

IN•TOUCH

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Flexible Polyurethane Foam And Sustainability, Part 2: Recycling

Recycled content and recyclability are two factors consistently identified with sustainable products. Flexible polyurethane foam (FPF) products are highly recyclable. In fact, the FPF industry has one of the most successful recycling records in the world.

In the United States, virtually all manufacturing scrap is collected and recycled. And according to the Carpet Cushion Council, approximately 600 to 700 million pounds of scrap foam are recycled each year from post-industrial sources.

As pioneers in recycling programs, FPF manufacturers first attacked the challenge of FPF waste by using more efficient manufacturing processes to minimize the amount of process scrap, then developed a program to commercialize systems for recovering and recycling scrap generated in downstream product applications, and finally addressed post-consumer FPF waste at end-of-life.

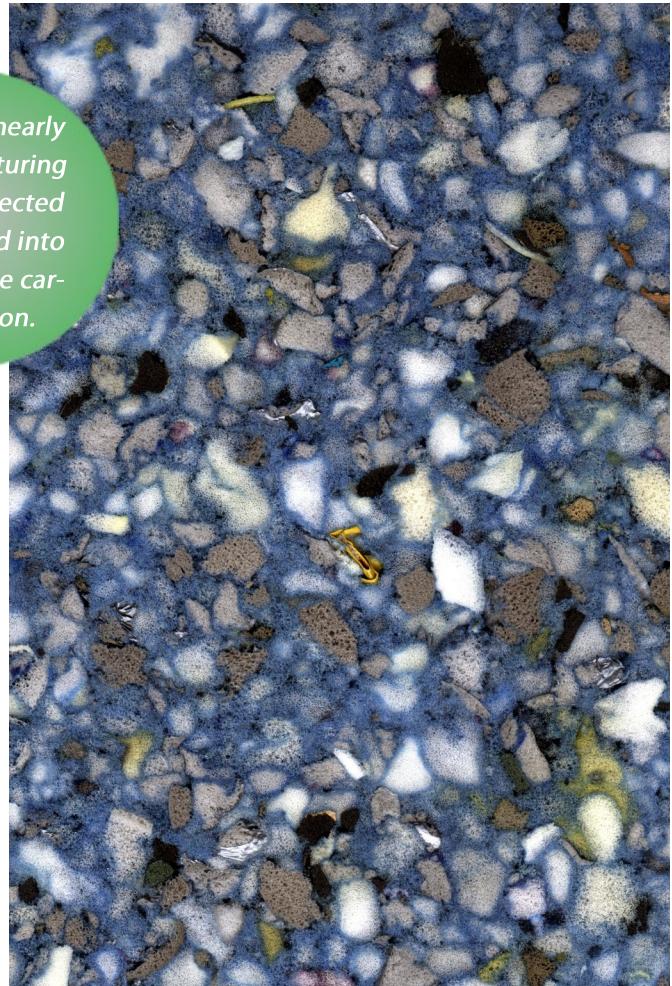
Today, FPF scrap provides needed raw materials and also generates additional revenue sources. With the development of practical end-uses for scrap flexible polyurethane foam, almost every piece of process scrap is potentially recyclable.

Bonded Polyurethane Carpet Cushion

Instead of being routed into landfills, FPF scrap and recovered materials are easily recycled into useful consumer products such as bonded carpet cushion (sometimes called “rebond”), which accounts for approximately 80% of all carpet cushion products sold in the U.S.

Bonded polyurethane foam carpet cushion boasts both recy-

In the U.S., nearly all manufacturing scrap is collected and recycled into products like carpet cushion.



Bonded polyurethane foam carpet cushion is made from small pieces of recycled foam, hence its multicolored appearance.

cle content and recyclability. Scrap collectors and processors can be found in most major metropolitan areas. (Note: many carpet installers will collect both carpet and cushion for recycling. This is strongly encouraged by the floorcovering industry.)

With a typical recycled content of around 90%, bonded polyurethane carpet cushion primarily uses scrap foam generated from various manufacturing processes and recovered post consumer waste from the “take up” of old product.

In spite of its start as “scrap,” it is considered a high quality product, with carpet manufacturers strongly endorsing the use of bonded carpet cushion to improve the comfort and extend the life of their products. (See [INTOUCH Vol. 1, Number 4: “Flexible Polyurethane Foam Carpet Cushion.”](#))

The process of manufacturing bonded flexible polyurethane foam carpet cushion requires the collection and shredding of scrap foam into small pieces. The pieces are combined with a binder in a blender/mixer,

then transferred into a cylinder. Under heat and pressure, the individual foam pieces fuse into one large cylinder-shaped piece.

