DYNAPORE® FLUIDIZING MEDIA

Bulk Powder Handling & Processing

Parker

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Dynapore's History

2017

Parker

Parker Hannifin bought Clarcor & Companies, which included Purolator Facet. Purolator Facet was put under Parker's Industrial Process Filtration Division under dba Metallics.

2005

Purolator

Purolator Facet bought MKI

1999

CLARCOR

Purolator Facet was bought by Clarcor

1996

Dynapore®

Dynapore® was developed and trademarked

1971

MKI

MKI – Martin Kurz Inc. & Co was incorporated

Fluidizing is a process where a solid particulate material (usually granular or powder) becomes suspended and behaves like a fluid when a gas or liquid is passed upward through it at a velocity sufficient to suspend the particles. This process causes the solid particles to act like a fluid, allowing better mixing, heat transfer, and chemical reactions.

Dynapore® LFM and HFM medias are precision-engineered, multilayer laminates used to distribute air flow evenly during the fluidizing process for optimized process performance.

With Dynapore medias, bulk powders flow like liquids.

NO ONE BUT PARKER CAN GIVE YOU DYNAPORE®

High-strength, cleanable, porous sintered laminate metal sheets for all fluidizing applications.

Dynapore LFM and HFM controlled permeability media are constructed from multiple layers of carefully selected stainless steel wire mesh, laminated through precision sintering (diffusion bonding) and calendering. The resulting monolithic structure is permanently bonded and offers highly uniform flow characteristics. Dynapore laminates are ideal for achieving even gas flow distribution in fluidizing and aeration applications.

Dynapore is constructed of 100% type 316L stainless steel. Other temperature and corrosion resisting alloys are available on special request. Custom laminates offering enhanced mechanical strength are also available.

Dynapore media can be easily sheared, formed, punched, welded, and cleaned using standard equipment and methods. Dynapore laminates are available in standard sheet sizes of 24” x 48” and 36” x 36”. Larger TIG butt-welded sizes are also available. Parker offers custom fabrication services to meet your specific requirements.

Dynapore media is abrasion- and puncture-resistant and will not chip, flake, or shed fibers. Depending on the load, Dynapore can withstand continuous operating temperatures up to 1000°F, with intermittent spikes up to 1200°F. Its abrasion, corrosion, and temperature resistance properties are superior to those of polyester or metal felts.

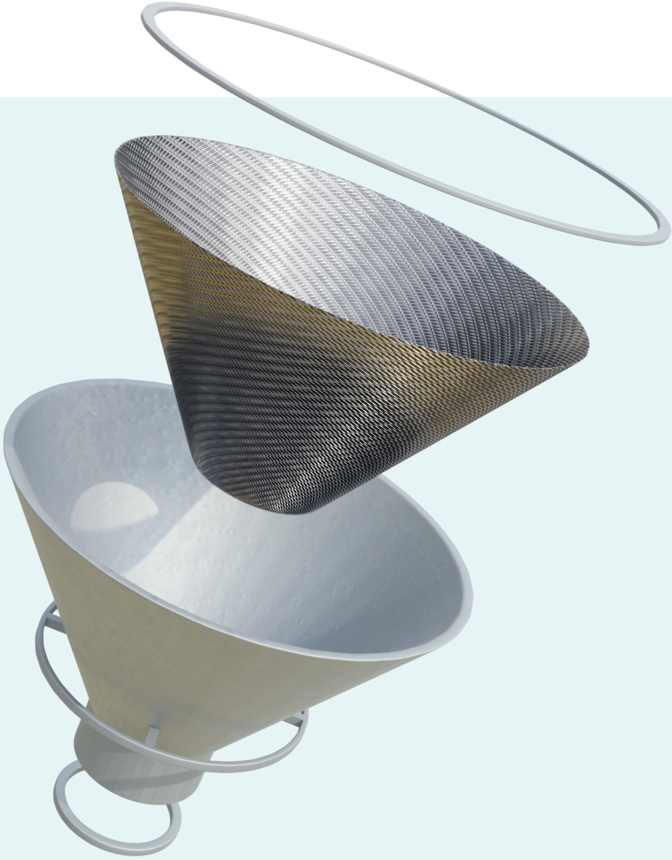
LFM and HFM air flow ratings and pressure drop curves are presented on the following page.

- LFM 3-layer media provide airflow rates ranging from 5 to 25 scfm/sf at a 2-inch water column pressure drop.
- HFM 2-layer media offer airflow rates from 50 to 400 scfm/sf at a 2-inch water column pressure drop.

