



Plastic Free Proving a Natural Solution



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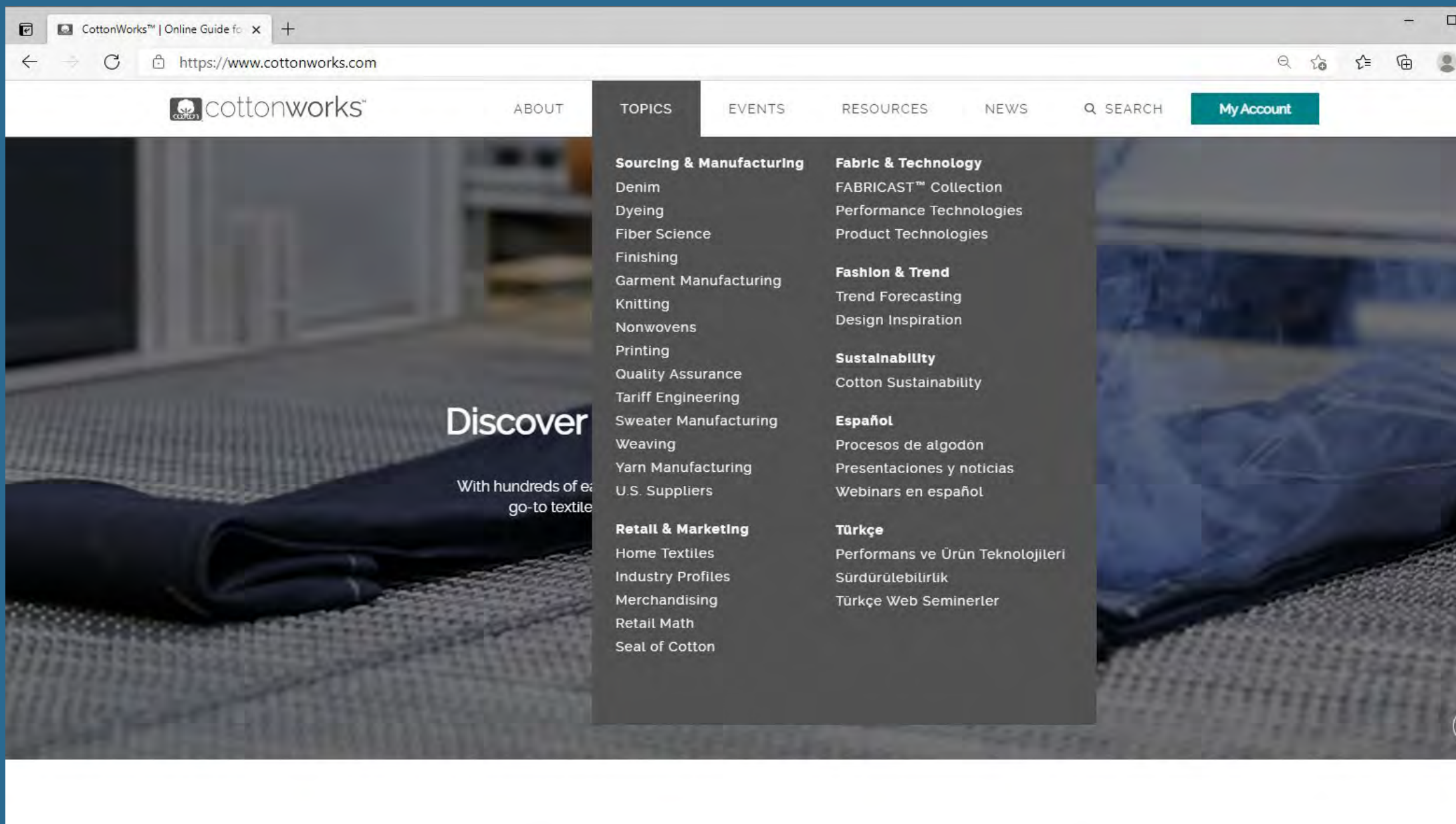


With hundreds of easily searchable resources, we're your go-to textile tool for discovering what's possible with cotton.

