PRODUCT DEVELOPMENTS IN MANMADE FIBRES: IS COTTON ABLE TO COMPETE?

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ABSTRACT

In the last 25 years global demand for fibres has increased more rapidly than population. Population rose by 37% to 7.3 billion people while fibres grew by 124% to 88 million tonnes.

While population is an obvious driver of fibre demand there have been other reasons for the high growth of fibre volumes. These include rising incomes, more affordable fibre, textiles and apparel products as well as changing attitudes to traditional textile products – used increasingly as disposable fashion.

Equally as important has been:

- The development of fibres to meet aesthetic and performance challenges in traditional textile products (such as intrinsic chemical properties, cross-section, diameter, texturing and bonding).
- Product and process innovation in both traditional and non- traditional textile product areas where the use of fibres has facilitated market growth. These include woven and non-woven products in markets as diverse as medical, hygiene, transport, construction and agricultural.

Manmade fibres contributed 90% of the growth in fibre consumption in the last 25 years with volumes rising from 19 million tonnes in 1990 to 63 million tonnes in 2015. Consumption of cotton increased from 19 million tons to 24 million tons in this period.

This presentation explores key fibre and product developments behind the extraordinary volume growth in manmade fibres as well as future challenges and opportunities.

Product developments in MMF: is cotton able to compete?

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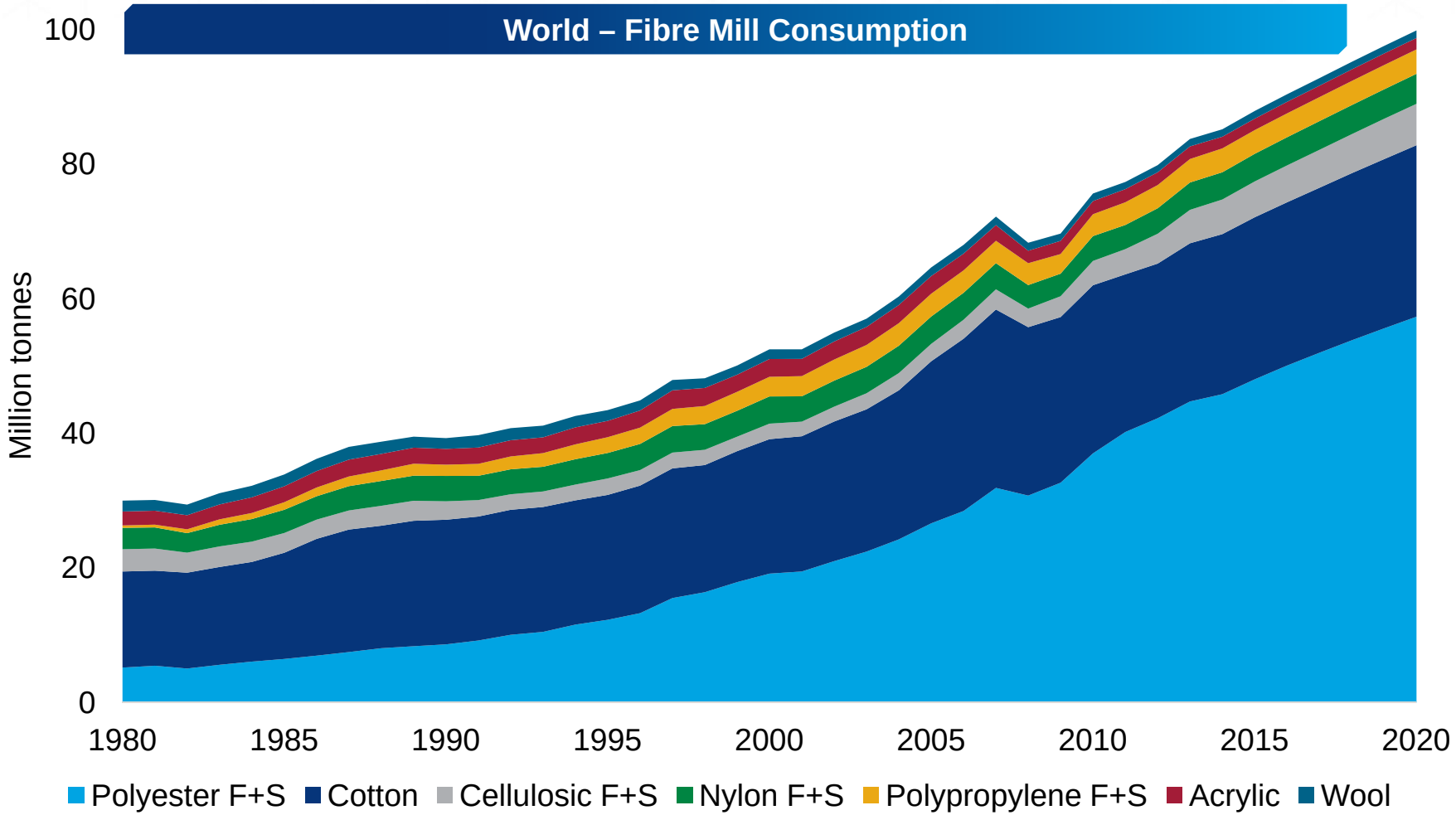
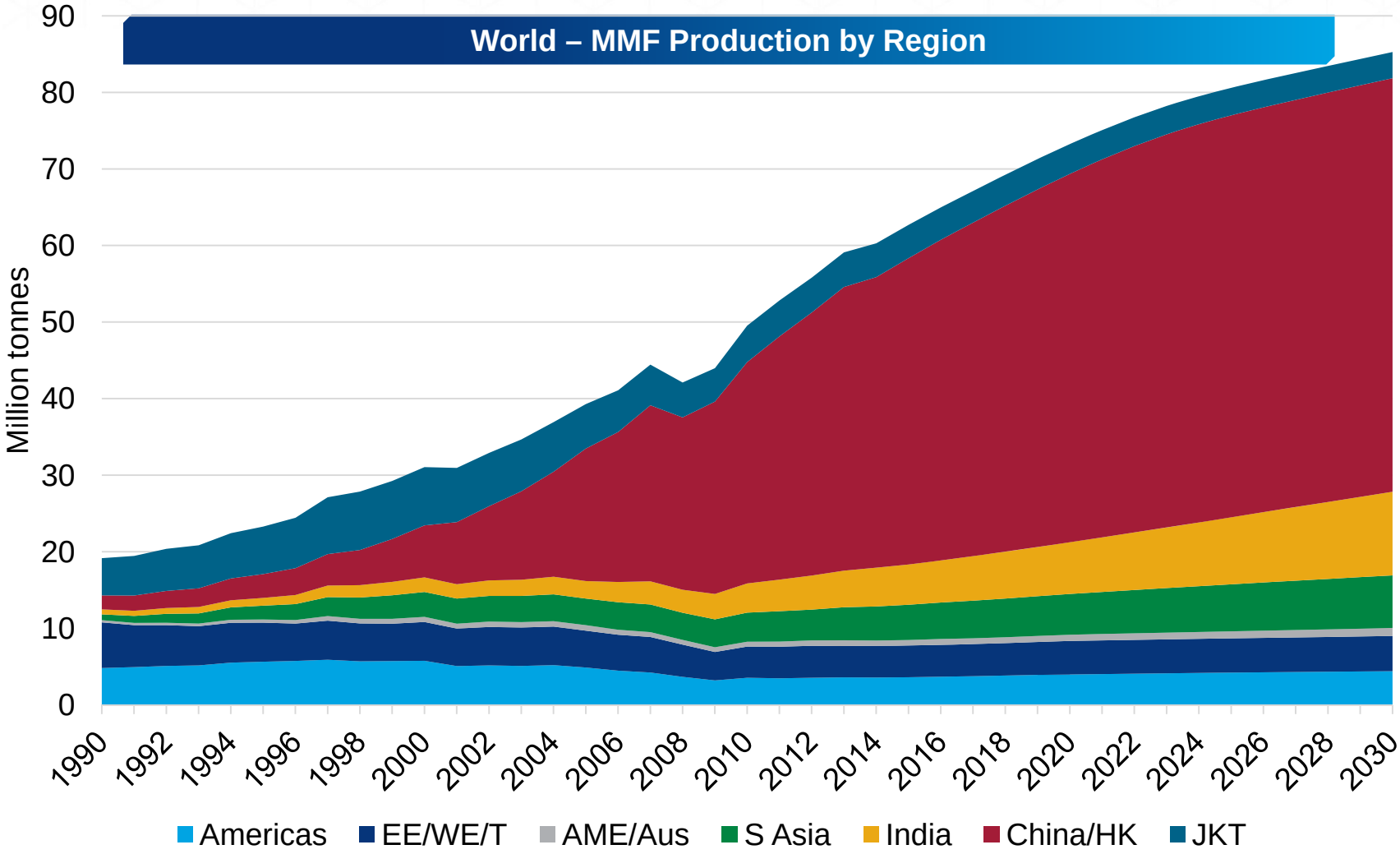
Agenda