This cylinder is then placed on a spindle and “peeled” into sheets of a specific thickness. The peeled foam sheets are collected in rolls. A backing material may be applied to make installation under carpet easier or to enhance the dimensional stability of the cushion.

In addition to its recycling advantages, bonded polyurethane carpet cushion contributes to the sustainability equation by extending the lifecycle of carpet.

Carpet cushion offers better appearance retention and longer carpet life. Less frequent replacement reduces raw material demand for replacement carpet as well as reducing the amount of used carpet requiring disposal by landfill or other routes.

Bonded carpet cushion, because of its inherent higher density levels, can provide exceptional



Industrial scrap collected for recycling.



A newly formed cylinder of bonded carpet cushion being “peeled” into a precise-thickness sheet. Bonded cushion, made up of approximately 90% recycled material, is the primary type of carpet cushion sold in the United States.

support, shock absorption, and sound dampening from walking or rolling traffic.

Other Recycling Efforts

Attention is now turning to post consumer recycling of foam from carpet cushion, home furnishings, and mattresses. The scale of this challenge is massive; there are literally millions of pieces of furniture and mattresses that go into landfills, and there are no standardized systems for breaking down home furnishings into individual components. PFA, the mattress industry, the Carpet Cushion Council and other organizations are working together to continue development of these recycling channels.

According to an estimate by the Carpet Cushion Council, post-consumer take-up carpet cushion recovery diverts between 400 and 500 million pounds annually from landfills to the manufacture of bonded carpet cushion.

There are already programs for mattress recycling in several states, including California, Connecticut, and Rhode Island (as of 2019), which recycle more than one million mattresses each year. The mattress industry has created The Mattress Recycling Council (www.mattressrecyclingcouncil.org) to research and develop more recycling opportunities and economic models for recycling bedding products. This is a challenge because of difficulties using post-consumer mattress scrap, along with health and safety issues.

Another element in the challenge is the presence of flame retardants (FRs) in many furniture pieces. FR use in furniture was effectively mandated by a 1978 California regulation (California Technical Bulletin 117), which was modified in

2013 ([California Technical Bulletin 117-2013](#)) to allow for manufacturing upholstered furniture with non-FR foam. Nevertheless, tens of millions of furniture pieces containing FR foam remain in use. By blending recycled foam containing FRs with other foam scrap, concentrations of FRs are significantly diminished, and the recycled foam can be used productively, rather than being discarded.

PFA, along with the Carpet Cushion Council, participated in a National Science Foundation (NSF)-sponsored workshop, “Management of Waste Foams and Plastics Mixed with Flame Retardants.” At NSF’s request, PFA worked with the Carpet Cushion Council on a peer-reviewed publication in a [science journal](#) documenting the benefits of mechanical recycling of FPF into carpet cushion and the accompanying “blend down” of FR content.

Continuing Technological Innovations

The FPF industry is in a continuous state of innovation, with particular focus on the development of bio-content products. Partially made with raw material derived from renewable plants such as soy and castor beans, foams with bio-content may offer some property improvements, including better resistance to yellowing and slightly better mechanical properties such as support factor and dynamic flex fatigue.

Although the technology does not exist to create flexible polyurethane foam with entirely renewable content, research continues.



Bundles of scrap flexible polyurethane foam reclaimed from mattresses. The foam industry continues to work with a variety of organizations to explore practical options for reclaiming and recycling post-consumer foam scrap from a variety of sources.

Summary

- FPF and Recycling: Recycled content and recyclability are two factors consistently identified with sustainable products. FPF scrap collection and reuse has developed into one of the most successful examples of recycling in the world.
- Bonded polyurethane foam carpet cushion is made from approximately 90% recycled foam scrap. The scrap comes from both industrial scrap and post-consumer sources. Bonded cushion accounts for more than 80% of the carpet cushion sold in the United States.
- According to the Carpet Cushion Council, approximately 600 to 700 million pounds of scrap foam are recycled each year from post-industrial sources.
- Recycling of foam into bonded carpet cushion may also help with the challenge of dealing with foams containing flame retardants. Mechanical recycling helps to significantly diminish concentrations of flame retardants in recycled foam, allowing it to be effectively used rather than discarded in landfills.
- PFA and the FPF industry work proactively on sustainability issues, often collaborating with a wide range of government and environmental groups to better understand the science and issues needed to further improve FPF sustainability.

For full details on PFA sustainability efforts and industry issues, visit www.pfa.org.

Visit the literature section at www.pfa.org for a complete, downloadable library of IN-TOUCH Bulletins.



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