



Sorona®
"Performance
+
Environmental Benefits"

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2015 Sustainability Goals

SOLUTIONS FOR A BETTER, SAFER, HEALTHIER WORLD



DUPONT

The miracles of science™

Eco-Action

- **Established Corporate Sustainability Goals:**
 - In 2000 set goals for 2010
 - In 2006, set goals for 2015
- **Both Operational and Market Facing Goals**
- **2007: Established the DuPont Renewably Sourced Materials Program that works across the 5 Business Platforms at DuPont.**

2015 Sustainability Goals: Serving the Marketplace

- **Environmentally Smart Market Opportunities from R&D Efforts:** Double our investment in R&D programs with direct, quantifiable environmental benefits everyone along our value chains.
- **Products that Reduce Greenhouse Gas Emissions:** Increase our annual revenues by at least \$2 billion from products that create energy efficiency and/or significant greenhouse gas emissions reductions.
- **Products that Protect People:** Introduce at least 1,000 new products or services that help make people safer globally.
- **Revenues from Non-Depletable Resources: Nearly double revenues from non-depletable resources to at least \$8 billion.**



Balance is KEY

Eco-Metrics

Metrics without buzz or action is a science project.

Goals
Corporate
Values

Eco-Communication

'Buzz' without action and metrics is greenwashing.

Eco-Action

Action without buzz and metrics is misdirected zeal.

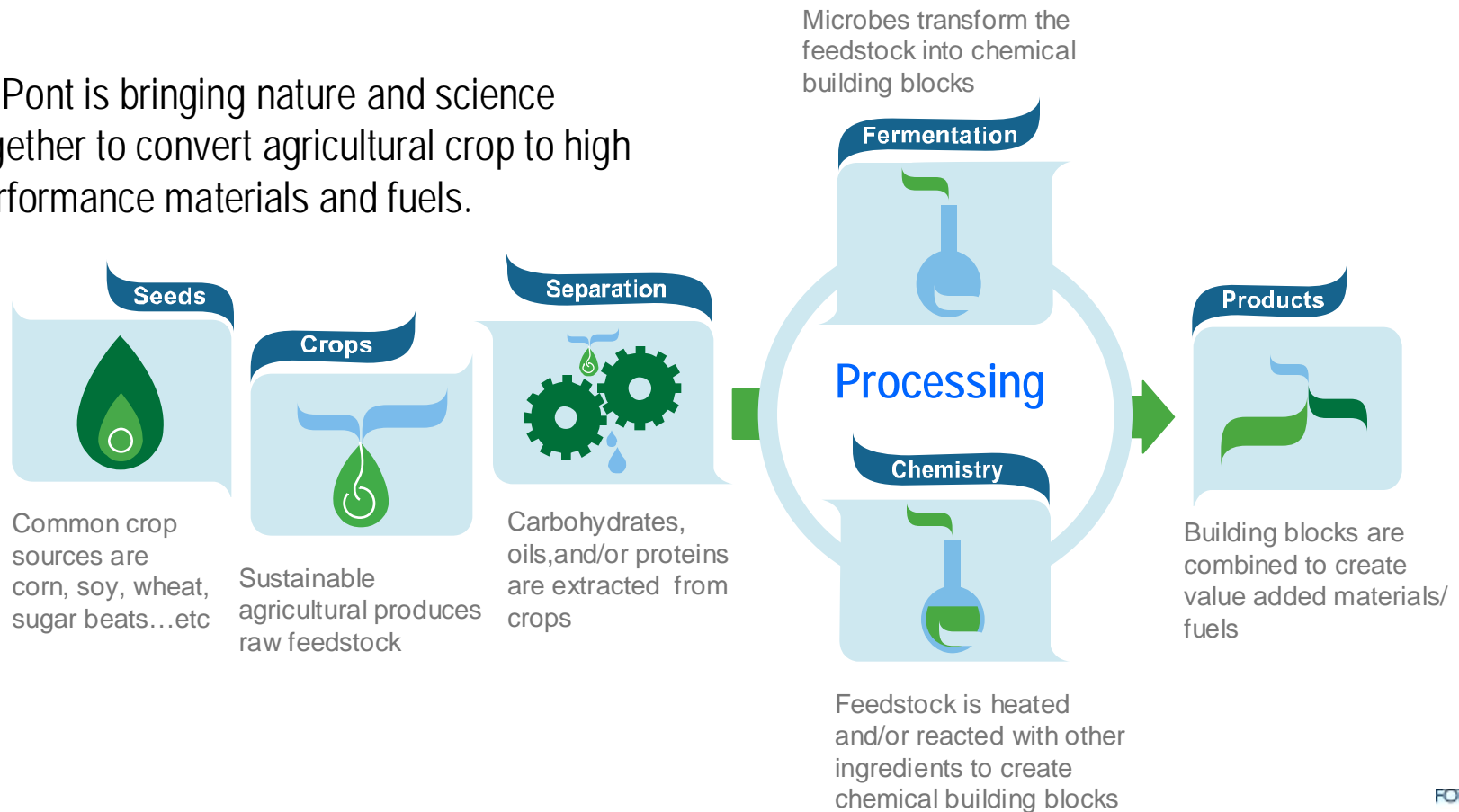
*There are many shades of “green”...
...why renewably sourced?*

- Starting from the source allows us to improve the environmental performance for products all the way to the end user
- Renewably sourced processes often bring other benefits (lower energy use, lower GHG emissions, etc.)
- Solutions can be implemented NOW using existing infrastructure
- Customers can control and guarantee the positive impact
- Freedom from petroleum dependency has other important benefits

The Renewably Sourced Process



DuPont is bringing nature and science together to convert agricultural crop to high performance materials and fuels.