- Textile fibre volumes:
  - » Fibre shares over the last 25 years, today, and a view of the next 15 years. Cotton's share slides as polyester grows towards 60% of fibre consumption.
  - » Cotton still dominant in the staple fibre market, but under pressure from polyester filament and viscose staple.
- As population grows, will cotton keep up with additional fibre demand?
- The challenge of polyester filament to all staple fibres.
- The growth of textile applications: MMF in apparel, home textiles and industrial products.
- Sustainability: a challenge for MMF.

Polyester continues to dominate textile fibre consumption



The vast majority of MMF production growth has been in China



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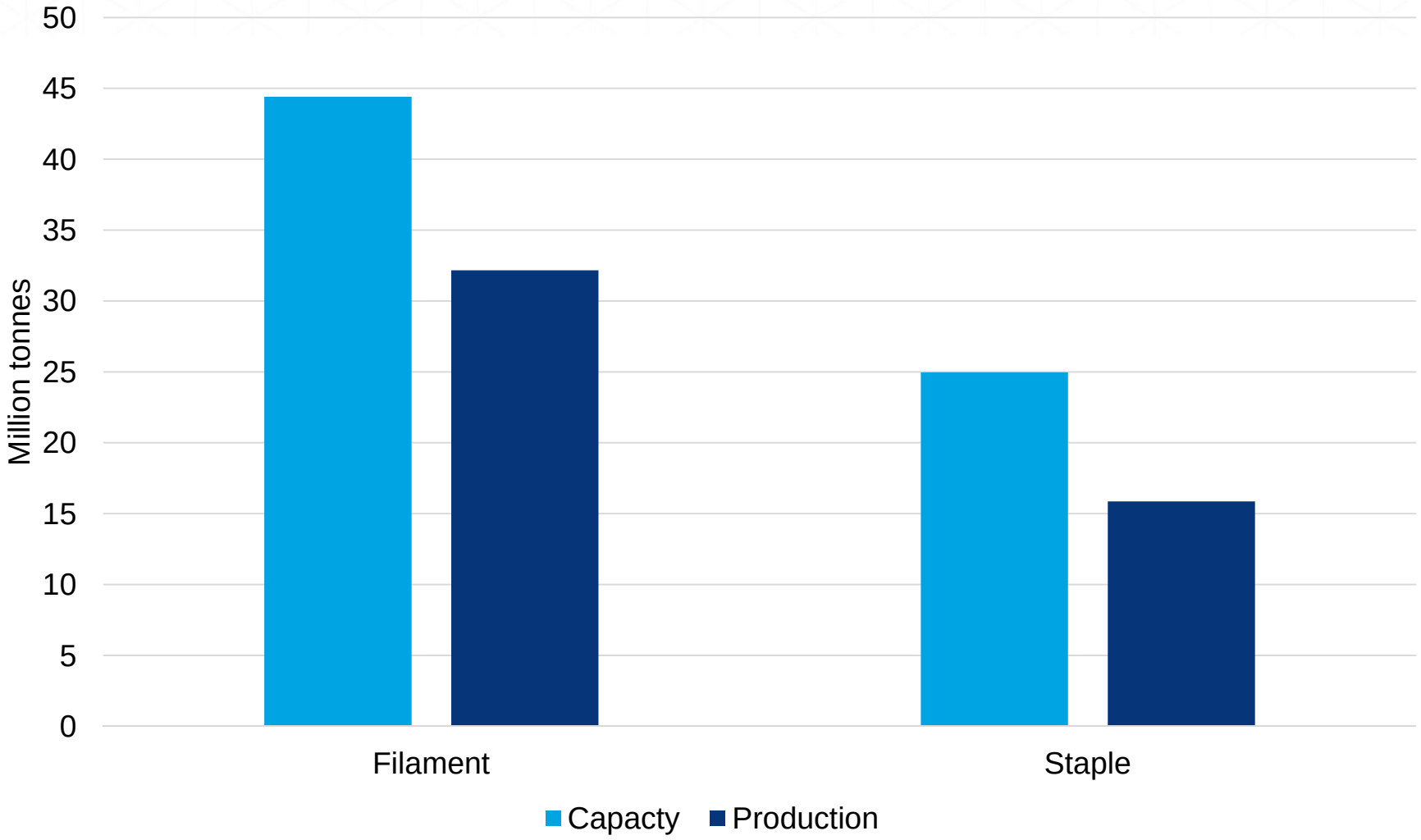
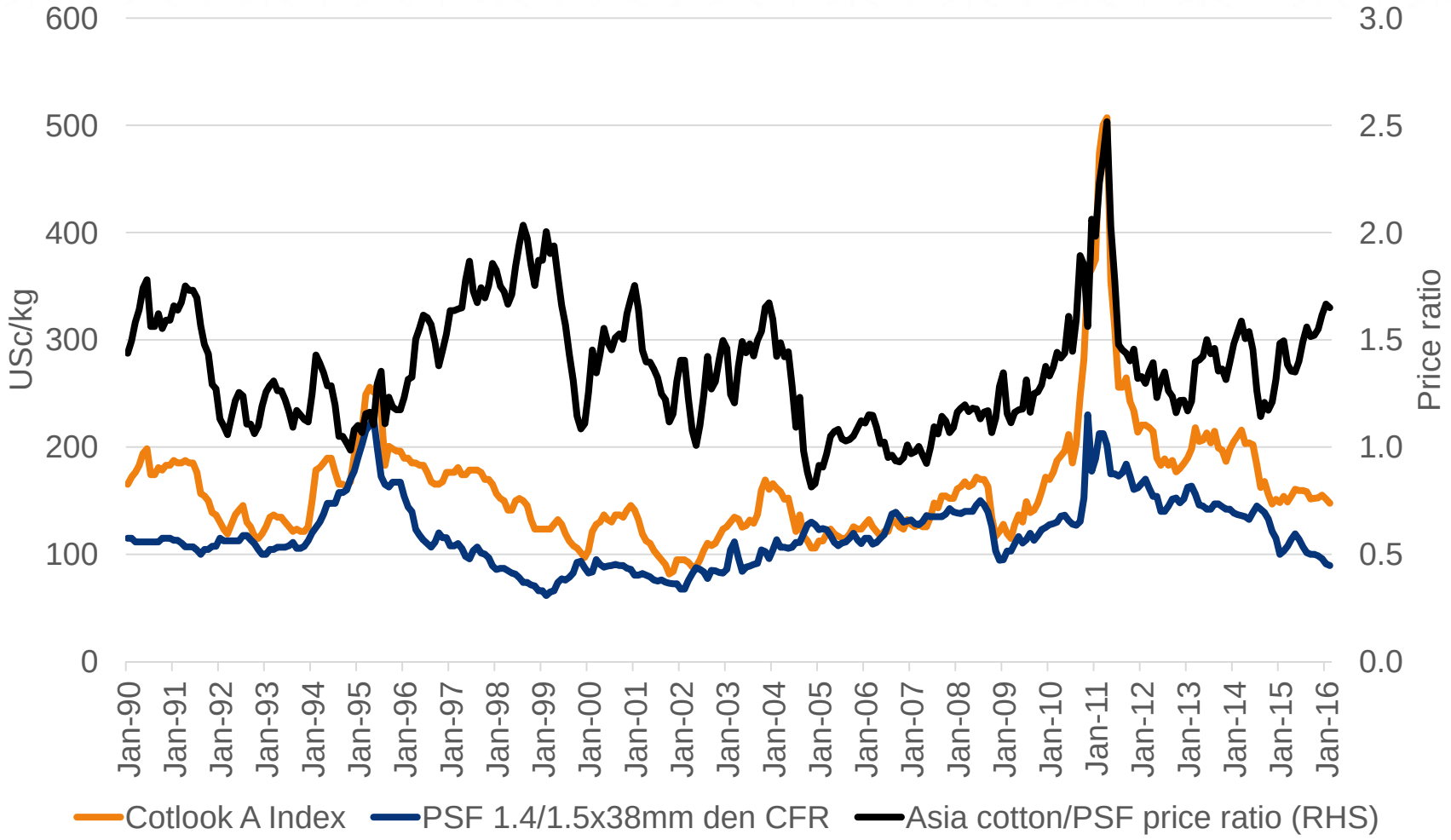
Excess capacity at polyester filament and staple 2015



