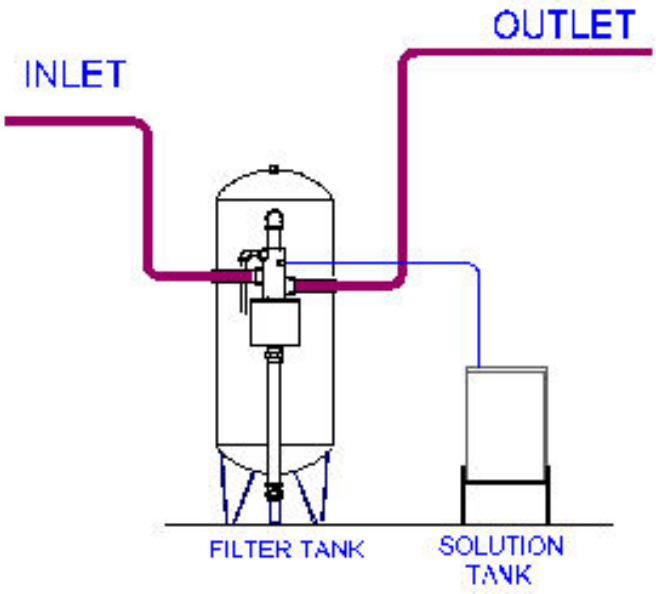
Iron Removal Filters

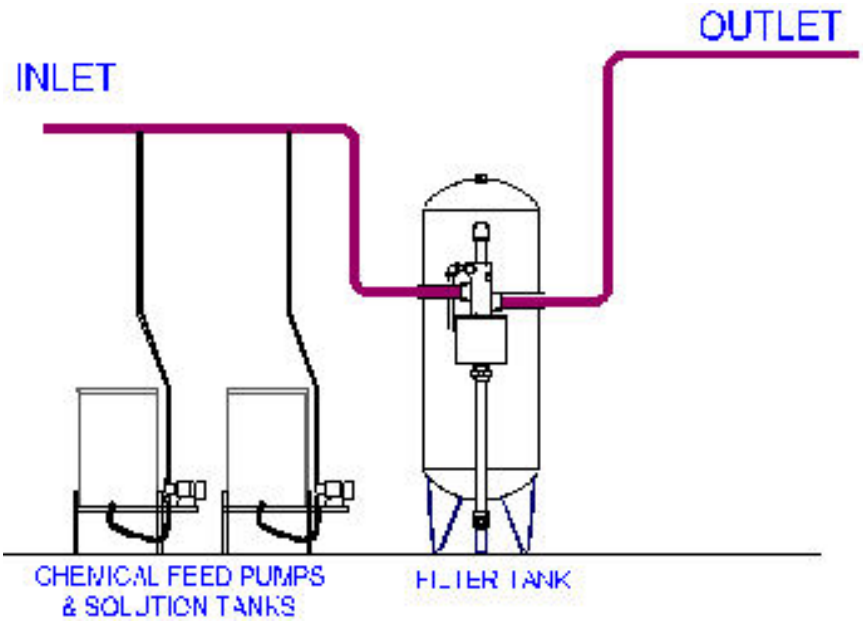
Manganese Greensand

General information. Iron and manganese are removed from water by converting them to an oxidized form and then removing the oxides by sedimentation or filtration. Manganese greensand can be used to remove iron and manganese from water by oxidation and filtration. It is unique since the media is coated with an oxidizing agent. The reaction is actually a surface oxidation of the divalent ions of iron and manganese to trivalent ferric and maganic ions which are then chemically bound to the mineral surface. The media bed serves the dual function of oxidizer and filter. Greensand also oxidizes and therefore eliminates hydrogen sulfide by converting it to sulfates.

There are two methods of operating a greensand filter – intermittent and continuous regeneration.



Intermittent regeneration systems. In intermittent regeneration, the water containing iron and manganese is applied to the bed and the iron and manganese are oxidized and adsorbed, thereby removing them from the water. The greensand is regenerated with potassium permanganate. The permanganate restores the oxidative and adsorptive capacity of the mineral. The process has the same five cycles as a water softener. The difference being that the regenerant is potassium permanganate and not salt, as in a softener. Three ounces of potassium permanganate in one gallon of water regenerates one cubic foot of manganese greensand. Most ferris and ferric iron, manganese and hydrogen sulfide can be effectively removed. Intermittent regeneration is used for FRF models 45 through 240.



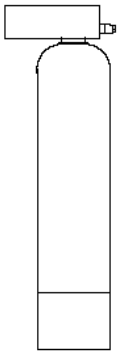
Continuous regeneration systems.
In the continuous process potassium permanganate, chlorine, or some other oxidant is continuously added to the water prior to entering the greensand bed. The iron and manganese are oxidized and converted to insoluble oxides, which are removed from the water by filtration in the greensand bed. Any unoxidized iron and manganese are removed by oxidation and adsorption on the greensand. Excess oxidant continuously restores the oxidative-adsorptive capacity of the greensand bed. Iron and manganese are periodically purged from the system by backwashing the greensand bed.

Application notes

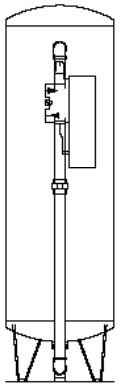
Retention Tank. Iron removal is often improved by providing a retention tank between the chemical feed pumps and the greensand filter. The retention tank allows more complete oxidation of the iron and manganese. The reaction time is typically 10 minutes. Blow down of the retention tank is required to remove settled oxides of iron and manganese. This system is especially applicable to waters containing organics and organic iron.

