DMI-65

PRODUCT CATALOGUE

The WATER & SOLAR COMPANY

WATER & ENERGY SYSTEMS

HOW DMI-65 WORKS

This catalogue aims to inform users of DMI-65 catalytic water filtration media about its functionality, capabilities, and limitations for water treatment processes. It provides an overview without delving into detailed scientific complexities, offering insights for both experienced individuals and newcomers in the field.

History

In the early days, zeolites were used for water treatment, later replaced by synthetic ion exchange resins for softening. Greensand continued to be used for iron and manganese removal, often as pretreatment before ion exchange. Despite its limitations, the demand for an alternative led to the development of DMI-65, an Australian granular catalytic media with superior properties derived from Japanese Infusion Technology.

Background Information

DMI-65 is a powerful water filtration media that removes iron and manganese without chemical regeneration. It can also eliminate arsenic, aluminum, heavy metals, and hydrogen sulfide. The material uses oxidation catalysis to filter insoluble precipitates. Interaction with water molecules distinguishes between adsorption and absorption processes. DMI-65 primarily acts through adsorption, removing target ions until saturation. Purely catalytic materials bring reactant ions close for chemical reactions without implicit removal, but solid precipitates can be filtered out. Some materials combine ion exchange and catalytic actions, requiring periodic regeneration for continued effectiveness.

DMI-65 – Advanced Oxidation Catalytic Media

DMI-65 is a dark brown to black granular material with manganese oxide outer layers. It acts as a catalytic media facilitating oxidation, precipitation, and filtration without being consumed. The media removes solids through depth filtration and does not require regeneration. After 5 to 10 years, it degrades due to backwashing and mechanical abrasion, necessitating replacement.

BASIC OPERATION:

The processes that take place in a bed of DMI-65 involve reduction/oxidation (redox). Redox reactions involve a transfer of electrons between species. Reduction is the gain of electrons or a decrease in the oxidation state of a molecule, atom or ion. Oxidation is the loss of electrons or an increase in the oxidation state of a molecule, atom or ion. Redox reactions occur simultaneously whereby there cannot be a reduction reaction without an oxidation reaction. The media "helps" chemical reactions to occur by interacting with the reaction without being permanently altered. An in depth discussion about redox chemistry is outside the scope of this paper, it will only deal with how the redox process applies in the removal of iron and manganese using DMI-65. The individual redox equations will be covered in the following iron and manganese removal sections.

In order to begin the process of oxidation of the ions in solution and to ensure that the oxidative layer is not compromised the media is designed to operate in the presence of chlorine or other oxidant. In this process the oxidant removes electrons and is consumed in the process. The operator needs to ensure that there is a 0.1 – 0.3 ppm free chlorine residual in the effluent water.

Chlorine, fed as sodium hypochlorite (NaOCl) or bleach (12.5% NaOCl), is the preferred oxidant since it is relatively inexpensive, readily available around the world and it is effective. Other oxidants such as hydrogen peroxide (H2O2), chlorine oxide (ClO2) or ozone can also be used so long as a residual can be measured and maintained.

Another function of the chlorine is that it keeps the media free from bacterial or slime growth. The manganese oxide catalytic surface has to remain clean so that the ions in the water can come in contact with it. At the same time, the chlorine is a source of oxygen more reactive than molecular oxygen. The following chart indicates safe levels for other water constituents that could interfere with the surface interaction.

Unlike ion exchange resins where higher regenerant dosages will increase the ion exchange capacity, chlorine residuals or concentrations higher than required to oxidize the Fe and Mn do not increase the oxidative properties of the media. Additionally, since the media is often used to pretreat waters prior to an Reverse Osmosis (RO) system a higher free chlorine residual would require more extensive post treatment to reduce the residual to protect the membranes from chlorine attack.

