

SIF-Z® Filter Foam

Product Sheet

Air Filtration

Overview

SIF® filter foam is a reticulated flexible polyester polyurethane foam. Unlike ordinary polyurethane foams, it has a three-dimensional structure of skeletal strands which gives it unique filtering properties. It is exceptionally porous and permeable therefore it is ideal for many filtration applications where other types of foam cannot be used.

SIF® filter foams are engineered high-performance, flexible polyurethane foams that meet many design criteria for a variety of filtration functions. They include removing dust and contaminating particles from air, gases, and liquids (filtration); collecting vaporized oils from industrial equipment (demisting); acting as an evaporative surface (humidification) and cleaning up oil spills (oil/water separation).

Benefits

The homogeneous and uniform structure of SIF® filter foam minimizes the possibility of open channels which could drastically affect filter efficiency. Each cell in the medium is completely interconnected with all surrounding cells. This allows for free passage of air and at the same time provides high surface-area contact for impingement of dust particles. The resilience and strength of the foam prevent strand displacement under normal conditions.

Applications

- Air filters for small engines
- Air conditioners
- Data processing equipment
- Electronic air cleaners
- Humidifiers
- Furnaces
- Condenser coils
- Refrigerators
- Cold drink dispensers and other appliances where moving air is required either by force or convection.



Products

Functions	SIF®	Sif® Felt	SIF® PVC-coated	Applications
Filtering	x	x	x	air filters for engines, air conditioners, furnaces, appliances
Demisting	x	x	x	fuels
Evaporative Media	x		x	humidifiers and evaporative coolers
Coalescing	x	x	x	oil spill cleanup

Matrix for Functional Applications of FXI Cellular Plastic Materials

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ASHRAE STD.52-76 Air Filter Performance Report

