

Purification of Process Solutions with Millistak+™ A Series Filters

■ A simple and efficient alternative to powdered carbon.

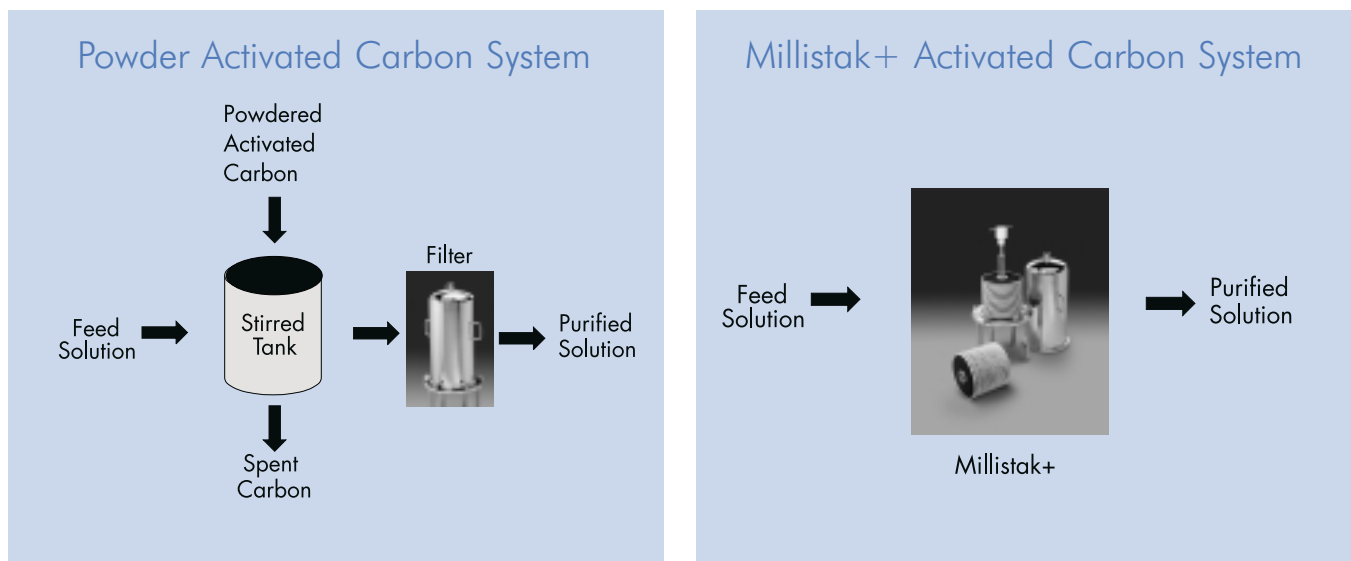
Often used in powdered form for batch-stirred vessel operations, activated carbon in the rigid matrix of a depth filter medium, such as Millistak+ A series products, presents significant advantages for the end-user.

Activated carbon is a material of choice used in the purification of many fluids in various Pharmaceutical markets. The activated carbon's very large internal surface area combined with high porosity provides exceptional adsorptive properties for the removal of color, odor, and trace organic impurities.

Control of pore size, pore distribution, and surface chemistry during activated carbon manufacturing will produce a variety of materials with different selectivity, capacity, and rates of adsorption. This versatility translates into a wide range of activated carbon products, able to meet the requirements of a specific purification application. Please refer to Millistak+ A series data sheet for available carbon types.



Process enhancement with Millistak+ A Series Filters



Higher Adsorption¹

Millistak+ A will retain more impurities than the equivalent weight of powdered carbon added to a solution.

Robust Process

Small-scale trials and scale-up methods specifically developed for the use of Millistak+ A allow process optimization.

Safer process

Millistak+ A is a self-contained product, and therefore does not present the health and safety concerns associated with powdered carbon.

Simpler process

Millistak+ A filters eliminate the need for a downstream settling or filtration step to remove the spent powdered carbon from the process fluid.

