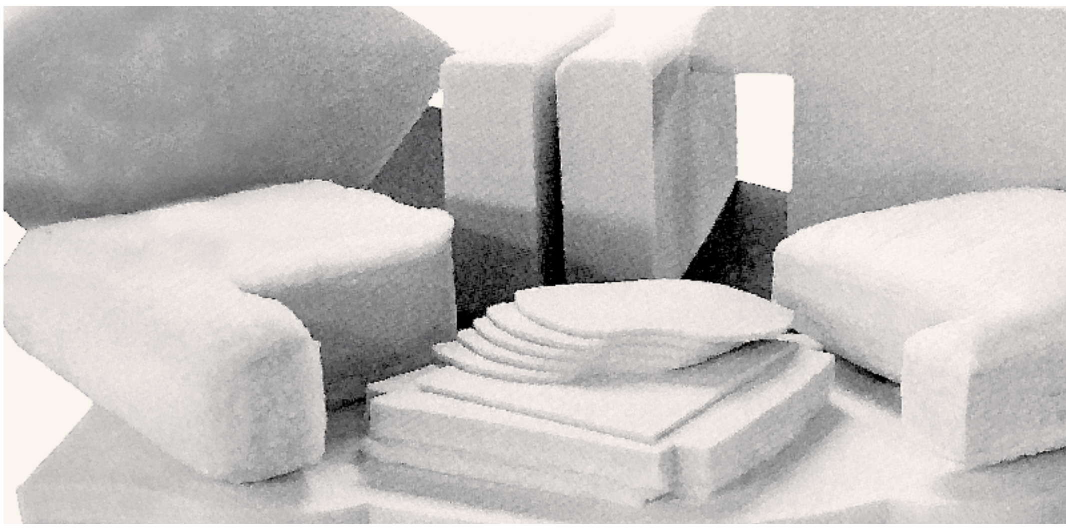
IN·TOUCH

Published by the Polyurethane Foam Association www.pfa.org

Volume 1 | No. 5 (Revised 2016)



One of the advantages of polyurethane foam is that it can be easily cut, shaped, or combined with other materials to produce cushioning. Foam fabrication can be anything from simple cutting of foam to precise forming and shaping of different components

Foam Fabrication

Flexible polyurethane foam has remarkable versatility. It can easily be cut and shaped to serve an almost unlimited number of purposes. And it works well in conjunction with other materials, like fiber and springs. Foam is one of the few materials where product designers have almost infinite flexibility: with foam, form does not follow function. Form equals function.

Virtually all foam is fabricated in some form before it is used. Foam fabrication may simply be cutting the foam to the proper size, or it may involve bonding and shaping several layers of foam and other materials together to get a composite that will provide a specific level of performance.

For users of flexible polyurethane foam, it is critical that they understand the fabrication options available to them that can help create quality, custom products.

There are literally hundreds of foam fabrication operations in North America. Some fabrication facilities are operated by foam producers or are directly linked to them. Others are independent operations whose sole business is foam fabrication.

The basic tools of foam fabrication – vertical bandsaws and horizontal slitters - have been adapted from woodworking machinery.

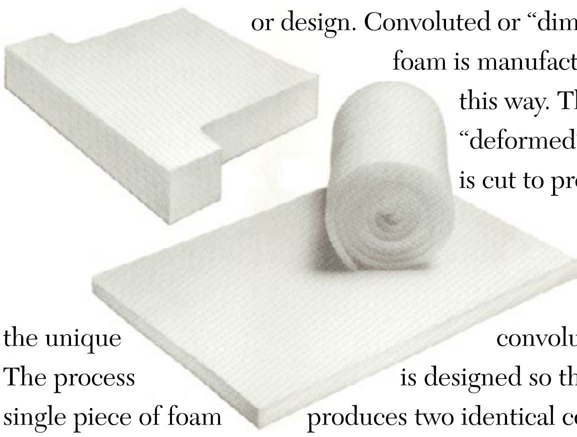
But there's much more to foam fabrication than just simple, straight, cut blocks of foam.

Basic Types of Fabrication

Fabrication techniques fall into two major categories: **cutting technologies and post treatment technologies**.

Cutting technologies are more diverse than most foam users imagine. Since the foam industry is very competitive, foam producers and fabricators have made major investments in equipment and methods to make foam cutting as efficient as possible.