Custom permeabilities are available upon special request.

For more information, see below Specification Sheets

- 401 Mechanical Properties
- 402 Installation Recommendations
- 403 Fluidized Conveyor Truss and Bolt Spacing
- 404 Flow Equations and Permeability Constants



Common Fluidizing Materials

- LIME
- CEMENT
- FLY ASH
- GYPSUM
- ALUMINA
- TEREPHTHALIC ACID
- IRON ORE

Common Applications

- BINS
- SILOS
- DRYERS
- HOPPERS
- REACTORS
- AIR-GRAVITY CONVEYORS
- TARE REMOVAL
- COOLERS

AIR FLOW CHARACTERISTICS

Bulk powders flow like liquids on Dynapore stainless steel fluidizing media.

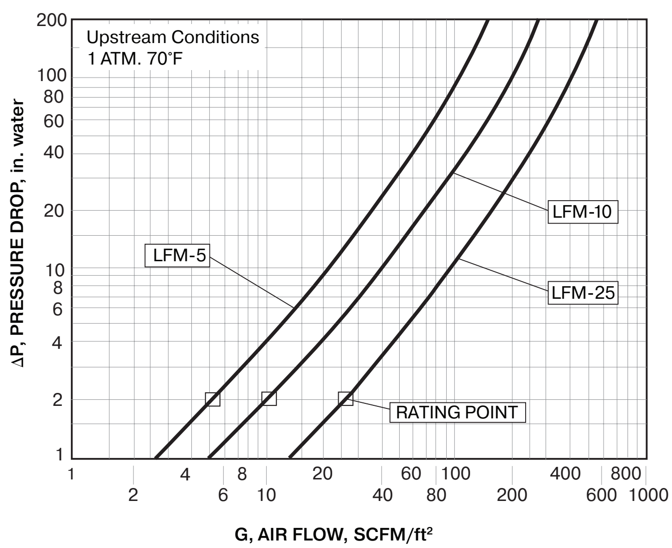
The air flow rating values for 3-layer LFM and 2-layer HFM Dynapore laminates are presented in the following tables. LFM laminates cover an air flow range from 5 to 25 scfm/ft² at a 2-inch water column pressure drop. HFM laminates provide flow rates from 50 to 400 scfm/ft² at the same pressure drop. In general, HFM media are lighter and thinner, with larger mean pore sizes compared to LFM media.

LFM

3-Layer Laminate (weight 2.0 lbs/ft²)

Medium Type	Part Number	Air Flow SCFM/Ft² @Δp 2 In. Water	Nominal Thickness Inches
LFM-5	407523	5.0	0.054
LFM-10	401303	10.0	0.056
LFM-25	407533	25.0	0.060

Pressure Dropvs Air Flow - 3-Layer Dynapore

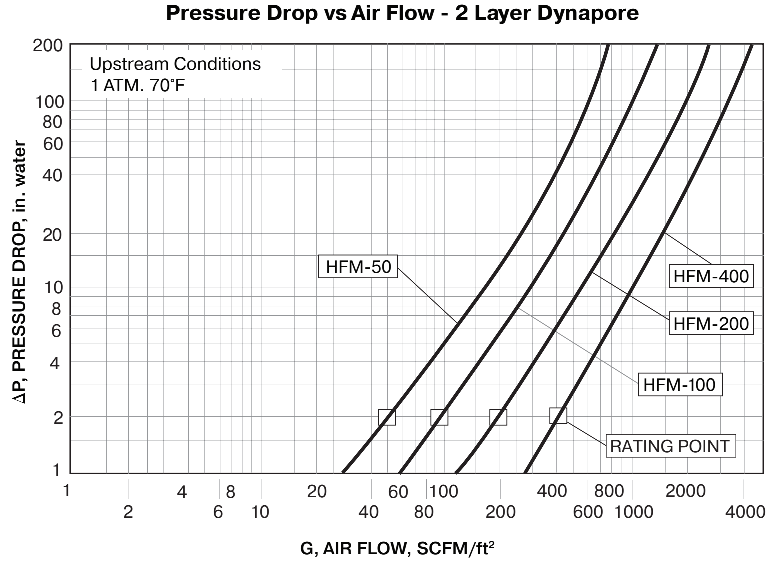


HFM

2-Layer Laminate (weight 1.5 lbs/ft²)

Medium Type	Part Number	Air Flow SCFM/Ft² @Δp 2 in. Water	Nominal Thickness Inches
HFM-50	401420	50	0.041
HFM-100	401430	100	0.044
HFM-200	401440	200	0.050
HFM-400	407570	400	0.060

Pressure Drop vs Air Flow - 2 Layer Dynapore



A PROVEN PRODUCT FOR MORE THAN 50 YEARS

Cleanability

Dynapore is easy to clean, as ordinary water and detergent, high-pressure steam, or chemical methods can be used to remove most oil and dirt.