¹ Adsorption is the mechanism by which activated carbon removes impurities from solutions. Absorbance as used in this document relates to the measurement, using a spectrophotometer, of the removal of color from solutions.

Activated Carbon Selection

Since pore structure and chemistry will impact adsorption of a particular impurity, side-by-side testing of each Millistak+ A carbon grade is recommended to determine which one will

be the best for a particular application.

A common method of performance evaluation of activated carbon is methylene blue dye adsorption. This method was applied to the Millistak+ A

products and powdered carbons to illustrate and compare some of those characteristics. Study results are reported in the next section of this document.

Greater Removal Efficiency with Millistak+

Absorption efficiency of an equivalent amount of the same carbon was compared in both powdered and Millistak+ format. A challenge solution of 100 ppm of methylene blue dye in 1500 ml water was prepared for each of the trials. The results are summarized here.

In this study, Millistak+ AC media was able to achieve complete removal of the dye with a much simpler process.

Treatment Type	Powdered Carbon		Millistak + AC
	Mixing Time & Centrifugation 24 min	48 min	Flow Through*
Residual Absorbance (664 nm)	0.25	0.27	0

* Trial was run at 20 lpm/m²

Higher Removal Capacity with Millistak+

Removal capacity of equivalent amount of the same carbon was compared in both powdered and Millistak+ format. Detection of any residual absorbance indicated dye breakthrough due to carbon saturation.

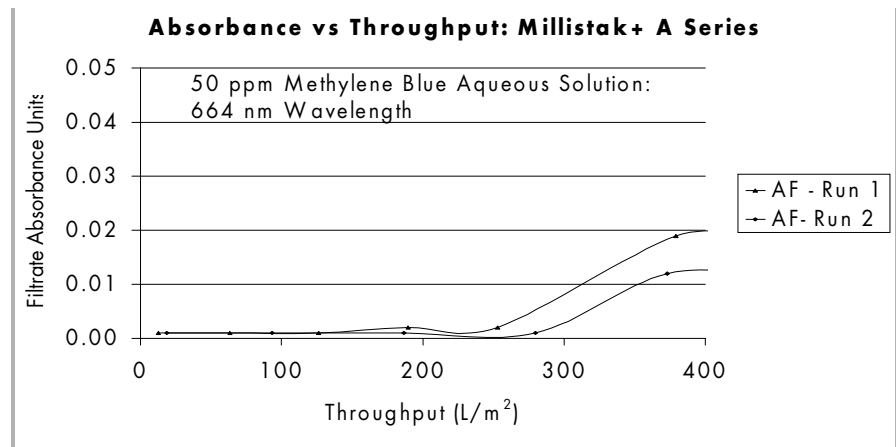
Well-dispersed activated carbon in the Millistak+ format enables better fluid contact, hence, processing of higher volumes prior to reaching saturation (breakthrough point).

Process Volume Aliquot (ml)	Residual Absorbance* at 664 nm Wavelength	
	Powdered Carbon	Millistak+ AC
500	0	0
1000	0	0
1500	0.25	0
2000	0.54	0.03

* Feed at 4.1 AU.

Consistent Performance with Millistak+

Performance consistency is achieved with activated carbon in Millistak+ format. The graph here shows similar removal capacity between two different Millistak+ AF filter lots.



Application of Millistak+ Activated Carbon Media

Application	Color Removal	Odor Removal	Haze Removal	Organic Impurities
SVP	x			
LVP	x			
Antibiotic	x			
Vitamin	x	x		
Enzymes	x	x		
Vaccine			x	
Plasma				x
Process Water		x		



Case Study: Decolorization of an SVP

Objective

Achieve current level of decolorization while eliminating carbon dust contamination in a cGMP manufacturing area.

Original Process

- Batch mode
- Powdered carbon
- 30 minutes mixing
- Carbon removal with filtration
- Color reduction equal or greater than 0.6 Absorbance Units (AU) at 380 nm, of feed stream typically at 1.2 AU.

