

# Iron and Manganese Removal



Iron and manganese are commonly found in waters. They can cause unsightly staining and at high levels they can cause health problems. Both can be removed to leave the water crystal clear. Some medias will also remove the hardness which causes furring in boilers at the same time with no extra treatment.



## Iron and Manganese Removal Media

### Crystal Right

Crystal Right works by an ion exchange process which removes iron, manganese **and** hardness. The minimum pH requirement is 6.0 and Crystal Right will raise the pH in these acidic waters. Crystal Right works at its best on clear water, i.e. when the iron/manganese are in a dissolved form. Crystal Right will also remove hardness with no extra treatment. Ammonia, lead, hydrogen sulphide and copper can also be reduced. The media bed can be sanitised with chlorine from time to time. The regeneration process is exactly the same as that used in a water softener and requires regeneration with salt (sodium chloride).

There are two types of Crystal Right. CR100 is used where the pH is between 6 and 7 and will increase the pH. CR200 is used where the pH is 7 or above.

Crystal Right has a number of advantages over conventional systems in that pH correction, iron/manganese removal and softening can all be addressed in a single process.

### Birm

Birm is a relatively inexpensive material which can be used for iron and manganese removal by oxidation. It requires a pH of 7 or more for iron removal and pH 8 for manganese removal (it uses dissolved oxygen in the water to oxidise the metal). As it acts a catalyst it is not consumed so Birm doesn't require regenerating or topping up. Birm also has the advantage of acting as a filter removing relatively high levels of turbidity. It is advised not to use Birm in combination with chlorination and the water should be free of oil and hydrogen sulphide. If the pH of the water is too low pH correction maybe required. Birm requires DO at at least 15% of the iron and manganese content to work.

### Manganese Dioxide

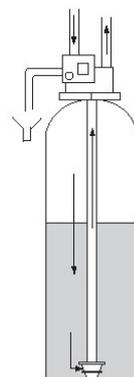
Manganese oxide can be used for iron and manganese and hydrogen sulphide removal by oxidation. It requires a pH of 7 or more for iron removal and 8 for manganese removal plus a dissolved oxygen level of at least 15% of the iron and manganese content. It needs a high backwash flow rate to remove the oxidised iron and manganese. Trade names such as Aquamandix and Filox-R are manganese dioxide based.

### Manganese Greensand

This material will remove iron, manganese and hydrogen sulphide which are all oxidised by the media itself. This oxidation capacity becomes exhausted and is periodically renewed (regenerated) by a solution of potassium permanganate. Greensand will operate over a wide pH range (6.2 to 8.8) without requiring pH correction. Chlorine does not have any harmful effect on the media or its operation.

### How does it work?

Water flows into the valve at the top, down through the media and then up through the 'riser' tube in the middle of the vessel. As the water travels through the media the iron and manganese are removed leaving crystal clear water. There are timer options that can be set to automatically self clean (backwash) and wash away any of the accumulated iron and manganese. Cleaning can be set for a given time or after a certain amount of water has been used. With Crystal Right salt is also added to regenerate it ready for service. Iron and manganese filters can also be used in conjunction with other filters such as sand filters if the water has high turbidity or pH correction filters if the pH of the water very low.



### How to size.

On average 160 litres of water is used per person per day. This normally occurs in two peak periods, one in the morning and one in the evening. A family of four typically uses 700 litres of water per day but may use 300 litres in an hour in the morning. Larger households, farms, stables and irrigations systems all use more water. The tables below indicate the size of system needed. When sizing a system the average flow and the peak flow rate need to be taken into account. With Crystal Right the hardness removal capacity is also very important. Note, there is typically a minimum size of 1054 recommended for any system.