Criteria

- **Renewable Content**
 - **A renewable ingredient is an ingredient obtained from sustainable agricultural sources**
 - **Minimum of 20% renewable content by weight.**
 - **Renewable content is verified by ASTM carbon dating (more on that later) that measures biobased carbon content; renewable content is then calculated using the stoichiometry of the raw material. These tests are performed in an independent testing facility.**
 - **Will disclose actual renewable content for each product carrying this icon along with other relevant environmental impact information**
- **Performance + Environmental Benefits**
 - **Product testing confirms that renewably sourced product meets or exceeds the analogous petroleum-derived product in critical performance dimensions.**

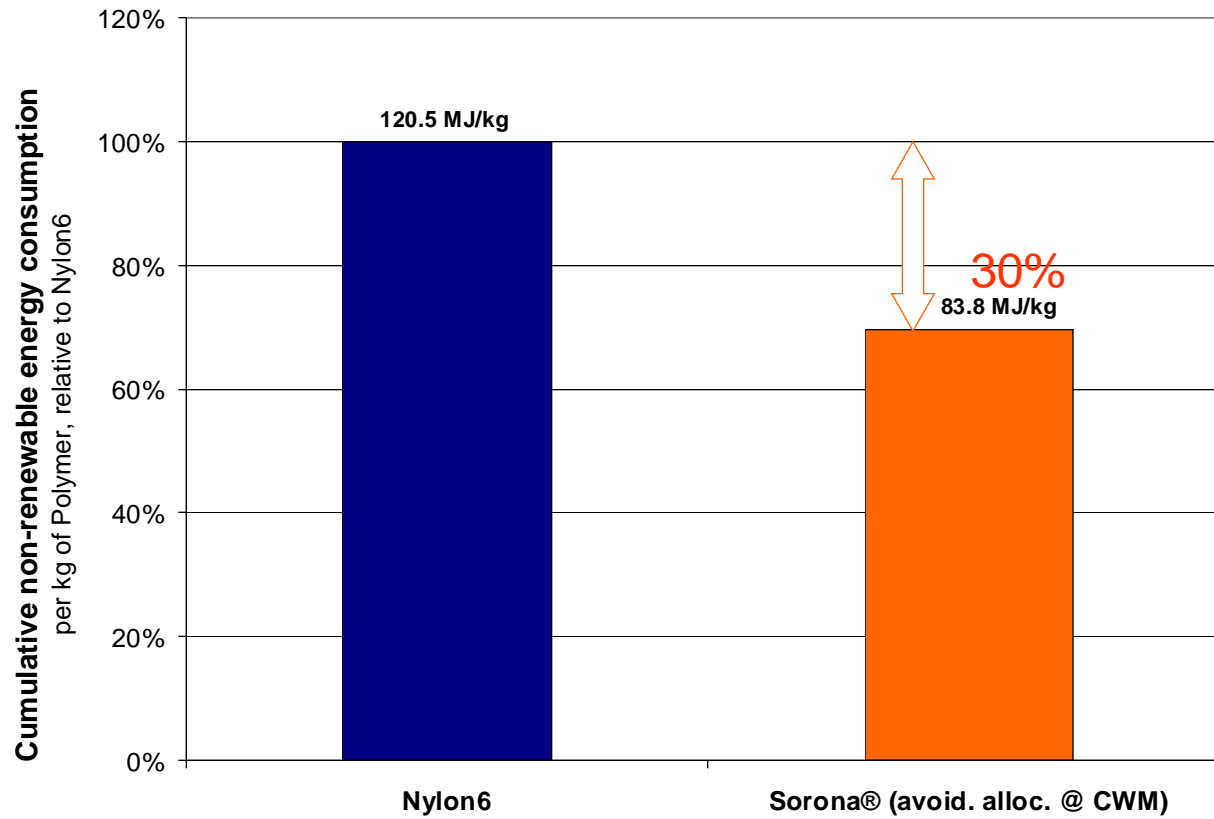
Eco-Metrics

- We are providing peer-reviewed life cycle analysis data on our products
- All information based on ASTM or other standard tests and procedures
- Gives customers the info to decide how to control and market the environmental impact of their products

