Sustainable growth through value innovation

通过价值创新实现可持续增长

Exclusive study on the occasion of the tenth anniversary of the CNTAC Round Table Forum

中国纺织工业联合会第10届圆桌论坛专稿

Beijing, January 2015
2015年1月 北京

Oerlikon Manmade Fibers
欧瑞康化学纤维

oerlikon
barmag

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neumag

Editorial – 编者的话

Dear Reader,

On the occasion of the tenth Round Table Forum in Beijing, I am very pleased that – with this exclusive Oerlikon Manmade Fibers study – we are able to propose potentials for future-oriented and environmentally-friendly manmade fiber production for the CNTAC and all its members. We have been closely accompanying our partners in China for more than half a century now.

With our POY, FDY and staple fiber spinning system innovations over the past five decades, we have been able to contribute to the extremely dynamic growth in the Chinese manmade fibers industry, and to the competitiveness of Chinese manufacturers.

As in all modern industries, though, growth is limited if ecological considerations go unheeded. With this in mind, in this study we want to identify ways in which innovative technologies can lead to considerably higher productivity while keeping energy consumption and land usage constant or even reducing these. This is why future innovations and continuous modernization of production facilities will form a key driver for the long-term success of yarn and fiber manufacturers in China.

Throughout these developments, Oerlikon Manmade Fibers will remain a reliable partner to the manmade fibers industry.

I hope you enjoy reading this study.

With best regards,

Georg Stausberg
CEO of the Oerlikon Manmade Fibers segment
欧瑞康化学纤维事业板块首席执行官

尊敬的读者：

值此第10届中纺圆桌论坛在北京举办之际，我非常高兴地以欧瑞康化学纤维此篇研究报告向中纺联及其成员介绍前瞻性和环保化纤生产的潜力。到目前为止，我们与中国客户的合作已经超过了半个世纪之久。

在过去的50多年里，通过对POY, FDY和短纤纺丝系统的不断创新，我们为中国化纤工业的快速增长和中国生产商竞争力的提高做出了贡献。

像所有现代化工业一样，如果忽视了生态环境问题，增长则会受到限制。以此为出发点，在此项研究中，我们希望找到解决这一问题的途径。在这些途径中，创新技术能够在保持或甚至降低能耗和土地使用的前提下提高生产效率。这就是未来创新和生产设施的不断现代化将成为中国纱线和纤维生产企业长期保持成功的主要动力的原因所在。

通过这些开发成果，欧瑞康化学纤维将始终是化学纤维行业可靠的合作伙伴。

希望大家愉快阅读此研究报告。

谨致问候

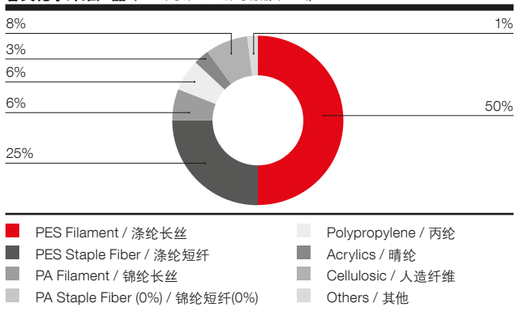
1. The manmade fiber market in China and worldwide – 中国及全球化纤市场

Worldwide, manmade fiber production totaled 58.6 million tons in 2013. 64% of this production took place in China, making it the largest market worldwide. In China, the share of polyester is around 82%, with polyamide accounting for only 5% of all manmade fibers in 2013. The other 13% are cellulosic, acrylic and polypropylene fibers. “The manmade fiber sector worldwide is now facing a tough situation. Markets that were thought to be expanding, such as Brazil and Russia, are seen to be too dependent on commodity exports, often to China. China itself exports nearly 60% of the manmade fibers it produces in the form of textiles and finished goods, so that, whatever the state of its domestic market, its fibers industry is very dependent on buoyant markets in the EU, Japan and the USA.” [1]

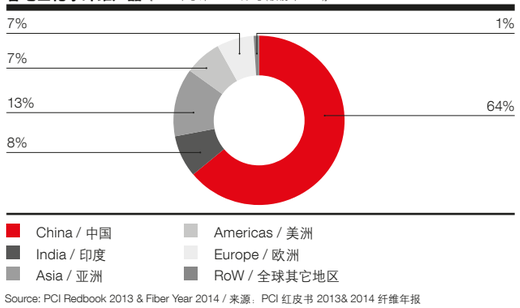
2013年，全球化学纤维产量达5 860万吨，其中中国的产量占64%. 成为全球最大的化纤市场。在中国的化纤产量中，涤纶约占82%. 锦纶仅占5%，包括纤维素纤维、腈纶和丙纶在内的其他纤维占13%. “全球化纤行业目前面临一个艰难的局面。被大家认为不断扩展的市场，如巴西和俄罗斯，太过于依赖商品出口，大多数情况下是对中国出口。中国本身大约有60%的化纤产量以纺织品和成品的形式出口，因此，无论其国内市场状况如何，其纤维工业对欧盟、日本和美国市场的依赖度也很高。” [1]

Manmade Fiber Market Overview
化学纤维市场概述

Manmade fiber production by type [(Total 2013: 58.6 mio t (+5% vs previous year)]
各类化学纤维产品 [2013年总计: 5860万吨 (较前年+5%)]



Manmade fiber production by region [Total 2013: 58.6 mio t (+ 5% vs previous year)]
各地区化学纤维产品 [2013年总计: 5860万吨 (较前年+5%)]



Source: PCI Redbook 2013 & Fiber Year 2014 / 来源：PCI 红皮书 2013& 2014 纤维年报

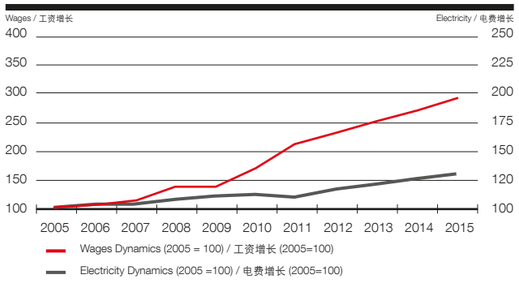
As China is currently the largest production site for manmade fibers in the world, the trend in electricity costs and wages in China plays an important role for the future of the textile industry there. From 2005 to date, China has faced a slight but steady increase in electricity costs. At the same time, wages have trebled, and today government aims to double the resident’s income in 2020 comparing with 2010.