Easily Fabricated

Dynapore can be easily fabricated, punched, sheared, or formed. It offers excellent weldability using TIG or other standard welding methods. Dynapore is available in seamless sheets measuring 24" x 48" and 36" x 36".

Air Flow Uniformity

High temperature diffusion bonding and precision calendering create the precise and uniform air flow properties of Dynapore.

Engineered Porous Media

Dynapore laminates are not limited to LFM and HFM constructions. Through careful mesh selection and sequencing, porous metal media can be engineered to meet virtually any specification for pore size, pore density, tortuosity, mechanical strength, permeability, corrosion resistance, and acoustical resistance.

Application Versatility

For extremely fine powders, Parker offers Dynapore Particle Control Fluidizing Media (PCM). PCM media is available in the same flow ranges as LFM, but feature particle barrier meshes as fine as two microns sintered to the downstream surface. Please consult the factory for more information.

- Fluidized hoppers, beds and slides
- Air film conveyors
- Air bearings
- Spargers and diffusers
- Transpiration cooling media
- Flame and spark arresters
- Flow restrictors
- Pressure snubbers
- Acoustical mufflers
- Propellant surface tension devices
- Resin and catalyst beds
- Filter leaves and cartridges
- Particle classification screens
- Vacuum forming and molding media
- Drying/de-watering media

FLUIDIZING MEDIA MECHANICAL PROPERTIES

Media Type	Ultimate Tensile Strength (psi)	Yield Strength @ 0.2% Offset (psi)	Elongation, 2 in. Gauge Length (%)	Tensile Modulus of Elasticity (psi x 10^6)	Thickness (in) Approximate
LFM-5	40,000	28,500	9.0	13.3	0.054
LFM-10	39,000	27,000	13.5	13.0	0.056
LFM-25	30,000	19,000	14.5	12.7	0.060
HFM-50	26,000	19,000	9.0	11.0	0.041
HFM-100	24,000	17,000	11.0	9.7	0.044
HFM-200	18,850	11,250	16.5	8.8	0.050
HFM-400	16,000	7,600	22.5	8.3	0.060
HFM-600	13,900	5,400	24.3	7.6	0.067

Notes

1.) Approximate weight: LFM 2.0 lbs/sq. ft.
HFM 1.5 lbs/sq. ft.

2.) Testing in accordance with ASTM A 370-95a.

3.) All data are approximate or average and are based on standard 316L stainless steel construction.

4.) Specifications are subject to change without notice.

5.) Designs should reflect the decreasing yield strength of 316L stainless steel at temperatures over 400°F.

Concrete Production

Bulk Powder Processing

Agriculture

Pneumatic Conveying

INSTALLATION RECOMMENDATIONS

- **Fitting Dynapore LFM & HFM Fluidizing Media**

  Dynapore fluidizing media, both LFM and HFM, can generally be handled like solid stainless steel sheets. They can be readily cut to size using a power shear, band saw, or nibbler with appropriate capacity. These media may also be formed using suitable bend radii; however, it is recommended to consult the factory for specific forming guidelines. Additionally, Dynapore media can be punched using standard punches and dies, with a suggested punch-to-die clearance of 3½% per side.

- **Welding**

  Welding Dynapore sheets together to create larger pieces can be readily accomplished through butt-welding. After shearing or cutting the media to obtain clean, straight edges, butt the sheet edges together on top of a copper plate or bar, which provides support and acts as a heat sink. Use TIG welding with an initial setting of approximately 32 volts and 45 amps. Employ a 0.063" diameter 2% thoriated tungsten electrode and T-347 filler wire with a diameter between 0.032" and 0.040". If cleaning the weld is necessary, use only a stainless steel wire brush. Additionally, these media can be welded using plasma, laser, or electron beam methods.