www.renewable.dupont.com

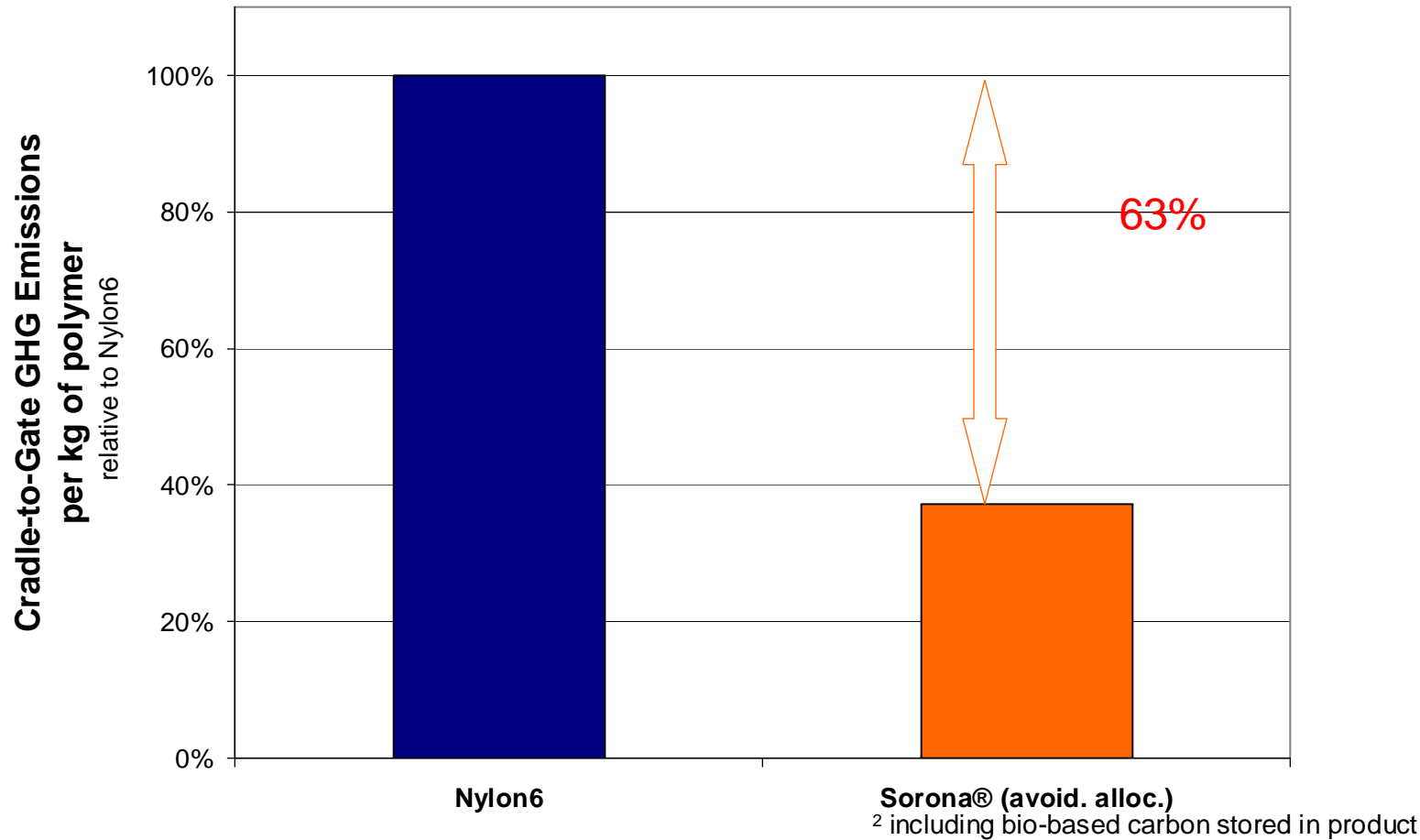
Sorona®: renewably sourced™ polymers			
	Our Product	Conventional Product	Substitute Product
BACKGROUND INFORMATION			
Product Name	DuPont™ Sorona® renewably-sourced polymer	PTT-01	Nylon
Chemical Name	poly(trimethylene terephthalate)	poly(trimethylene terephthalate)	polyamide (Type 6)
Major Uses	Textile & carpet fibers	Textile & carpet fibers	Textile & carpet fibers
DuPont Manufacturing Location	Kinston, SC, USA; Jiangsu, China (DuPont licensee Zhenjiang Glory)	n/a	n/a
CRADLE-TO-GATE MANUFACTURING PARAMETERS			
Greenhouse Gas Emissions kg CO2 equivalents/kg	3.38 ^{1, 2}	Propylene route: 4.42 ¹ Ethylene oxide route: 4.04 ³	9.1 ⁴
Non Renewable Energy Consumption MJ/kg	83.8 ^{1, 5}	Propylene route: 101.2 ^{1, 5} Ethylene oxide route: 94.6 ³	120.5 ^{4, 5}
PRODUCT PROPERTIES			
Renewable content % by weight	37%	0%	0%
Biobased Carbon Content % by weight ⁶	28%	0%	0%
Biodegradability ⁷	n/a	n/a	n/a
Compostability ⁸	No	No	No
Other Information	Recyclability of Sorona® in the PETE waste stream is being established via Association of Postconsumer Plastic Recyclers (APR) guidelines		
References	<ol style="list-style-type: none"> Peer-reviewed LCA of Bio-PDO / Sorona production (Peer reviewer: Prof. Konrad Saur, Five Winds International) includes bio-based carbon stored in product G. Elliott, L. Cisneros, R. Ramachandran "A Life Cycle Assessment of Corterra Polymer" (May 12, 2005) PlasticsEurope (March 2005), A. Boustead, Ecoprofiles of the European Plastics Industry, Polyamide 6 (Nylon 6) (www.lca.plasticseurope.org/) based on higher heating values (HHV) ASTM Standard D 6852: Standard Guide for Determination of Biobased Content, Resources Consumption, and Environmental Profile of Materials and Products ASTM Standard E1720 Standard Test Method for Determining Ready, Ultimate, Biodegradability of Organic Chemicals in a Sealed Vessel CO2 Production Test ASTM Standard D6400 Standard Specification for Compostable Plastics 		
DuPont™ Renewably Sourced™ Materials contain a minimum of 20% renewably sourced ingredient by weight.			