由于目前中国是世界上最大的化学纤维生产基地，中国的电价和工资水平走向对其纺织工业的未来发展有重要影响。从2005年至今，中国已经历了电价小幅稳定增长。与此同时，工资增长了3倍，而且目前中国政府计划到2020年将居民收入在2010年的基础上翻一番。

In order to remain competitive, it is important to focus on topics such as energy savings and machine productivity. Currently, increasing environmental awareness is already leading to changes in the textile value chain; the noticeable trend from piece-dying to printing or dope-dying saves energy as well. In addition to this, increasing competition from low-cost countries requires good products at optimum production costs. In order to remain competitive with these, it is essential for China’s textile machine manufacturers to reduce production costs by focusing on energy savings, as energy accounts for a large share of operational expenses.

为了保持竞争性，必须要关注节能和机器生产效率等话题。目前，不断提高的环境意识已经使纺织价值链发生了变化；其中一个明显的趋势就是从匹染转向印花或纺前染色以节约能源。除此之外，来自低成本国家的竞争也要求中国企业以合理的生产成本创造出高质量产品。为了保持竞争力，中国纺织企业应通过节能来降低生产成本，因为能源在运营费用中占比很高。

Manmade Fibers Industry Indicators - China
化学纤维工业的方向标 – 中国



[1] Peter Driscoll 2014 (PCI)

2. Innovations in 50 years of partnership with China – 与中国50年的创新合作伙伴关系

Oerlikon Manmade Fibers and the Chinese textile industry – a success story

For more than 90 years now, the textile machines and systems supplied by the world’s leading Oerlikon Barmag and Oerlikon Neumag brands – part of the Oerlikon Manmade Fibers segment – have consistently provided new innovations for manufacturing manmade fibers. High-tech, ‘Made by Oerlikon’-quality machines can be found in the production halls of yarn manufacturers across the globe.

Oerlikon Barmag and Oerlikon Neumag have been reliable partners to the Chinese textile industry for the past 50 years. In the 1960s, the two partners kicked off an impressive success story together. The Chinese textile industry became the world’s leading textile manufacturer by deploying reliable technologies from Germany.

For many decades, the most important, future-oriented developments in the manmade fiber industry have come, and continue to come, from Oerlikon Barmag. If we look at the just past seven years, it becomes clear that ‘history’ can be transported to the present: WINGS, the compact take-up machinery for POY and FDY, offers the latest example of a revolutionary concept in a long line of ground-breaking innovations in filament yarn manufacturing.

欧瑞康化学纤维与中国纺织工业 – 一个成功的故事

90多年来，欧瑞康化学纤维事业板块旗下的两个世界著名品牌 – 欧瑞康巴马格和欧瑞康纽马格向全球提供的纺织机器和设备不断为化学纤维生产带来创新。高科技“欧瑞康制造”的高品质设备遍及全球化纤丝生产厂。

在过去50年里，欧瑞康巴马格和欧瑞康纽马格一直是中国纺织工业可靠的合作伙伴。早在20世纪60年代，这两个合作伙伴就开始一起撰写一个成功的故事。中国纺织工业通过从德国引进可靠技术而成为全球领先的纺织生产商。

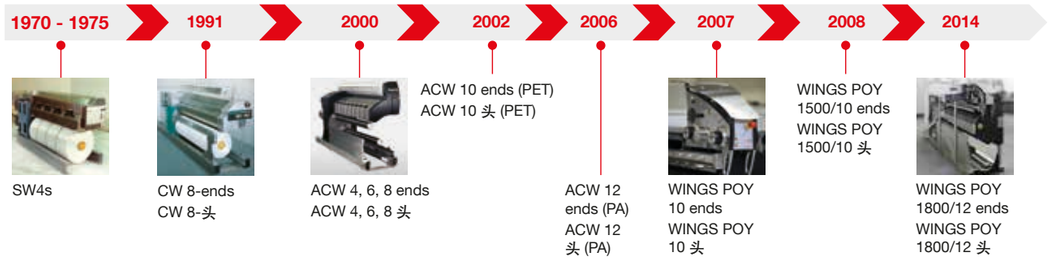
几十年来，欧瑞康巴马格一直源源不断地向化纤行业提供最重要的和前瞻性的开发成果。仅在过去7年里，我们就可以清楚地看到历史的演变：WINGS，这一紧凑型POY和FDY卷绕设备便是长丝加工中突破性创新成果的一个最新革命性概念。

3. The development of POY and FDY technology – POY和FDY技术发展概述

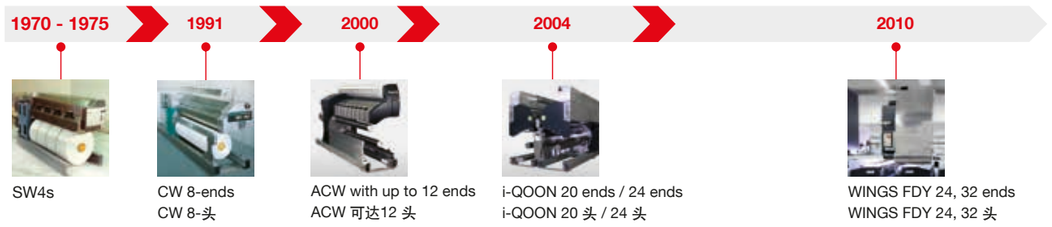
The age of fast POY and FDY spinning began in 1969 when the former Barmag AG developed the SW4S fast winder with winding speeds of 4000 m/min, 5000 m/min and even higher. This winder was part of a 'spinning-drawing machine,' which still spun yarn slowly, but then drew it at the winding speed in a directly subsequent work step and also provided it with the desired functional properties (stretch, tenacity, modulus, shrinkage, etc.).

高速POY和FDY纺丝时代始于1969年，当时，以前的巴马格公司开发了卷绕速度达4000 m/min, 5000 m/min及5000 m/min以上的SW4S高速卷绕机。这种卷绕机是一种“纺丝 – 拉伸机”的一部分，这种机器以较低的速度纺丝，但在一个直接后道工序里以上述速度对丝进行拉伸，并使丝获得理想的功能特性（伸长、强力、模量、收缩率等）。

POY



FDY



This graph provides an historical overview of technological developments at Oerlikon Barmag in the area of POY and FDY over the past 50 years.

