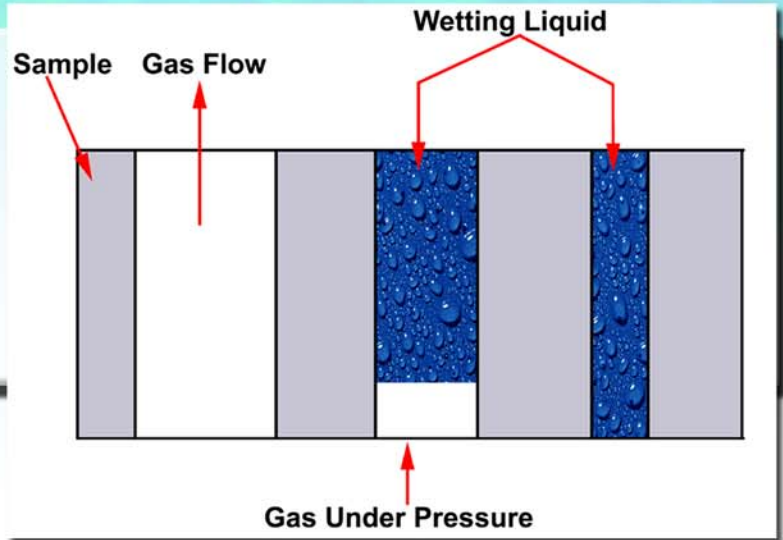


# Capillary Flow Porometer

## Application:

The PMI Capillary Flow Porometer is used for R&D and quality control, in industries World-wide such as filtration, non-wovens, pharmaceutical and battery. Samples often tested include: filter media, membranes, paper, powders, ceramics, battery separators, and health care products.



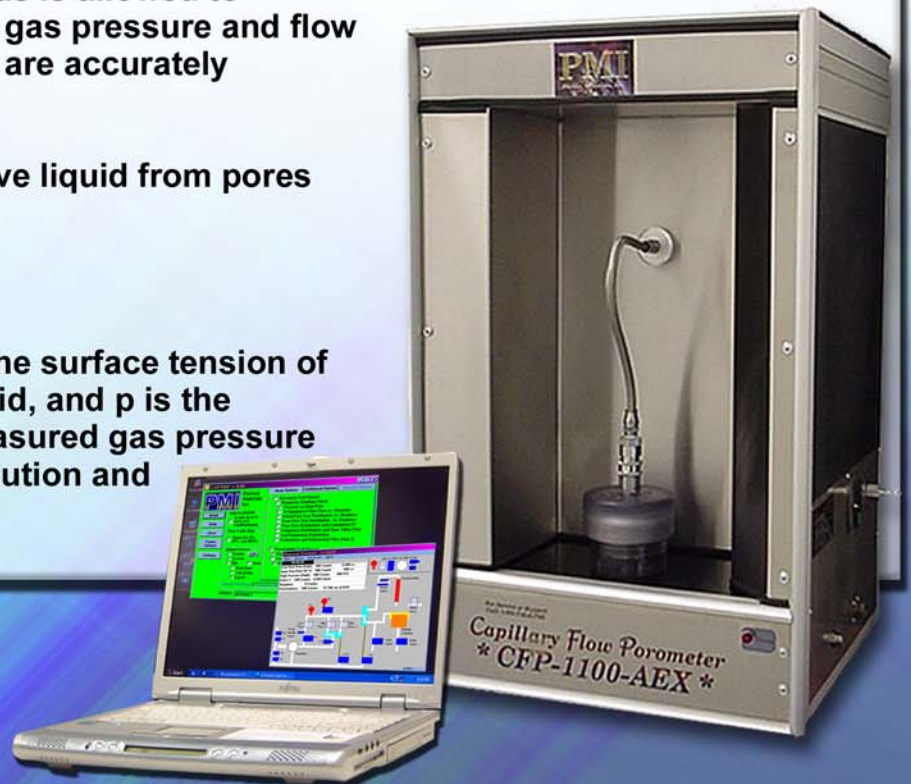
## Principle:

A wetting liquid is allowed to spontaneously fill the pores in the sample and a non-reacting gas is allowed to displace liquid from the pores. The gas pressure and flow rates through wet and dry samples are accurately measured.