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Trend Forecasting




New Resource
Sourcing Cotton




FABRICAST™ Collection
Digital Fabrics



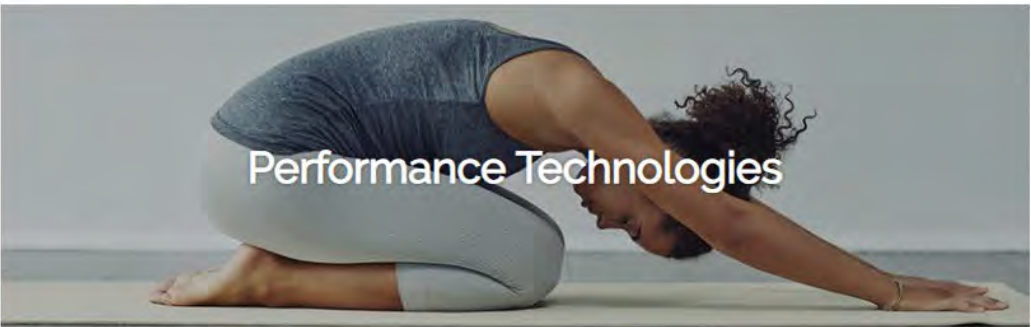
Sustainability
Cotton Circularity



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Sourcing Cotton

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ADD TO LIST ?

Basic Information for Developing or Adjusting Sourcing Strategies


The United States imports textiles from more than 80 countries. Brands, retailers, and companies importing apparel and other textiles have many choices when it comes to the geography of sourcing cotton and cotton products. As companies develop or adjust their sourcing strategies, it is helpful to understand vital information about cotton, trade in cotton and production, and manufacturing practices that can affect sourcing and traceability.

Many companies are searching for information about cotton production in China and how this may be affected by current regulations by U.S. Customs and Border Protection.

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Sourcing Cotton Webinars

Basic Information for Adjusting Sourcing Strategies

If business conditions, regulations, or compliance requirements have you rethinking your cotton sourcing strategy, this webinar takes you through basic information essential to evaluating your cotton sourcing plan.

Download PDF: [Sourcing Cotton: Basic Information for Adjusting Sourcing Strategies](#)

Webinar originally played 2/10/21.




59:49

Understanding Chinese Cotton & U.S. Import Regulations

Learn how cotton flows through each stage of China's supply chain and how a leading trade association for U.S. importers is helping companies assess the situation.

Download PDF: [Sourcing Cotton: Understanding Chinese Cotton & U.S. Import Regulations](#)

Webinar originally played 3/9/21.



1:00:03



Plastic Free Proving a Natural Solution

Cotton Incorporated



Global not-for-profit research
Neither manufacture nor sell



Cotton from seeds to sustainability



400-500 Research projects per year

Driving Forces:

European Union Single-Use Plastics Directive

- Plastic products are accumulating on land, in small waterways, and in large marine environments
- Products most commonly found on beaches are being banned or restricted
- Legislative & Regulatory activity around the world
- Consumer sentiment and brand behavior
- Drive for plastic-free products in many markets

What is being found on beaches?



Driving Forces: Legislation & Pending Legislation

– EU Single Use Plastics Directive 2019/904 June 5th, 2019



- What is a single-use plastic?
 - What is a plastic?
 - Labelling requirements to be implemented in July 2021
- } Due to be answered in July 2020, still unclear in April 2021



Adoption by the
EU, entering
into force

Clarification of
open points
(studies being
carried out)

Final version
including all details,
implementation in
national law starts

Implementation in
member states must
be finalized, it
becomes law

January 2021: Final
SUPD guidelines
delayed – latest
draft still cause for
dissatisfaction and
discussion between
EC and member
states

Raw Material Options

Plastic

Polyhydroxyalkanoate (PHA)
Cellulose acetate
Polystyrene
Silicone
Polyester
Polypropylene
Polybutylsaccharide (PBS)
PVA
Acrylic

Non-Plastic

Cotton
Wood pulp
Flax
Hemp
Sisal
Lyocell
Starches
Cellulose derivatives (CMC)
Natural waxes

Not Yet Determined

Rayon/viscose

SUPD Product Categories and Guidelines

ANNEX Part A: **Sustained reduction** in consumption

- Beverage cups, food containers

ANNEX Part B: **Prohibited** placement in the market

- Balloon sticks, beverage stirrers, cotton bud sticks, cutlery, plates, straws, polystyrene cups, polystyrene food/beverage containers

ANNEX Part D: **Clear markings** for waste management and presence of plastics

- Sanitary towels (pads), tampons & applicators, wet wipes, tobacco products with filters or filters for use in combination with tobacco, beverage cups