上图显示过去50年里欧瑞康巴马格的技术发展历史概况。

Until this point in time, speeds of up to 1500 m/min were considered conventional, while maximum speeds peaked at 2000 m/min. Because slowly-spun polyester and nylon develop physiochemical properties that are different from those of the yarn produced today, they could not be transported over long distances or stored for longer periods of time. This new winder technology enabled the fast spinning of polyester and polyamide.

当时，1500 m/min的速度被看作是一般速度，最高速度为2000 m/min。因为以较低速度所纺的涤纶丝和锦纶丝所具有的物理化学特性与今天所纺的丝的物理化学特性不同，它们不能长距离运输或长期储存。这种新的卷绕机实现了高速纺涤纶丝和锦纶丝。

The global advent of the SW4S winder began when, at the ATME 1969 – the leading trade fair for textile machine construction at the time – was unveiled to international trade audiences. With this winder, the former Barmag AG was able to secure itself an approx. 80% share of the global market. Across the world, the company sold in excess of 45000 type SW4 and SW6 winders.

SW4S卷绕机的全球首秀是在ATME 1969 （美国国际纺织机械展览会，当时最重要的纺机展会）上。通过此款卷绕机，原巴马格公司赢得了将近80%的全球市场份额。该公司总共向全世界售出4.5万多台SW4和SW6型卷绕机。

In the 1980s, machine construction research focused on the ever-greater demand for increasing productivity in manmade fiber production. This demand was met with the development of the birotor vane traverse system, which enabled the production of an ever-larger numbers of threads per position and supports higher profitability in manmade fiber production to this very day.

上世纪80年代，机器制造方面的研究重点放在进一步提高化纤生产效率。这一需求随着巴马格双转子拨叉式导丝机构的诞生而得到满足。该机构可提高每个卷绕位丝的头数，一直到今天都能提高化纤生产的效益。

Until 2000, the spinning systems we called extruder spinning systems and comprised eight, twelve or 16 winders, generally with eight threads per winder. 'Direct spinning systems', in which a polymerization system is combined with an FDY take-up unit (or POY & FDY), were virtually unknown at the time.

在2000年之前，我们把纺丝系统称作挤压机纺丝系统，这种纺丝系统一般配备8个、12个或16个卷绕头，每个卷绕头通常卷绕8根丝。当时，把聚合系统和FDY （或POY& FDY）卷绕装置集于一体的“直纺系统”还前所未闻。

This has radically changed since then. Today, direct spinning systems supply 600 or 800 tons of PET a day. To be able to convert this into yarn, the corresponding spinning system must be able to produce 10000 endless filaments. These filaments are no longer wound on six- or eight-end winding units, but on at least twelve- or even 16 end winders with consistent package weights. This is made practicable by the fact that the entire process has become extremely reliable thanks to continual innovation (yarn breaks now interrupt production far more rarely than they used to), with winders able to cope with up to 16 ends.

自那时起，化纤设备领域发生了重大改变。如今，直纺系统每天可加工600或800吨聚酯，为了将其转化为丝，相应的纺丝系统必须能够加工1万根不间断的长丝。这些长丝不再卷绕在6或8头卷绕机构上，而是卷绕在至少12头甚至是16头卷绕机上，而且丝饼重量保持不变。由于不断的创新（影响生产的断头率远远低于从前）及有了适应16头纺的卷绕机，整个工艺都变得非常可靠，从而使上述生产变成了现实。

4. Development in processing FDY– FDY加工领域的进展

Parallel to this, there was also progress in the development of the production of FDY. Until the year 2000, there had been spinning and winding technology with up to 12 ends (and, to a small extent, up to 16 ends) per winding position.

与此同时，FDY加工技术和设备也取得了进展。到2000年，每个卷绕位12头（少数16头）的纺丝和卷绕技术已经出现。

Beginning in 2004, this technology was superseded by Oerlikon Barmag's i-QOON technology, providing 20, and very soon 24, yarn ends per winding position. This winder permits a doubling in take-up performance, with the same package weight and still just one draw unit. One control unit is all it takes to operate this double winder. This comes hand in hand with huge savings in conversion costs. This was accompanied by the development of the EvoQuench quenching system, which permitted production of demanding products on a 20- or 24 end basis as well.

2004年初，这项技术被欧瑞康巴马格的i-QOON技术取代。i-QOON实现每个卷绕位20头，并很快发展成24头。这种卷绕机在丝饼重量不变、拉伸设备仍为一台的情况下使卷绕效率翻了一番。这种卷绕机由一个控制装置统一控制，这大幅度节约了加工成本。与i-QOON卷绕机同时诞生的EvoQuench吹风系统，使在20或24头纺丝设备上加工要求比较苛刻的产品变为现实。

5. WINGS – revolution in POY and FDY production – WINGS - POY和FDY生产的革命

There are many factors that determine the commercial efficiency of a modern spinning system. The most important factors are yarn quality, productivity, efficiency, space requirements and energy consumption. And it is against this background that we must view WINGS, Oerlikon Barmag's revolutionary POY and FDY solution. WINGS was developed with the aim of increasing the productivity, efficiency and quality of POY systems.

决定一种现代化纺丝系统营利效率的因素有多种。其中最主要的因素有成丝质量、生产效率、效益、占地面积和能耗。在此背景下，我们来分析一下WINGS卷绕机 – 欧瑞康巴马格这一革命性的POY和FDY解决方案。开发WINGS的宗旨是提高POY生产系统的生产效率、效益和产品质量。

WINGS – Winding INtegrated Godet Solution – integrates godets for reducing yarn tension and the tangling unit into the winder. This makes the winder a complete take-up machine. This ends the spatial separation, common until 2007, of the godets and the winder in a draw unit and a separate take-up unit, hence reducing the spinning system a level in height. In newly designed systems, this reduces the investment volume considerably. With the lower system height, the string-up process can now be performed by a single operator – and this in a quarter of the time an experienced operator requires for string-up of a conventional spinning system. The innovative 'zigzag' layout also increases the production volume of the spinning system by up to 30% for the same footprint.