Sorona® / Nylon6 Benchmark: Energy



PlasticsEurope (2005)

Sorona® / Nylon6 Benchmark: Cradle-to-Gate GHG Emissions²



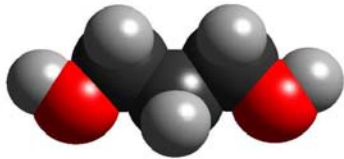


Eco-Communications or 'Buzz'

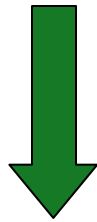
- **Recipient of the U. S. Environmental Protection Agency's 2003 Presidential Chemistry Award for Bio-PDO™**
- **DuPont™ Sorona® renewably sourced polymer was recognized in 2004 as the “Most Visionary Innovation” by the China State Intellectual Property Office and China Central Television (CCTV)**
- **Named to the 2006 “Wired 40” list, published by *Wired* magazine to recognize companies for innovation, strategic vision and global reach.**
- **Named to Fast Company's 2006 “Fast 50” list of people and organization who will change the world.**
- **DuPont rated #1 on *Business Week's* 2005 list of the “Top Green Companies.”**
- **DuPont randed #1 in the U.S. and #2 Globally by Ceres in 2006 for meeting the business challenges associated with climate change.**
- **Named to 2006 Wired 40 list, published by Wired magazine to recognize companies for innovation, strategic vision and global reach**
- **Named to Fast Company magazine's 2006 “Fast 50” list of people and organizations who will change the world.**

DuPont™ Sorona® Polymer

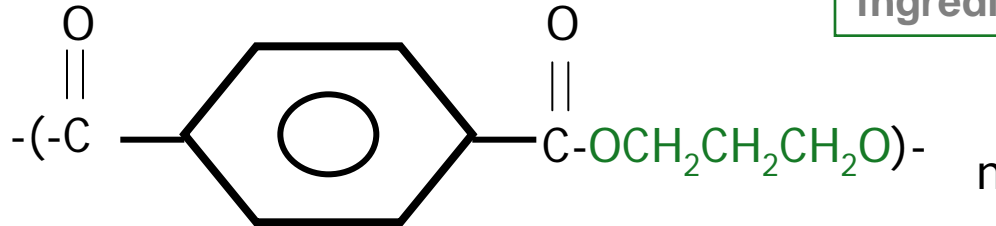
1,3-propanediol + DMT / TPA



Bio-PDO™



Catalyst



Sorona® renewably
sourced polymer

- Unique polymer with versatile properties
- 37% renewably sourced ingredients, by weight

Sorona®: a high performance polymer

- Unique molecular structure and crystalline morphology giving unique properties in fibers, plastics and films. Strain deformation occurs in crystalline regions, allowing full recovery.

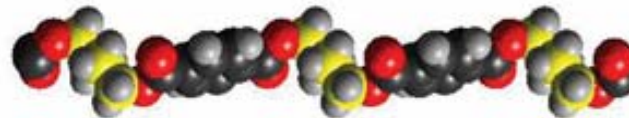
- Tough
- Stretch with recovery
- Resilient
- Soft
- Thermo-formable