- **Chemical Finishing**

  Some applications may require passivation or electropolishing of the Dynapore media. These media can be finished using either of these chemical processes; however, due to variations in bath compositions, concentrations, and residence times, it is important to test a small sample or test coupon before proceeding with the full production lot. Additionally, thorough rinsing after the finishing process is essential to ensure proper results.

- **Caulking**

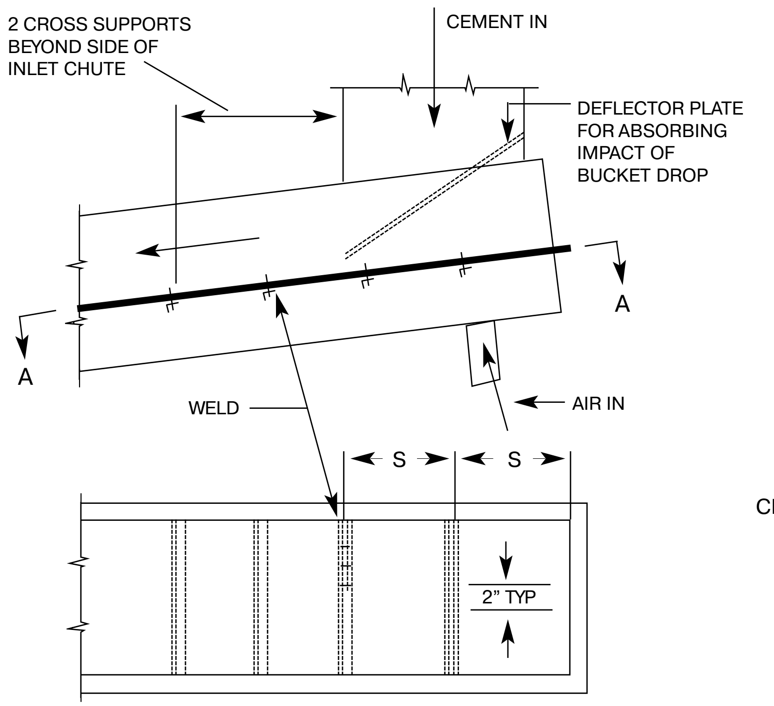
  Airflow losses must be prevented around the panel edges where the Dynapore media are clamped between plenum flanges. To ensure a proper seal, an appropriate caulking compound should be applied to both the upper and lower surfaces of the media. When Dynapore media are used to retrofit an existing slide or in combination with another medium, shimming may be necessary if the variations in media thickness exceed the adjustment allowances of the flange.

- **Air Supply**

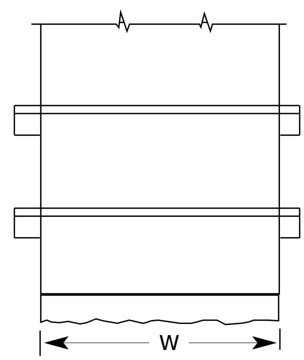
  To ensure optimal operating life, the fluidizing air supply must be of instrument quality—that is, clean and dry. Regular replacement of air supply filters and provision of moisture-free air will help maintain long service life. Additionally, thorough cleaning of the plenum prior to installation is essential to prevent immediate plugging, provided the plenum has been properly and adequately sealed.

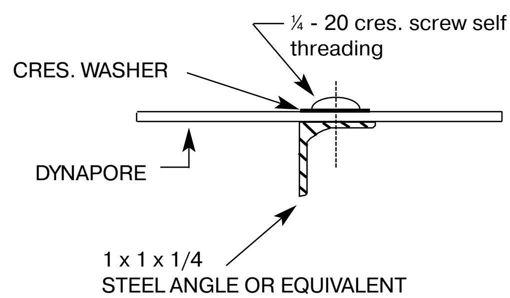
INSTALLATION RECOMMENDATIONS

In applications where the conveyor experiences intermittent loads from dropping powder, it is recommended to use a deflector plate, cross supports, and a bolting arrangement as illustrated in the accompanying sketch. The provided table specifies the appropriate support spacing based on various inside conveyor widths and air supply pressures.