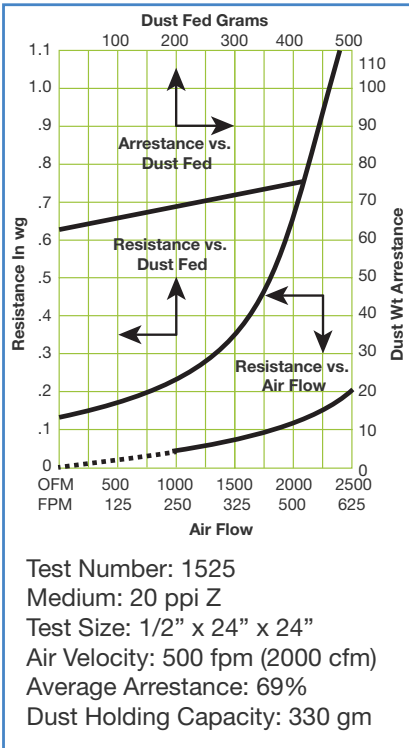


Figure 1: Test Number 1525

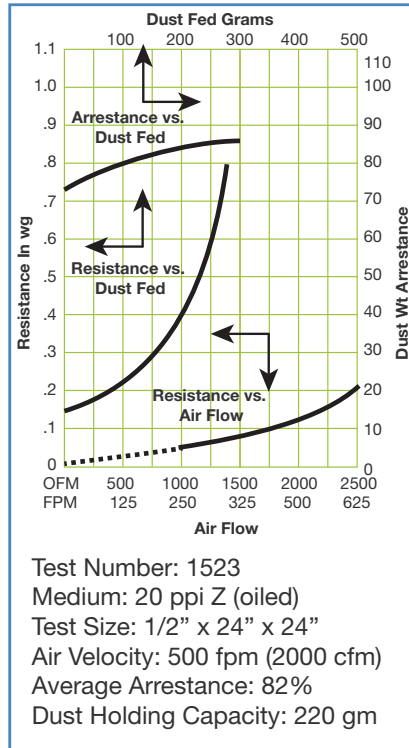


Figure 2: Test Number 1523

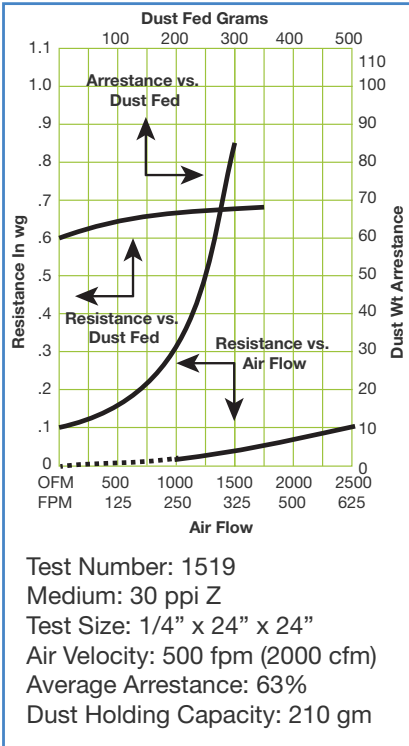


Figure 3: Test Number 1519

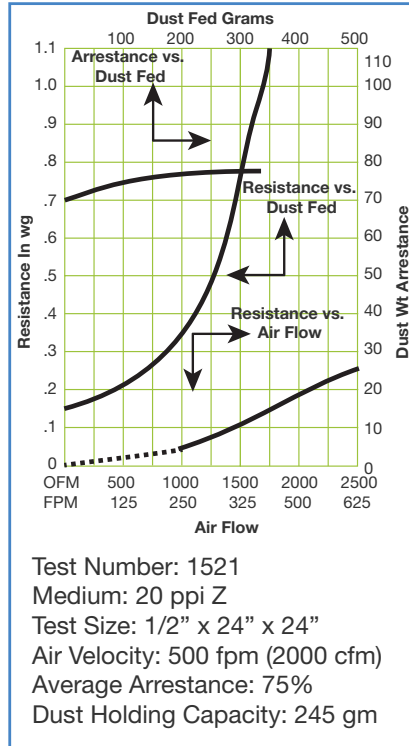


Figure 4: Test Number 1521

Additional Test Reports Available

FXI filter products include filter foam (SIF®), polyvinyl chloride-coated foam (SIF® PVC), and SIF® Felt foam. These are reticulated flexible polyester polyurethane foams or specially engineered variations of a polyether foam. Unlike ordinary polyurethane foams, they have a three-dimensional structure of skeletal strands which give them special filtering properties. They are exceptionally porous and permeable; therefore, they are ideal for many filtration applications where other foams cannot be used.

SIF® PVC coated foam is a flexible open-pore polyurethane foam coated with polyvinyl chloride. This coating preserves the foam strands without significantly increasing their resistance to air or liquid flow. SIF® PVC coated foam resists chemical attack and has greater tear strength and compression deflection than uncoated urethane foam.

SIF® Felt is a compressed, reticulated flexible foam made by permanently compressing a 90 pores-per-linear-inch (ppi) foam.

Product Description

Physical Properties

The homogeneous structure of SIF® helps minimize the possibility of open channels which could drastically affect filter efficiency. Each cell in the medium is completely interconnected with all surrounding cells. This allows for free passage of air and at the same time provides high surface-area contact for impingement of dust particles. The resilience and strength of the foam helps prevent strand displacement under normal operating conditions.

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Fabrication

The high tensile strength and tear resistance of SIF®, with its ease of fabrication provide great flexibility in product design. It can be sewn, stapled, glued or grommeted. This foam can be framed as a more conventional filter medium, or it can be used simply as a filter pad with no additional fabrication. The material, however, is most practically and economically used as a filter pad alone where design of original equipment will accommodate this type of application.

SIF® Felt

Made from a reticulated polyester or polyether polyurethane foam, SIF® Felt has excellent permeability, high physical strength, outstanding filtration efficiency, abrasion resistance and oil wicking characteristics.

SIF® Felt Grade 900 is manufactured by compressing 90-ppi (pores-per-linear-inch) reticulated foam under heat to impart a permanent compression set. By varying machine conditions and the ratio of initial foam thickness to final felt thickness, the specific design properties of the end product can be controlled. This compression ratio is called the firmness of the material. A firmness as high as 20 and a thickness as low as 0.025" are available. For filter applications as the particle size to be filtered decreases, the firmness increases and the resistance to fluid flow increases.

SIF® Felt is easy to work with and can be cut can be, glued, or shaped into unusual or curved configurations.