ANNEX Part E: **Extended producer responsibility**

- Food containers, flexible food packets and wrappers, beverage containers up to 3 L, beverage cups with covers and lids, tobacco products, wet wipes, balloons, lightweight plastic bags

ANNEX Part G: Required **special measures to inform consumers** about environmental impact and alternatives

- Sanitary towels (pads), tampons & applicators, food containers, flexible food packets and wrappers, beverage containers up to 3 L, beverage cups with covers and lids, tobacco products, wet wipes, balloons, lightweight plastic bags

Driving Forces: Legislation & Pending Legislation

North American SUP Activity

- US Federal Legislation
 - Clean Future Act
 - Break Free from Plastic Pollution Act
- US State Legislation
 - CA Multiple Single Use Plastic Bills under consideration
 - NY EPR Bill
 - Multiple other states contemplating SUP Legislation
- Canadian Legislation
 - Strategy on Zero Plastic Waste
 - Potential EPR, Bans or EU Type Initiative by end of 2021/2022

Consumer Sentiment & Brand Activity



Consumer Sentiment & Brand Activity Examples



Consumer Sentiment & Brand Activity Examples



Consumer Sentiment & Brand Activity Examples

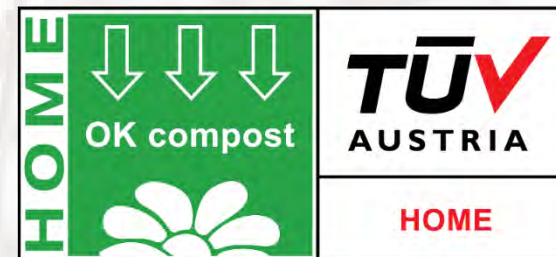
Apparel and Home Textile Products

Madewell

PRODUCT DETAILS

Tie-dyed in pretty pastel colors, this sweatshirt has a cool shrunken fit to layer over slim tees and tanks. The subtle heart embroidered on the chest is a low-key nod to Valentine's/Galentine's/Palentine's. Feel-good bonus: Our (Re)sourced fabric is made using 38 percent recycled cotton, so it's earth-friendly too.

Green Marks Certifications



TESTING: Organic Waste Systems (OWS)



Test 1: Volatile Solids, Heavy Metals, & Fluorine

Purpose: To determine the material characteristics of 100% purified cotton.

EN 13432 / ISO 17088

Volatile solids content is determined by heating at 550°C and weighing sample.

Heavy metals and fluorine content are measured through separate chemical processes.

Flemming Cornielje 9/30/20



100% purified cotton nonwoven sample

Test 1: Purified Cotton Results

Volatile solids – minimum 50%:

Characteristics	100% purified cotton spunlace nonwoven
Total solids (TS, %)	96.0
Moisture content (%)	4.0
Volatile solids (VS, % on TS)	99.8
Ash content (% on TS)	0.2

Heavy metals & fluorine:

Analysis	100% purified cotton spunlace nonwoven	Limit values				Test procedure
		Europe EN 13432 (2000)	France NF T51-800 (2015)	USA** ASTM D6400 (2019)	Canada CAN/BNQ 0017-088 (2010)	
Heavy metals*						
As	< 0.50	≤ 5	≤ 5	< 20.5	< 19	NBN EN ISO 11885
Cd	< 0.40	≤ 0.5	≤ 0.5	< 19.5	< 5	NBN EN ISO 11885
Co	< 0.60	-	≤ 38	-	< 38	NBN EN ISO 11885
Cr	< 5.00	≤ 50	≤ 50	-	< 265	NBN EN ISO 11885
Cu	< 3.00	≤ 50	≤ 50	< 750	< 189	NBN EN ISO 11885
Hg	< 0.10	≤ 0.5	≤ 0.5	< 8.5	< 1	NBN EN ISO 11885
Mo	< 0.30	≤ 1	≤ 1	-	< 5	NBN EN ISO 11885
Ni	1.61	≤ 25	≤ 25	< 210	< 45	NBN EN ISO 11885
Pb	< 7.00	≤ 50	≤ 50	< 150	< 125	NBN EN ISO 11885
Se	< 0.75	≤ 0.75	≤ 0.75	< 50	< 4	NBN EN ISO 11885
Zn	< 9.00	≤ 150	≤ 150	< 1400	< 463	NBN EN ISO 11885
Fluorine						
F	< 10	≤ 100	≤ 100	-	-	DIN 51723 mod.