WINGS（集成导丝盘卷绕机解决方案）将降低丝线张力的导丝盘与网络装置集合到卷绕头中。这使卷绕头成为名副其实的卷绕机。这结束了2007年之前普遍存在的拉伸装置和卷绕装置中导丝盘与卷绕头的空间分隔，从而降低了纺丝系统的总体高度。新设计的系统可大幅度降低投资资金。通过降低系统高度，生头工艺可以由一个操作人员完成，而且对于一位有经验的操作人员来说，生头时间仅为原来的1/4。创新的 "之字形" 布局也可将纺丝系统的产量提高30%。

Furthermore, the measurement data produced with operating POY systems equipped with the WINGS technology reveal that the energy consumption is considerably lower than with conventional spinning systems. Measurements conducted to date have identified energy savings of up to 30%. In times of ever-scarcer, and correspondingly more expensive, energy resources, this is a major factor.

另外，对目前运转的配备了WINGS技术的POY系统的测试数据显示，这种系统比传统系统更加节能。到目前为止的测试数据证明节能效率达30%。在当今能源日益短缺和更加昂贵的背景下，这是一个主要因素。

In 2010, Oerlikon Barmag introduced – as a logical consequence following the POY concept – another breakthrough technology with WINGS FDY. The new FDY machine breaks through the limitations of conventional FDY spinning systems by optimizing production processes, waste rates and energy consumption. This is all the more meaningful as the energy costs for the FDY process make up around 45-50% of the conversion costs.

2010年，作为POY概念的一个逻辑序列，欧瑞康巴马格推出了突破性的WINGS FDY技术。该机通过优化生产工艺及降低废丝率和能耗突破了传统FDY纺丝系统的局限。这对于能源成本占加工成本45% - 50%的FDY工艺来说更具意义。

With its multi-stage energy concept, WINGS FDY reveals its benefits in various ways. First, a new kind of process guiding system reveals its potential: whereas WINGS FDY requires just 6 kW for a single godet, a conventional system configuration requires up to 4 kW per individual heating zone alone (16 kW in total). The considerably shorter godets thus require significantly less installed heating capacity.

通过多级能源概念，WINGS FDY以多种方式体现其优点。首先，一种新的导丝系统展现其潜力：WINGS FDY的每个导丝盘耗电量仅为6kW，而传统设备上每个独立加热区就耗电4kW（总共需要16kW）. 大幅度缩短的导丝盘可有效降低装机加热能耗。

A further aspect is retaining the generated energy within the system. With regards to WINGS FDY, this means that 'hot' and 'cold' within the FDY process are systematically separated. Separating the heat and yarn handling process stages makes the energy loss that is unavoidable and design-related in conventional systems a thing of the past. The hot and cold zones – the hot godet zone and the yarn handling zone – can each be operated separately. The excellent insulation of these process steps ensures that energy is preserved and remains within the system.

这一点是通过改进导丝机构来实现的 – 采用 "S" 形丝道代替常见的多重包覆，并对导丝盘形状加以修改，从而降低了长丝束加热时所需的能耗。新型导丝盘的一个实用特点是更小的辐射面确保低能耗。另一个特点是将生成的能量保持在系统内部。就WINGS FDY而言，这意味着FDY工艺中的 "热" 和 "冷" 被系统地分隔。分隔热与丝的处理工序使传统系统中不可避免的和由于设计而引起的能源损失成为了过去的事情。热区和冷区（热导丝盘区与丝处理区）可单独操作。这些工序的良好保温确保能源在系统中得到保留。

2014 – WINGS POY 1800 successfully launched

2014年成功推出WINGS POY 1800

The first pilot positions successfully commissioned prove: performance, package build and yarn quality are at the same high level as in the case of the 1500-mm stroke-length model. This guarantees superlative results in the DTY process. With package weights of 15 kg (12 end variant) or 10 kg (16 end), the winding unit with extended stroke is extremely competitive.

第一组试验卷绕位的成功试产结果证明：效率、丝饼成形和丝的质量与WINGS 1500型水平相同。这确保了DTY工艺取得最佳结果。丝饼重量为15 kg （12头纺）或10 kg （16头纺），该机的动程加长，更具竞争性。

Special highlight: string-up for the WINGS 1800 is now even faster with its new string-up device – despite its 12 packages. The new technology saves around 30 precious seconds compared to its 10 end counterpart – making it considerably faster than its competitors. The result: less waste.

特殊亮点：通过采用新型生头装置，即使加工12个丝饼，生头速度更快。与10头纺设备相比，新技术可节约大约30秒的生头时间，比竞争对手快得多，从而有效地减少了废丝。

Furthermore, the WINGS POY 1800/12 end excels compared to the 1500/10 end model, requiring less space per filament and thus increasing efficiency even further. The difference in the required space for the zigzag layout of the spin packs is even more noticeable, where the 16 end winder is able to reveal its advantages even better, making it appealing for in-house further processors in particular, despite its lower package weight.

另外，WINGS POY 1800/12头卷绕机胜出1500/10头卷绕机之处在于每根长丝占用更少的空间，从而进一步提高效率。所占空间之差别在纺丝组件的 "之字形" 布局之处更加明显，16头卷绕机显示出更大的优势，尽管丝饼重量较低，仍受到用户，尤其是那些配有后道加工的生产商的青睐。

WINGS POY 1800/12 ends
WINGS POY 1800/12 头

6. Staple fiber technology from Oerlikon Neumag – 欧瑞康纽马格的短纤技术

In the 1950s, filament and fiber production for synthetic fibers was more or less oriented exclusively on PA6 or PA66. This was the age of Perlon. Neumag was also the supplier of the fiber take-up machines and the fiber tape processing line for the Perlon fiber production at the sister plant in Neumünster. With the fiber processing lines both then and now, the process steps of drawing, after-treatment, crimping, fixing and cutting, produced the end product – staple fiber. This, and subsequent, first-generation fiber processing lines were designed for tow thicknesses of max. 500 000 den.

上世纪50年代，合成纤维，无论是长丝还是短纤，大多以PA6或PA66为原料。这是Perlon的时代。纽马格公司通过位于德国新明斯特的姊妹工厂同时提供Perlon纤维生产用的卷绕机和纤维束加工成套设备。无论是那时还是现在的纤维加工设备都是通过拉伸、后处理、卷曲、定型和切断等工序最终加工出成品 – 短纤维。第一代纤维加工设备设计用于加工丝束纤度最高达500 000旦的纤维。

Neumag took the first step towards becoming a total systems manufacturer in 1955 with the construction of the first fiber processing line.