Greensand and softeners. Installing a softener after a greensand filter will remove the small amount of iron and manganese that may escape the greensand. Greensand filters are often used as pretreatment for softeners, deionizers, and reverse osmosis systems since all are subject to fouling by iron and manganese. Iron over 2 mg/L as Fe requires a greensand filter prior to a softener.

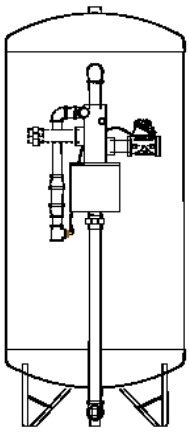
FRF, FMF & FHF Series



FRF SERIES



FMF SERIES



FHF SERIES

FRF series filters. Polyglass 100 psi vessels with top mount Task Master II™ 1 ½ " valve and single point PVC internals.

FMF series filters. Carbon steel epoxy lined and coated vessels with side Task Master II™ 1 ½ " valve side and multipoint PVC internals.

FHF series filters. Carbon steel epoxy lined and coated vessels with side Task Master™ 2 " valve side and multipoint PVC internals.

GREENSAND FILTERS	FRF 50-I	FRF 70-I	FRF 100-I	FRF 120-I	FRF 150-I	FMF 150-I	FRF 240-I	FMF 240-I	FHF 300-I	FHF 600-I	FHF 900-I
Part No.		940051-3	940052-3	940053-3	940054-3	940056-3	940071-3	940057-3	940058-3	940059-3	940060-3
Diameter (in)	12	13	14	16	21	20	24	24	30	36	42
Side Sheet (in)	52	54	65	65	62	54	72	54	60	60	72
Bed Area ($ft.^2$)	0.79	0.92	1.07	1.40	2.40	2.18	3.14	3.14	4.90	7.10	9.60
Pipe(in)	1 ½	1 ½	1 ½	1 ½	1 ½	1 ½	1 ½	1 ½	2	2	2
Media (ft^3)	1.5	2.00	3.25	4.00	5.00	5.00	8.00	8.00	10.00	20.00	30.00
Underbed (ft^3)	0.20	0.30	0.35	0.55	2.00	2.00	2.00	2.50	3.00	6.50	10.00
Width(in)	18	18	18	18	22	20	24	24	30	36	42
Depth (in)	12	13	14	15	21	31	24	35	44	50	57
Height (in)	59	61	72	72	69	71	78	71	81	83	99
Flow rate at 3.5 gpm/ft^2	1.9	3.2	3.8	4.9	8.5	7.6	11.0	11.0	17.2	24.8	33.7
Flow rate at 5 gpm/ft^2	2.7	4.6	5.4	7.0	12.1	10.9	15.7	15.7	24.5	35.4	48.1
Flow rate at 15 gpm/ft^2	8.18	13.8	16.0	21.0	36.0	32.7	47.1	47.1	73.5	106.5	144.0
Head Loss in PSI at 5 gpm/ft^2	4.0	6.3	6.5	7.3	7.0	8.5	8.5	8.5	8.1	8.4	10.2
Backwash Rate in GPM	8	10	10	15	30	30	35	35	60	90	115
Shipping Weight in Pounds	240	335	496	570	900	975	1205	1485	2285	3200	4250

GREENSAND (IRON REMOVAL) FILTER PACKS							
PART NO	DESCRIPTION		TANK (1)		MEDIA CUBIC FT	GRAVEL lbs.	WEIGHT POUNDS
479601	I FILTER PK	45	10x54	F	1	15	100
479602	I FILTER PK	50	12x52	F	1	15	100
479603	I FILTER PK	70	13x54	F	2	30	200
479604	I FILTER PK	100	14x65	F	3	40	295
479605	I FILTER PK	120	16x65	F	4	55	395
479606	I FILTER PK	150	21x62	F	5	140	565
479607	I FILTER PK	240	24x72	F	8	200	880
479608	I FILTER PK	300	30x72	F	10	200	1,050
479609	I FILTER PK	450	36x72	F	15	300	1,575
479621	I FILTER PK	120	18x54	S	4	100	440
479622	I FILTER PK	150	20X54	S	5	100	525
479626	I FILTER PK	240	24X54	S	8	200	880
479627	I FILTER PK	300	30X60	S	10	300	1,150
479629	I FILTER PK	600	36X60	S	20	600	2,300
479631	I FILTER PK	900	42X72	S	30	1000	3,550
479632	I FILTER PK	1200	48X72	S	40	1100	4,500
479633	I FILTER PK	1650	54X72	S	56	1300	6,060
479634	I FILTER PK	2100	60X72	S	70	1600	7,550
479635	I FILTER PK	2550	66X72	S	86	2100	9,410
479636	I FILTER PK	3000	72X72	S	100	2600	11,100
4800005	MANGANESE GREENSAND 1 ft ^{3}– 85 lbs bags						

History. The earliest ion exchangers were inorganic sodium aluminosilicates. Some were manufactured by processing greensand, a natural zeolite mineral, into more stable, higher capacity forms. Manganese zeolite or manganese greensand is made by coating greensand (glauconite) with maganic oxide (MnO_2).