Vessel size Cxxyy - C = composite material, xx is the diameter and yy is the height (inches)

Recommended operating pressure range 20 to 120 psi. Water temperature range from 2 to 38 degrees Celsius

Valve Type	255	263 & 268	273	273 & 278	Magnum
Inlet & outlet connections	3/4"	1"	1"	1"	1 1/2"
Drain connection	1/2" hose con.	3/4" hose con.	1" hose con.	3/4" hose con.	1 1/2"

### Crystal Right 100 Simplex Unit

Vessel size	C1044	C1054	C1354	C1465	C1665	C1865	C2160	C2469	C3072	C3672
Valve Type	255-762	255-762	268-762	268-762	278-762	278-762	Mag 962	Mag 962	Mag 962	Mag 962
Service flow rate - m3/hr	1.5	1.5	2.0	2.5	3.0	4.0	5.5	7.0	11.0	15.0
Capacity @ 100ppm CaCO3 - m3	7.4	13.4	21.8	29.7	38	51	59	93	161	293
Max Iron+Manganese in ppm	8	10	15	15	15	15	15	15	15	15
Salt usage in Kgs	4.0	5.2	7.5	10.5	13.8	17.3	20.7	32.2	55.3	73.5

### Crystal Right 200 Simplex Unit

Vessel size	C1044	C1054	C1354	C1465	C1665	C1865	C2160	C2469	C3072	C3672
Valve Type	255-762	255-762	268-762	268-762	278-762	278-762	Mag 962	Mag 962	Mag 962	Mag 962
Service flow rate - m3/hr	1.5	1.5	2.0	2.5	3.0	4.0	5.5	7.0	11.0	15.0
Capacity @ 100ppm CaCO3 - m3	12.4	20.7	31.2	39.5	50.8	67.8	79	124	214	293.0
Max Iron+Manganese in ppm	8	10	15	15	15	15	15	15	15	15
Salt usage in Kgs	4.0	5.2	7.5	10.5	13.8	17.3	20.7	32.2	55.3	73.5

### Crystal Right 100 Duplex Unit

Vessel size	C1044	C1054	C1354	C1465	C1665	C1865	C2160	C2469	C3072	C3672
Valve Type	255-762	255-762	268-762	268-762	278-762	278-762	Mag 962	Mag 962	Mag 962	Mag 962

### Crystal Right 200 Duplex Unit

Vessel size	C1044	C1054	C1354	C1465	C1665	C1865	C2160	C2469	C3072	C3672
Valve Type	255-762	255-762	268-762	268-762	278-762	278-762	Mag 962	Mag 962	Mag 962	Mag 962

Crystal Right works best on "clear water" iron and manganese, where a water sample is clear of precipitated iron when freshly pumped. The lifetime can be reduced on very low TDS water so we do not recommend its use with a TDS of less than 80 ppm or a hardness of less than 50 ppm. Crystal Right 100 is used where the raw water pH is between 6.0 and 7.0. (if the pH is lower than 6.0 then conventional pH correction will also be needed.) Crystal Right 200 is used where the raw water pH is 7.0 or above, its advantage in this situation is a higher capacity.

### Birm

Vessel size	C1054	C1248	C1354	C1465	C1665	C1865	C2160	C2469	C3072	C3672
Valve Type	263-740	263-740	263-740	263-740	273-740	273-740	Mag 942	Mag 942	Mag 942	Mag 942
Service flow rate - m3/hr	0.6	0.9	1.0	1.2	1.6	2.0	2.7	3.6	5.6	8.0
Backwash flow rate - m3/hr	1.1	1.8	2.0	2.3	3.4	3.9	5.7	6.8	11.4	17.1

Hydrogen Sulphide should be removed prior to contact with Birm media. Oil and polyphosphates should not be present. Dissolved oxygen level should be at least 15% of the iron content. pH must be at least 7 for efficient iron reduction and at least 8.0 for manganese reduction.

### Filox-R

Vessel size	C1054	C1252	C1354	C1465	C1665	C1865	C2160
Valve Type	263-740	263-740	263-740	263-740	273-740	273-740	Mag 942
Service flow rate - m3/hr	2.0	2.7	3.3	4.0	5.3	5.7	6.1
Backwash flow rate - m3/hr	1.8	2.3	3.1	3.7	4.7	5.4	5.7

Manganese dioxide, and Greensand kits are also available as are other medias such as pH correction, sand, softeners, carbon etc.