ChemSorb® Fitler Granules

(Zeolite Filter Media)

Background

Zeolite filter media offers advantages over conventional sand, sand & anthracite or multimedia for gravity flow or pressure vessel beds. Historically, natural zeolite mineral deposits were discovered in the 1950's and zeolite has been quary, mined, crushed, air-dying and sieve sized to produce commercial products for >30 yrs. Natural zeolite (Clinoptilolite) is crystalline, aluminum oxide/silicn oxide classified as a crystalline, molecular sieve, mineral consisting of hydrated Ca_2 (Na_2 or K_2) $Al^8Si^{28}O_{72}$•24 H_2O (Fig. I). Most zeolite deposits are low quality and can't be used as molecular sieve beds or water filtration media. Zeolite has been used for water softening and to remove NH_4 ion using slow flow rates (1-2 gpm/ft^2) and Na-ion regeneration cycles. Since 1985 numerous technical and engineering studies have demonstrated the utility of zeolite mineral as an effective water filter media.

Zeolite Filter Media

ChemSorb® Filter Granules is a high quality, granular, zeolite filter media that achieves superior filtration & solids loading compared to conventional filter media. The zeolite media is from a unique, mineral deposit in the western USA having high porosity, hardness, high surface area (~28m^2/gm) and surface, micro-mineral, projections that make it an ideal water filtration media (fig 2 & 3).. The 14 x 40 mesh filter media has a dry bulk wt.55 lb/ft^3 & is attrition resistant. The zeolite mineral is classified under 21CFR Part 182.2729 & 40 CFR Part 180. as GRAS (Generally Recognized As Safe) and is NSF Standard 61 Listed.

Advantages of Zeolite Media

This zeolite filter media removes finer particles and has higher solids loading capacity vs sand/anthracite or multimedia and is competitive with fine sand (Table I).

Fig 1. Zeolite (Clinoptilolite) crystal structure.

ADVANTAGES & BENEFITS

-Cost-effective replacement for sand, garnet & multimedia.
-Lower DP for a given flow rate (gpm/ft^2).
-Highest solids loading reduces backwash frequency..
-Superior filtration performance at high flux rates.
-Requires less backwash water.

APPLICATIONS

- *Bottle water & drinking water plants.*
- *Economical pre-filter for RO.membranes.*
- *Well water & Industrial wastewater filtration.*
- *Cooling tower, chillers, heat exchanger water filtration..*

Tables II, III & IV list the zeolite media service flow rates & specifications for water filters.

Figure 2. High magnification (SEM) photomicrograph showing micro-crystal structures (0.2- 0.9μ spacing) on the surface of the zeolite granules.

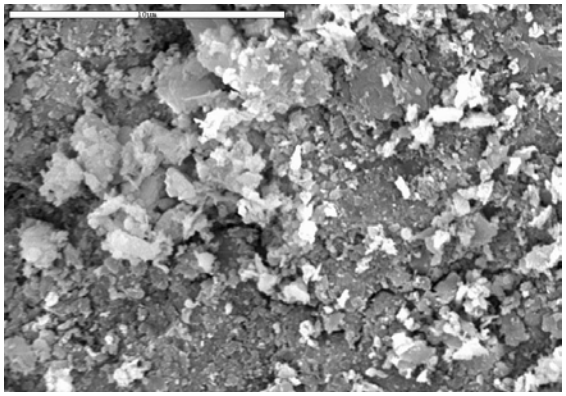

Figure 3. Photomicrograph (SEM) showing the relatively flat, minimal, surface structure of a sand particle.