Asia cotton and polyester staple prices



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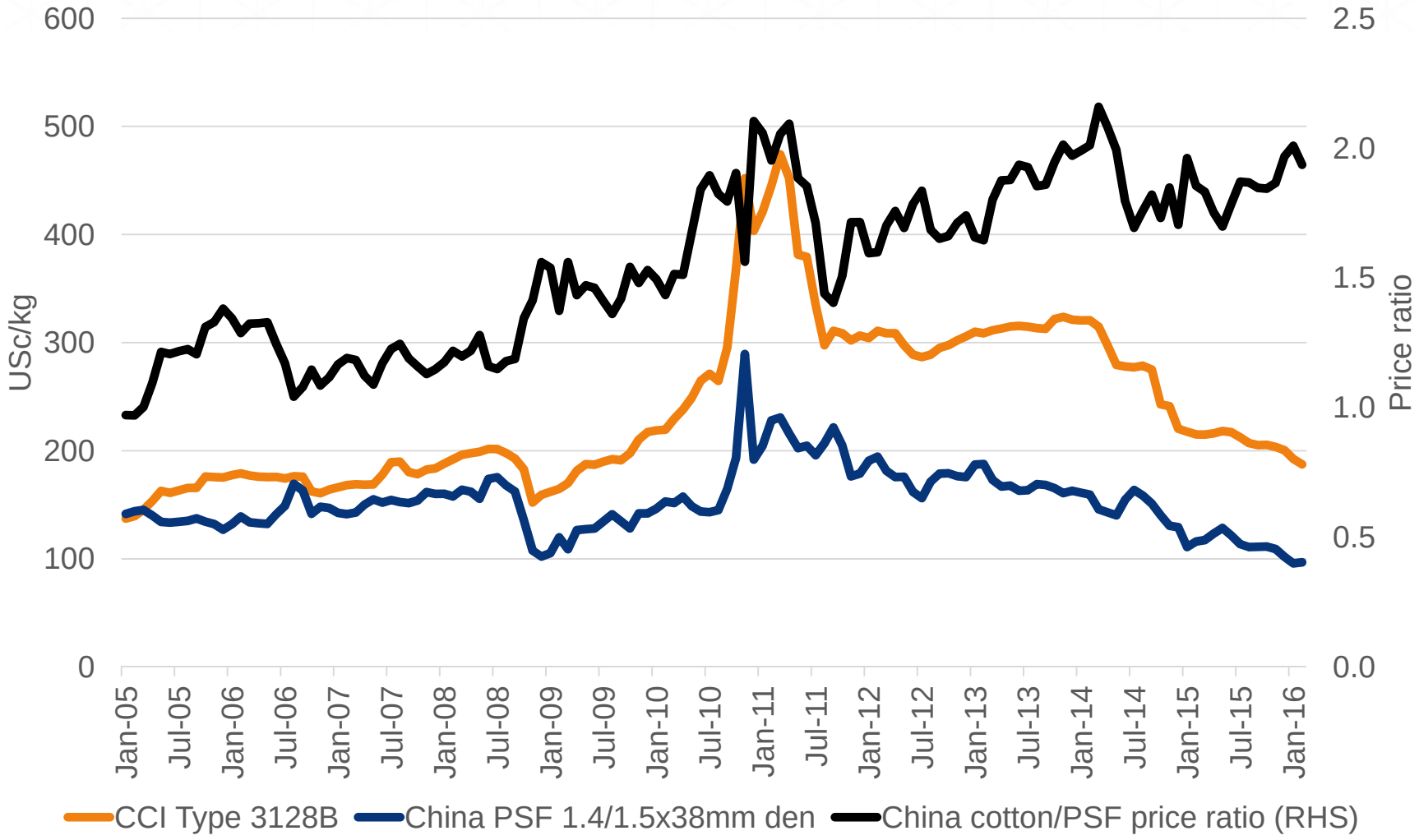
China cotton and polyester staple prices



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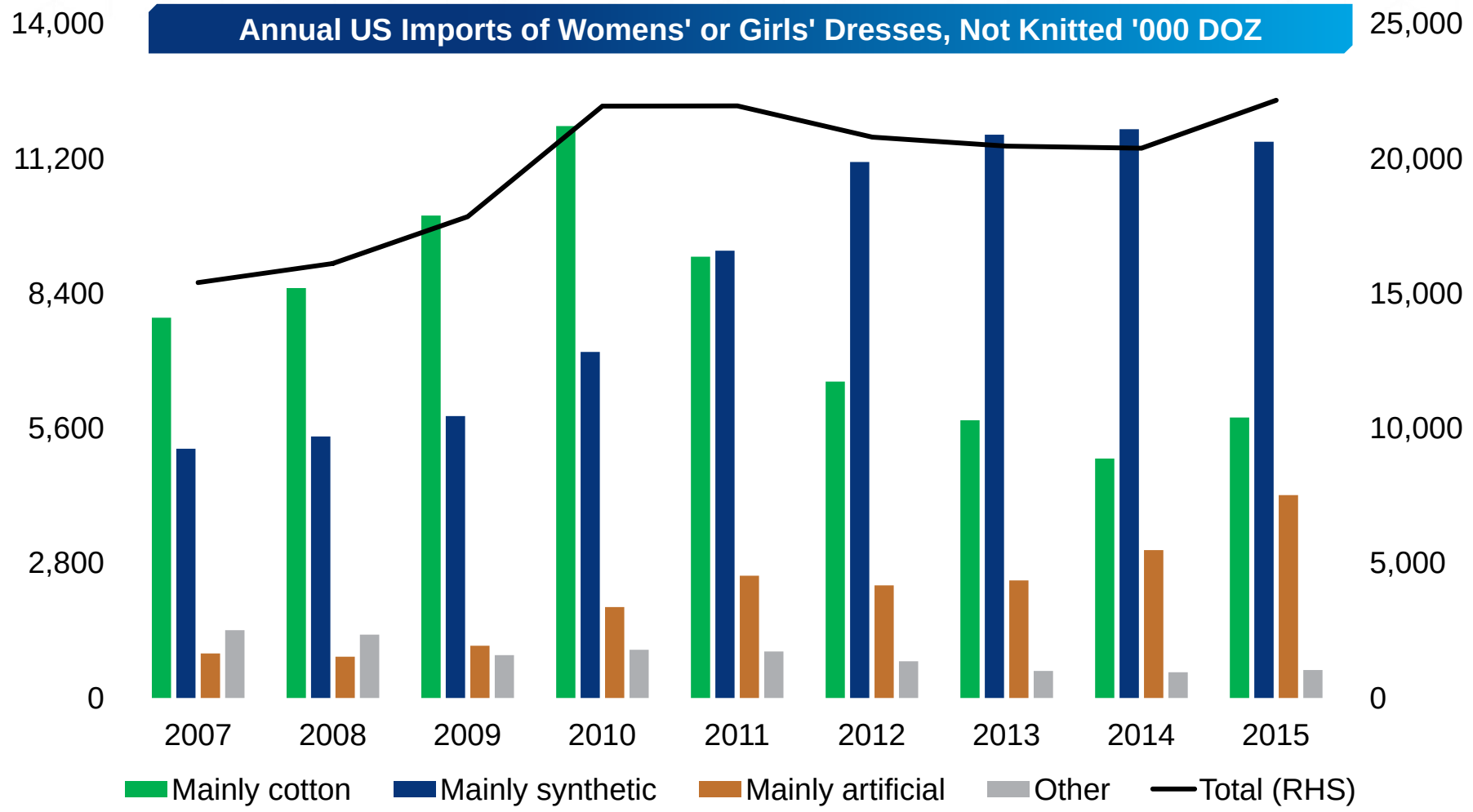
Cotton losing share and volume to MMF in women's dresses