Figure 5: Specific Surface Area vs Pore Size

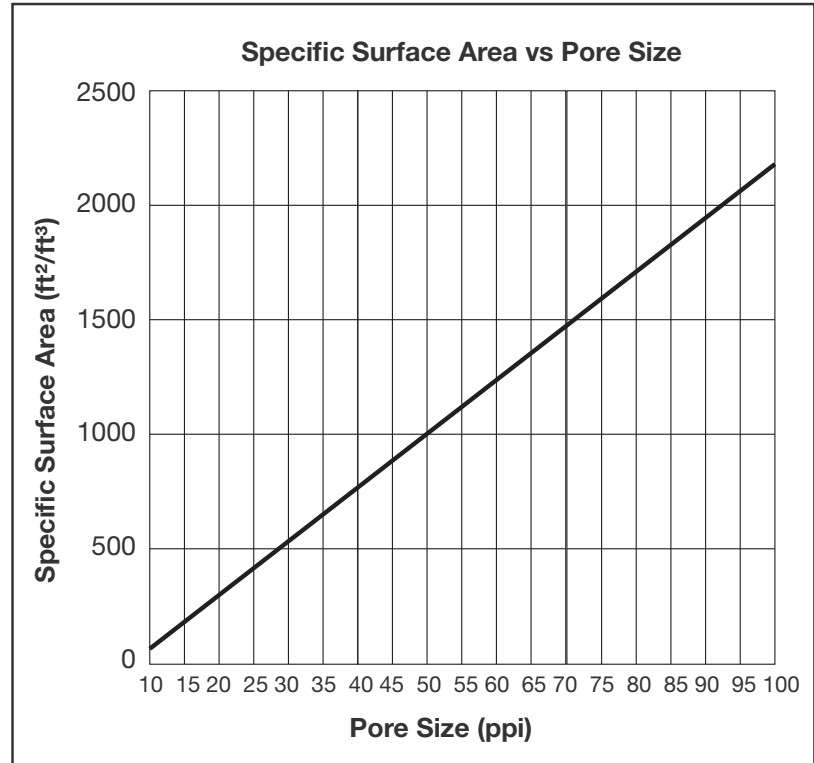
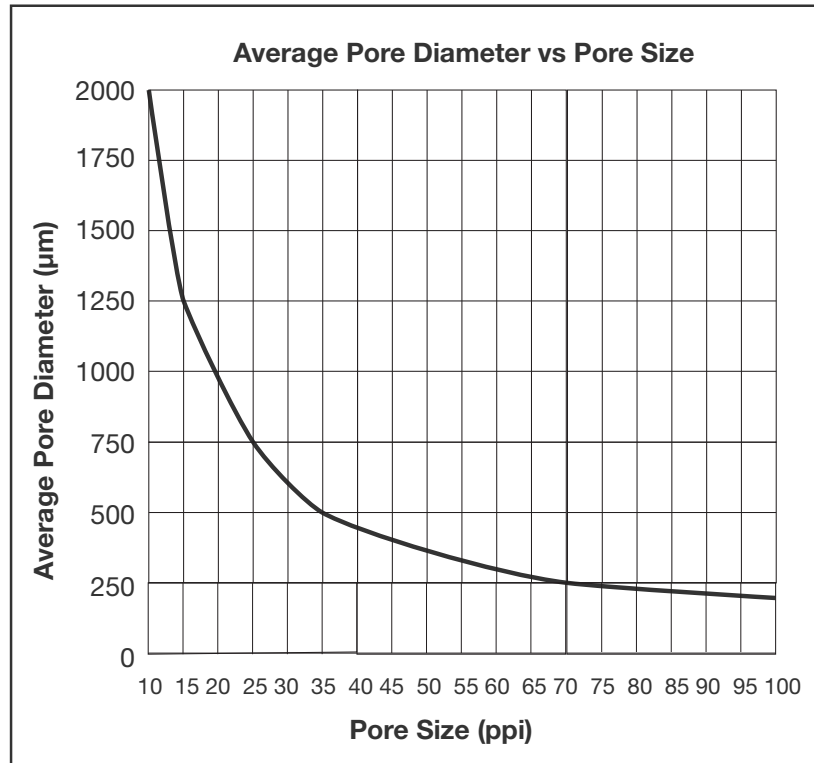


Figure 6: Average Pore Diameter vs Pore Size



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Pore Sizes

SIF® filter foam is produced in many pore sizes. Expressed as the average number of pores-per-linear-inch, these grades range from 3 to 110 ppi. Two or three-phase filters can be produced by combining several pore sizes. Range in pore size for each grade is controlled within specified limits.

Thickness

SIF® filter foam is available in thickness from 1/8" through full bun height in increments of 1/16". The availability of such fine increments in a complete range is a valuable tool in filter design.

Temperature Characteristics

SIF® filter foam has excellent high and low-temperature features. It can withstand intermittent temperatures as high as 250 °F. At temperatures above 500 °F, SIF® filter foam decomposes. At -40 °F, it shows no evidence of cracking or tearing when bent around a mandrel equal in diameter to the foam thickness.

Age Resistance

Observation of 5-year-old samples maintained at normal room conditions indicate no deterioration. Prolonged exposure to sunlight should be avoided. SIF® filter foam, showed no loss in tensile strength after being submerged in tap-water for one year at room temperature. Other grades of SIF® filter foam are made for use in extended environments.