SECTION A-A





Width "W"	Spacing of Cross Supports, "S", Inches					
	1 PSIG	2 PSIG	3 PSIG	4 PSIG	5 PSIG	6 PSIG
6	-	-	-	-	6.0	4.5
8	-	-	8.5	6.0	6.0	4.5
10	-	-	8.0	6.0	6.0	4.5
12	-	10.0	7.0	6.0	6.0	4.5
14	-	9.0	7.0	6.0	6.0	4.5
16	16.0	9.0	7.0	6.0	6.0	4.5
18	15.0	9.0	7.0	6.0	6.0	4.5
20	14.5	9.0	7.0	6.0	6.0	4.5
22	14.5	9.0	7.0	6.0	6.0	4.5
24	14.5	9.0	7.0	6.0	6.0	4.5

FLUIDIZING MEDIA TECHNICAL DATA

Air Flow Characteristics

The air flow rating values for the 3-layer and 2-layer Dynapore laminates are presented in the following table. The 3-layer laminate covers the air flow range from 5 to 25 SCFM/ft^2 at 2 in. water pressure drop. The 2-layer laminate flows from 50 to 400 SCFM/ft^2 at 2 in. water pressure drop.

Air Flow Rating

3-Layer Laminate (Weight 2.0 Lbs./Sq. Ft.)

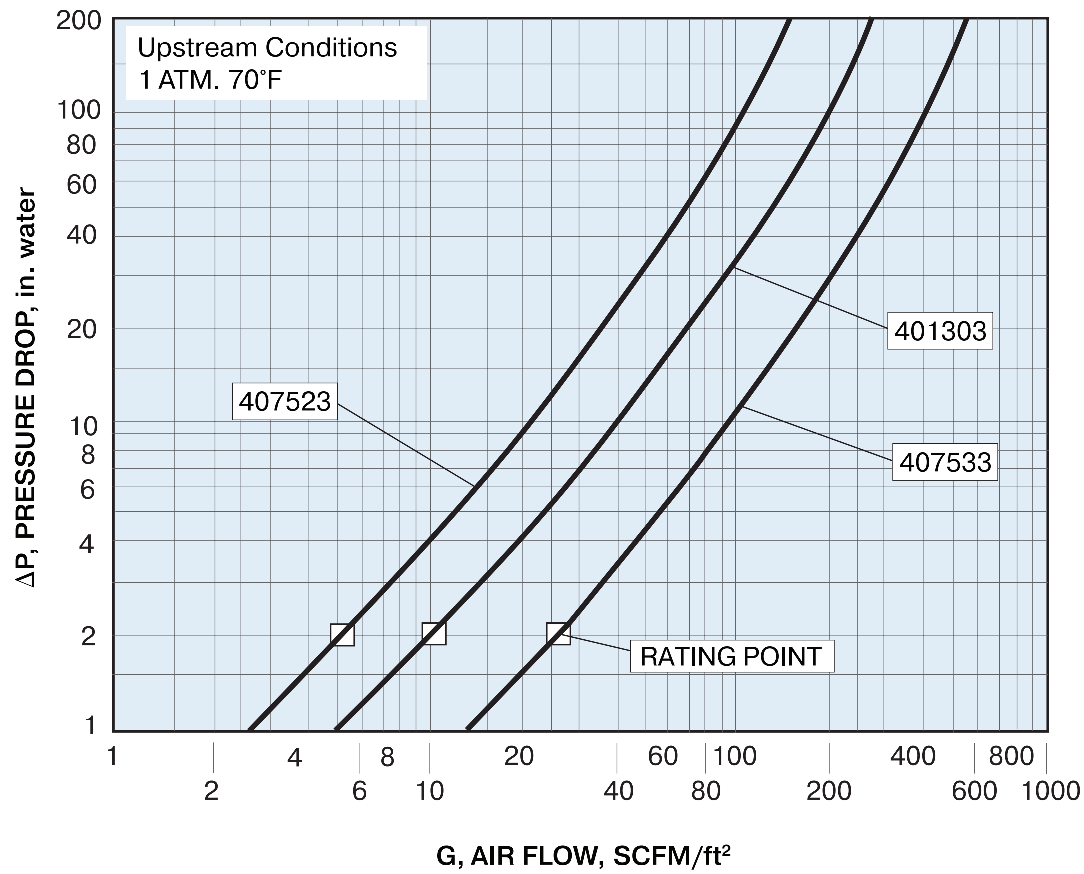
Part Number	Air Flow SCFM/Ft.^{2} @ Δp 2 In. Water	Nominal Thickness Inches
407523	5	0.054
401303	10	0.056
407533	25	0.060

2-Layer Laminate (Weight 1.5 Lbs./Sq. Ft.)