2GT, PET



Sorona®
3GT, PTT



4GT, PBT

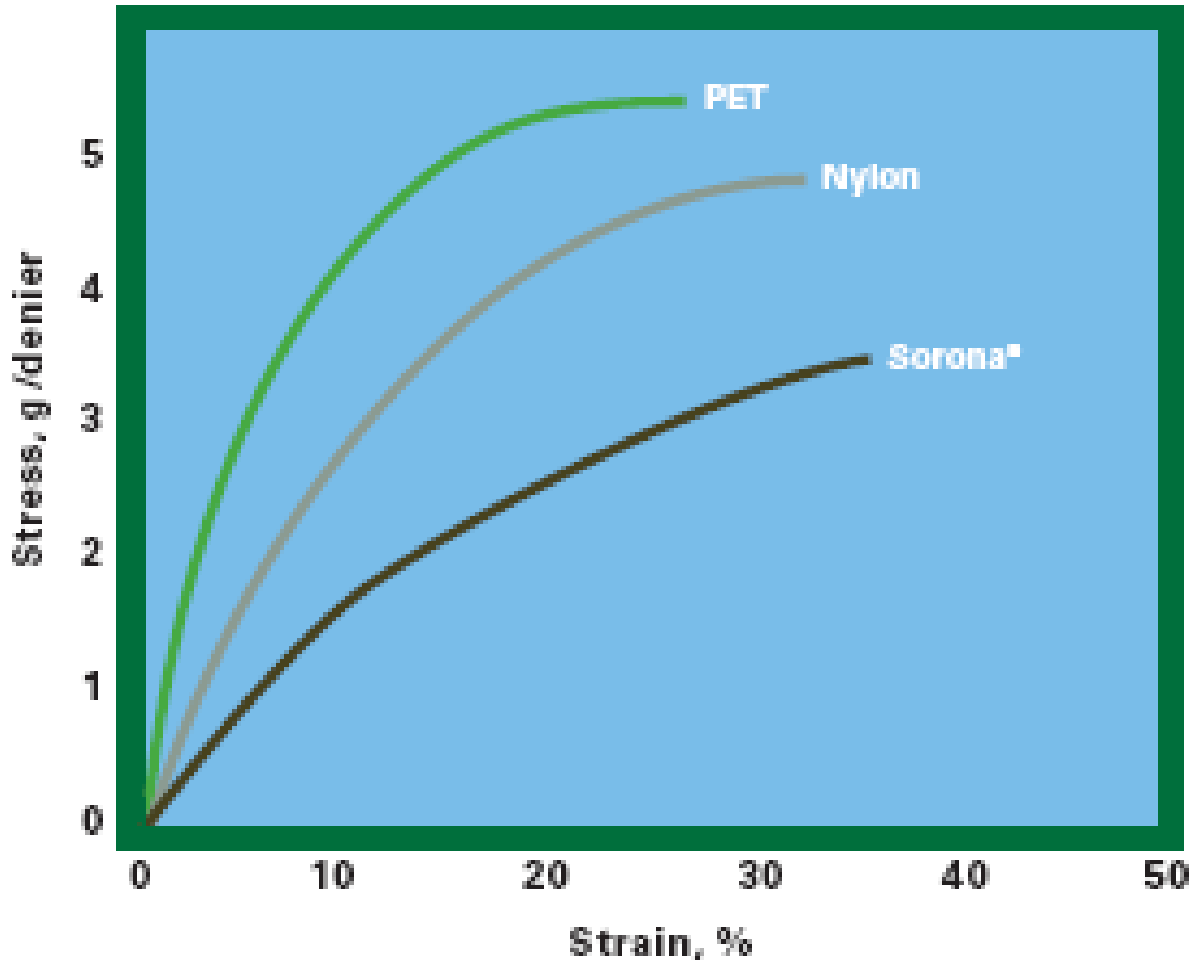
FIBER PROPERTY COMPARISON

<i>PROPERTY</i>	<i>Sorona®</i>	<i>PET</i>	<i>Nylon 6</i>	<i>Nylon 6.6</i>
Tenacity (cN/dtex)	3.1 - 3.5	3.7 - 4.4	4.1 - 4.5	4.1 - 4.5
Elongation @ Break (%)	36 - 42	30 - 38	32 - 44	32 - 44
Initial Young's Modulus (cN/dtex)	23	97	31	31
Load at 10% Strain (cN/dtex)	0.8	2.0	1.2	N/A
Tensile Recovery from 20% Strain (%)	90	30	60	60
Glass Transition (°C)	45 - 65	70 - 80	40 - 87	50 - 90
Melting Point (°C)	228	265	220	263
Specific Gravity (g/cm ³)	1.33	1.38	1.13	1.14
Boil Shrinkage (%)	14	7	13	13
Water Absorption (% by weight – 14 days)	0.15	0.5	9.5	9.0

Type of Fibers Produced

Extruded Yarn	Converted Yarn	Fabric Structure	Sorona® Benefits
POY	DTY	Weft Knits	Comfort Stretch, Moisture Management, Bright Colors
		Filling Yarns for Natural Warps	Width Stretch, Stability for Natural Fibers at lower heat-setting temperature
		Filling Yarns for Sorona® Warps	Width Stretch, Resistance to: wrinkling, soiling, UV Degradation
		Back bar for warp knitting	Comfort length stretch
FDY		Weft Knits (with or without elastane)	Drape, silkiness, softness, bright colors
		Warp Knits (with or without elastane)	Drape, silkiness, softness, bright colors
		Warp Yarns for weaving	Softness
BCF		Carpet	Resilience, Softness, Permanent Stain Resistance
Staple	100%	Weft Knit, Woven, Hosiery	Good Pilling Resistance, comfort stretch, softness bright colors
	Blended with Natural fibers	Weft Knit, Woven, Hosiery	Comfort stretch, low temperature heat-set, softness