Chemical Resistance

SIF® filter foam is not adversely affected by water, soap, detergents, perspiration, oils, cleaning solvents, or greases at normal temperatures. Aliphatic hydrocarbons cause slight swelling and aromatics cause considerable swelling. Removal of the hydrocarbons allows the foam to regain its original dimensions and strength. SIF® filter foam is attacked by strong acids, caustics and chlorine, and is not recommended unless protected by PVC coating.

Void Volume Relationship

Approximately 97 percent of the total volume of SIF® filter foam is air, or void space. This results in an enormous dust-holding capacity for any given filter design. SIF® filter foam has been tested to hold more than three times its weight.

Lightweight

SIF® filter foam is feather light...easy to ship, support, and handle.

Ease of Cleaning

In this area, SIF® filter foam is exceptional. Where the filter can be removed from its supporting structures, it can be washed, wrung out, and dried quickly. In a framed unit, it can be cleaned by simply reverse flushing with water. Since it is used dry in most applications, it can be easily cleaned with a vacuum. Immersion in hot water and detergent is all that is required to remove oil and entrapped particles. SIF® filter foam can also be cleaned by most conventional filter-cleaning machines.

The "toughness" inherent in Filter Foam eliminates the need for careful treatment during handling or washing that many competitive media require. It does not mat down or form channels under constant or repetitive washing or handling.

Compactness

Due to depth loading of the cells and the resulting efficiency, less SIF® filter foam is required to achieve desired performance.

Handling

SIF® filter foam is completely safe to handle. There are no metal or glass particles to harm the hands or to foul the intricate parts of air-moving equipment. It is also non allergenic, non toxic, and resistant to most common detergents and solvents.

Antimicrobial

In any of the porosity grades, either flame-retardant or anti-microbial additives designed to protect the foam from deterioration and musty odors can be incorporated into the SIF® filter foam. Coated or treated foams are also available allowing for improved life or efficiency.

Air filters For Automobile and Truck

A combination of paper and SIF® filter foam provides much greater service life than conventional pleated paper air filters alone.

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Small Engine Air Cleaner

The largest manufacturer of small gasoline engines uses SIF® filter foam to replace conventional oil-bath air cleaners because it is efficient, washable, and age resistant.

Industrial Plant Dust Remover

SIF® filter foam installed in a humidification system of a Canadian plastic firm removed dust resulting from plastics manufacture.

Face Mast for Doctors and Dentists

SIF® filter foam "as light as another layer of skin" is now being used as face masks in medical and dental fields.

Blood Oxygenators

Several manufacturers of blood oxygenators used in open-heart surgery employ SIF® filter foam as a defoamer and remover of CO from the blood before it is pumped back into the patient.

Ceramic and Metalized Filter Manufacturers

The three-dimensional continuous open-pore structure of SIF® filter foam acts as the foundation of their high-tech filter.

Humidifier Manufacturers

SIF® filter foams allow large surface area and low pressure drop for very efficient moisture transfer.

Evaporative Cooler Manufacturers

SIF® filter foam is used as their evaporative medium because it has a large wettable surface area.

Table 2: SIF® Foam Pore Size

Nominal Pore Size Ranges			
Porosity ^{1,2} (ppi)	Minimum	Maximum	Suggested Minimum Sheet Thickness (in.)
100	80	110	-
80	70	90	-
60	55	65	-
45	40	50	1/8
30	25	35	3/16
25	20	30	7/32
20	15	25	1/4
10	5	15	1/2

¹ FXI Internal Test Method
² Custom porosities available outside listed range

Table 3: SIF® Foam Typical Physical Properties

SIF® Foam - Typical Physical Properties ¹						
Porosity ¹ (ppi)	Density (pcf)	Tensile Strength (psi)	Ultimate Elongation (%)	50% Compression Set (%)	Compression Force Deflection (psi)	
					25%	65%
10	1.9	20	315	8	0.48	0.72
20	1.9	25	320	8	0.42	0.67
30	1.9	25	320	8	0.40	0.65
45	1.9	28	340	12	0.40	0.65
60	1.9	33	400	12	0.40	0.65
80	1.9	35	415	12	0.40	0.65
100	1.9	35	415	12	0.40	0.65

¹ Not to be used as a specification
² FXI Internal Test Method; all other properties tested in accordance to ASTM D3574

Demisting

SIF® filter foam effectively filters vaporized liquids from air drawn through it. The moisture coalesces, or gathers, on the foam, trickles to the bottom and is collected for reuse or disposal. SIF® filter foam is an excellent demisting medium due to its large surface area—up to 2,300 ft²/ft³ of foam.

Oil/Water Separation

Being oleophilic, SIF® filter foam can be used to attract and separate oil-based materials in a water environment.