Selection of Millistak+ Carbon Type

Based on these trials performed on 13 cm² disc the end user selected the Millistak+ AC.

Process Optimization: Effect of Flux

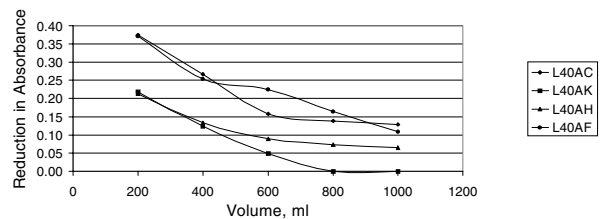
Reducing the flux rate from 2430 LMH (liters per m²/hr) to 540LMH effectively improved absorbance of the impurities.

Processing Optimization: Two Stage Process

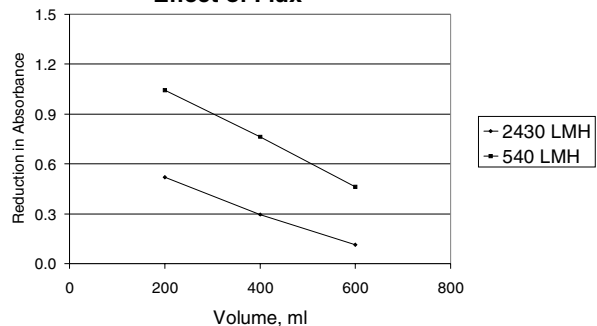
Absorbance reduction objective was exceeded by using a second stage of filters in series.

The original process was replaced by two stages, in series of Millistak+ AC filters operating at 540LMH.