Tensile Properties of Flat

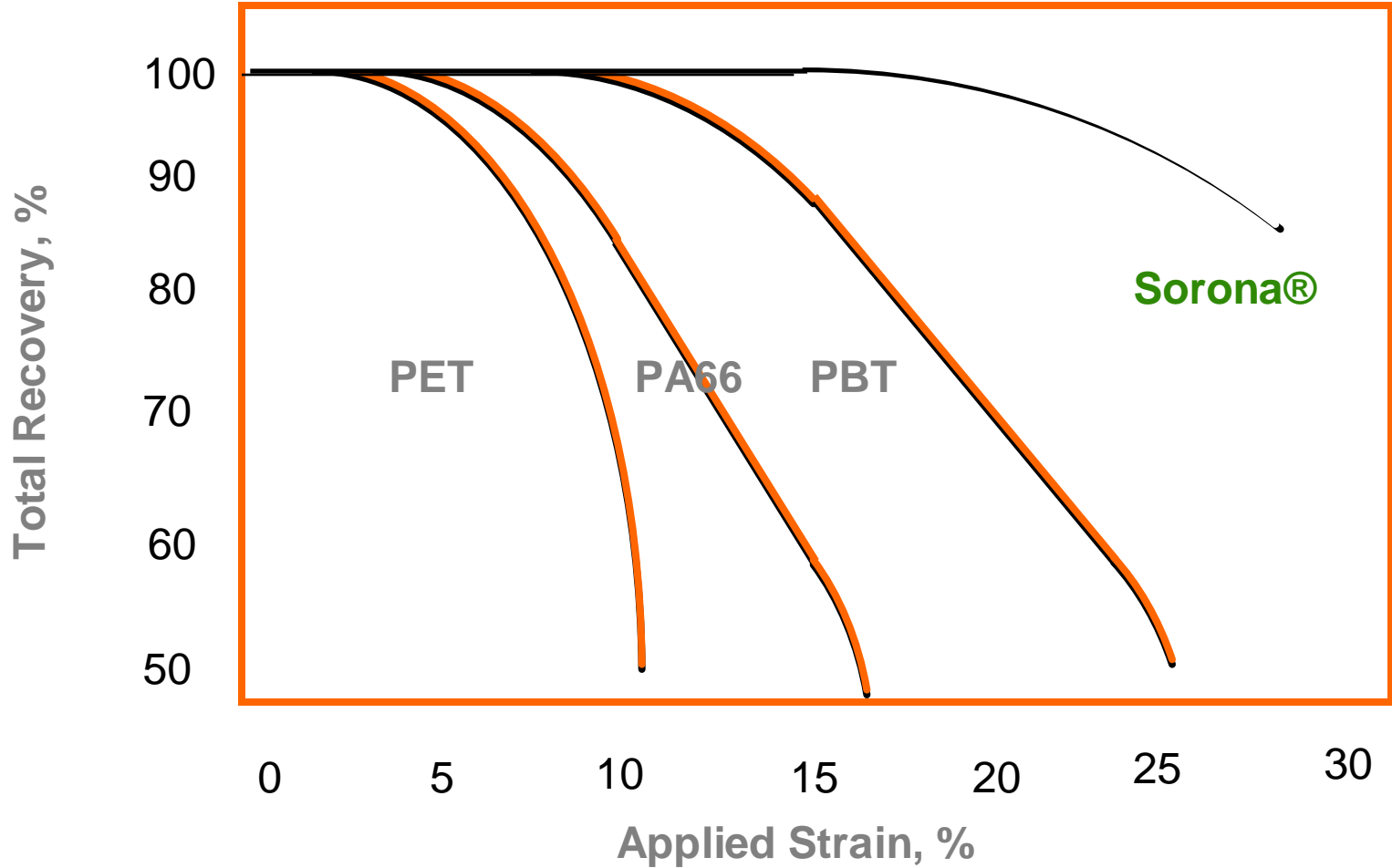


- Longer Break Elongation
- Good Toughness
- Lower initial modulus

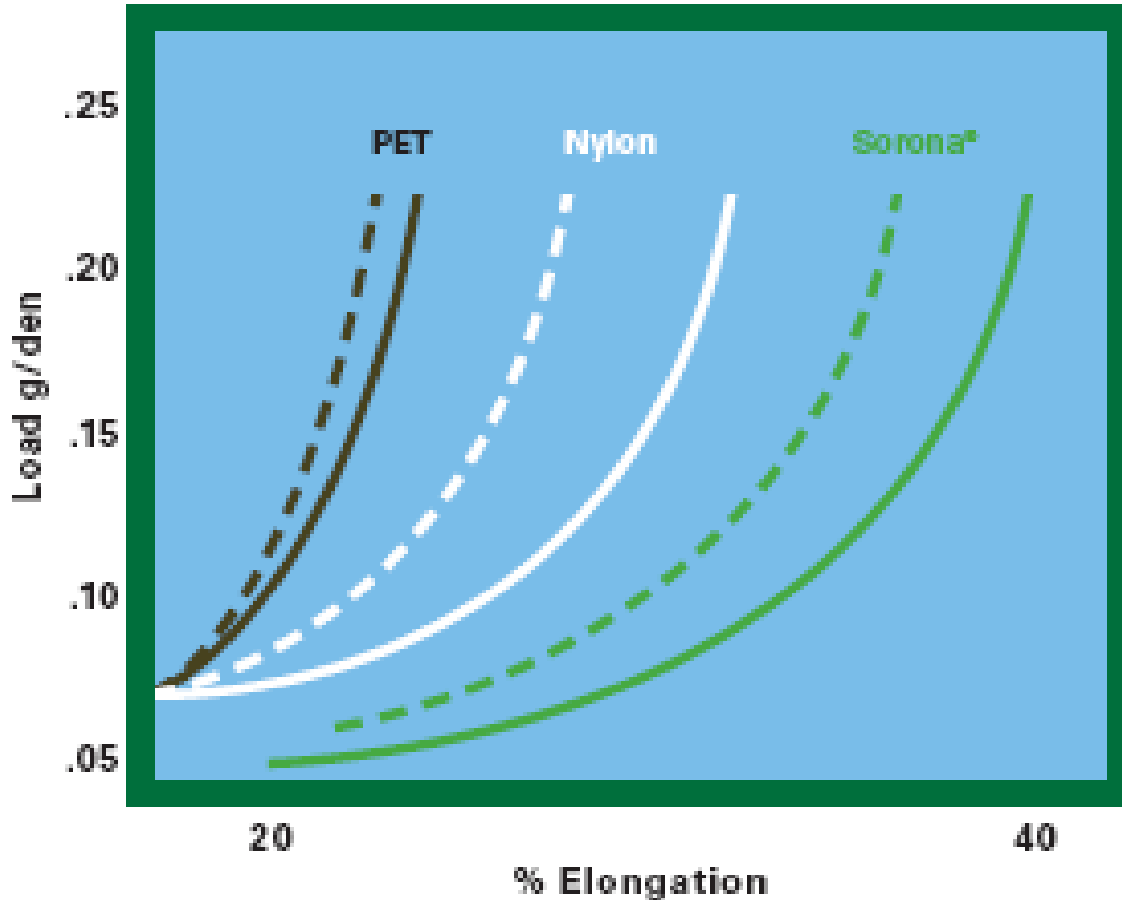