* Microwave digestion was executed on the sample according to DIN EN 13656 Mod. for all heavy metals

** Maximum levels for USA (according to ASTM D6400 (2019) heavy metals content must be less than 50% of those prescribed for sludges or composts in the country where the product is sold)

Test 2: Marine Aerobic Biodegradation

Purpose: To determine the biodegradability of 100% purified cotton in a marine environment.

ASTM D6691 / ISO 14851

Reference material (cellulose) and 100% cotton sample are suspended in seawater and incubated at 30°C for 84 days.

Biodegradation is based on CO₂ production.

Threshold: 90% of reference material within the specified time frame.

Silvie Denis 1/14/21

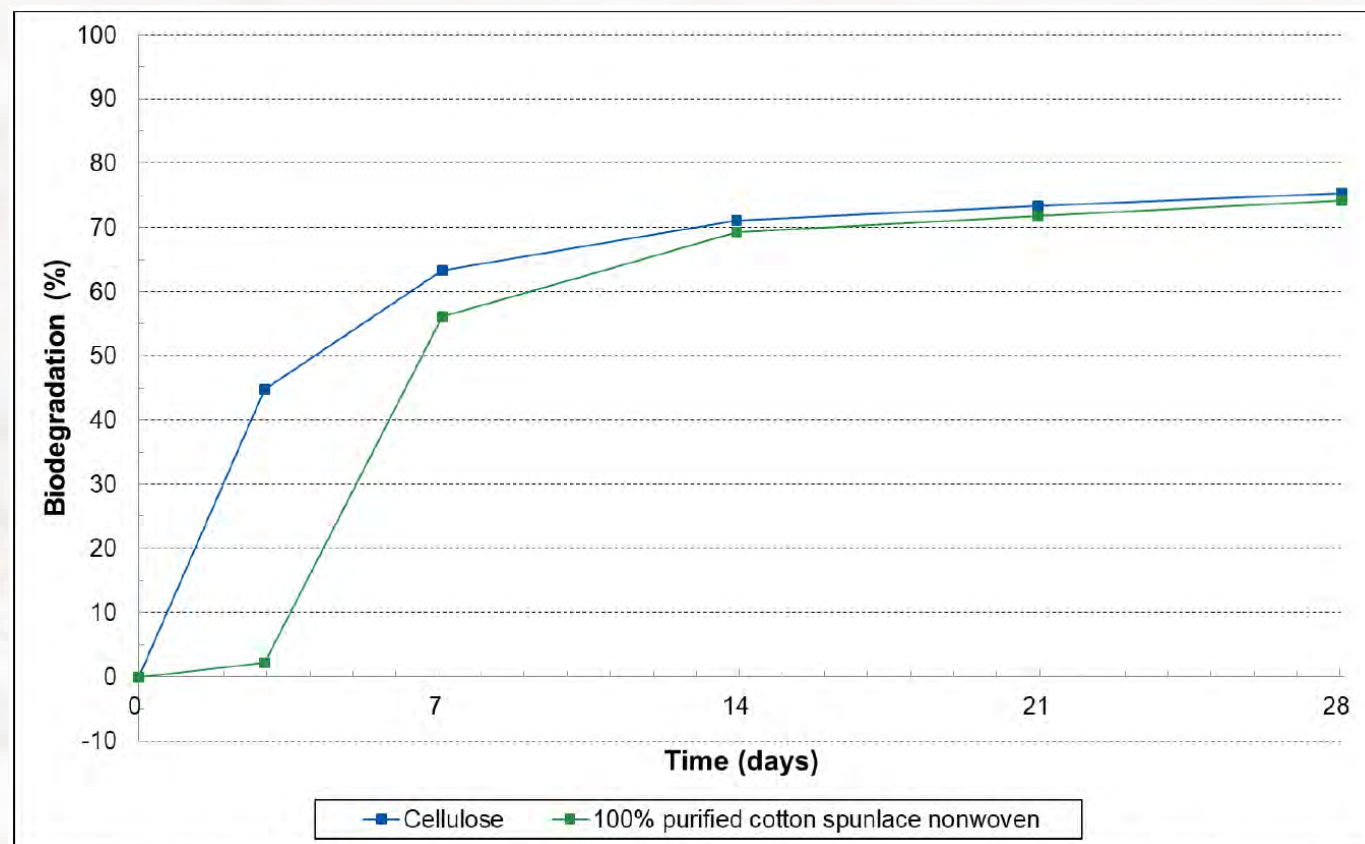


Figure 1. Evolution of the biodegradation percentages of reference and test item

Test 2: Purified Cotton Results

100% cotton sample surpassed the 90% biodegradability requirement relative to the reference material after 28 days. Test was stopped.