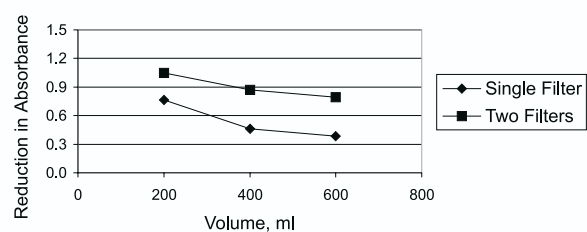
Millistak+ Carbon Media Screening



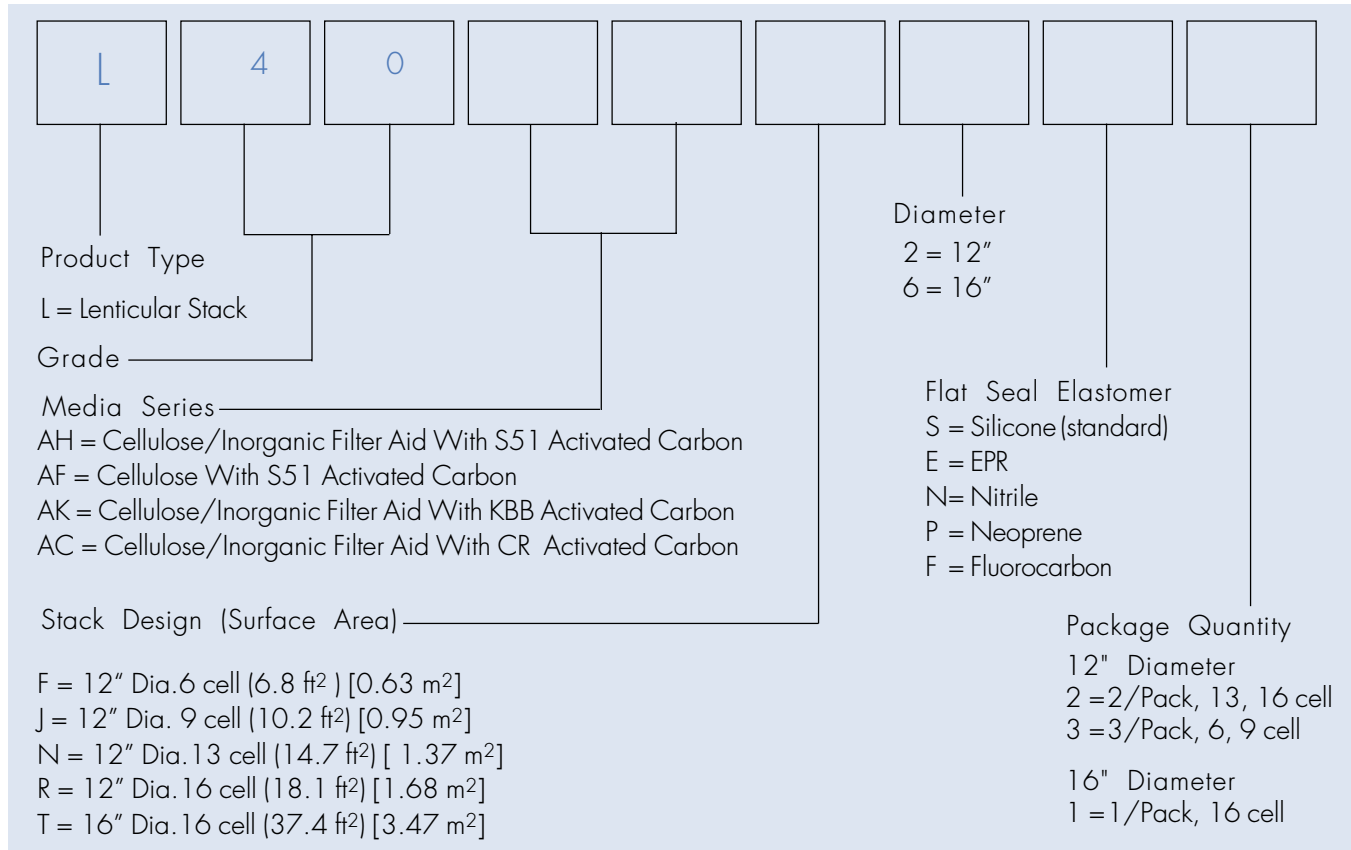
Effect of Flux



Effect of Series Filtration



Millistak+ Ordering Guide



LAB SCALE MEDIA DISCS

L40AH9800 MILLISTAK+ 40AH DIE 98 2" DIA 100/PK
L40AF9800 MILLISTAK+ 40AF DIE 98 2" DIA 100/PK
L40AK9800 MILLISTAK+ 40AK DIE 98 2" DIA 100/PK
L40AC9800 MILLISTAK+ 40AC DIE 98 2" DIA 100/PK

LAB SCALE HOLDER

LSSP02HOP MILLISTAK+ 2" PYREX / SST HOLDER

PROCESS SCALE HOUSINGS

LSSH012SN MILLISTAK+ 1X12" 9 CELL SANITARY HOUSING
LSSH112SN MILLISTAK+ 1X12" 16 CELL SANITARY HOUSING
LSSH212SN MILLISTAK+ 2X12" 16 CELL SANITARY HOUSING
LSSH312SN MILLISTAK+ 3X12" 16 CELL SANITARY HOUSING
LSSH412SN MILLISTAK+ 4X12" 16 CELL SANITARY HOUSING
LSSH116SN MILLISTAK+ 1X16" 16 CELL SANITARY HOUSING
LSSH216SN MILLISTAK+ 2X16" 16 CELL SANITARY HOUSING
LSSH316SN MILLISTAK+ 3X16" 16 CELL SANITARY HOUSING
LSSH416SN MILLISTAK+ 4X16" 16 CELL SANITARY HOUSING

To Place an Order or Receive Technical Assistance

For additional information call your nearest Millipore office. In the U.S. and Canada, call toll-free 1-800-MILLIPORE (1-800-645-5476). In the U.S., Canada and Puerto Rico, fax orders toll-free 1-800-MILLIFX (1-800-645-5439). On the Internet <http://www.millipore.com>, E-mail: tech_service@millipore.com

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