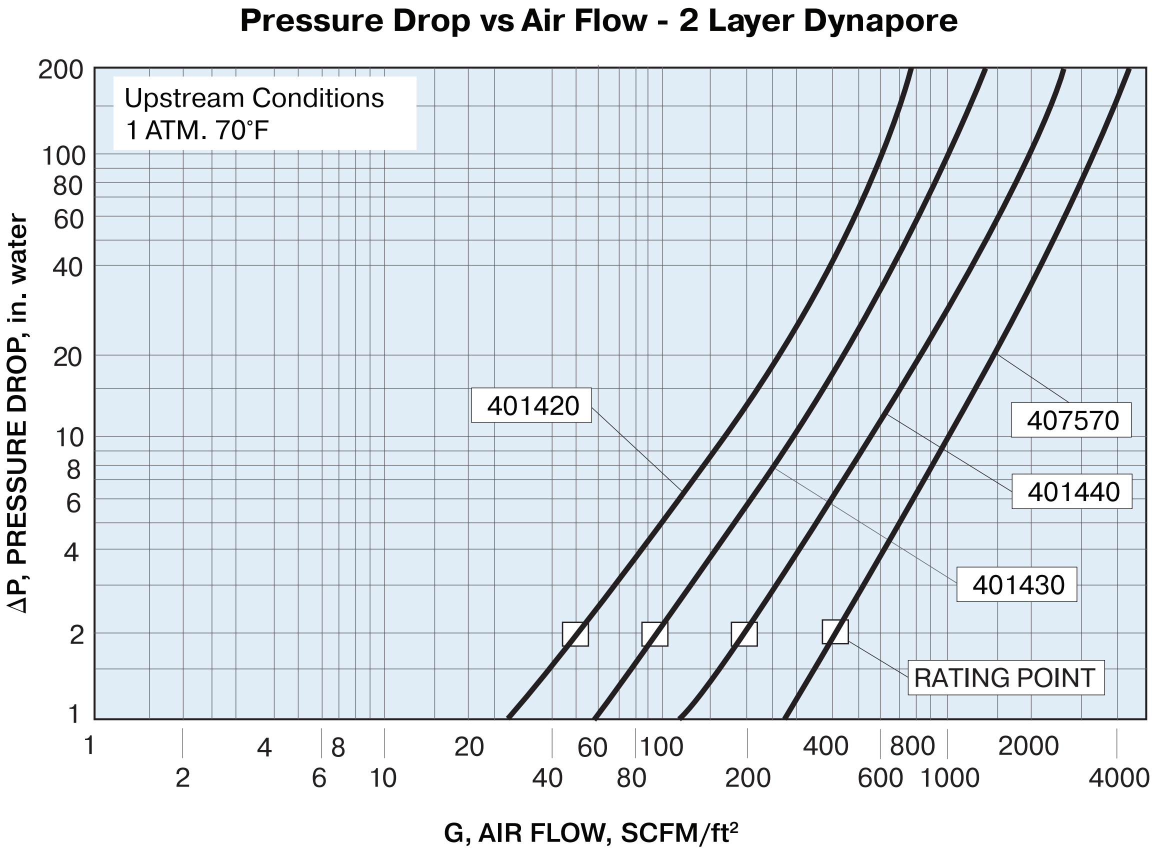
Part Number	Air Flow SCFM/Ft.^{2} @ Δp 2 In. Water	Nominal Thickness Inches
401420	50	0.041
401430	100	0.044
401440	200	0.050
407570	400	0.060

Pressure drop curves for the 3-layer and the 2-layer laminates are given in the following figures for standard pressure and temperature air entry conditions. For other conditions, flow equations are provided to facilitate pressure drop calculation.

Pressure Drop vs Air Flow - 3-Layer Dynapore



FLUIDIZING MEDIA TECHNICAL DATA



The flow permeability of Dynapore material may be presented in equation form for estimating the flow characteristics for a variety of conditions and fluids.

For incompressible air flow the equation is: $\Delta P = AG + BG^2$

Where ΔP is pressure drop (in. water column) and G is air flow (SCFM/ft² @ 70°F).
The constants A (viscous flow coefficient) and B (inertial flow coefficient) are listed in the table.

For compressible air flow the equation is: $\overline{\Delta P}^2 = AG + BG^2$

Where $\overline{\Delta P}^2 = P_1^2 - P_2^2$, and P_1 is the upstream pressure and P_2 is the downstream pressure, (both in "in." water column absolute. G is air flow (SCFM/ft² @ 70°F). The applicable constants, A and B are listed in the table. Note that they are different than for incompressible flow.