Stretch & recovery of fibers from Sorona[®]

Fully drawn Sorona[®] recovers well without any permanent set

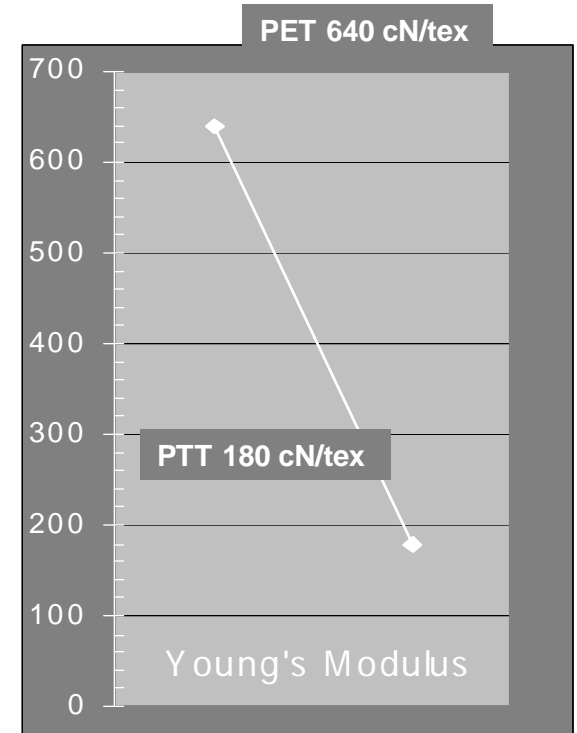
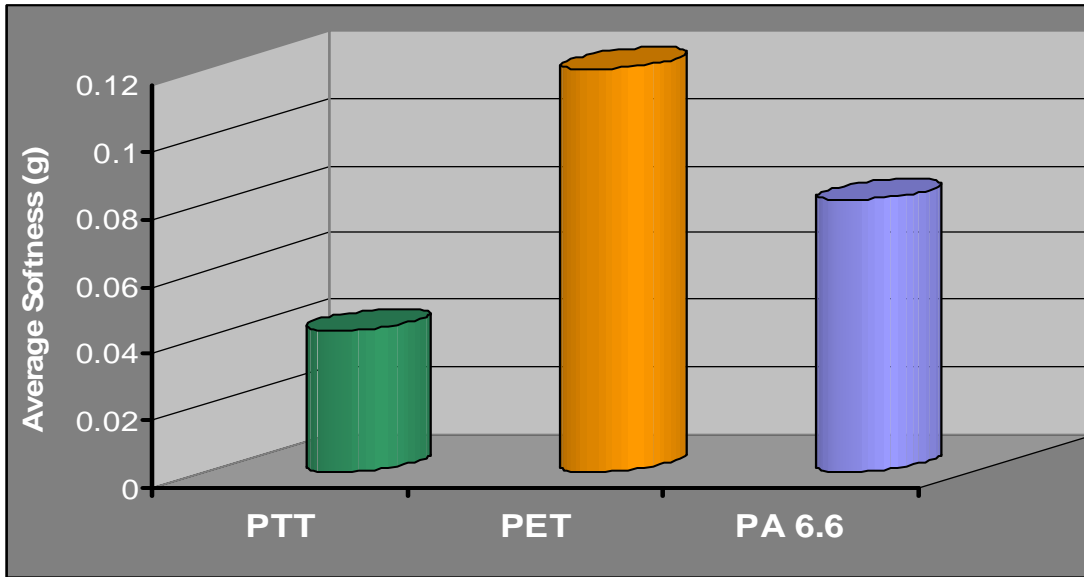