Table 1. TOC, net CO₂ production and biodegradation after 28 days

Test series	TOC (%)	Net CO ₂ (mg)	Biodegradation (%)		
			AVG	SD	REL
Cellulose	42.7	70.7	75.3	1.9	100.0
100% purified cotton spunlace nonwoven	40.9	66.8	74.1	1.1	98.5

With AVG = average, SD = standard deviation and REL = relative biodegradation

Test 3: Disintegration In Industrial Composting

Purpose: To determine 100% purified cotton's compostability in an industrial composting environment.

ISO 16929

Control bin and test bin were incubated at 40°C, not to exceed 45°C. Oxygen concentration remained above 10%.

Disintegration was defined as a size reduction to <2mm.

Threshold: 90% degradation in 12 weeks

Kwok Kuen Chow 12/24/20

Compartment	Content
Control bin 1	Biowaste, filled to the top
Control bin 2	Biowaste, filled to the top
Test bin 1	Biowaste + 1% 100% purified cotton, Cut into 10x10 cm pieces, filled to the top
Test bin 2	Biowaste + 1% 100% purified cotton, Cut into 10x10 cm pieces, filled to the top

Test 3: Purified Cotton Results

100% disintegration in 12 weeks. After analyses, not a single piece of 100% purified cotton could be retrieved from sieving at $>2\text{mm}$.



Figure 4. Visual presentation of the evolution of the disintegration of 100% purified cotton spunlace nonwoven (0.48 mm; 51 g/m²) in slide frames

Test 4: Disintegration In Home Composting

Purpose: To determine 100% purified cotton's compostability in a home composting environment at ambient temperature.

ISO 16929 (Modified)

100% purified cotton nonwoven was put into slide frames and mixed with compost inoculum.

The mixture was incubated in the dark at ambient temperatures ($\sim 28^{\circ}\text{C}$).

Threshold: 90% in 26 weeks

Johanna Camerlink 10/13/20



Figure 2. Visual presentation of the contents of a composting reactor with 100% purified cotton spunlace nonwoven, put into slide frames, after 6 weeks of composting at ambient temperature (= end of the test)

Test 4: Purified Cotton Results

100% disintegration in 6 weeks. After 6 weeks, all slide frames were empty, and no loose test material could be retrieved from composting reactors.



Figure 1. Visual presentation of the evolution of the disintegration of test material 100% purified cotton spunlace nonwoven in slide frames during the composting process

Test 5: Disintegration In Soil

Purpose: To determine the disintegration of 100% purified cotton at ambient temperature in soil.

ISO 20200 (Modified)

A soil inoculum was prepared with 70% quartz sand, 10% clay, 16% natural soil, 4% mature compost, and added salts.

100% purified cotton nonwoven material was placed in slide frames mixed with the soil.

Threshold: 90% in 26 weeks

Johanna Camerlink 11/27/20



Figure 3. Visual presentation of the contents of a reactor with 100% purified cotton spunlace nonwoven (0.48 mm; 51 g/m²), put into slide frames, after 12 weeks of incubation in soil (= end of the test)

Test 5: Purified Cotton Results

95% disintegration in 12 weeks. This figure was based on the determination of the remaining surface of test material in the slide frames. No loose pieces were retrieved.



Figure 4. Visual presentation of the evolution of the disintegration of test material 100% purified cotton spunlace nonwoven (0.48 mm; 51 g/m²), put into slide frames, during the incubation process in soil

Test 6: Disintegration In Sea Water

Purpose: To determine the aerobic disintegration of 100% purified cotton in sea water.

OK Biodegradable MARINE / ASTM D7081

100% purified cotton nonwoven was cut into 2x2 cm pieces and added to sea water disintegration reactors. Materials were sieved over a 2mm screen and visually monitored every 4 weeks.