Air Flow Equation Constants

Part Number	Flow SCFM/Ft.^{2} @ Δp 2 In. Water	Incompressible[1] (Δp, In. Water G, SCFM/Ft.^{2})		Compressible[2] (Δp^2, In. Water^2 G, SCFM/Ft.^{2})	
		A	**B, X 10^{-3}**	**A**	**B**
3-Layer Laminates					
407523	5	0.375	4.95	300.0	4.40
401303	10	0.181	1.90	147.0	1.45
407533	25	0.0697	0.415	58.0	0.33
2-Layer Laminates					
401420	50	0.0295	0.210	24.2	0.165
401430	100	0.0130	0.070	10.8	0.054
401440	200	0.0050	0.025	4.60	0.0177
407570	400	0.00192	0.0077	1.78	0.0057

1. Incompressible - upstream conditions: 70°F, 1 Atm.
2. Compressible - upstream conditions: 70°F

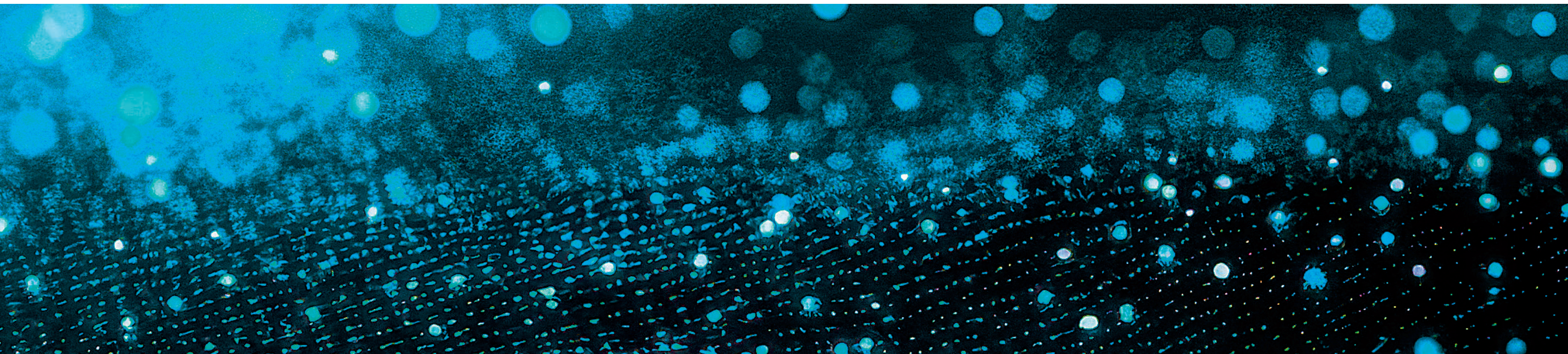
When estimating the flow permeability for air at temperatures other than 70°F, or for other fluids the more general gas flow equations are applicable.

For incompressible gas (or liquid) the equation is: $\Delta P = A\mu V + B\rho V^2$

Where μ is absolute viscosity (in centipoise, CP) ρ is specific weight (lb/ft^3), ΔP is pressure drop (in. water) and V is flow (CFM/ft^2). The constants for A and B are obtained from the gas flow table.

For compressible gas the equation is: $\overline{\Delta P}^2 = A\mu \frac{T}{M} G + B \frac{T}{M} G^2$

Where $\overline{\Delta P}^2 = P_1^2 - P_2^2$ and P_1 is the upstream pressure, P_2 is downstream (in. water column), G is flow (SCFM/ft^2 referred to 70°F, 1 Atm.), T is absolute temperature (°R), M is molecular weight, and μ is viscosity (centipoise), the constants A and B are given in the gas flow table for compressible flow.