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Figure 7: Pressure Drop vs Pore Size

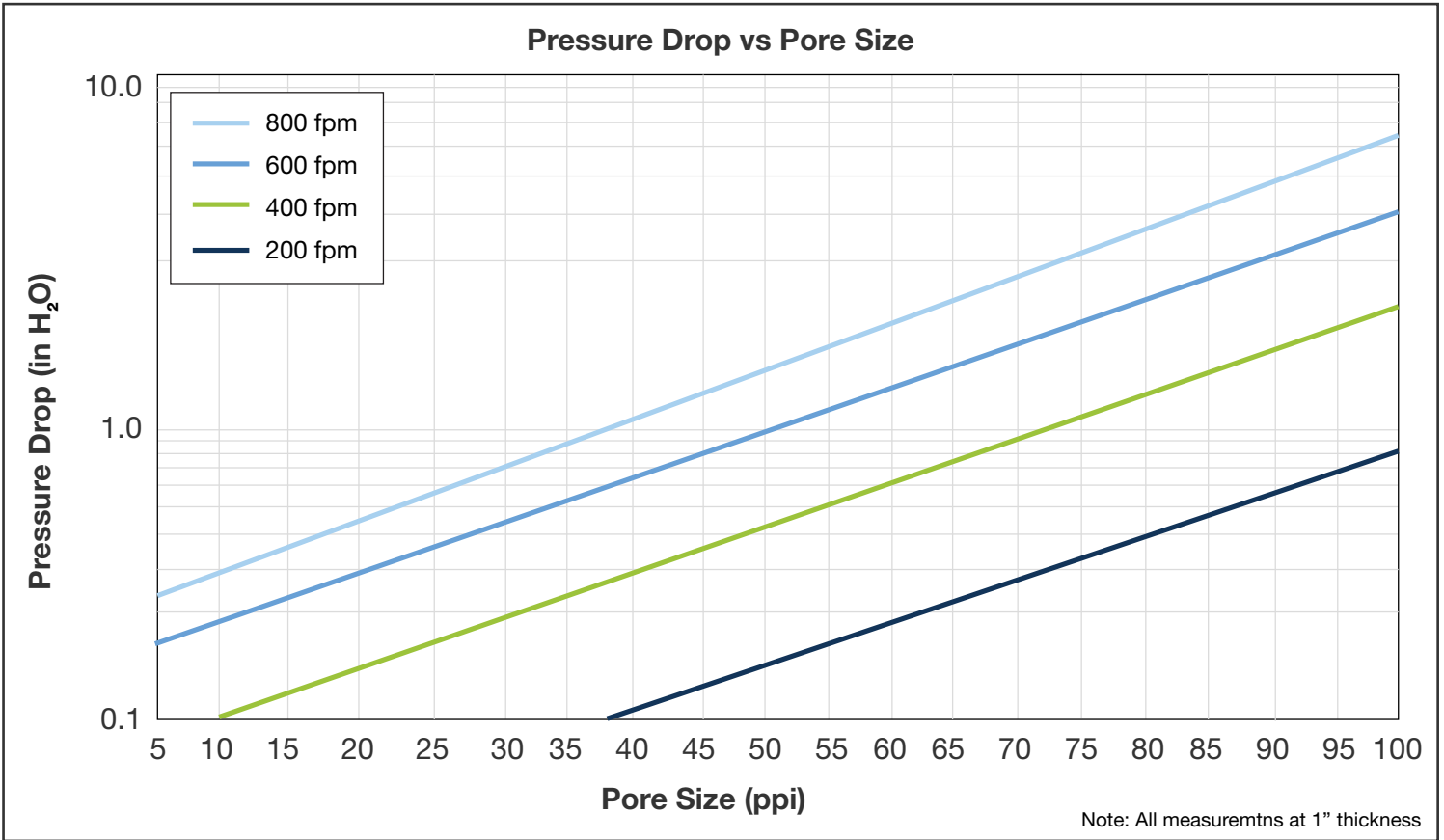
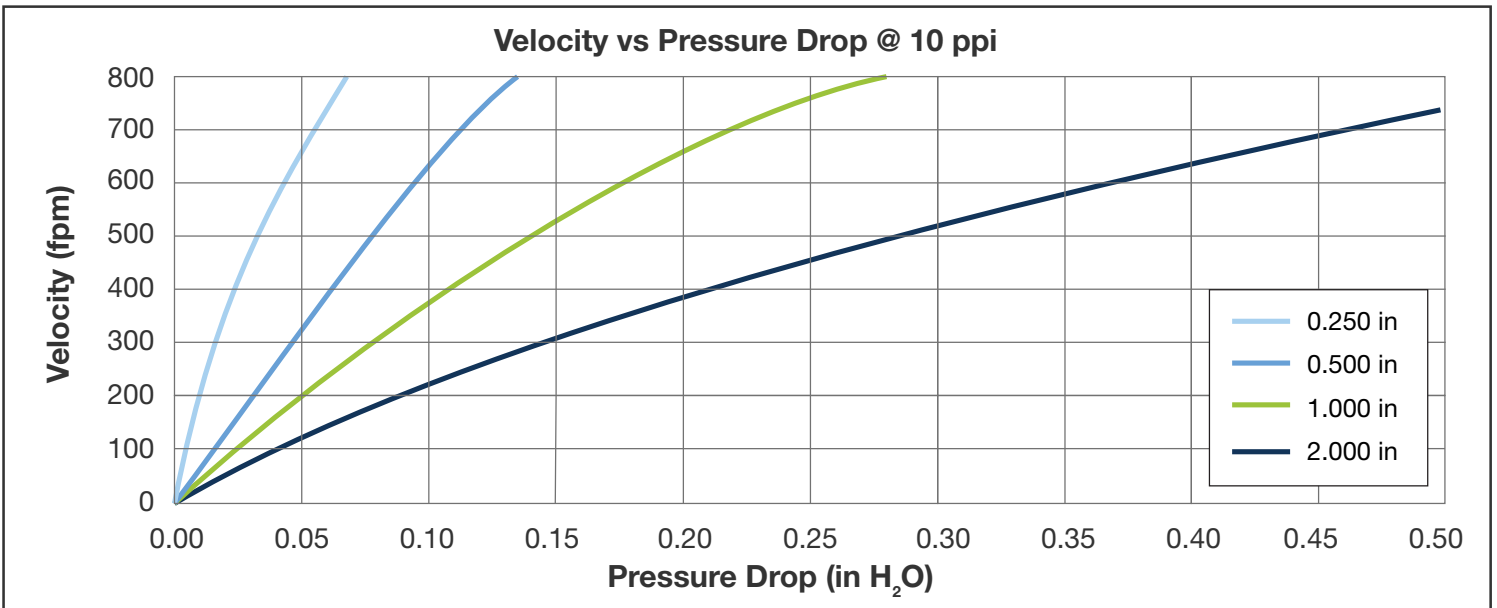


