

URI'S Research Turns Ocean Plastic Waste into Textiles. By Kathlyn Swantko

Taking on Recycling Challenges

The advent of plastic technology and the man-made fiber production boom of the 1950s and '60s has led to a dramatic increase in plastic and textile waste finding its way into our oceans, landfills and global environment. Plastics, including textile fibers, can take hundreds of years to break down and can cause further environmental pollution in the process.

Within the past 30 years, progress has been made recycling plastics (rPET), and fabrics made of nylon, polypropylene or 100% polyester, but much more recycling is needed. There are significant obstacles, particularly with polyester blended fibers and fabrics. According to the Textile Exchange, polyester accounted for 54% globally of all textile fibers in 2022. However, only about 14% of polyester waste was being recycled, and the majority of this involves plastic bottles. Obstacles still remain with blended synthetic fibers and fabrics. In addition, a much broader expansion of consumer recycling awareness and participation is needed to solve the ongoing problem of textile/apparel/plastic waste.

Research at the University of Rhode Island (URI) is taking on the complex challenge of recycling textile and plastic waste. Under the direction of Izabela Ciesielska-Wrobel, assistant professor in the Department of Textiles, Fashion Merchandising & Design, URI, is finding new ways for recycling plastic waste with one goal of finding a new type of "raw material" with practical textile applications. Currently, URI works mostly with recycled polypropylene (PP), polyester (PET), and nylon, but the sources of plastic wastes are much broader, including fishnets/gear, films, and other plastic debris.

Focus on Sustainability

Within the textile program at URI, there is a group of passionate conservationists dedicated

Extrusion Line



Melted at 200 degrees celsius at 25RPM dosage done by hand as well as extraction.

Spun Filament

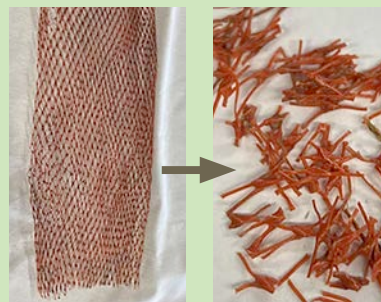


First Sample



Orange net/bag. Fiber content unknown.

Clean & Cut Samples



to recycling textile waste. "Whenever the faculty and our group discuss textile research, we invariably end up talking about pollution, sustainability, plastic waste, the textile industry, and plastic conversion concepts," explains Ciesielska-Wrobel.

It was at one of these meetings that Ciesielska-Wrobel met Robert Torgerson, founder and president of Kestrel Innovative Fibers, LLC (KIF), Wakefield, Rhode Island, and John Riendeau from US Extruders, based in Westerly, Rhode Island. KIF produces fibers from recycled plastics harvested from the ocean. Currently, KIF's multi- and mono-filaments

are used for tennis racket strings, clothing, and sports apparel.

URI is also working with the Commercial Fisheries Research Foundation in Newport, RI, on collecting and submitting samples of fishnet waste for URI to test, recycle, and convert into filament fiber. Currently, Ciesielska-Wrobel and Torgerson are studying these ocean plastic conversions for textile filament fibers.

Testing/Recycling Process

URI uses Mechanical Recycling as its method of recycling textile waste. The major challenges incurred with this recycling

include the cost of sorting, cleaning, and processing waste plastics, as well as the quality and grade of plastics in relation to newer, stronger plastics. The partnership with KIF, while informal, keeps URI's Lab busy testing materials and sharing ideas. A goal is to find applications for various types of recycled plastic waste.

Ciesielska-Wrobel explains, "When Robert brings me samples, we test them, see what's wrong, what wasn't successful, and what works! It's a hands-on collaboration between us. To answer the key question of which types of ocean plastic wastes are suitable for textiles, I rely on our new micro-compounder with an extrusion line."

URI's micro-compounder allows mixing different polymer formulations in the melt on a small scale. The extrusion process pushes the polymer through a small hole, which creates a filament with a circular, fixed cross-section profile. The URI textile lab also has a power washer for cleaning and examining textile waste, and a Stoll flat knitting machine. The power washer can collect enough residual filth for melting, spinning, and processing the plastic in the micro-compounder. "I can even examine the surface dirt and marine organisms on the plastic waste," Ciesielska-Wrobel says.

Looking Forward

URI's partnership with KIF hopes to advance further study in addition to creating something that can be produced on a larger



Commercial Fisheries Research Foundation

scale. Torgerson notes, "With Izabela, I'd like to teach URI students about polymers and plastics, along with recycled materials, sustainability, and the circular economy. It's a great opportunity for kids to learn about this technology."

URI's textile program mainly involves the conversion of different raw material wastes into filaments for textiles and artistic installations that URI students can use in their designs. However, Ciesielska-Wrobel wants to do more. She states, "I prefer not to call textile waste, 'trash,' but rather to refer to it

as a 'new raw material.'"

Going forward, Ciesielska-Wrobel will join the Main Debris project run by Prof. Hirotsugu Uchida from the College of Environmental and Natural Resource Economics at URI, where she will have an opportunity to work with Prof. Vinka Oyanedel-Craver from the College of Engineering on using textile wastes to make bricks for construction. While these projects hold significant potential and may be transformative, many full-scale programs hinge on a broader messaging for upcycling, recycling, and converting a variety of materials. ■

Support

THE TEXTILE GATEWAY

Connecting the Industry to Students

MISSION

Educate and encourage students at all levels; outreach & promote career paths in the industry; and, serve as a catalyst for future innovation.

Build a community to re-energize the textile industry for the future, help fund and inspire the next generation of leaders, innovators, and entrepreneurs.

Contact:
 Tom Swantko, Director
 toms@thetextilegateway.com

LEARN MORE AND HOW YOU CAN HELP