纽马格在1955年建成了第一条纤维加工生产线，迈出成为一个整体系统制造厂商的第一步。

In 1982 the new PETfiber processing line with a throughout of 150 tons/day, was designed for two tows of 1 500 000 den each.

1982年，新的日产量达150吨/天的聚酯纤维加工生产线，被设计成两条丝束，每条丝束150万旦。

At ITMA 95 in Milan a new crimper type was presented. With a crimper width of 460 mm, just one crimper was required for systems producing in excess of 150 tons/day for the very first time. Until then, two crimpers always had to be used for 150-200 tons/day units , which resulted in concessions to the fiber quality.

在米兰举办的ITMA1995上，推出了一台全新的卷曲机。卷曲机宽度为460 mm，仅一台卷曲机就首次可以满足日产150吨生产线的需求。在这之前，必须使用两台卷曲机，对纤维质量不利。

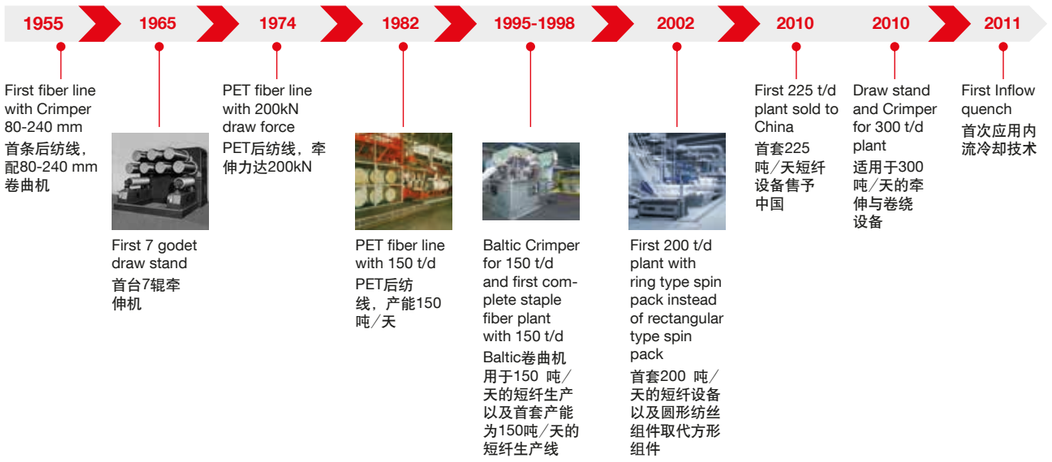
2002 saw the commissioning of the very first 200+ tons/day systems. With this, Oerlikon Neumag entered a whole new dimension of productivity and efficiency. This had been made possible due to the fact that the new ring spinneret with its 410 mm diameter had been unveiled, which achieved additional increases in performance in the new, large-scale systems.

2002年，首套日产200+吨系统开始试运转。通过此设备，欧瑞康纽马格使生产效率和效益达到一个全新水平。这主要归功于直径达410 mm的新型圆形喷丝板的问世，它使新型大规模设备的效率进一步提高。

The next development stage took place in 2010 with the launch of the 300 tons/day system. Here, Oerlikon Neumag supplied a solution in the form of a newly-developed, higher-performing spinning system, draw units (280 kN draw force, 2400 mm godet length and 650 mm godet diameter) and 680-mm-wide crimpers. This was followed one year later by the outside-to-inside quenching unit with improved fiber qualities for cotton-type fibers and high energy efficiency as an alternative to the inside-to-outside quenching unit.

下一个开发阶段始于2010年推出的日产300吨设备。欧瑞康纽马格以一套新开发的、效率更高的纺丝系统以及拉力为280 kN、导丝辊长度和直径分别为2 400 mm和650 mm的拉伸装置及680 mm宽的卷曲机向客户提供成套解决方案。1年后，纽马格又推出了气流从外向里的吹风装置来替代自里向外的吹风装置，用以提高棉型纤维的质量。

Staple Fiber



7. Ecological impact - 生态影响

Ecological impact of installed capacity of Oerlikon Manmade Fibers POY, FDY and staple fiber technologies in China

欧瑞康化学纤维事业板块POY、FDY和短纤技术在中国已安装的能力对生态环境的影响

As China currently faces challenges such as excessive CO_2 emissions, increasing electricity costs, environmental-protection legislation, problems with the overload of the power supply system in peak times and increasing labor costs, the issue of environmental and economical production is becoming increasingly important.

由于中国目前正面临CO_2过度排放、电价提高、更严格的环保法规、电力系统高峰期超负荷和劳动力成本上升等挑战，环保和经济型生产正变得日益重要。

With its POY, FDY and staple fiber technologies, Oerlikon Manmade Fibers has always set new benchmarks for energy savings per ton, CO_2 emissions savings, savings in manufacturing space (land) and productivity and efficiency increases. Oerlikon Barmag and Oerlikon Neumag innovations are always developed with the following four e-save aspects in mind: energy, economics, ergonomics and environment.

通过POY, FDY和短纤技术，欧瑞康化学纤维业务板块一直在单位产量节能、减少CO_2 排放、节约加工场地（土地）以及提高生产效率和效益方面奠定新的水准。欧瑞康巴马格和欧瑞康纽马格的创新一直强调下列4项e-save原则：节能性、经济性、人体工程学和环保性。

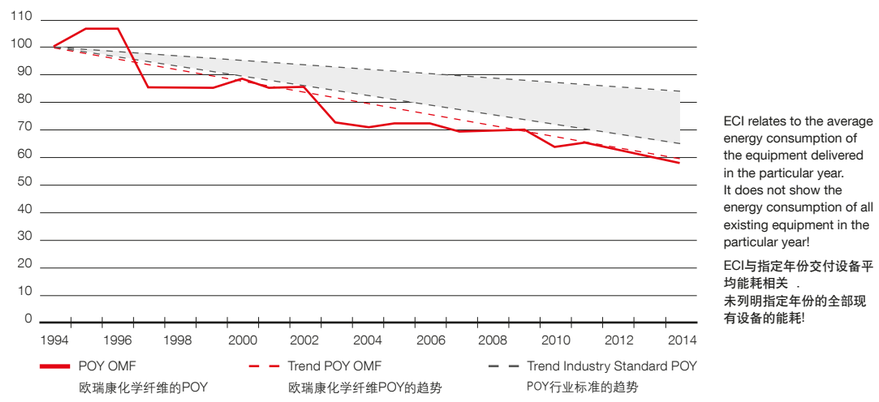
e-save
comprehensive efficiency

As energy savings are one of the most important issues, a strong focus on continuous improvements in the efficiency of textile machinery has always played an important role. Over the last 20 years, Oerlikon Barmag has continuously reduced the specific power consumption of the newly installed POY and FDY capacities in the market. In the case of Oerlikon Barmag POY machines, continuous development has improved the energy efficiency of the latest plant installations by 40% compared to the technology installed back in 1994.