The gas pressure required to remove liquid from pores and cause gas to flow is given by:

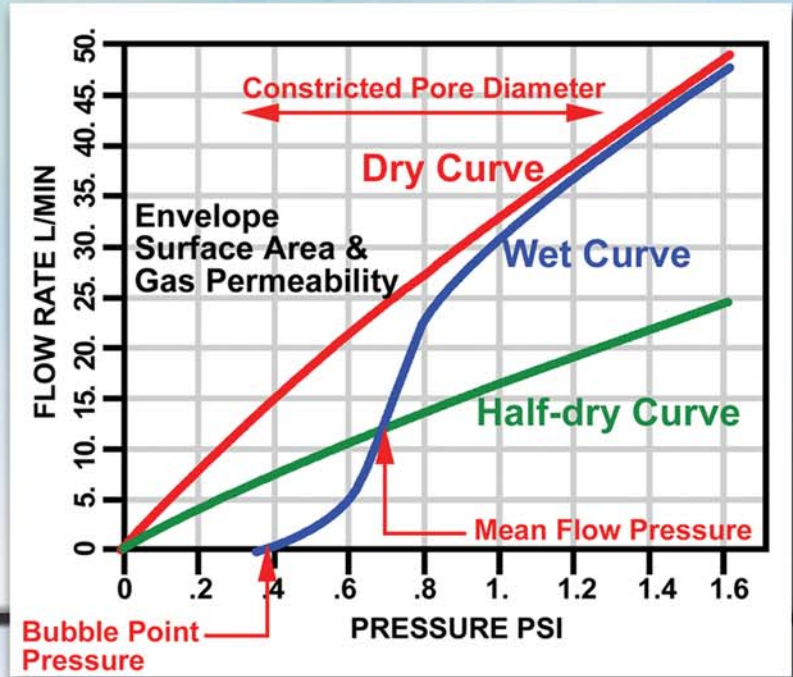
$$D = 4 \gamma \cos \theta / p$$

Where  $D$  is the pore diameter,  $\gamma$  is the surface tension of liquid,  $\theta$  is the contact angle of liquid, and  $p$  is the differential gas pressure. From measured gas pressure and flow rates, the pore size distribution and gas permeability are calculated.



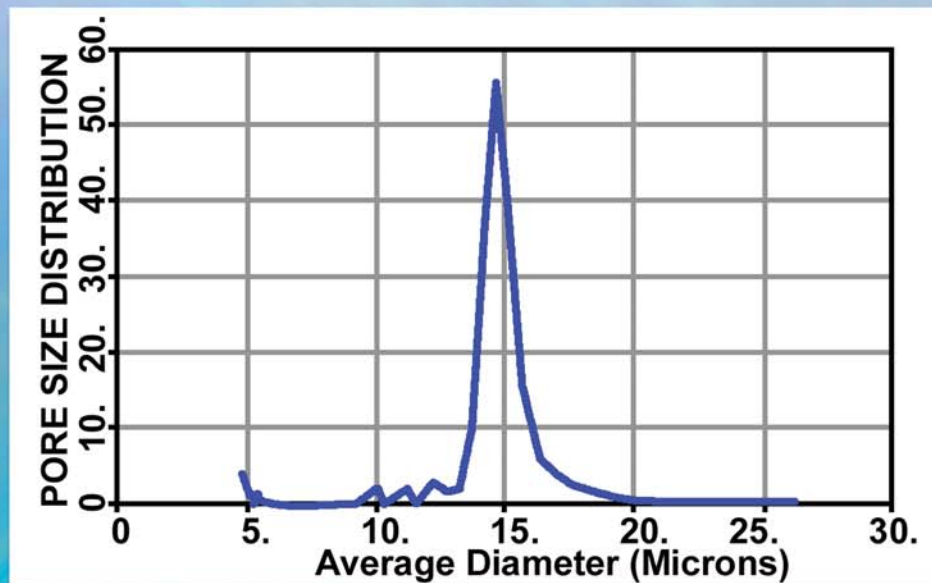
# Features:

- ◆ Maximum pressure, 500 psi.
- ◆ Tests small samples as well as complete parts.
- ◆ Pore diameter range 0.0135 to 500 microns.
- ◆ Any sample geometry (Example: sheets, rods, tubes, hollow fibers, cartridges, powders, etc.).
- ◆ Any wetting fluid.
- ◆ Runs test in QC, research, or any number of user defined modes.
- ◆ See-through sample chamber for visual observation of test.
- ◆ Real-time graphic display.
- ◆ Window based software handles all control measurement, data collection, data reduction and report preparation.



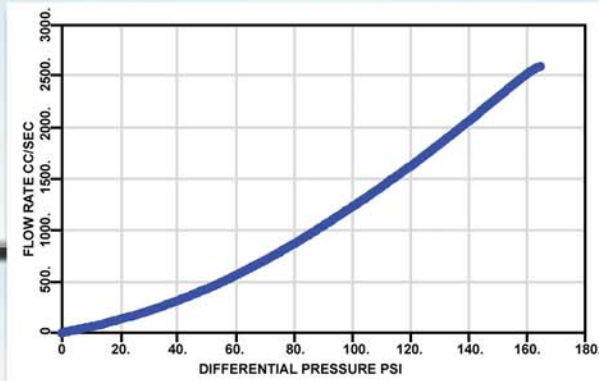
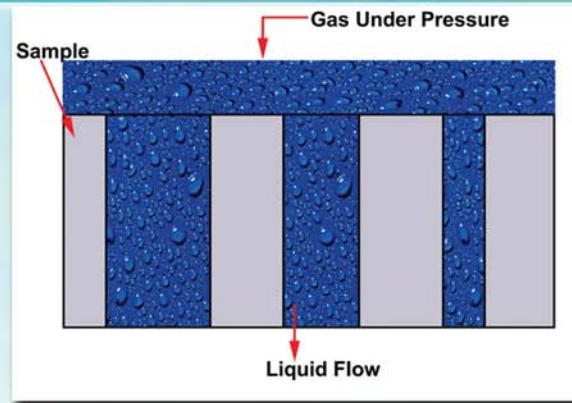
# Capabilities:

- ◆ Measures diameter of the most constricted part of a through pore
  - ◆ Bubble point (the largest pore diameter)
  - ◆ Mean flow pore diameter
  - ◆ Pore diameter range
  - ◆ Pore size distribution
- Distribution function f:
- $$f = -d[(f_w/f_d) \times 100] / dD$$
- $f_w$  = flow rate through wet sample  
 $f_d$  = flow rate through dry sample
- ◆ Gas permeability (Frazier, Gurley, Rayle, Darcy, etc.)



