Nevertheless, carbon emissions reduction protocols are essential for reducing costs, fostering efficiency, and driving growth. They enable a business to achieve a target in the most efficient, cost-effective way possible. Investors are increasingly aware of the need for businesses to demonstrate this sort of action to reduce a business’s carbon risk. It is clear that a company’s position on climate change is a driver for investment, and this will continue to grow.

To calculate the product carbon footprint (PCF), first the life cycle assessment according to ISO 14044, BSI, and PAS2050 is determined. Facilitating such ‘cradle-to-grave’ carbon footprint analysis of our products discloses the real PCF, identifies potential emissions abatement and accentuates the negative tradeoffs. Thanks to the constant research carried out by R&D, the latest innovations are not just more efficient, they are also greener. The graph below is an explicit verification of this fact.

**Carbon Footprint Comparison for the FDY process**  
Amount of tons CO<sub>2</sub>/year for the production of 207,36 tons/day





Product carbon footprinting is limited to only the emissions created by one plant, to set it up, and the emissions during the production over one year. Oerlikon Barmag has calculated the PCF for all of its textile machines.

Once we have determined and analyzed the PCF, the next step is to reduce it and make it carbon-neutral in the future. Reduction methodologies may include energy efficiency, eco design, fuel switching, material substitution, etc. In order to achieve carbon neutrality, unavoidable carbon emissions can be offset by investing in emissions reduction projects.

Oerlikon's holistic approach starts out by conducting comprehensive analyses of the carbon footprint of the organization and its products. Oerlikon understands the business benefits associated with carbon reporting – including the identification and the quantification of threats and opportunities. Furthering this action to build carbon efficiency into a business and to realize its powerful potential as a driver of performance requires its integration into the core of the business and leadership from the company to focus as much on monetary business goals as environmental concerns. With this approach, Oerlikon combines the benefits of satisfying the concerns of stakeholders, customers and enhancing its reputation with clear and tangible bottom line savings, risk management and the inevitable business growth.

Oerlikon does not just limit itself to, and keep a check on, the product consumption, it also controls the in-house company emissions. The footprint for the three German locations is approximately 17,218 tons of CO<sub>2</sub>e.

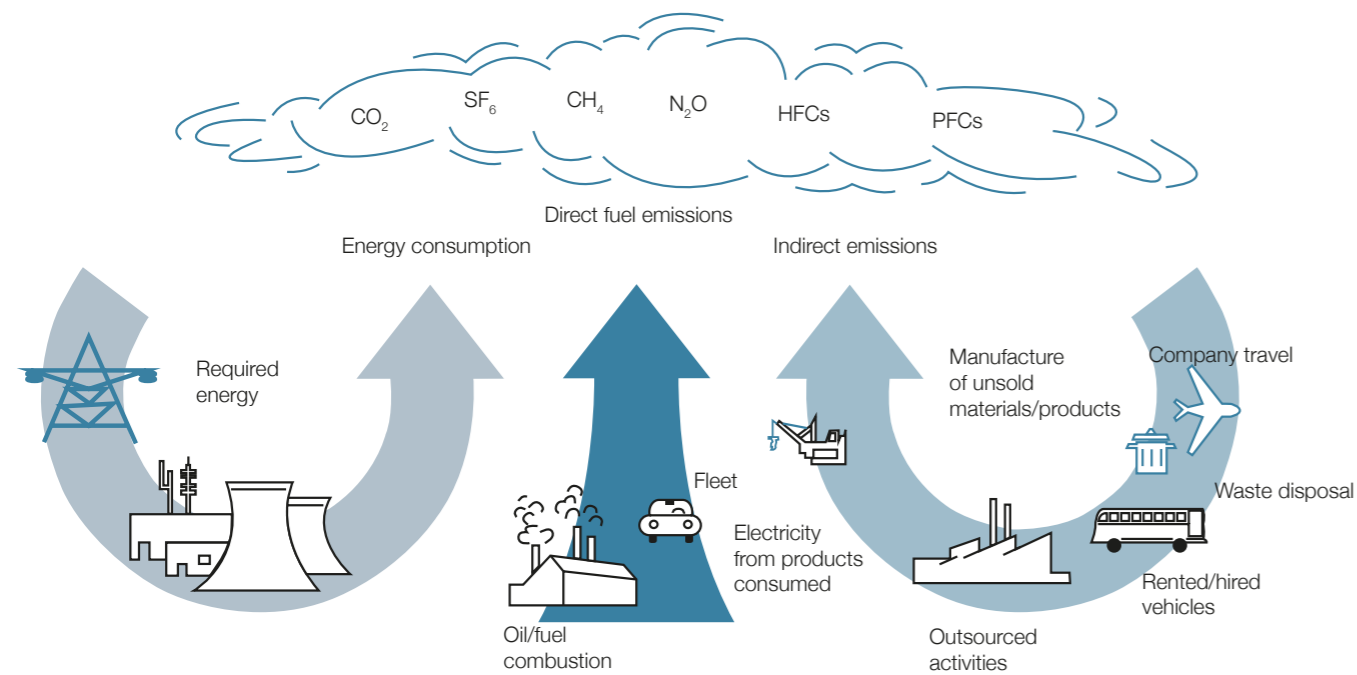
Reporting the carbon footprint is the most important part of carbon management. As stated in the Economia online magazine, "The GHG (Greenhouse Gas) protocol is the most widely used international accounting tool. GHG emissions reporting uses clear, concise and comparable performance metrics supported by a robust and transparent narrative. It is not yet known to what extent the government will go beyond just direct emissions. While the reporting of indirect emissions is likely to remain optional, it will be important for governments to try and ensure comparability where it is disclosed and for businesses to provide a footprint report that properly represents the true impact the business makes." (Source: <http://economia.icaew.com/opinion/july12/mandatory-greenhouse-gas-reporting-for-listed-companies>).

Intensity reports compare GHG emissions based on constant factors, such as number of employees, man hours worked, turnover and even floor space area. The intensity report summarizes all figures on one page, which makes it easier to analyze and view the results.

Nullifying carbon emissions is Oerlikon's aim for the near future. Oerlikon has been calculating its footprint for over a year now. Setting up such data collation is a huge task and is very complex due to the company's size and the dispersion of data. Oerlikon collectively works on integrating different segments, cross-checking data to ensure the carbon emissions data are as accurate as possible.

This article is aimed at – in conclusion - spreading awareness and making customers and stakeholders not only realize the need for carbon management, but also to show the steps taken by Oerlikon in the process of understanding, measuring, communicating, reducing and reporting its carbon emissions. Oerlikon's constant innovation in the field of technology is proving to be its increasingly lower energy consumption.

(pchat)



In addition to the full compensation of the CO<sub>2</sub> consumption connected with the printing processes Oerlikon Manmade Fibers used a high class recycling paper due to its demand for sustainable economy. The print version of this brochure is printed on "revive" by Deutsche Papier.



**oerlikon**  
barmag

**oerlikon**  
neumag

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