Source: GTIS/PCI Wood Mackenzie

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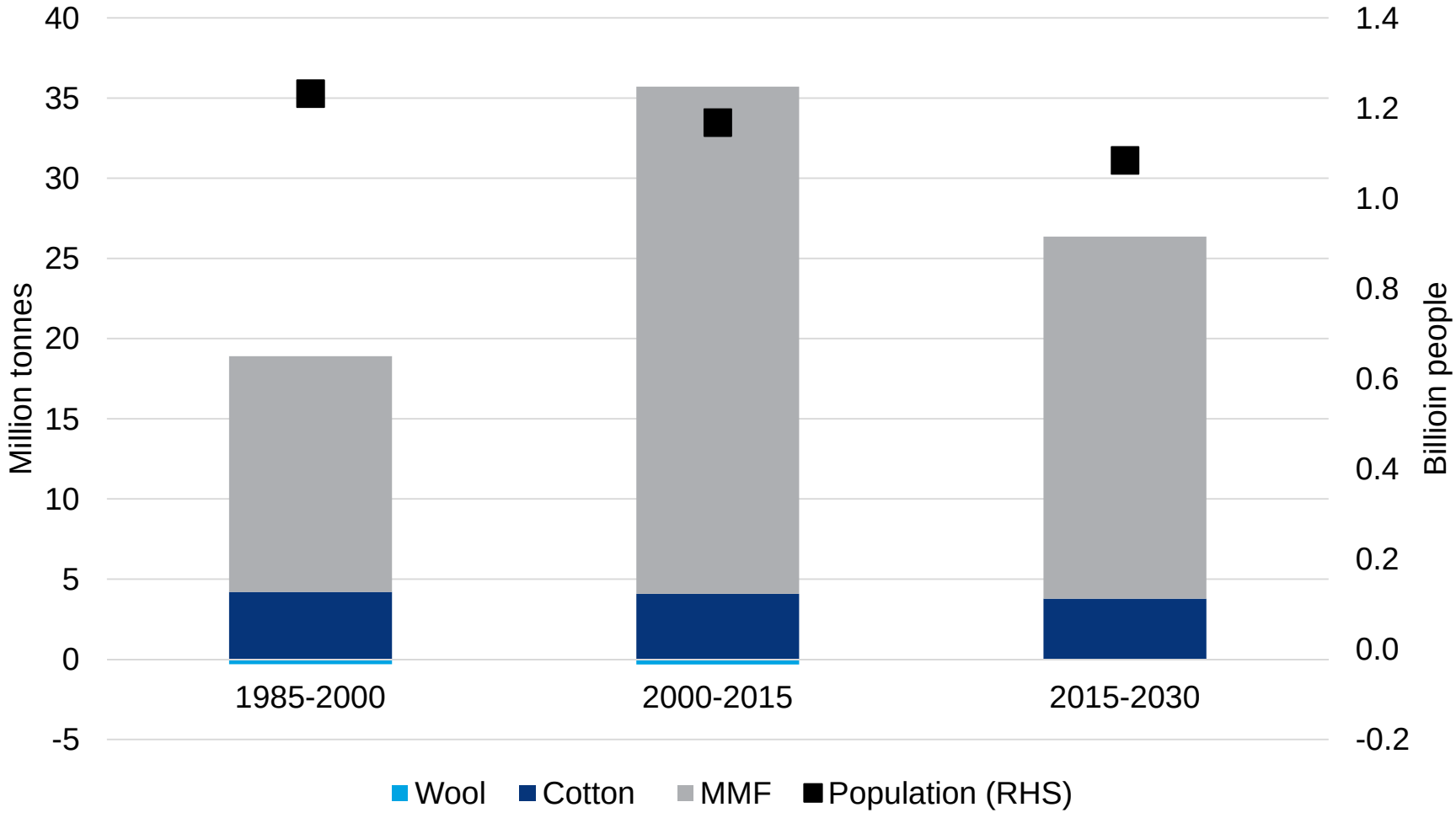
Incremental growth in fibre textile mill consumption and population



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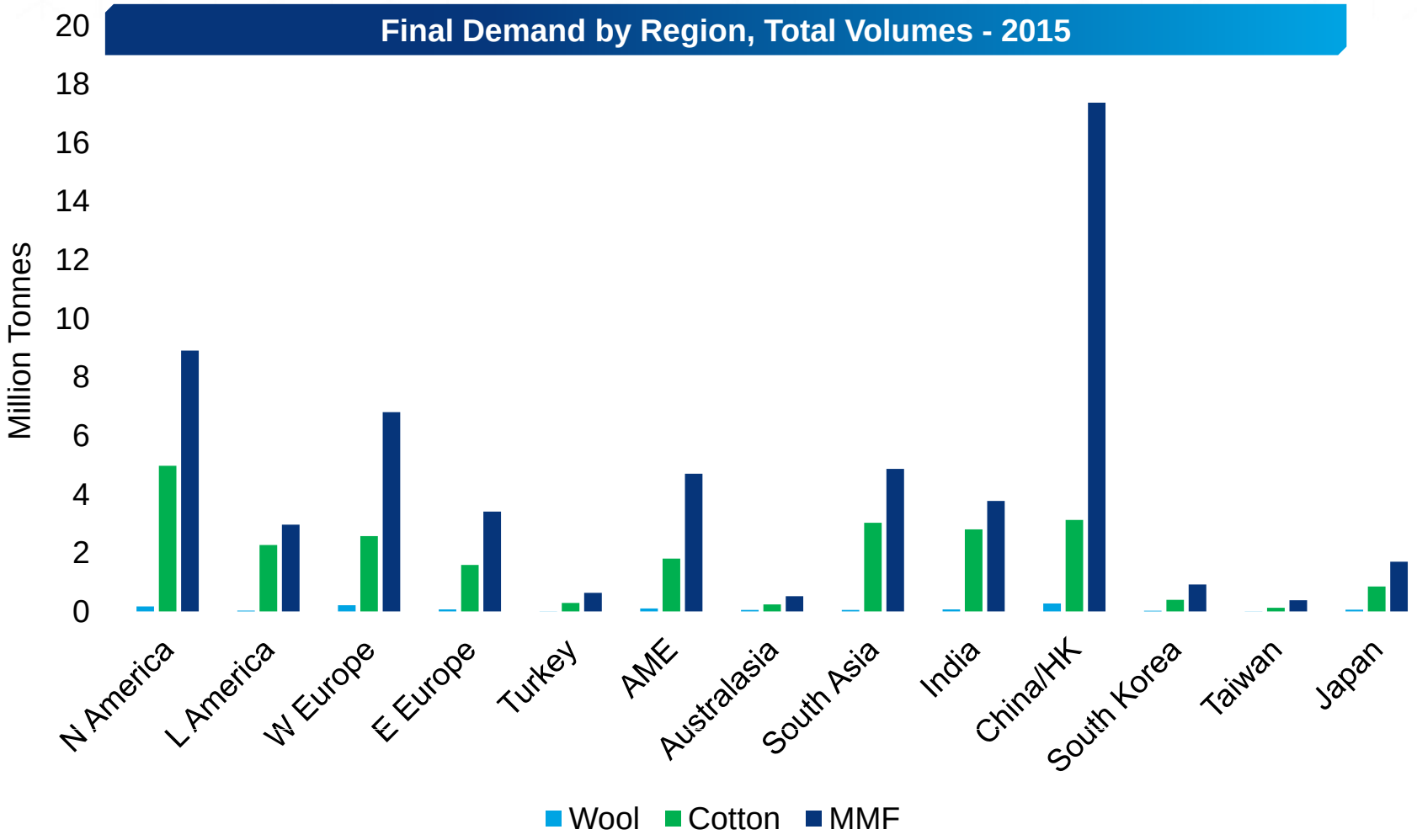
Final demand for MMF now exceeds that for cotton in all regions