Figure 8: Velocity vs Pressure Drop @ 10 ppi



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Figure 9: Velocity vs Pressure Drop @ 45 ppi

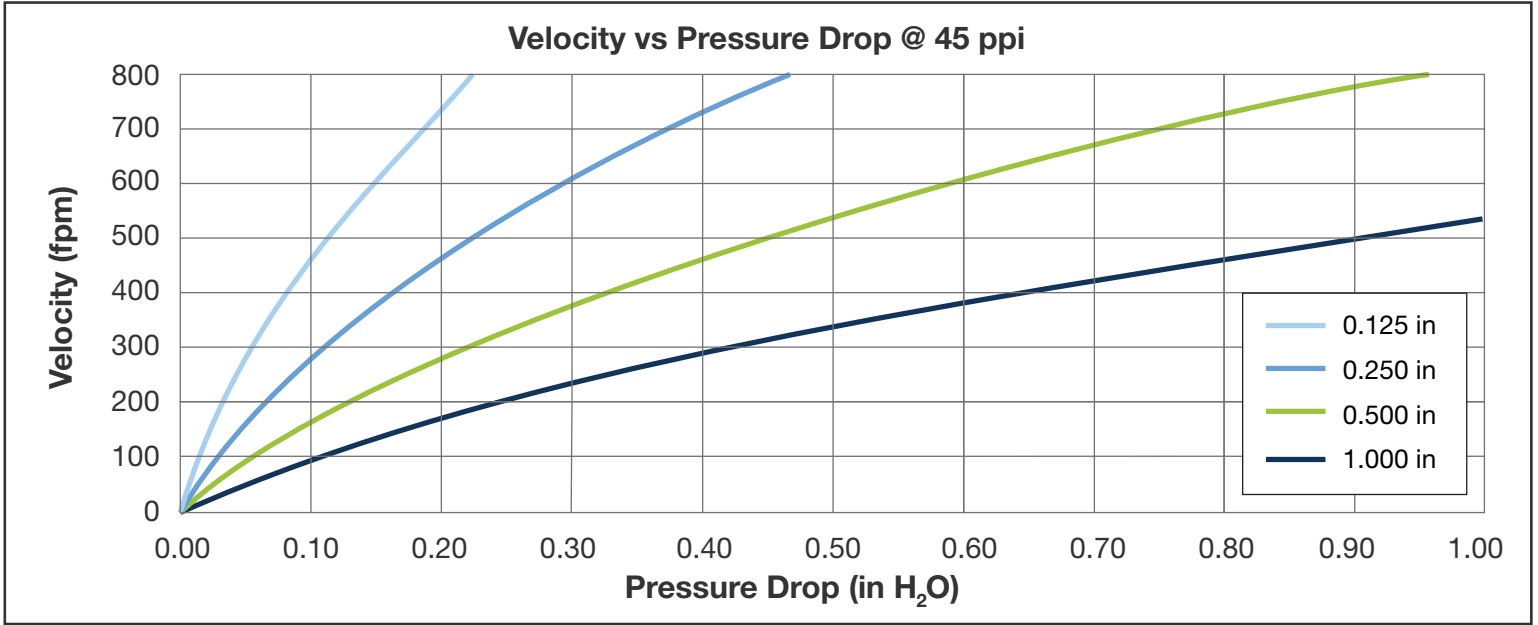
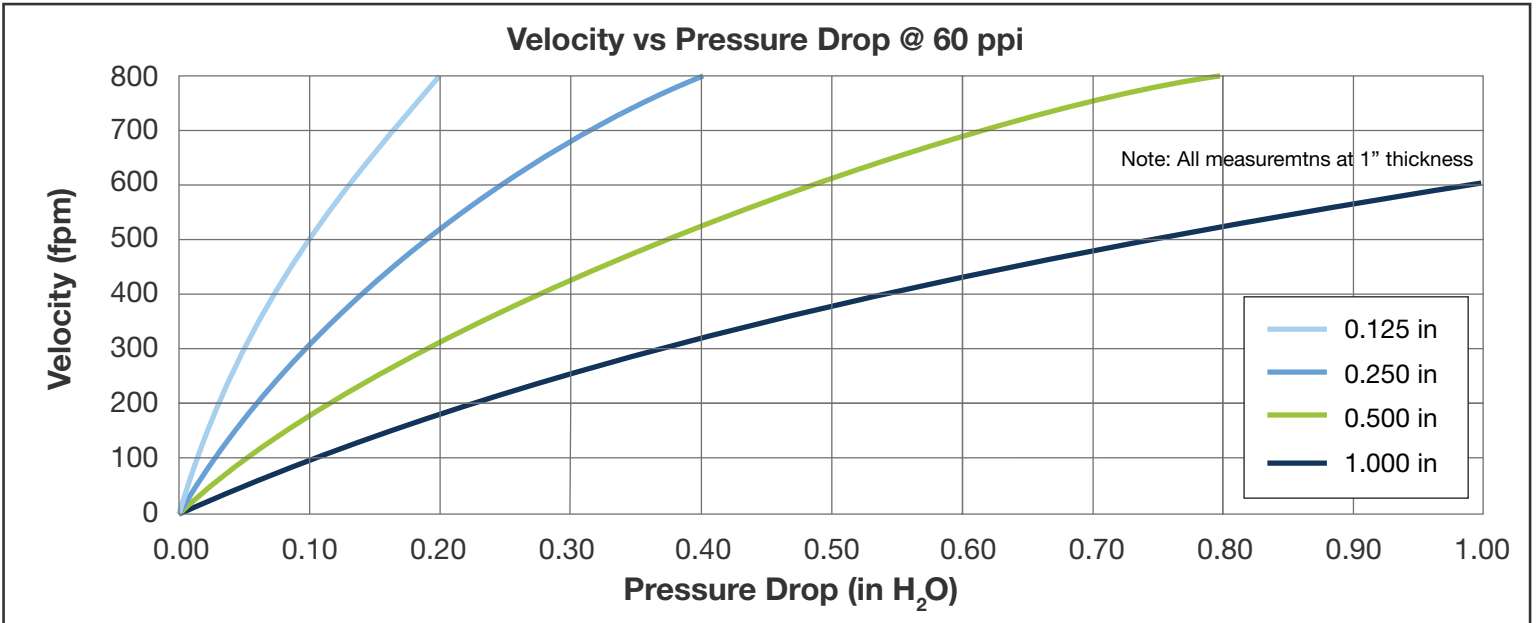