由于节能是最重要的课题之一，欧瑞康化学纤维一直强调对纺织机械的效率不断进行改进。在过去的20年，欧瑞康巴马格不断降低新安装的POY和FDY生产设施的额定能耗。以欧瑞康巴马格的POY设备为例，通过不断创新，新装设备的能源效率比1994年安装的设备提高了40%。

Energy efficiency increase with Oerlikon Barmag POY Technology
POY Electrical Consumption Index (1994 = 100). Consumption per ton of product.

使用欧瑞康巴马格POY技术 更高的能效
POY耗电指数(1994 = 100) 每吨生产消耗.



ECI relates to the average energy consumption of the equipment delivered in the particular year. It does not show the energy consumption of all existing equipment in the particular year!

ECI与指定年份交付设备平均能耗相关 。未列明指定年份的全部现有设备的能耗!

For Oerlikon Barmag FDY solutions, the savings from the latest plant installations actually account for 55% compared to the technology installed in 1994.

在欧瑞康巴马格的FDY设备和技术方面，与1994年相比，新设备的能源效率提高了55%。

Regarding the different technologies, introduction of WINGS FDY 32 end as the latest state-of-the-art technology permits energy savings of 44% compared to ACW FDY 12 end.

按不同技术，WING FDY 32头卷绕机作为最先进的技术，比ACW FDY 12头卷绕机节能效率达44%。

The energy savings mainly derive from the optimized FDY process, which saves compressed air and offers a superior cooling system. At the same time, 44% of CO_2 emissions are saved with WINGS FDY 32 end.

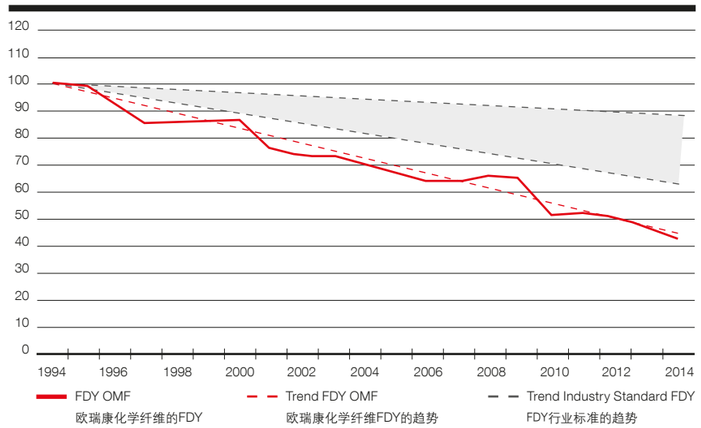
节能主要源于对FDY工艺的优化，即通过节约压缩空气和提供一个高效冷却系统来实现。与此同时，WINGS FDY 32头卷绕机还可降低44%的CO_2 排放。

Energy efficiency increase with Oerlikon Barmag FDY Technology

FDY Electrical Consumption Index (1994 = 100). Consumption per ton of product.

使用欧瑞康巴马格FDY技术 更高的能效

FDY耗电指数(1994 = 100) 每吨生产消耗.



ECI relates to the average energy consumption of the equipment delivered in the particular year. It does not show the energy consumption of all existing equipment in the particular year!

ECI与指定年份交付设备平均能耗相关 . 未列明指定年份的全部现有设备的能耗!

Energy saving per ton yarn and CO_2 saving (tons/year) for POY & FDY

每吨POY & FDY长丝节能及CO_2减排(吨/年)

POY

ACW 8 ends (based on a production of 211 968 tons/year)
ACW 8 头 (基于211 968 吨/年的生产)

WINGS 10 ends (22,2 % energy saving; 9 996 tons/year)
WINGS 10 头 (节能22,2 %; 9.996 吨/年)

WINGS 12 ends (25,3 % energy saving; 11 406 tons/year)
WINGS 12 头 (节能25,3 % ; 11 406 吨/年)

WINGS 24 ends (30,2 % energy saving; 13 590 tons/year)
WINGS 24 头 (节能30,2 % ; 13 590 吨/年)

FDY

ACW 12 ends (based on a production of 223 560 tons/year)
ACW 12 头 (基于223 560 吨/年的生产)

i-QOON 24 ends (11,8 % energy saving; 16 623 tons/year)
i-QOON 24 头 (节能11,8 % ; 16.623 吨/年)

WINGS 24 ends (40,1 % energy saving; 56 394 tons/year)
WINGS 24 头 (节能40,1 % ; 56 394 吨/年)

WINGS 28 ends (42,2 % energy saving; 59 391 tons/year)
WINGS 28 头 (节能42,2 %; 59 391 吨/年)

WINGS 32 ends (44,0 % energy saving; 61 887 tons/year)
WINGS 32 头 (节能44,0 % ; 61 887 吨/年)

The optimized process technology with WINGS also saves space and hence land requirements for production-facility construction. FDY WINGS 32 end, for instance, requires 45% less land than the ACW 12 end. This leads to greater productivity as the saved land can be used for additional machinery.

The development of new technologies also boosted productivity. WINGS FDY 32 end is 2.6 times more productive/efficient than the ACW FDY 12 end. This is the result of both the increase in yarn ends and also the optimized process, which allows greater productivity than in the case of older processes. The savings potential for POY is similar to that achieved for FDY.

Developments in staple fiber technology by Oerlikon Neumag have also focused optimizing the process in order to save energy, as this reduces operational costs. Over the last 12 years, Oerlikon Neumag has achieved energy savings in excess of 10% with state-of-the-art staple fiber machines with current capacities of up to 300 tons/day.