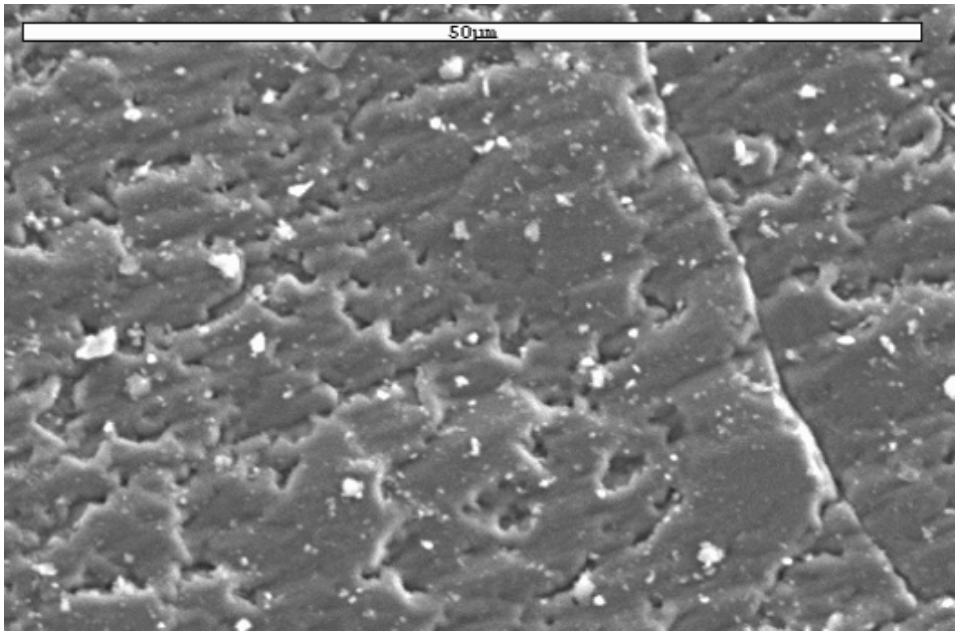

Table I. Comparison of Zeolite vs Sand & Multimedia Service Flow Rates, Performance & Backwash Water Requirements.

FILTER MEDIA		SERVICE FLOW RATES	SOLIDS LOADING	NOMINAL FILTRATION RATING[4]	BACKWASH WATER/CYCLE
Sand *(20 x 40 mesh)*		6-9 gpm/ft^2	Low	20μ	X gal
Fine Sand[1] *(~0.2mm)*		10-17 gpm/ft^2	Low	<5μ	~0.80-0.85X
Multimedia		12-18 gon/ft^2	Moderate	~15μ	1-1.1.2X
Zeolite[2]					
Standard Design		12-20 gpm/ft^2	High	<5μ	0.70-0.75X
Conical Design[3]		15-25 gpm/ft^2	<High	<5μ	0.45-0.50X

[1] *Vortisand (Sonitec, Quebec, Canada) use a fine sand in the Vortisand design, pressure vessels.*

[2] *ChemSorb® Filter Granules, 14 x 40 mesh zeolite filter media.*

[3] *Intercepter vessel design, PEP Filters, Mooresville, NC 28117-9920.*

[4] *Electronic & laser scatter sizing analysis statistics variability increases dramatically in the 1-4μ range, hence the data are reported as <5μ, which is considered a practical resolution limit for particle sizing.*

Table II. Pressure Vessel Sizing & Flow Rate Specifications (conventional design).

FILTER BED FLUX RATE[5]		SERVICE FLOW RATE (gpm)						
12 gpm/ft^2		9	21	38	59	85	150	340
15 gpm/ft^2		12	27	47	74	106	189	425
18 gpm/ft^2		14	32	56	89	127	227	509
20 gpm/ft^2		16	35	63	98	141	251	565
TANK Dia. →		12”	18”	24”	30”	36”	48”	72”

[5] *The standard zeolite filter media bed depth is 3 ft. Reducing bed height proportionally reduces the solids loading capacity & increases the backwash frequency.*

Table III. Pressure Vessel Sizing & Flow Rate Specifications (Conical Vessel[6]).

FILTER BED FLUX RATE		SERVICE FLOW RATE (gpm)						
15 gpm/ft^2				47	74	107		*Multiplexing*
20 gpm/ft^2				63	98	142		*used for higher*
25 gpm/ft^2				78	123	178		*flow rates.*
TANK Dia. →				24"	30"	36"		

[6] *Interceptor vessel design, PEP Filters, Mooresville, NC 28117-9920. Surface area 3.14 ft^2, 4.91 ft^2, 7.1 ft^2 for 24", 30" & 36" respectfully.*

Table IV. Gravity Flow Zeolite Media Bed Design Specifications.

FILTER BED FLUX RATE[7]		SERVICE FLOW RATE (gpm)						
2 gpm/ft^2		9	21	38	59	85	150	340
4 gpm/ft^2		9	21	38	59	85	150	340
TANK Dia. →		12"	18"	24"	30"	36"	48"	72"

[7] *The standard zeolite filter media bed depth is 3 ft. Reducing bed height proportionally reduces the solids loading capacity & increases the backwash frequency.*