Threshold: Per TÜV AUSTRIA Belgium's Ok biodegradable MARINE mark, the test material may contain no more than 10% of its original weight after sieving through a 2mm sieve within 12 weeks of testing.

Sylvie Denis 10/3/20

Test 6: Purified Cotton Results

The 100% purified cotton test material reached the 90% disintegration requirement within 4 weeks of testing. Test was stopped.

Reference (Cellulose Filter Paper)



Figure 1. Visual presentation of reference item cellulose filter paper after 4 weeks of incubation

100 Purified Cotton

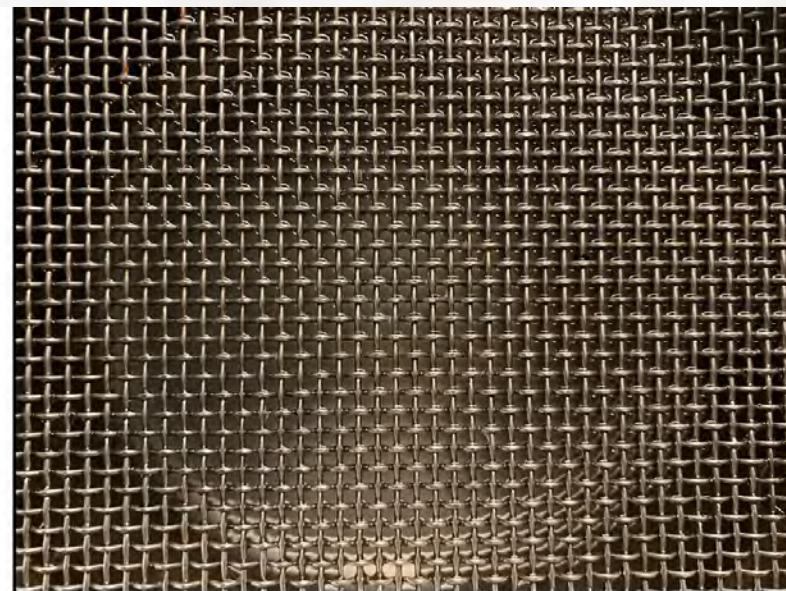


Figure 2. Visual presentation of test item 100% purified cotton spunlace nonwoven after 4 weeks of incubation

Test 7: Daphnia Toxicity

Purpose: To determine the toxicity of 100% purified cotton to aquatic invertebrates (*Daphnia magna*) in a freshwater environment.

OPPTS 850.1010

100% purified cotton was added to a chemically-defined aqueous solution spiked with micro-organisms at a 0.1% concentration and incubated at 30°C for 96 days.

Threshold: Per OK biodegradable MARINE certification standards, at least 90% of tested organisms should remain mobile over a 2 to 3-day observation period after 96 days of incubation.

Sieglinde Debruyne 12/1/20

Test 7: Purified Cotton Results

Passing Threshold: 90% mobility retained

With the mobility of the Daphnia Magna was measured at 95% at the end of this test, cotton passed.

Table 2. Mobility and immobility of Daphnia neonates after 24 hours and 48 hours

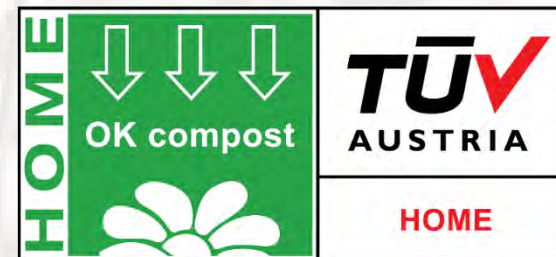
Test series	24 hours			48 hours		
	Mobility (%)		Immobility (%)	Mobility (%)		Immobility (%)
	AVG	SD	AVG	AVG	SD	AVG
SFW	100	0	0	100	0	0
Control	100	0	0	100	0	0
100% purified cotton spunlace nonwoven - 1000 mg/l	95	10	5	95	10	5

With AVG = average, SD = standard deviation.