通过优化工艺技术，WINGS还节约了占地面积，从而减少了生产设施建设用地。以FDY WINGS 32头卷绕机为例，它比ACW 12头卷绕机节省45%的占地面积。这进一步提高了生产效率，因为节省的土地可用于其它机器和设备。

新技术的开发也提升了生产效率。WINGS FDY 32头卷绕机的生产效率比ACW FDY 12头卷绕机高2.6倍。这是通过提高丝的头数和优化工艺来实现的。POY卷绕机的节约潜力与FDY卷绕机相当。

欧瑞康纽马格公司对短纤技术的开发同样注重通过优化工艺进行节能，从而降低操作成本。在过去12年里，欧瑞康纽马格日产300吨的短纤设备节能达10%以上。

8. Modernization potential – 中国化纤工业的现代化潜力

Modernization potential for the Chinese manmade fiber industry

With improved Oerlikon Manmade Fibers technologies, manufacturers can save energy, reduce CO_2 emissions, lower land requirements and further increase productivity.

The aim of this exclusive study is to calculate the modernization potential and to see how much energy, CO_2 and land can be saved if all Oerlikon Barmag POY machines ≤ 8 ends and all Oerlikon Barmag FDY machines ≤ 12 ends are replaced with modern technologies.

In terms of energy savings, outdated equipment is producing 16% of the total yarn in the Chinese market, but is responsible for 30% of the energy consumption. With modern technology of Oerlikon Manmade Fiber this part of consumption could be reduced by 44%, making it the most energy efficient textile production.

In absolute numbers, this means that 78000 MWh of power consumption could be saved each year if outdated technologies were replaced. This savings potential will help China reduce its grid load, which is a major issue in China, especially in summer.

Similar to the energy savings, modernized technology could reduce CO_2 emissions as well. The figure shows that outdated capacities account for 95 184t of total CO_2 emissions. If these technologies were replaced with modern ones, this would reduce the CO_2 emissions by 42 193t.

中国化纤工业的现代化潜力

通过采用欧瑞康化学纤维改进的技术，生产企业可节约能源、减少CO_2 排放、减少土地使用和进一步提高生产效率。

本研究报告的宗旨是计算现代化潜力，来看一看如果所有欧瑞康巴马格8头及以下POY设备和所有12头及以下FDY设备都被先进技术所替换能够节约多少能源、减少多少CO_2 排放和节省多少土地使用面积。

在节能方面，陈旧设备生产的丝在中国市场上占16%，但能耗却占30%。通过采用欧瑞康化学纤维的先进技术，这部分能耗可降低44%，使之成为能效最高的纺织生产。

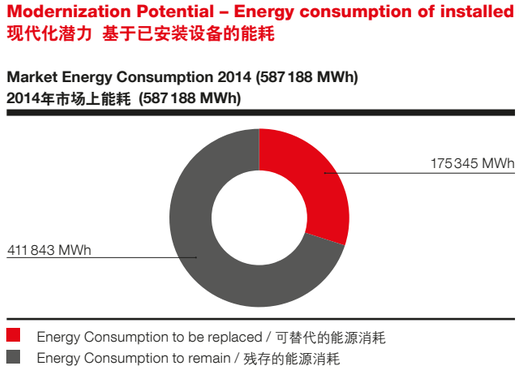
以绝对数字计，这意味着如果陈旧的技术被更新，每年可节约7.8万MWh的用电量。这种节约潜力将帮助中国减少电网负荷。电网负荷是中国面临的一个主要问题，尤其是在夏天。

与节约能源一样，现代化技术同样可以降低CO_2 排放。数据显示，落后产能占总CO_2 排放量中的95 184吨。如果这些技术被现代技术替代，CO_2 排放可减少42 193吨。

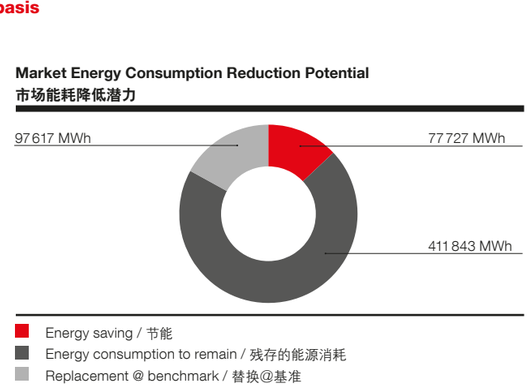
Modernization Potential – Energy consumption of installed basis

现代化潜力 基于已安装设备的能耗

Market Energy Consumption 2014 (587 188 MWh)
2014年市场上能耗 (587 188 MWh)



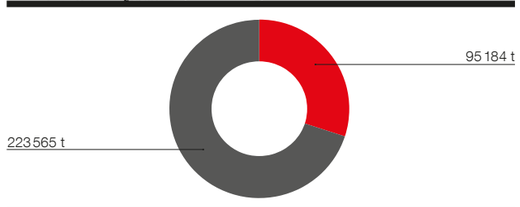
Market Energy Consumption Reduction Potential
市场能耗降低潜力



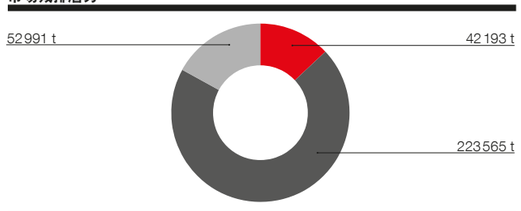
Modernization Potential – CO_2 emission of installed basis

现代化潜力 基于已安装设备的能耗

Market CO_2 Emissions in 2014 (318 749 t)
2014年市场上CO_2排放量 (318 749 吨)



Market Emission Reduction Potential
市场减排潜力

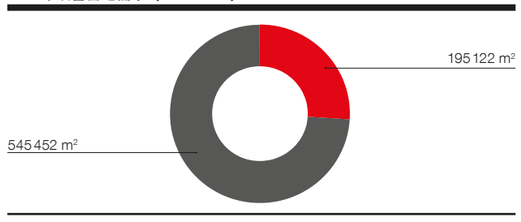


As Oerlikon Manmade Fibers technologies become increasingly space-saving, land is another potential source of savings. The figure shows that outdated capacities are responsible for 26% of the total land required for filament spinning. 48% of this land could be released to nature if these capacities were replaced with the latest technology.

