



Diatomaceous Earth Filtration

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A well-designed and properly maintained diatomaceous earth (DE) or precoat filtration system successfully removes disease-causing organisms like *Giardia*, *Cryptosporidium*, bacteria, and viruses. These simple guidelines and performance goals will help you keep your system running effectively and efficiently.

Use the correct DE grade as shown in the table below. You can evaluate grades of precoat and body feed material to optimize filter performance and production for varying water quality seasons. With proper material selection your plant's filter effluent turbidity should be below 0.2 NTU. Your DE media must be ANSI/NSF Standard 61 listed.

Follow the minimum precoat application rates in the table. A bit heavier is okay, but don't go below these minimums. You can make small adjustments in these rates to be able to use full bag(s) of media for your plant's filter area.

Add bodyfeed continuously during filtration. Bodyfeed maintains the permeability of the filter cake as particles are trapped on the surface. This extends the length of the filter cycle and makes it more efficient by reducing the frequency of cleaning and reapplication of precoat. Your optimal bodyfeed application rate will likely vary over the year as the amount of suspended solids (in mg/L) present in your raw water changes. With most Washington raw water sources, you can safely plan on adding bodyfeed at a ratio slightly above 1:1. This means that you will generally be adding more bodyfeed (in mg/L) than the amount of suspended solids. For example, if you have 30 mg/L suspended solids in your raw water, you might need to add 35 mg/L bodyfeed.

Always operate DE filters continuously without stopping or interrupting the filter effluent flow. Keep flow through the filters above 0.25 gpm/ft² at all times. This maintains filter cake integrity and prevents it from separating, cracking, or dropping during operation. If flow to the filter is stopped during a run, even if only briefly, you must terminate the run, clean the filter, and reapply precoat before starting a new filter run.

Condition the water before it enters the filter to eliminate air bubbles and modify piping if necessary to avoid turbulence or flow jetting, which might disturb or erode any part of the filter cake.

If your system does not meet the turbidity optimization goals listed in the table below, systematically review your DE grade, precoat application rate, bodyfeed dose and the other guidelines listed here to identify possible strategies to improve your plant's performance.

Optimization Goals

Parameter	Recommended Value	Notes													
DE Grade	Permeability \leq 1.3 Darcy	Typical products: EP Minerals FW-12, IMERYS Celite Hyflo Super-Cel, Celite 501.													
Precoat application rate, Vacuum systems	\geq 15-20 lbs per 100 ft ² of septum area														
Precoat application rate, Pressure systems	\geq 25 lbs per 100 ft ² of septum area														
Bodyfeed dose (mg/L) Added continuously.	\geq Raw water suspended solids (mg/L).	<table border="1"> <thead> <tr> <th colspan="2">Suspended solids (mG/L)</th> <th>NTU (approx.)</th> <th>Appearance</th> </tr> </thead> <tbody> <tr> <td><20</td> <td><5</td> <td>clear</td> </tr> <tr> <td>>40</td> <td>>50</td> <td>cloudy</td> </tr> <tr> <td></td> <td>>500</td> <td>opaque</td> </tr> </tbody> </table>	Suspended solids (mG/L)		NTU (approx.)	Appearance	<20	<5	clear	>40	>50	cloudy		>500	opaque
		Suspended solids (mG/L)		NTU (approx.)	Appearance										
		<20	<5	clear											
		>40	>50	cloudy											
	>500	opaque													
Minimum Flow	> 0.25 gpm/ft ²														
Maximum Flow	As specified in design approval	Usually between 1.0 and 2.0 gpm/ ft ² . If you do not have a copy of the design approval letter, or if a maximum flow rate is not identified, keep filter's flow rate below 1.0 gpm/ ft ² at all times.													
IFE and CFE Turbidity	<ul style="list-style-type: none"> ◆ Never exceed 1.0 NTU ◆ Achieve < 0.5 NTU within 30 minutes of the start of the run ◆ Maintain 0.2 NTU during the remainder of the run. 	Measured continuously													

Darcy (D) = Unit of permeability measurement, equivalent to the passage of one cubic centimeter of fluid per second through a one square centimeter cross section of the material under a pressure of one atmosphere per centimeter of material thickness.

IFE = Individual filter effluent.

CFE = Combine filter effluent.

NTU = Nephelometric turbidity units.



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