Foam Expands Material Choices for Medical Device Manufacturers

Polyurethane foam consists of a thin membrane of polyurethane encapsulating a network of open cells. The reticulation process subjects the foam to heat and pressure to remove the membrane, producing an open-pore reticulated foam with a skeletal structure through which fluids easily pass.

Pore size of the foam is precisely controlled during the manufacturing process to meet specific application requirements. Pore sizes range from 4 to 100 pores per inch, with void volumes of up to 98% and surface areas up to 2,000 square feet per cubic foot.

The different polymer types available (polyester and polyether), combined with a range of pore sizes within each type, provide controlled permeability, design flexibility, and a pleasing aesthetic appearance. The material can also be produced with fungicidal and/or bactericidal additives for enhanced antimicrobial activity.

Medical Benefits
The unique characteristics of reticulated polyurethane foam provide extensive application versatility, making this material particularly well-suited for the types of filtration, absorption, wiping, and padding tasks associated with medical devices and equipment.

Reticulated foam filters with very fine pores are being used in medical nebulizers, ventilators, oxygen concentrators, and air compressors as a moisture evaporative medium and filter. Some units use compressed reticulated foam, with even smaller pore sizes, to achieve finer filtration.

The foam can be coated with a surfactant that breaks down the bubbles caused in blood by oxygenation. For example, heart-lung machines use this material to aid in the oxygenation process.

Surgical instruments are being protected by reticulated foam in several ways. Trays lined with the material prevent instruments from banging into each other. In addition, because foam for this application is hydrophilic (water-absorbing), it wicks liquids away from the instruments. Before sterilization in a steam autoclave, each instrument is placed in its own reticulated foam bag, which allows the steam to penetrate and do its job while preventing the instruments from contacting each other.

EKG pads are made of a fine-pore reticulated foam impregnated with a conductive gel. The gel allows the electrodes to make electrical contact with the patient’s skin.

Fine-cell reticulated foam is used to fashion artificial legs. The foam is contoured to the shape of a leg and hollowed out. The prosthesis device is then inserted, and the foam is covered with a washable flesh-colored film or stocking.

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Slings and braces are lined with soft, fine-pore reticulated foam to increase comfort. The foam has cushioning properties and breathability, and also may be washed.

Both reticulated and non-reticulated foams are used as hand-scrub sponges by surgeons. The sponges can be impregnated with a steroid soap or used separately with traditional soap.

**Felted Foam**
Compressing the foam produces a felt with superior physical and mechanical properties compared to the initial uncompressed foam. The felt also offers significant advantages over conventional media, such as fiber felts, glass fiber, woven and non-woven fabrics, and paper.

Felted foam comes in varying degrees of density—higher densities filter out smaller particles. This makes the felt suitable for filters used in a variety of analysis and research applications.

Lint-free wipes are also made felted foam. Because it is made of a continuous strand structure, with no beginning or end, there are no finite strands to shake loose, virtually eliminating linting problems.

Other medical product uses for reticulated foams and felts include applicators for antiseptic ointments, transdermal patches, blood filters, foam swabs, surgical masks, cervical collars, orthopedic insoles, hospital bedding comfort pads, and surgical drapes.

Because they are used in such a variety of applications, the foams themselves have not undergone FDA review. The manufacturer of the final product or device is responsible for performing the appropriate testing to evaluate the safety, efficacy, and overall suitability of the finished product, and for obtaining the required approvals for the device.

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