Recovery of Textured Yarns



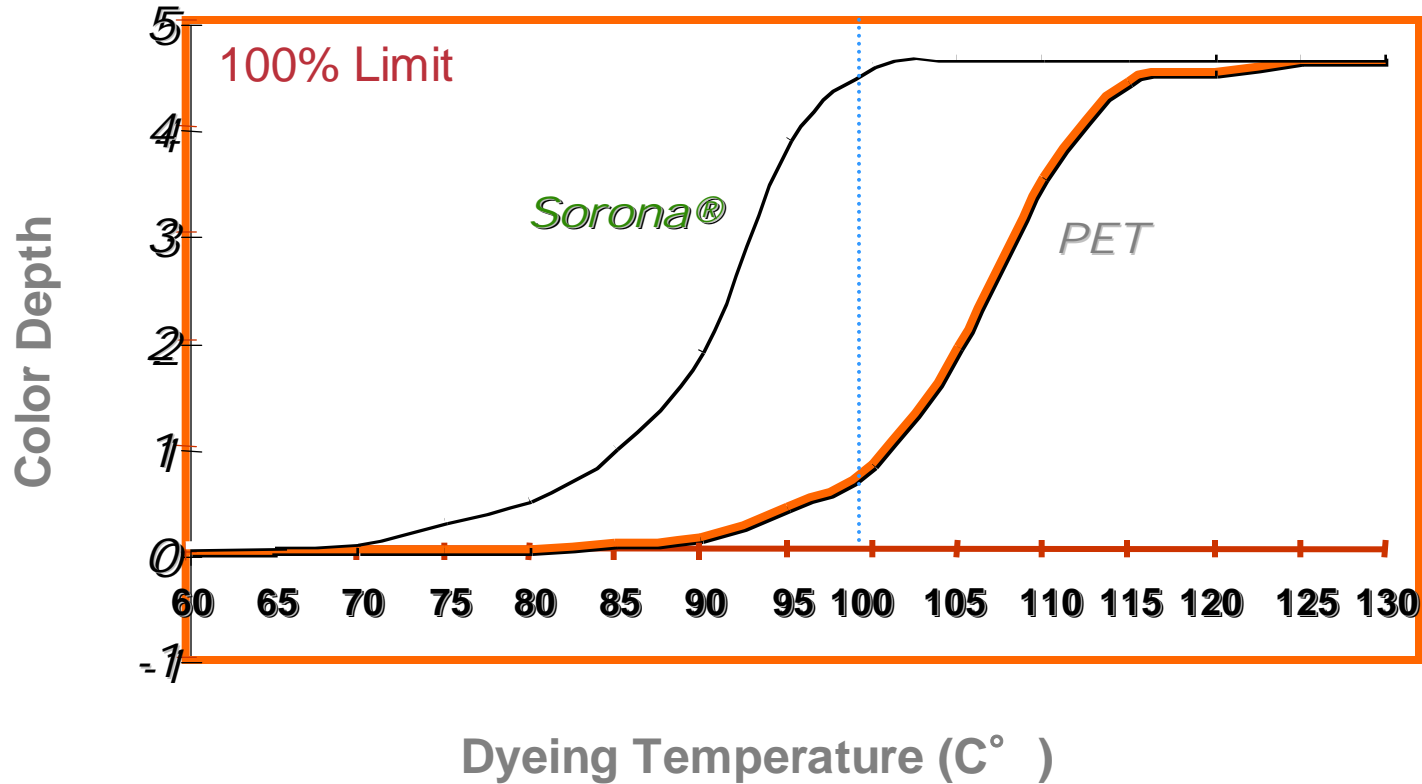
Sorona® textured yarns recover 100% from elongations of up to 45%

Sorona® is Softer



- Low bending rigidity results in
- Softer fabrics at equal dpf or
- Higher dpf for equal softness

Dye Performance Atmospherically Dyeable Without Carriers*



* High energy dyes may require temperatures above 100°C

Target Market: Swimwear

- Women's Stretch Swimwear
 - Warp Knit and Circular Knit
 - Softness – FDY silky and drape – DTY cottony aesthetic
 - Bright Colors with good fastness
 - Good printability (heat-transfer)
 - Fast drying
 - Chlorine-proof
- Men's Rigid Swimwear – Board Shorts Softness
 - Woven fabrics – without elastane
 - Cottony aesthetic
 - Bright Colors with good fastness
 - Good printability (heat-transfer)
 - Fast drying
 - Chlorine-proof



Target Market: Intimate Apparel

- Women's Panty, Brassiere and Foundation Fabrics
 - Warp knits and Weft Knits
 - Softness and drape
 - Color depth with fastness
 - Printability with good separation
 - Comfort stretch
 - Moldability at lower temperature
 - Easy-care



Target Market: Active Apparel

- Base Layer, Active Top and Mid-Layer Fabrics
 - Weft Knits, seamless
 - Moisture Management
 - Softness
 - Comfort stretch
 - Bright Colors with good fastness
- Liner, Shell and Running Short Fabrics
 - Woven fabrics
 - Moisture Management
 - Quick drying
 - Softness
 - Comfort stretch
 - Bright Colors with good fastness



Target Market: Ready to Wear

Broad range of fabric options

- Spun yarn blends – produce softer fabrics because Sorona® heat sets at lower temperature (150°C)

- Fabric blends – warp/fill wovens or combined on the knitting machine

✓ Sorona® / cotton

✓ Sorona® / wool

✓ Sorona® / modal

✓ Sorona® / bamboo



DuPont® Sorona®
renewably sourced™ polymer™



The miracles of science™