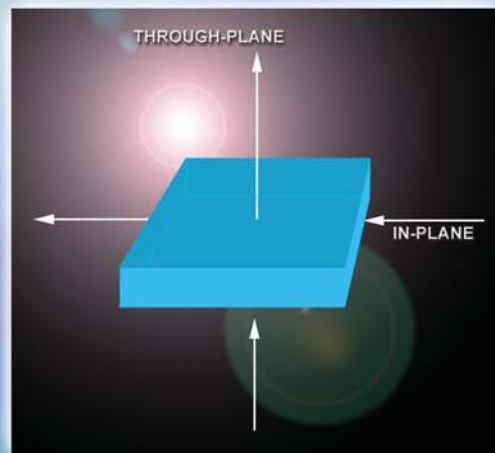
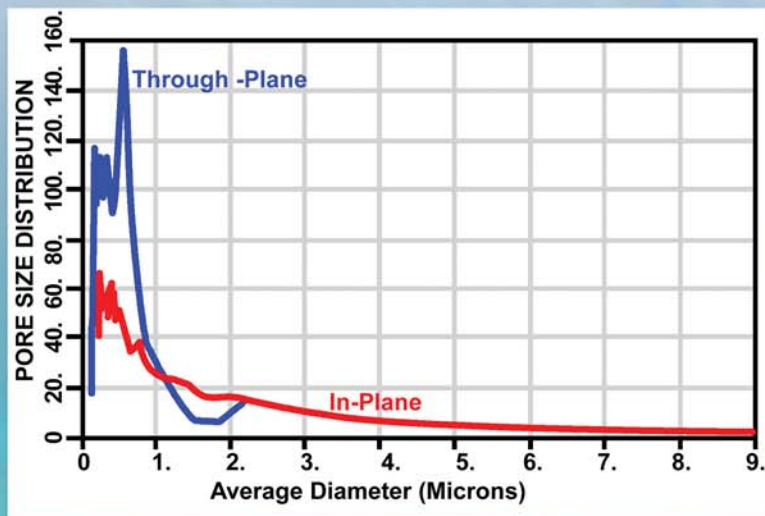
# Optional Capabilities:

- ◆ Liquid permeability: Obtained by measuring liquid flow rate through the sample when pressure is applied on excess liquid on the sample. Volume of liquid is measured using a penetrometer.
- ◆ Pressure hold
- ◆ Hydro-head (break through pressure)
- ◆ Integrity
- ◆ Envelope surface area, average particle size and average fiber diameter obtained from gas flow rate through dry sample.
- ◆ Multiple sample chamber
- ◆ Multiple test mode
- ◆ In-plane test
- ◆ Sheffield smoothness test
- ◆ Burst pressure test
- ◆ Use of desired fluid
- ◆ Elevated temperature



# Multi-mode Instruments:

- ◆ Q.C., Clamp-On, In-Plane, and Compression modes maybe combined.
- ◆ In-plane test permits measurement of pore in the x-y plane
- ◆ In-plane test permits in-situ determination of pore diameter and structure of each layer of the multi-layer media.



# Specifications:

**Pressure Accuracy:** 0.15% of reading

**Test Pressure:**

100, 200 and 500 PSI instrument-versions  
700, 1400, 3500 kPa instrument-versions

**Pressure and Flow Resolution:**

1/60,00 of full scale (1 part in 60,000)

**Maximum Pore Size Detectable:**

500  $\mu\text{m}$

**Flow Rates:**

Up to 200 SLPM (standard liters per minute)

**Sample Size:**

Standard: .25" to 2.5" diameter  
(up to 1.5 inches thick). Others Available  
Standard: 5 mm to 60 mm diameter  
(up to 40 mm thick). Others Available

**Sample Geometry:** Sheets, Rods, Tubes,  
Hollow Fibers, Cartridges, Powders, etc.

**Minimum Pore Sizes Detectable:**

Fluid	Surface Tension, dynes/cm	$\mu\text{m}$ , (100 PSI Porometer)	$\mu\text{m}$ , (200 PSI Porometer)	$\mu\text{m}$ , (500 PSI Porometer)
Water	72	0.30	0.15	0.06
Mineral Oil	34.7	0.14	0.07	0.03
Petroleum Distillate	30	0.12	0.06	0.03
Denatured Alcohol	22.3	0.09	0.05	0.02
Silwick	20.1	0.08	0.04	0.02
Porewick	16	0.07	0.03	0.014
Galwick	15.9	0.07	0.03	0.014

# Other Products:

- ◆ Bubble Point, QC, Clamp-On, Compression and Cyclic Compression Porometers.
- ◆ Liquid/gas Permeameters.
- ◆ Envelope Surface Area Analyzer.
- ◆ Mercury Free Extrusion Porosimeters.
- ◆ Pycnometers.
- ◆ Mercury/Non-mercury Porosimeters.
- ◆ BET Surface Area and Pore Analysis Sorptometers.
- ◆ Testing Services.

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