A viable solution – a blended compost product that includes cotton and coir from recycled mattresses and yard wastes.

Mattress Recycling Council Successfully Composts Cotton, Coir from Mattresses

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Background and Executive Summary: The Need for New Seconardy Markets

About 1,300 tons of cotton fibers and coir (coconut fiber) are extracted from discarded mattresses annually, according to Mattress Recycling Council's 2021 mattress composition study. Most of these materials are landfilled due to a lack of secondary markets for the material. The purpose of this study was to understand if cotton and coir (combined together) could be composted in commercial composting facilities in California.

The commercial composter concluded that composting could be a viable solution for mattress recyclers seeking to divert their post-consumer cotton and/or coir from California landfills. The composter is considering charging a cotton and coir disposal fee per ton, which is in line with other organic materials and less than area landfill disposal fees, incentivizing composting of these materials.

Cotton
Depending on the product construction, a mattress may contain a layer of non-woven mote cotton which is a by-product of cotton manufacturing. In the context of cotton production, a mote refers to small particles or impurities that can be found within the cotton fiber. These motes can include seeds, leaf fragments, immature fibers, and other contaminants.

During the processing of raw cotton, efforts are made to remove motes to obtain cleaner and higher-quality cotton fibers. Various mechanical and technological processes, such as ginning, cleaning, and carding, are employed to separate the motes from the desirable cotton fibers. While the removal of motes is important for finished textiles because they can affect the quality and appearance of cotton products, this lower-quality cotton is suitable for use in mattress construction.

When secondary markets exist, recyclers separate and bale this material. However, fiber markets for used mote cotton are limited and depend on whether the reclaimed material is co-mingled with other fibers and prevailing market conditions. End uses for this material include insulation and acoustic panel products for the construction and building industry.

Coir (coconut fiber)
Mattress coir, also known as coconut coir or simply coir, refers to a natural fiber derived from the husk of coconuts. Coir is used in the bedding industry, particularly in mattress manufacturing, due to its beneficial properties.

To produce mattress coir, the fibrous material surrounding the inner shell of a coconut is extracted and processed. The fibers are typically cleaned and dried to enhance their physical properties. In mattress applications, coir is typically compressed into layers and bound together using a latex binding agent. Coir may be used as ground cover for erosion control but lacks aesthetics for many applications. Today, most coir layers are landfilled.

Mattress recycling facilities in California extract about 2.1 million pounds (1,051 tons) of cotton, and 500,000 pounds (250 tons) of coir for recycling annually, according to the Mattress Recycling Council's (MRC) 2021 Waste Characterization Study. These two components combined represent an estimated 10 percent of annual landfilled material. Currently, most of this material is landfilled due to a lack of end markets.

Pilot Project: The Composting Process at Z-Best
In October 2022, MRC delivered one ton of loose mote cotton and one ton of coir to GreenWaste Z-Best Composting Facility in Gilroy, Calif. The facility required the material to be delivered loose in a walking floor trailer to avoid manual unloading of the material. The material was then mixed with 60 tons of yard waste and processed through a horizontal grinder for particle size reduction (*see Figure 1*). This ratio was chosen due to the low volumes of cotton and coir relative to other compostable material received by

Figure 1
One ton each of loose cotton and of coir mats.

Figure 2
The cotton and coir was mixed with 60 tons of yard waste and were formed into uncovered windrows.

Figure 3
The compost is screened to separate the finished compost.

California composting operations, however, GreenWaste indicated they could create a compost using up to 50 percent by weight of loose mote cotton and coir.

The shredded material was then formed into an uncovered windrow (*see Figure* 2) and the pile was turned and watered every three days or as needed during a composting period of 17 weeks. The pile was covered for another five weeks until heavy rain abated and allowed the material to sufficiently dry before final material screening. (*see Figure 3*)

In March 2023, GreenWaste screened the compost using 3/16-inch grates to separate the finished compost from overs, which are larger particles, uncomposted material and contamination.

Pilot Project Results

No pieces of cotton or coir were visually observed in the screened finished product or overs. (see *Page 1 photo*).

A sample of the finished compost was collected and transported according to TMECC (Test Methods for the Examination of Compost and Composting) chain of custody procedures to the Soil Control Lab in Watsonville, Calif. (*see Figure 4).* Analytical chemists and bacteriologists approved by the state of California studied the sample for a variety of characteristics including pathogens, nutrients, metals and physical contamination, compost stability, particle size and maturity.

The compost sample passed, or scored in the average range or above, in all tests except for fecal matter contamination which was likely due to animal or bird dropping contamination on the compost pile. GreenWaste does not believe the cotton or coir contributed to this contamination which is commonly found in compost products.

Test	Score	Interpretation
Pathogens	Fecal >1000/g dry wt Salmonella <3/g dry wt	High Pass
Nutrients	3.4% (N+P2O5+K2O) dry wt	Average nutrient content
Metals	Pass	10 heavy metals do not pose toxic risk
Physical contamination	Ash 51.5% dry wt	Average
Stability	2.0 mg CO2-C/g OM per day	Low-Good for all uses
Particle size	0% greater than >6.3MM	Suitable for all uses
Maturity	AmmoniaN:NitrogenN ratio – 0.27	Very mature

Figure 4