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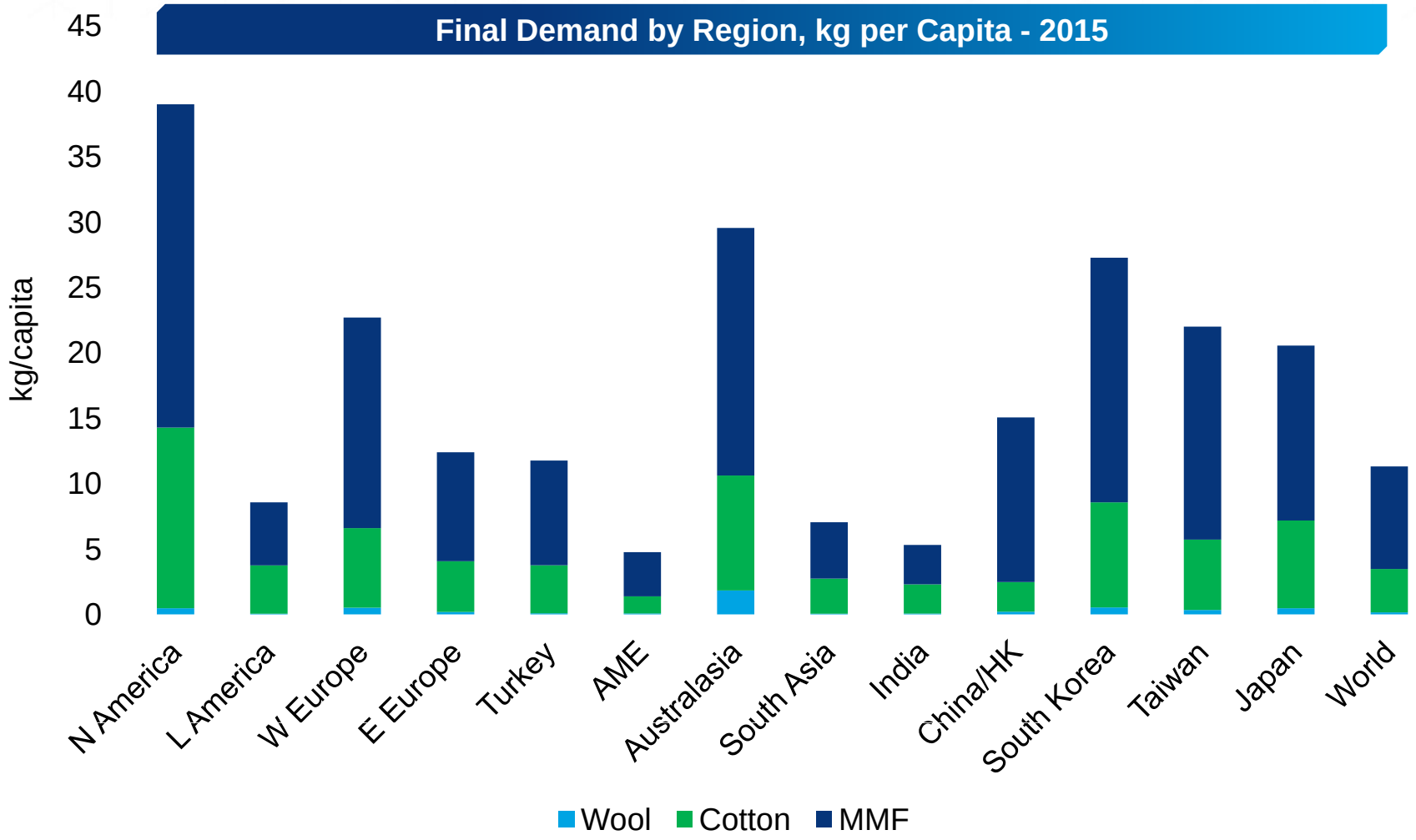
Is there potential for higher cotton demand in China?