Cutting technologies are designed to minimize waste and increase the speed with which fabricated parts can be properly manufactured. In some cases, equipment actually compresses the foam before it is cut so that the cut foam has a unique shape or design. Convoluted or "dimpled" foam is manufactured in this way. The foam is "deformed" as it is cut to produce the unique convoluted shape. The process is designed so that a single piece of foam produces two identical convoluted parts – thus eliminating any waste material.



Other "cutting" technologies include wave convolutes, channeling, grooving or scoring foam, drilling, slitting, and grinding or buffing foam edges to produce a rounded look. There is also hot wire, template, die and computer contour cutting for intricate parts. Automated (CNC) techniques allow complex foam pieces to be duplicated with accuracy. Fabricators also use laser technology and water jets to cut foam.

Once foam is cut, it is often further fabricated with post treatment technologies. These may involve combining foam with another material, such as a nonwoven substrate, netting, fabric or fiber, or perhaps bonding several different types of foam together.

Techniques for this process include flame bonding, hot film bonding, hot melt adhesion, or powder laminating, where a powder adhesive is used to bond foam to a substrate through a heat process.

For simpler components, such as furniture seat cushions which are covered with a layer of fiber, contact adhesives may be sprayed onto the foam by hand and the fiber applied.

Cutting is the most common fabrication technique. Most fabricators can easily set up "just-in-time" delivery programs to provide customers with foam cushioning components on an as-needed basis.

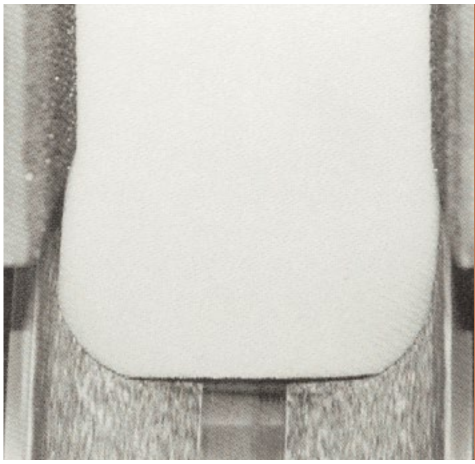
More complex post-treatment technologies include bonding several layers of foam and fabric together in a steam heat process to form the assembly into a specific shape. The shaped foam composite is then used for applications like seat cushions for contract furniture.

Making the Most of Fabrication

Proper use of foam fabrication offers a number of benefits for users of flexible polyurethane foam. Properly fabricated foam components can speed up manufacturing or improve the appearance of finished products such as furniture and mattresses. Foam fabrication can enhance the comfort, support, and durability of the foam components.

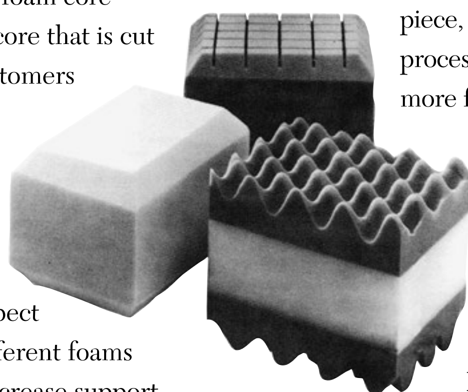
For example, convoluted foam can be used to increase the surface softness of a finished upholstered cushion or mattress topper pad and can provide more durability than fiber-wrapped cushions. Foam cushions for upholstery can be fabricated to fit surprisingly intricate curves. Holes drilled in an upholstered cushion can make it easier for upholsterers to apply buttons for a tufted look. And foams used for packaging can be cut to exactly fit delicate instruments to provide protection from shock.

Foam fabrication is important for another reason. It can also be used to differentiate finished products in the marketplace.



One popular fabrication technique involves buffing edges of foam blocks to create a curved, "bullnose" effect. This can be accomplished using a variety of fabrication techniques and makes upholstering cushions an easier task.

For example, although a block of foam without any special treatment can be used to produce a comfortable, durable mattress, it may be difficult for consumers to see the value of the product. A similar mattress using a foam core layered with convoluted foam, or a foam core that is cut across the top into a pattern, can help customers differentiate one product from another. Innovative fabrication contributes to product appeal. It also provides sales staff with easy-to-illustrate product benefits. Fabrication techniques can also enhance a particular performance aspect of a product. For example, laminating different foams together in a mattress construction can increase support without sacrificing surface comfort.



In a multiple-product line, using different foam fabrication techniques can produce a "good, better, best" product assortment that helps merchandise the products and demonstrate the value-added features of one versus another.