Figure 10: Velocity vs Pressure Drop @ 60 ppi

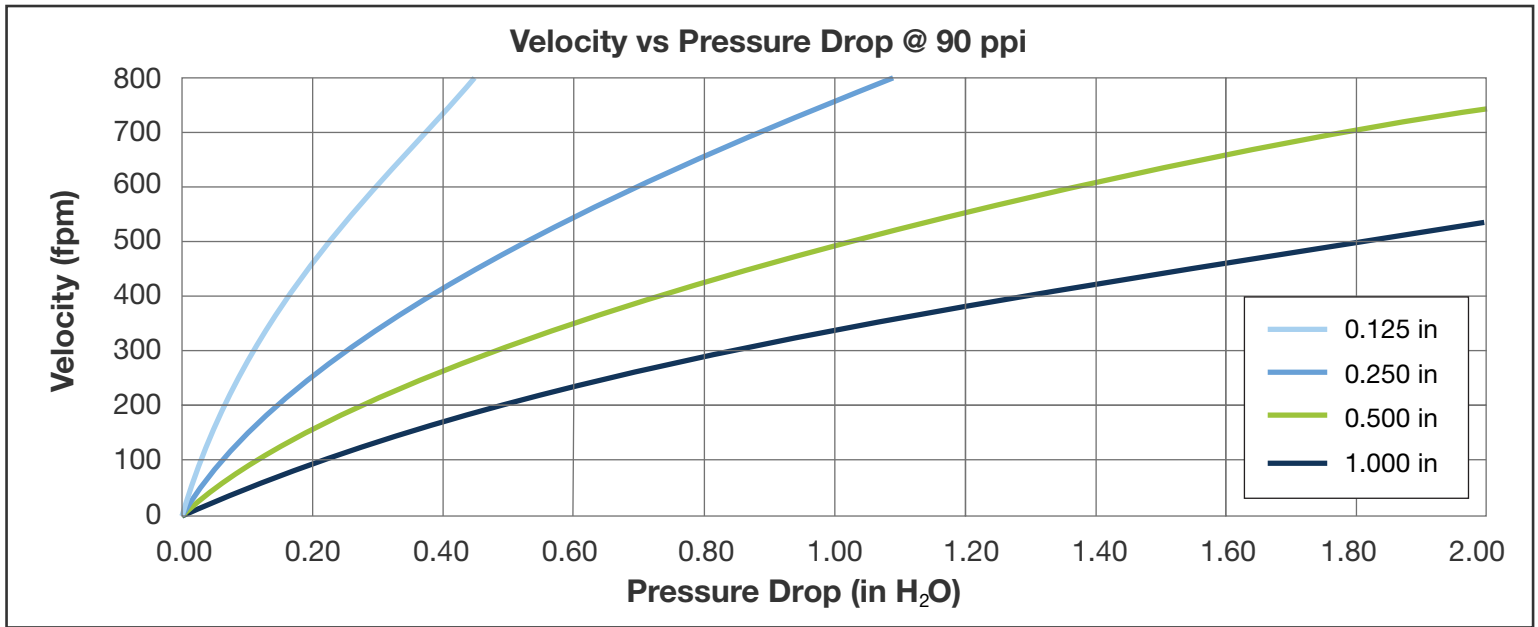


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Figure 11: Velocity vs Pressure Drop @ 90 ppi





About FXI

FXI is a leading producer of foam innovation in the Bedding, Furniture, Industrial, Home & Office, Healthcare and Transportation Markets. Our focus is on finding tailored solutions for our customers that are driven by consumer insights and industry trends. Our products include finished goods, sub-assemblies, services and raw materials for OEMs, fabricators and retailers. You will find FXI's foam innovations inside, around and under yourself in countless applications. We protect automobile passengers on the highway, help consumers sleep sounder and furniture manufacturers create comfort. We provide for sharper images in digital printers and help consumers keep their homes clean. We provide critical components for filters, gaskets and seals in everything from blood oxygenators to computer disk drives. Everywhere foam goes; FXI's innovations lead the way.

IMPORTANT NOTICE REGARDING FLAMMABILITY— All polyurethane foams including combustion modified foams will burn and generate smoke and gases. Performance conditions and corresponding data refer to typical performance in specific tests, such as UL-94 and MVSS-302, and should not be construed to imply the behavior of this or any other product under other fire conditions. All data regarding these products were obtained using specific test methods under controlled laboratory conditions intended to measure performance against specifications. Due to the great number and variety of applications for which FXI products are purchased, FXI does not recommend specific applications or assume any responsibility for use results obtained or suitability for specific applications. FXI warrants its products only to direct buyers. (See FXI's Standard Terms of Sales for FXI's warranty.) IN NO EVENT SHALL FXI BE RESPONSIBLE FOR ANY CLAIM IN EXCESS OF FXI'S SALE PRICE OF THE PRODUCT TO WHICH THE CLAIM RELATES.

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