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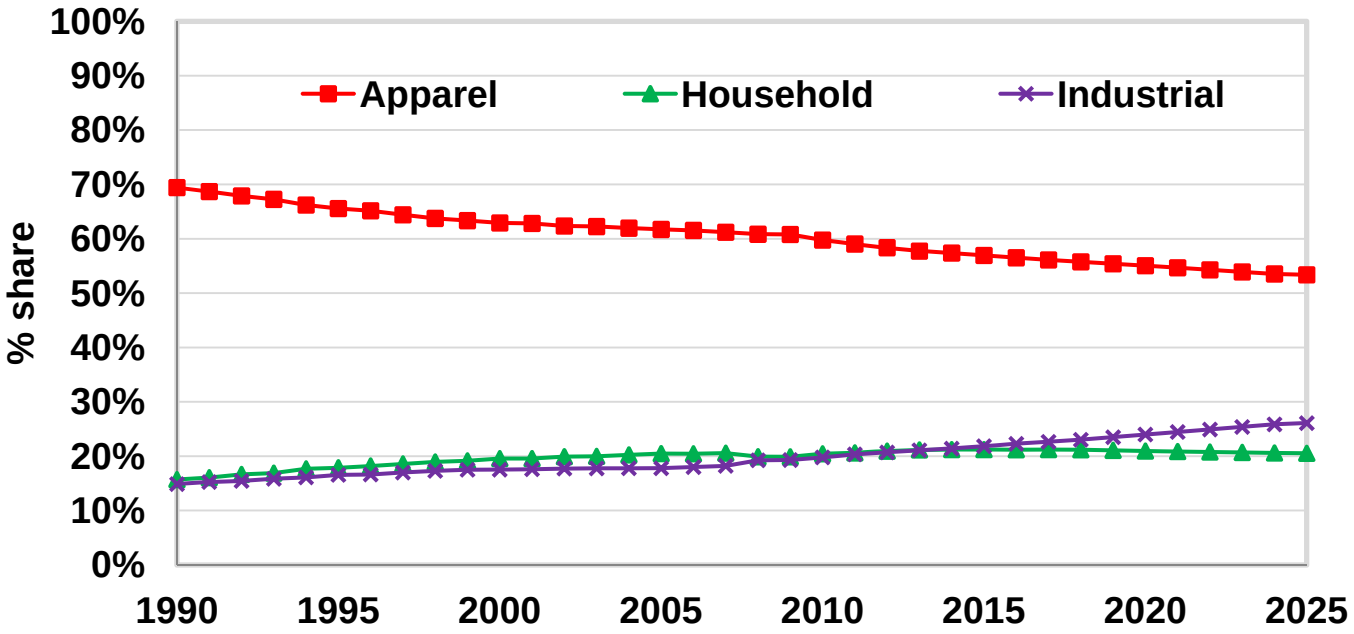
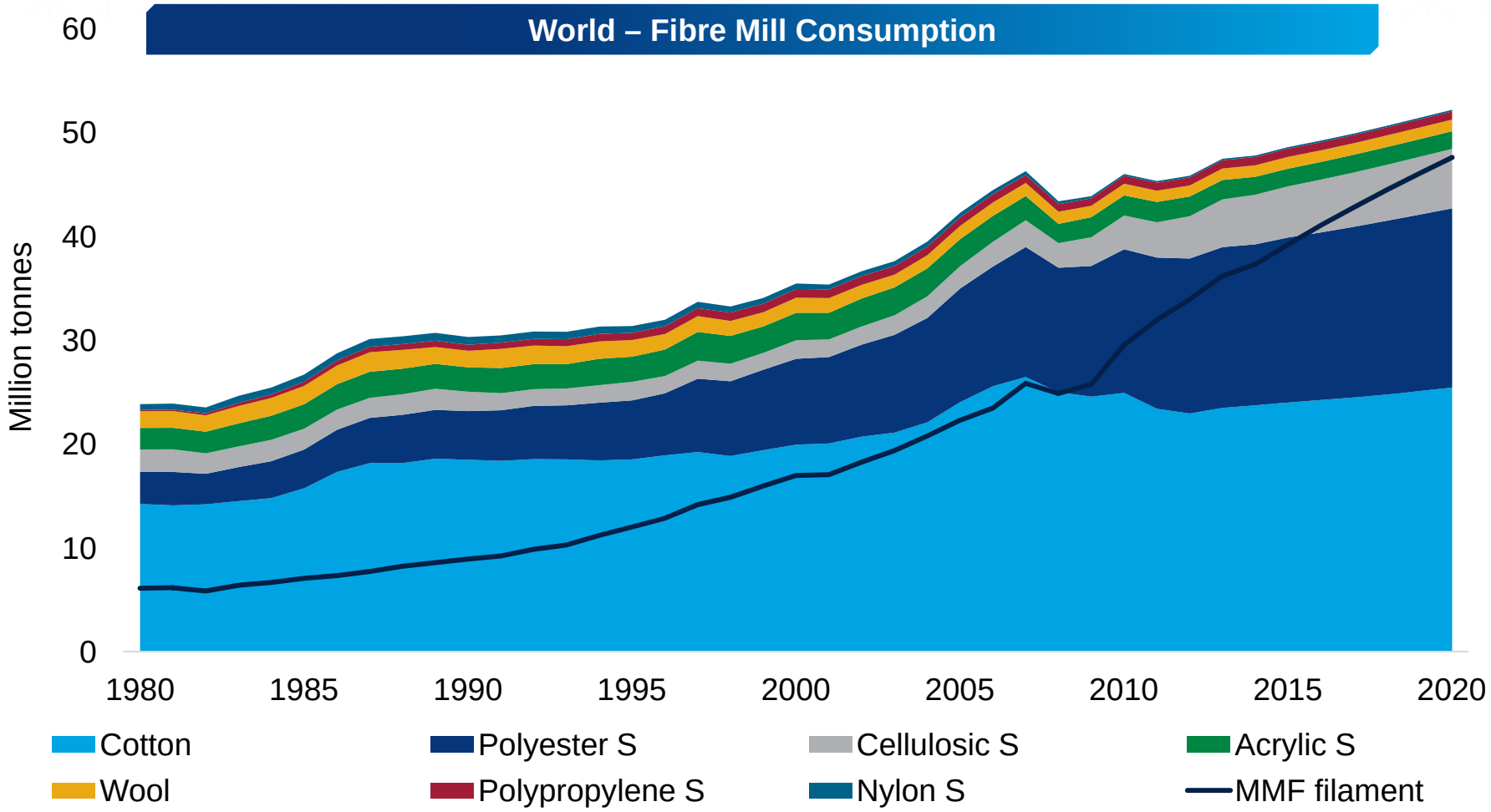
End-use mix - % share global all-fibres demand 1990-2025

Global all-fibres demand by end-use share (%)

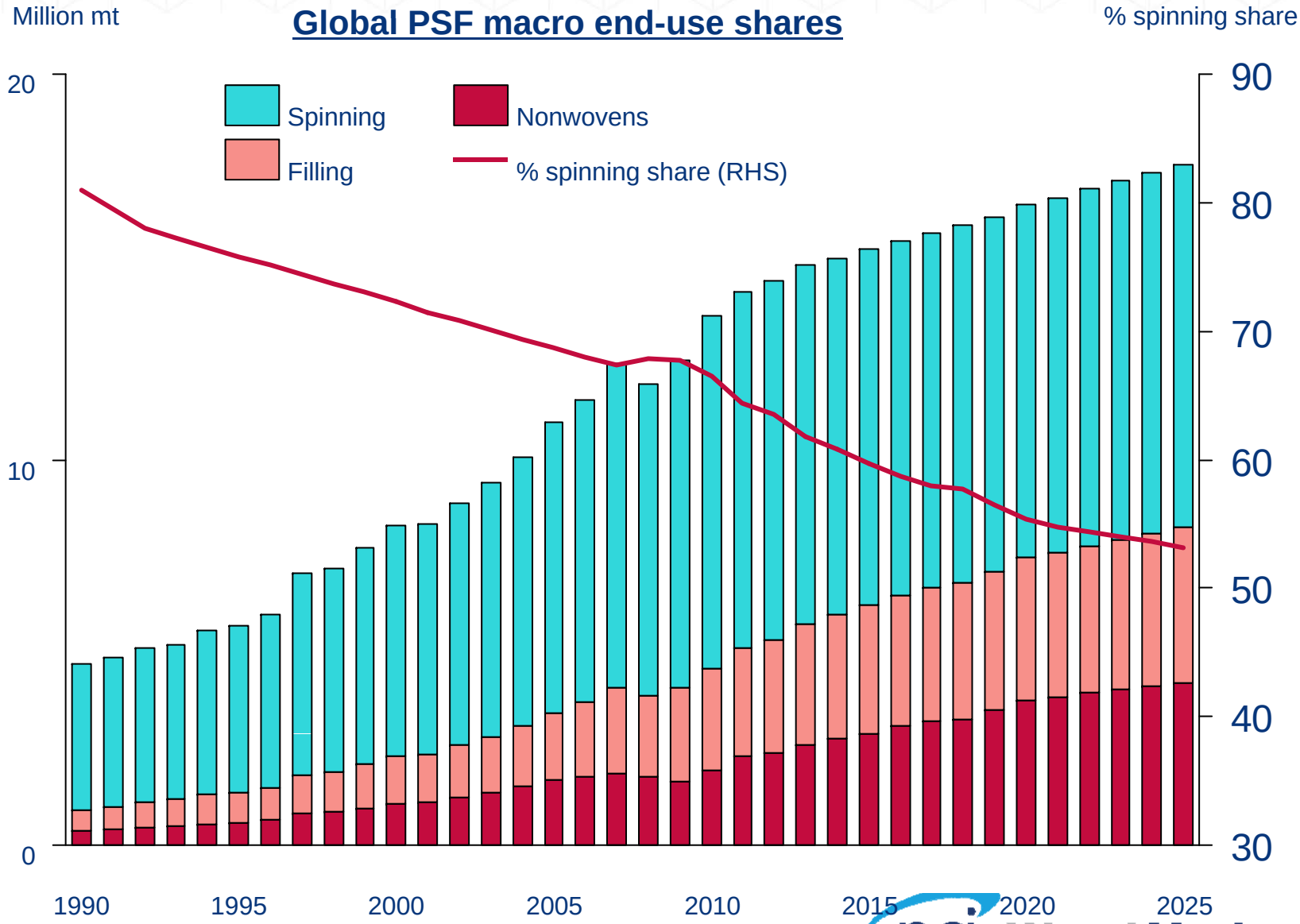


% share	1990	2025
Apparel	69.4%	53.4%
Industrial	14.9%	26.1%
Household	15.7%	20.5%