FLUIDIZING MEDIA TECHNICAL DATA

Gas Flow Equation Constants

Part Number	Flow SCFM/Ft.^{2} @ ΔP 2 In. Water	Gas or Liquid Incompressible (ΔP, In. Water V, CFM/Ft.^{2})		Gas Compressible ($\overline{\Delta P^2}$, In. Water^2 G, SCFM/Ft.^{2})	
		A	**B, x 10^{-3}**	**A**	**B, x 10^{-3}**
3-Layer Laminates					
407523	5	20.60	66.10	900.0	241.00
401303	10	9.92	25.40	441.0	79.40
407533	25	3.82	5.54	174.0	18.10
2-Layer Laminates					
401420	50	1.616	2.80	72.6	9.00
401430	100	0.712	0.934	32.4	2.90
401440	200	0.274	0.336	13.8	0.969
407570	400	0.105	0.103	5.34	0.312

Sample Calculations

To illustrate the use of the flow equations, sample calculations are presented for the four equations for Dynapore Part No. 401303 (10 SCFM/ft^2 @ 2 in. water) for the following conditions:

Incompressible Air Flow

Air Flow, G = 100 SCFM/ft^2

Upstream Temperature = 70°F

Upstream Pressure = 1 Atm.

$\Delta P = AG + BG^2$

$\Delta P = 0.181\ (100) + 1.90 \times 10^{-3}\ (100)^2$

$\Delta P = 37.1$ in. water

From Air Flow Table:
A = 0.181
B = 1.90 x 10^{-3}

Compressible Air Flow

Air Flow, G = 250 SCFM/ft^2

Upstream Temperature = 70°F

Upstream Pressure, P_1 = 814.4 in. water absolute

$\overline{\Delta P^2} = AG + BG2$

$\overline{\Delta P^2} = 147(250) + 1.45(250)^2$

$\overline{\Delta P^2} = 127{,}375 = P_1^2 - P_2^2$

$P^2 = \sqrt{(814.4)^2 - 127{,}375} = 732.0$ in. water

$\Delta P = P_1 - P_2 = 814.4 - 732.0 = 82.4$ in. water

Subscripts:
0 = Standard
1 = Upstream
2 = Downstream

From Air Flow Table:
A = 147
B = 1.45

FLUIDIZING MEDIA TECHNICAL DATA

Incompressible Gas Flow (or Liquid)

Upstream Air Conditions:

P_1 = 814.4 in. water absolute

T_1 = 200°F + 460° = 660°R

V_1 = 62 CFM/ft^2

ρ_1, specific weight = $\rho_0 = \frac{P_1}{P_0} x \frac{T_0}{T_1} = \frac{0.07493(814.4)\ (70 + 460)}{(407.2)\ (660)} = 0.1203$ lb./ft^3

μ_1 = viscosity = 0.02127 centipoise @ 660°R

$\Delta P = A\ \mu_1\ V_1 + B\ \rho_1\ V_1^2$

$\Delta P = 9.92(0.02127)62 + 25.4 \times 10^{-3}\ (0.1203)(62)^2$

ΔP = 24.8 in. water

From Gas Table:
A = 9.92
B = 25.4 x 10^{-3}

Compressible Gas Flow

Upstream Air Conditions:

P_1 = 814.4 in. water absolute

T_1 = 200°F + 460° = 660°R

V_1 = 248 CFM/ft^2

$G = V_1 = \frac{P_1}{P_0} x \frac{T_0}{T_1} = \frac{248(814.4)\ (70 + 460)}{(407.2)\ (660)} = 398.3$ SCFM/ft^2

ρ_1, specific weight = $\rho_0 = \frac{P_1}{P_0} x \frac{T_0}{T_1} = \frac{0.07493(814.4)\ (70 + 460)}{(407.2)\ (660)} = 0.1203$ lb./ft^3

μ_1 = viscosity = 0.02127 centipoise @ 660°R

M = Molecular weight = 28.97

$\overline{\Delta P}^2 = A\mu_1 \frac{T_1}{M} G + B \frac{T_1}{M} G^2$

$\overline{\Delta P}^2 = \frac{441(0.02127)(660)(398.3)}{28.97} + \frac{79.4 \times 10^{-3}\ (660)\ (398.3)^2}{28.97}$

$\overline{\Delta P}^2 = 372{,}086 = P_1^2 - P_2^2$

$P_2 = \sqrt{(814.4)^2 - 372{,}086} = 539.6$ in. water

$\Delta P = P_1 - P_2 = 814.4 - 539.6 = 274.8$ in. water

From Gas Table:
A = 441
B = 79.4 x 10^{-3}

Viscosity of Air

°F	°R	Viscosity (CP)
-60	400	0.0145
70	530	0.0182
140	600	0.0200
340	800	0.0250
540	1000	0.0285
1040	1500	0.0370

NO ONE BUT PARKER CAN GIVE YOU DYNAPORE®

INFORMATION ON HOW TO PURCHASE
DYNAPORE FLUIDIZING MEDIA

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