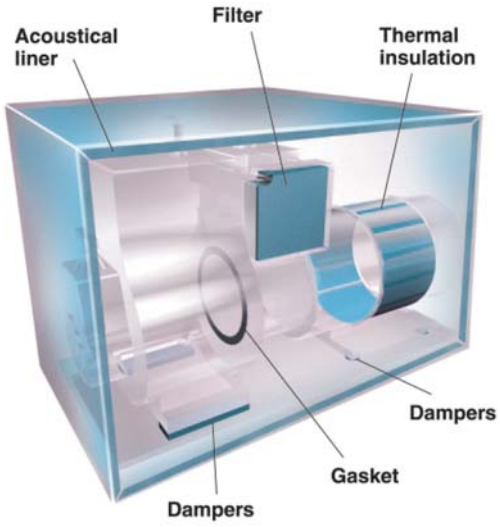
As seen in the November 21st,
2002 issue of Machine Design

Less Noise and vibration wih foam

Innovative foams not only damp noise and vibration, they also filter particles and act as heat shields, cushions, and seals.

James R. Dovorany
Vice President, pinta foamtec, inc.
Minneapolis, Minnesota



Foam placement in generator
A generator set that provides emergency and standby power uses several different foams to meet requirements for filtering, gasketing, cushioning, noise and vibration-absorption, and heat-shielding.

Foam is versatile. Through innovative manufacturing and fabrication techniques, foam can take on a variety of properties. Foam can be water resistant, absorbent, porous, and flame retardant either through formulation or by cutting, laminating, impregnating, felting and thermoforming.

Foam consists of individual cells or pores which have been completely polymerized and solidified to form a skeletal structure. Varying foam-cell structure alters physical properties to meet specific applications. This lets foam improve machinery performance or help equipment meet a variety of health and safety standards.

Foam's versatility was key in the design of a generator set that provides emergency and standby power to schools and hospitals. The generator uses several different foams to meet requirements for filtering, gasketing, cushioning, noise and vibration-absorption, and heat shielding.

Outfitting the Generator

Reticulated polyurethane provides a two-part foam filter that protects the generator engine from harmful particles. A prefilter of open-cell foam (10 parts-per-inch (ppi)) catches leaves, dirt, and other particulates that enter the air intake. A fine-grade final filter (72 ppi) is oiled to help trap dust and other fine particles. Specially fabricated in metal-framed sheets, the two part filter protects the engine from tiny contaminates but doesn't impede airflow.

Polyethylene gaskets ensure a proper seal. Dense and semirigid, closed-cell polyethylene creates a housing seal between the motor and the generator, preventing moisture and particles from entering the moving assemblies. Polyethylene used in this application is a special variety. During manufacture,

(Continued >>)

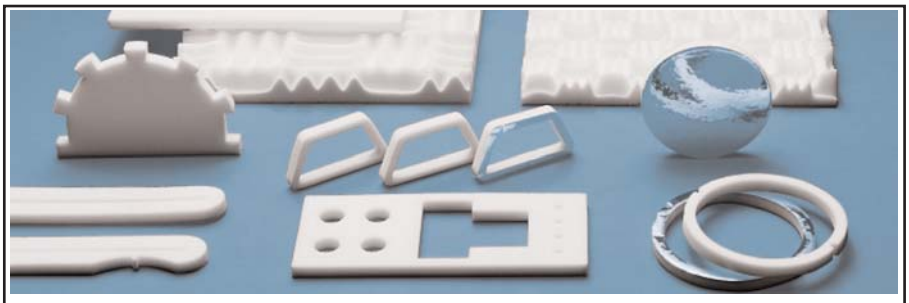
the material is “crosslinked.” Crosslinking makes the foam more durable, flexible, and prolongs its life. Soft and pliable yet dense and strong, closed-cell foams seal and conform to irregular surfaces better than open-cell foams.

A proprietary **melamine-based** foam called willtec® serves as thermal insulation. It withstands up to 302°F (maximum sustainable). The foam is also Class 1 fire-rated (ASTM E-84) for flame spread and smoke density, which makes it an ideal heat shield when applied next to the generator and engine. The open-cell structure gives the foam a low density (0.62 lb/ft^3), making it easy to fabricate for special applications. Additionally, willtec foam resists organic solvents and a variety of diluted acids and alkali.

Vinyl composite dampers serve a dual purpose by both absorbing sound and damping vibration. Viscoelastic damping materials applied directly to the surface ofthe vibrating structure absorb and distribute vibration or shock while helping reduce any noise present.

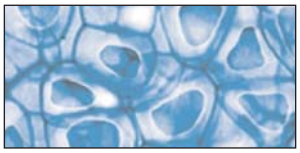
Damping materials, about 1/8" thick, can substantially reduce structure-borne vibrations before they produce annoying sound or destructive resonance. When bonded to inch-thick open-cell polyurethane foam, the composite provides a non-reflective surface that absorbs air noise from gears, linkages, fan blades, and motors. It also reduces vibration. Vibration dampers and sound-absorbing foam should be selected so they both absorb in the same low-frequency range produced by the machinery.

Polyurethane foam is perhaps the most widely used foam material. Open-cell polyurethane foams are odorless, breathable, fire retardant, and resist bacteria, dust, and oils. They also absorb sound. When applied on the inside walls of the generator, the polyurethane foam absorbs noise before it reaches outside. Hospitals, schools, telecommunications, and other buildings that rely on standby power can operate the generator with minimal interference from operating noise – at 23 ft, the sound pressure level of a 150 kW generator is reduced to approximately 72 dB.



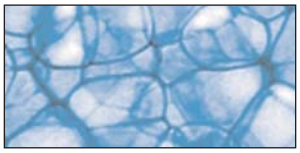
Whether cut to specific shapes, laminated to different films, or chemically altered during manufacture, foam’s versatility makes it integral in applications ranging from medical devices and safety wear to packaging materials.

OPEN-CELL



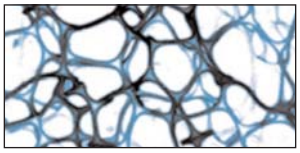
Open-cell foams such as polyurethane ether and polyurethane ester have inter-connected cells with a thin membrane between the skeletal ribs and the foam.

CLOSED-CELL



Closed-cell foams made from polyethylene, silicones, and neoprene have intactand separate cells, making them nonpermeable and resistant to moisture and oil.

RETICULATED FOAM



Cell walls within the foam can be removed through a thermal or chemical process called reticulation, which dissolves the cell membranes, leaving only a three-dimensional structure of skeletal strands. This makes reticulated foam exceptionally porous and permeable. Engineered, high-performance, reticulated-polyurethane foams meet many design criteria for filtration, including filtering, demisting, humidification, and oil/water separation.

Ranging from 3 to 100 pores/in., reticulated polyurethane foam filters air with relatively little air resistance or pressure drop because of the special combination of particle-catching strands and dust-holding capacity in their void space.

However, these foams retain their high tensile strength and tear resistance, making them easy to cut and mold into complex shapes.

3800 Washington Avenue North ■ Minneapolis, MN 55412 ■ Toll-Free 1-800-438-0678 ■ sales@pinta-foamtec.com ■ www.pinta-foamtec.com