MMF filament growing faster than staple fibres



Polyester staple fibre – macro end-use applications



Key PSF market segments (ktes) 2015

Market segment	% share
Hygiene / wipes	15%
Fillings / waddings	27%
Technical	2%
Carpets	4%
Home furnishings	16%
Auto	2%
Activewear	3%
Apparel	33%
Volume total ktes	***15868***

End-use definitions – Apparel Textile Product Format

	Knitting	Weaving	Nonwovens	Other
Intimate apparel	Textile filament **PE, PA, viscose, cotton, wool**	Textile filament Spun yarns (minority) **PE, PA, viscose, cotton**	Staple nonwovens **PE, viscose, minor PP**	Textile filament Spun yarns (minority) **PE, PA, viscose**
Swimwear	Textile filament **PE, PA, cotton**	Textile filament Spun yarns (minority) **PE, PA, cotton**		
Sportswear	Textile filament Spun yarns **PE, PA, cotton, wool, viscose, ACR**	Textile filament Spun yarns **PE, PA, viscose, cotton**	Staple nonwovens Membranes **PE / others**	Textile filament Spun yarns (minority) **PE, PA, viscose, cotton**
Hosiery	Textile filament Spun yarns **PA, PE, cotton, ACR, wool**			
Outerwear	Textile filament Spun yarns **PE, PA, viscose, cotton, ACR**	Textile filament Spun yarns Minor IF yarns **PE, PA, viscose, cotton, ACR, wool**	Staple nonwovens Spunbond nonwovens **PA, PE**	Textile filament Spun yarns **PE, PA, viscose, cotton, ACR**
Career apparel / uniforms	Textile filament Spun yarns **PE, PA, viscose, cotton, ACR**	Textile filament Spun yarns Minor IF yarns **PE, PA, viscose, cotton, ACR, wool**	Staple nonwovens Spunbond nonwovens **PA, PE, PP, viscose**	Textile filament Spun yarns **PE, PA, viscose, cotton, ACR**
Ethnic costumes	Textile filament Spun yarns **PE, PA, cotton**	Textile filament Spun yarns **PE, PA, viscose, cotton**		
Diapers and personal hygiene			Staple nonwovens Spunbonded nonwovens **PE, PP, viscose**	

***PE=polyester, PA=polyamide, PP=polypropylene, ACR=acrylic. Viscose includes other cellulosic variants.**

End-use definitions – Household Textile Product Format

	Knitting	Weaving	Nonwovens	Other
Curtains / upholstery	Textile filament Spun yarns PE, PA, viscose, cotton, ACR	Textile filament Spun yarns PE, PA, viscose, cotton, ACR	Staple nonwovens Spunbond nonwovens PE, PP, PA, viscose	Textile filament Spun yarns PE, PA, viscose, cotton
Carpets / floorcoverings		Filament yarns Spun yarns PE, PP, cotton, ACR, wool	Staple nonwovens Spunbond nonwovens PE, PP, PA	BCF filament Spun yarns PE, PP, PA, wool
Linen	Textile filament Spun yarns PE, viscose, cotton	Textile filament Spun yarns PE, PA, viscose, cotton	Staple nonwovens Spunbond nonwovens PE, PP, viscose	
Towels	Textile filament Spun yarns PE, viscose, cotton	Spun yarns PE, viscose, cotton	Staple nonwovens PE, PP, viscose	
Wipes/ cleaning			Staple nonwovens Spunbonded PE, PP, viscose	
All other	Textile filament Spun yarns PE, PP, cotton, ACR	Textile filament Spun yarns PE, PP, cotton, ACR	Staple nonwovens Spunbond nonwovens PE, PP, viscose	Textile filament Spun yarns PE, PA, viscose, cotton

***PE=polyester, PA=polyamide, PP=polypropylene, ACR=acrylic. Viscose includes other cellulosic variants**

End-use definitions – Industrial Textile Product Format

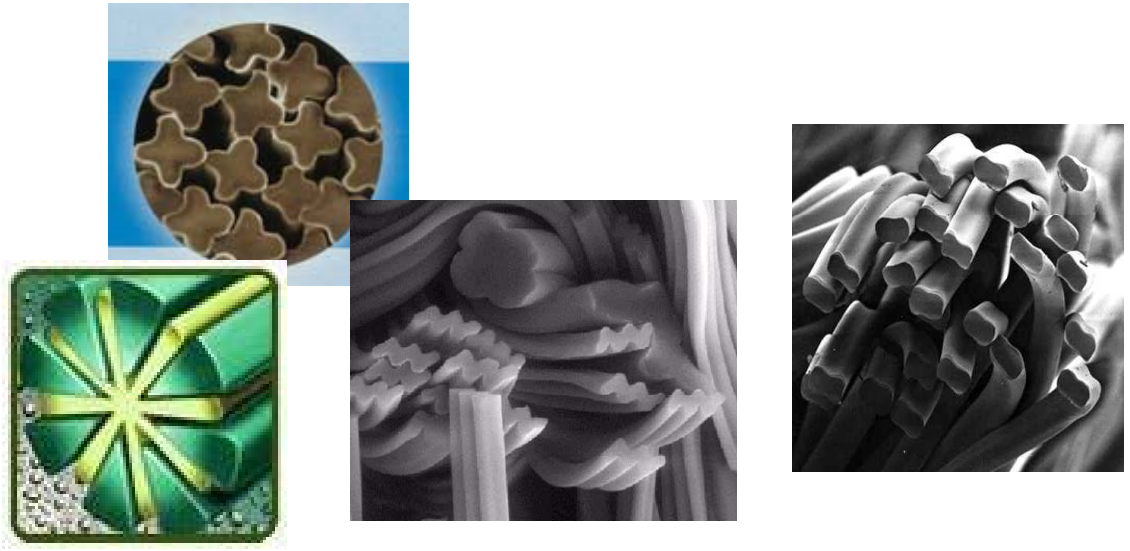
	Knitting	Weaving	Nonwovens	Other
Automotive textiles	Textile filament Spun yarns (minor) **PE, PA**	Textile filament Spun yarns (minor) **PE, PA**	Staple nonwovens **PE, PA, PP**	Industrial filament **PE, PA**
Light denier industrial		Industrial filament **PE, PA**		Industrial filament **PE, PA**
Heavy denier industrial	Weft insertion / warp knit **PE**	Industrial filament **PE, PA, rayon**		Industrial filament **PE, PA, rayon**
Airbags		Industrial filament **PE, PA**		
Geotextiles		Industrial filament **PE, PP**	Staple nonwovens Spunbond nonwovens **PE, PP**	
Filtration		Textile filament Industrial filament PE, PA, high performance yarns	Staple nonwovens Spunbond nonwovens PE, PA, PP, high performance	
Composites / Concrete / Reinforcement				**Staple, filament** **PP, glass fibre, steel etc.**
Paper reinforcement				**Staple** **PP**
All other	Textile filament Industrial filament Spun yarns (minor) **PE, PP, cotton, ACR**	Textile filament Industrial filament Spun yarns (minor) **PE, PP, cotton, ACR**	Staple nonwovens Spunbond nonwovens **PE, PP, PA, rayon**	Textile filament Industrial filament Spun yarns (minor) **PE, PP, rayon, ACR**

***PE=polyester, PA=polyamide, PP=polypropylene, ACR=acrylic. Viscose includes other cellulosic variants**

Polyester filament functionalities

Yarn functionality can be modified by various methods….