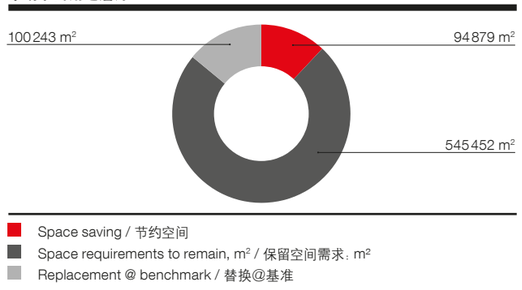
由于欧瑞康化学纤维技术变得越来越节省占地面积，土地成为另一节约潜力所在。数据显示，落后产能占长丝纺丝总土地使用面积的26%。如果这些产能都被最新技术所取代，48%的土地可还归自然。

Modernization Potential – Land requirement of installed basis
现代化潜力 基于已安装设备的占地需求

Machine Space Requirements in 2014 (740 574m²)
2014年设备占地需求 (740 574m²)



Market Space Reduction Potential
市场节约用地潜力

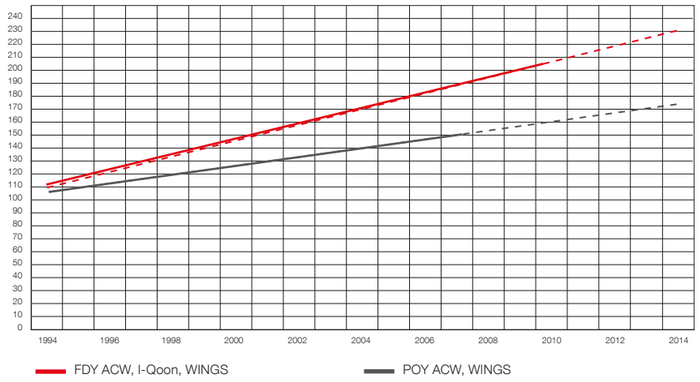


As labor costs have steadily increased in China over the past years, the increase in productivity per operator now plays an important role. The last figure shows that – thanks to ongoing technology developments – Oerlikon Manmade Fibers has been able to continuously increase productivity per worker over the last 20 years.

随着近些年中国劳动力成本稳步提高，每位操作人员的生产效率也是提高节约潜力的重要因素。数据显示，通过不断的技术开发，欧瑞康化学纤维在过去20年里一直在提高每位工人的生产效率。

Productivity increase per employee/operator
Oerlikon Manmade Fibers Worker Efficiency Index (1994=100).

每个人工生产力的增加
欧瑞康化学纤维工作效率指数(1994 = 100).



Introduction of its state-of-the-art- technology – Oerlikon Barmag WINGS POY in 2007 and Oerlikon Barmag WINGS FDY in 2010 – has provided an additional productivity boost. The machines were built and modified to make them more operator-friendly, so handling of the machines has become easier, and fewer people are now needed to operate the same number of machines at the same time. In addition to this, the string-up concept has been improved, and this also makes it much easier for operators to work on WINGS machines. With the introduction of WINGS POY 12 ends in 2014 the productivity could further be increased by nearly 20%.

欧瑞康巴马格2007年推出WINGS POY和2010年推出WINGS FDY等最新技术，使生产效率进一步提高。通过创新设计和改良，这两款机器更加人性化和便于操作，在卷绕头数量不变的前提下，减少了用工人数。除此之外，生头概念也经过改进，使操作人员更容易操作WINGS机器。2014年推出的WINGS POY 12头卷绕机使生产效率进一步提高约20%。

Executive summary – 小结

The study investigates the potential savings to the Chinese textile industry if outdated machinery were to be replaced with modernized technologies. Continuous development of Oerlikon Manmade Fibers technologies has generated high economical benefits that include energy savings, reductions in CO_2 emissions, land savings and productivity increases.

本研究报告探讨了通过用先进技术替代落后技术中国纺织业的节约潜力。欧瑞康化学纤维技术的不断开发和创新已经产生了较高的经济效益，包括节能、减少CO_2 排放、节省土地使用面积和提高生产效率。

Outdated filament spinning technologies in China currently account for 42% of the total energy consumption and CO_2 emissions, but can supply only 16% of the total filament production. With the latest technology, the specific average power consumption per ton was reduced by 55% (WINGS FDY) and 40% (WINGS POY) compared to outdated technology dating from the mid nineties. If these machines were to be replaced with the latest Oerlikon Barmag equipment, the energy consumption would be reduced by 78 000 MWh and the CO_2 emissions by 42 000 tons, The lower load to the power grid reduces the difficulties with power shortages in high-demand peak seasons, such as hot summers or smog in winter, as fewer coal power plants are needed. The latest technology could increase productivity by up to 200%. This is essential for maintaining the competitiveness of the Chinese textile industry.

目前，中国的落后长丝纺丝技术占总能耗和CO_2 排放的42%，但产量仅占长丝总产量的16%。通过采用先进技术，单位吨产量额定平均能耗可比1994年的技术降低55%（使用WINGS FDY）和40%（使用WINGS POY）。如果这些机器被欧瑞康巴马格的最新设备所取代，每年可降低7.8万 MWh的用电量和4.2万吨的CO_2 排放。这也降低了电网负荷，从而解决了用电高峰季节（如炎热的夏季和有雾的冬季）的电力短缺问题，也减少了对煤电厂的需求。最新技术可使生产效率提高200%。这对保持中国纺织工业的竞争力来说是非常重要的。

Another big environmental topic these days is the energy and water consumption as well as waste water pollution within the textile value chain. Especially the dying plants are in focus of the government due to the water pollution. Oerlikon Manmade Fibers 3DD polymer mixing technology offers the production of high quality spun dyed yarns for direct ussage, eliminating the polluting dying step in the textile chain.

另一个大的环保话题就是在纺织价值链中的能源和耗水量以及废水污染。特别是染色厂，由于水污染成为了政府部门关注的焦点。欧瑞康化学纤维3DD聚合物混合技术提供了高质量的能直接使用的纺前染色丝线的生产，消除了纺织产业链中产生污染步骤。

All in all, this study shows that Oerlikon Barmag's and Oerlikon Neumag's latest technologies can support China to reach the energy saving potentials and to support the people to have a better and cleaner living environment.

总之，本研究报告显示欧瑞康巴马格和欧瑞康纽马格的最新技术可以帮助中国挖掘节能潜力，使居民拥有更好和更干净的生活环境。

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