Unbleached Cotton Tests & Passing Results

#		Standard Test Method	Threshold	Results
1	Heavy Metals, Fluorine	EN 13432 ISO 17088	Volatile solids: 50% minimum Heavy metals: As ≤ 5, Cd ≤ 0.5, Co ≤ 38, Cr ≤ 50, Cu ≤ 50, Hg ≤ 0.5, Mo ≤ 1, Ni ≤ 25, Pb ≤ 50, Se ≤ 0.75, Zn ≤ 150. Fluorine ≤ 100	Volatile solids: 98.3% Heavy metals: All below threshold Fluorine: 18
2	Aerobic Biodegradation under Marine Conditions	ASTM D6691 ISO 14851	Average reference cellulose: 88.8% biodegradation in 12 weeks (SD 2.3%) Minimum calculated threshold: 90% biodegradation	Average: 81.8% in 12 weeks (SD 8.2%) Calculated: 92.1%
3	Disintegration under Industrial Composting Conditions	ISO 16929	90% minimum disintegration in 12 weeks.	
4	Disintegration under Home Composting Conditions	ISO 16929 (Modified)	90% minimum disintegration in 26 weeks.	90% disintegration in 26 weeks.
5	Disintegration in Soil	ISO 20200 (Modified)	90% minimum disintegration in 26 weeks.	90% disintegration in 26 weeks.
6	Disintegration in Sea Water	OK Biodegradable MARINE ASTM D7081	90% minimum disintegration in 12 weeks.	96% disintegration in 12 weeks.
7	Daphnia Toxicity Testing (Fresh Water)	OPPTS 850.1010	90% minimum microorganism mobility over 3 days.	

Green Marks Certifications



What does this mean?

- Cotton meets or beats biodegradation standard thresholds.
- Safe, plastic-free raw material - EU SUPD Top 10 list
- One solution for providing products consumers want and need while improving the health of our environment.



Plastic Free Proving a Natural Solution

Webinars

PAST WEBINARS:

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Cotton & U.S. Import
Regulations

Advancements in
Cationic Cotton
Technologies

Sourcing Cotton: Basic
Information for Adjusting
Sourcing Strategies

Consumers & Clothes:
Adapting to a Changing
World

Less Ouch, More Ahh:
Clinical Evaluation of the
Hypoallergenic
Properties of Cotton

Artwork Files for
Knitwear Design

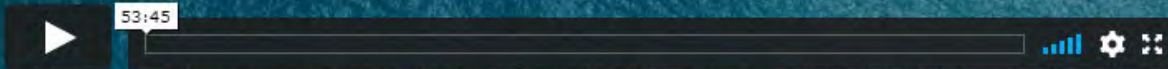
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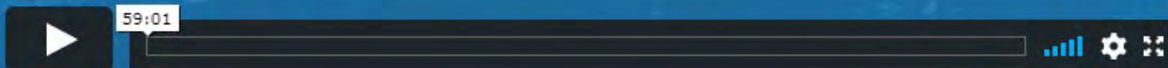
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Turning the Tides: Tackling Our Ocean's Plastic Pollution Problem



Stop the Leak: Addressing Plastic Leakage in Your Supply Chain



Webinars on Plastic Pollution

Want to hear more about
this topic?

Watch our past webinars:

- *Turning the Tides*
- *Stop the Leak*

cottonworks.com/biodegradability

Biodegradability of Cotton

Macroplastic & Microplastic Pollution

Did you know apparel begins to break down in the wash?

Fabrics, both natural and synthetic, shed microfibers which enter into rivers, lakes, and oceans.

Research shows synthetic fibers contribute to plastic pollution in the earth's water supply by shedding microplastics into waterways when laundered.²

Download the brochure: *Understanding the Depth of the Plastics Problem*.



Understanding the Depth of the Plastics Problem

Did you know apparel begins to break down in the wash?

Read our brochure on macroplastic and microplastic pollution to learn more.

cottonworks.com/biodegradability

Circularity of Cotton

Choose a product pathway to explore the many ways you can close the loop with cotton

Textile to Textile



Recycle

Brands are quickly realizing that textile-to-textile recycling is an important path toward the circular economy – and deeply satisfied consumers. One-hundred-percent cotton textiles can be recycled* and may be used to create new apparel and home good products.

Circularity

Cotton can be **reused**, **recycled**,* and **returned**** to the earth.

Explore these three intersecting paths of cotton's circular lifecycle and start envisioning your opportunities.

cottonworks.com/circularity

* Cotton products are recyclable only in a few communities that have appropriate recycling facilities.

** In composting tests, cotton fabric samples underwent a weight loss of approximately 50-77% after 90 days in a composting facility.



Plastic Free Proving a Natural Solution



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using the Q&A feature.



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presentation prior to exiting the webinar.