The Role of the Foam Supplier

Foam suppliers work with their customers in a variety of ways. Some merely deliver products based on foam users specifications; at the other extreme, some become very involved in their customers' business strategies so they may be able to provide detailed technical information on how to use new fabrication techniques to best advantage.

Foam fabrication is a rapidly changing function, and it can be of great value for users of foam to periodically work with their foam suppliers to review the fabrication options available. Though foam suppliers may offer new fabrication processes, they may not immediately see how the fabrication capabilities might serve a particular customer - unless the customer spends some time explaining needs and goals.

The combination of the wide variety of foam grades and fabrication techniques available provides product designers with a broad spectrum of design potential.

It's also important to realize that not all fabricators are equipped with all types of fabrication machinery. This is not a negative; usually there is more than one mechanical method that can be used to fabricate foam to a desired shape. For instance, foams for upholstery cushions can be glued together to create a "bullnose" effect if the fabricator doesn't have a buffer available to shape the foam.

It should be understood that most fabrication processes affect the cost of foam pieces, but to truly evaluate the final cost of the piece, one must consider the entire manufacturing process. A fabricated piece that costs a few cents more from the foam supplier may actually save several dollars of expense in product handling or assembly and produce more consistent shapes in the finished product. The end cost of the finished furniture or bedding product may actually be less because of fabrication efficiencies. Total value – in processing, performance, and sales features – must be analyzed. Foam suppliers can work with companies to help evaluate the advantages of using new fabrication processes.

Safety in Fabrication Processes

Caution should be exercised when engaging in hot wire cutting, bonding, laminating or any other processes where foam is exposed to significant heat sources. In such processes, potentially dangerous fumes are emitted which should be exhausted through properly engineered ventilation systems. Furthermore, flexible polyurethane foam is flammable and can ignite when exposed to open flames or other significant heat sources. Once ignited, polyurethane foam can burn rapidly, generating great heat and dangerous and potentially toxic gases which can be harmful or fatal to people if inhaled in sufficient quantities.

The fabricator should be guided by a Safety Data Sheet, or SDS, from his foam supplier to determine the proper procedures for handling the foam and to be aware of any special requirements for handling in the fabrication steps.

A Glossary of Fabrication Terms

***Bonding.** The combination of two or more components into a composite. Foam is often adhered to polyester fiber batting or other foam grades, and a variety of techniques are used to accomplish this. A ventilation hood should be used with this technique to exhaust fumes.

Computer Numerical Control (CNC). This automated process can be used with various CAD (computer assisted design) technologies to cut foam.

Contour cutting. A special saw cuts a pattern through a foam block, producing a custom foam part.

Convolution. A common type of fabrication, known primarily as foam with an "dimpled" design. Dimpled is the most popular style, but foam convolutions may differ significantly, from waves to very sharply defined points.

Deformation. A process whereby the shape of the foam is changed from what it was originally by compression or heat. It is usually glued to a wood or metal form of the same contour.

Die cutting. The "stamping out" of foam into parts, useful for long runs of cut parts requiring consistency in size.

Drilling. Drilling of holes in foam to increase air flow, make the foam feel softer, or allow easier button application for tufted designs.

Grinding (Buffing or Milling). The process where the edge of a piece of foam is ground off to produce a more rounded edge.

***Hot wire cutting.** A high-temperature wire is used instead of a saw blade to cut foam. This process is used typically for intricate parts. A ventilation hood should be used with this technique to exhaust fumes.

***Laminating.** The bonding of layers of foam and/or other materials together in a simple composite. This may be accomplished through adhesives or through heat processes like flame lamination. A ventilation hood may be required to exhaust fumes (see also Bonding).

Laser. Laser technology can be used to cut foam, particularly for intricate or artistic applications.

Peeling. The process where thin sheets of foam are cut from a cylinder of foam (see Slitting).

Slitting. The process where sheets of foam are cut from a rectangular foam block (see Peeling).

Waterjet. The process where a very high pressure jet of water, or a mixture of water or an abrasive substance, is used.

*Compliance with state and/or federal laws – such as state permitting requirements – may be required before this type of operation can be performed.

This information is provided as a service of the Polyurethane Foam Association to improve the understanding of key issues that affect flexible polyurethane foam cushioning. To learn more about specific foams, contact your foam supplier.

A complete library of PFA IN•TOUCH issues can be found at www.pfa.org.

Polyurethane Foam Association
334 Lakeside Plaza, Loudon, TN 37774
Phone (865) 657-9840 | Fax (865) 381-1292
www.pfa.org