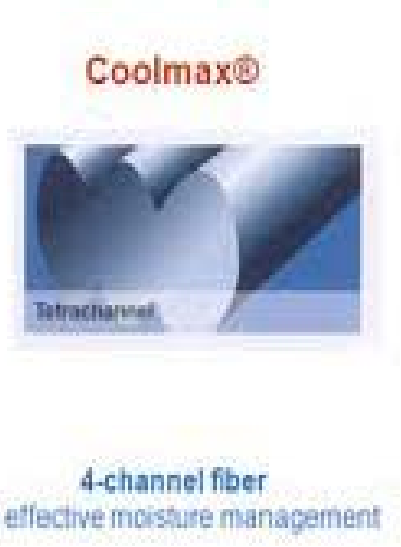
filament/fibre thickness	touch/softness, brushability, drape
bright/dullness level	appearance (lustre, shine, matt)
filament/fibre cross section shape	appearance & functionality
dye-uptake levels	standard dye, deep dye
shrinkage	
stretch/recovery	
strength/tenacity	
bulk	

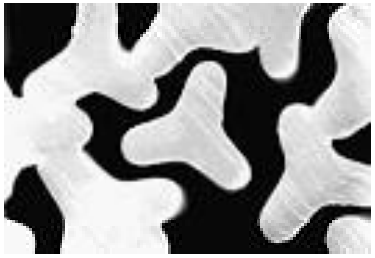


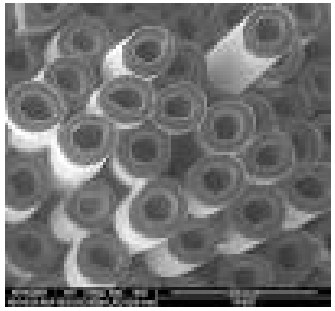
Adjusting fibre cross-section is the first step to differentiated product

Very broadly speaking, cross sections are used as follows:

- Trilobal, octolobal, tape, diabolo (ie different solid shapes) alter the lustre (and to a lesser degree handle) of the fabric.
- A channelled surface (eg Coolmax, Gcool) is generally about moisture transportation, wicking, etc.
- Hollow cross sections are used to regulate thermal properties (often to store heat) .
- Certain cross sections are used in bicomponent yarns to alter the differential shrinkage of the two polymer components and so achieve properties like stretch, different colour values, etc.







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Challenge: marine litter. Plastic waste to the oceans, persistent macro particles as well as micro and nano particles

Macro plastics in fishing nets with catch.

Source: ECOALF

One solution: recycling

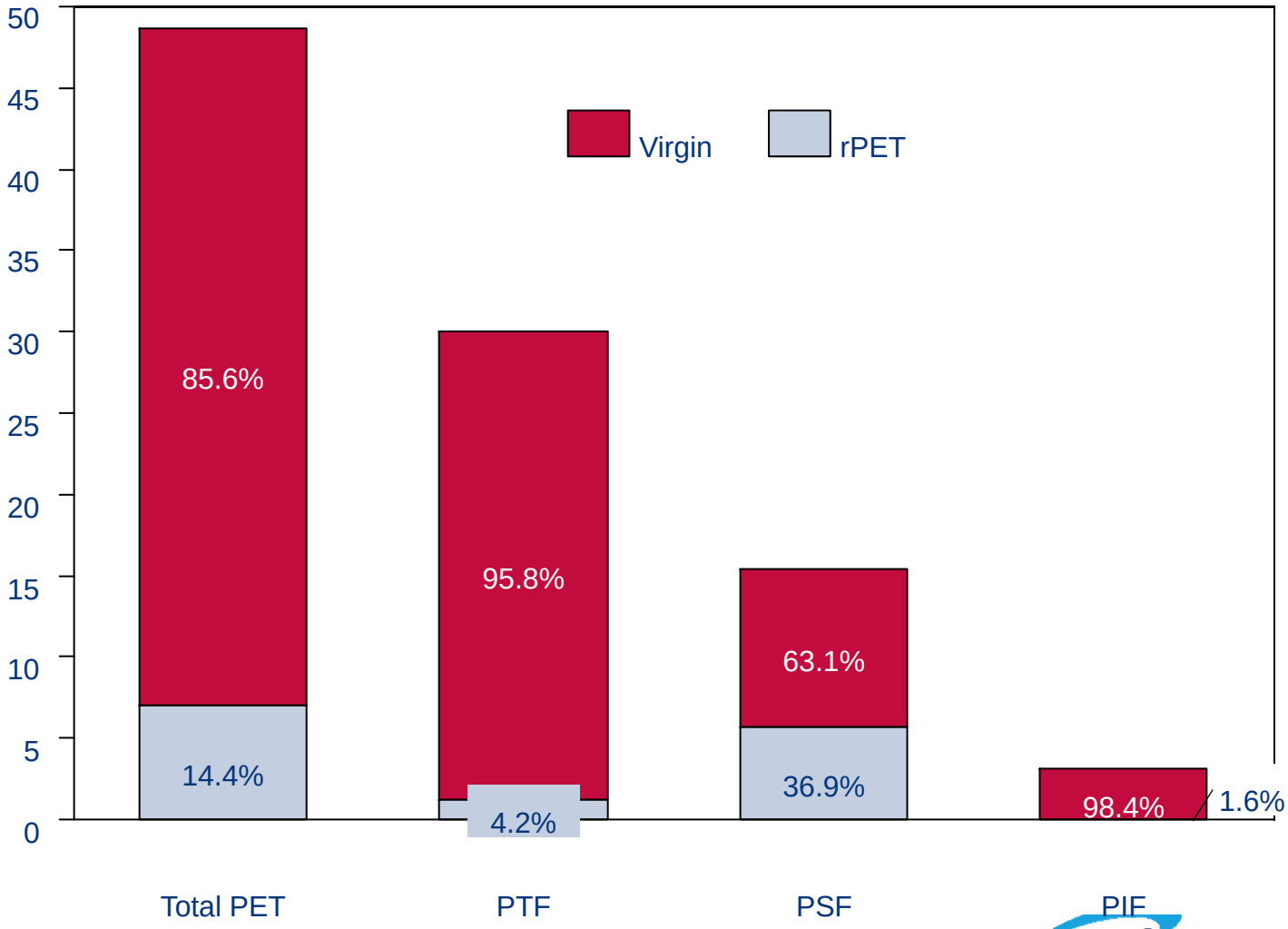
Bale of PET bottles ready for recycling

Source: ECOALF

Polyester filament / staple in rPET

million mt

Share of polyester variants in rPET



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Polyester in apparel - rPET

Source: http://www.nike.com/

20 denier recycled polyester

Source: http://www.eddiebauer.com/

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MMF end-product examples addressing product innovation and sustainability

- Nike's Fyknit athletic footwear: Nike Vapor Untouchable: http://news.nike.com/news/nike-vapor-untouchable-cleat-merges-speed-strength-and-sustainability
- Adidas/Parley for the Oceans footwear/Primeknit technology: http://news.adidas.com/US/Latest-News/ALL/ADIDAS-AND-PARLEY-FOR-THE-OCEANS-SHOWCASE-SUSTAINABILITY-INNOVATION-AT-UN-CLIMATE-CHANGE-EVENT/s/f66a1b3e-8a9f-48b5-825f-63ddc72c09e7
- Aquafil ECONYL ® http://www.econyl.com/
- Unifi REPREVE http://repreve.com/
- RadiciGroup MERMAIDS challenge – mitigation of the migration of micro and nano-particles from synthetic textiles during laundering http://www.radicigroup.com/en/news-media/news/radicigroup-and-cnr_ismac-biella-take-up-the-mermaids-challenge-commitment-to-environmental-sustainability-30413
- ECOALF http://ecoalf.com/us_en/about/
- Tamicare http://www.tamicare.com/
- Bio-raw materials for MMF.

Thank you

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