The DMI-65 must be activated prior to being placed into service for the first time. This activation requires a higher dosage of chlorine than used during normal operation but only has to be performed once during the initial start up. The dosage rate is 10 fluid ounces of 12.5% chlorine per cubic foot (ft3) of the media. The activation only requires a soak of several hours but an overnight soak is preferred.

Once activated, the vessel(s) must be backwashed to remove the excess NaOCl and any fines. Since manganese oxide is one of the constituents used in the manufacture of the media an extended rinse is required at start up to remove any trace free manganese oxide residual left over from the

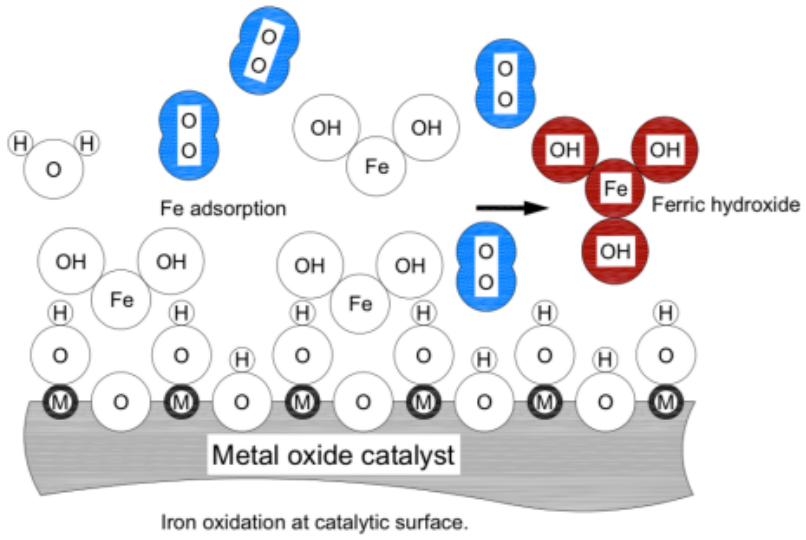
manufacturing process. Once the Mn level in the backwash water reaches values of 0.05 to 0.15 ppm and the free chlorine residual is set the filter is ready to be placed into service.

Media replacement due to the decreased physical filtration properties of the Media due to physical abrasion will occur before complete degradation of the catalytic layer takes place. Under normal operating conditions media life is estimated at 5 – 10 years.

Iron (Fe) precipitation and removal using DMI 65

Iron (Fe) is the fourth most common element found in the earth's crust and exists in a wide range of oxidation states from -2 to +6 although the most common states are ferrous (+2) and ferric (+3).

Ferrous salts are readily soluble. Before the ferrous iron, a dissolved solid commonly found as ferrous bicarbonate, can be removed by filtration it must be oxidized, become ferric hydroxide and in neutral pH waters precipitate out in the media bed. The catalytic surface of DMI-65 contains manganese oxide or exposes manganese and oxygen sites for adsorption of [Fe] ions that are in the water. The reaction of ferrous bicarbonate and NaOCl is almost instantaneous and the ferrous bicarbonate oxidizes (gives up an OH-) to become the insoluble ferric hydroxide which is then removed through filtration in the catalytic surface of the media. The following redox reaction equation explains the process.



Iron oxidation at catalytic surface.

$$2Fe(HCO_3)_2 + NaOCl + H_2O \rightarrow 2Fe(OH)_2 + 2CO_2 + NaCl$$

In the above figure the catalytic surface is presented in a simplified smooth form. Letter "M" was used to represent a generic metal ion in the lattice of this surface. Letter "O", in the centre of circles, represents an oxygen atom. Various ion size and oxygen molecule (blue) are represented at true relative scale. Except the oxygen molecule, bonded irons are shown as tangent circles. The interpretation for letters and ions in the figure "Ion oxidation at catalytic surface" is:

M: generic metal ion in the catalytic surface lattice (Mn^+); n = 1, 2... O: oxygen atom or ion (O^-)

Fe: iron atom or ion (Fe^{2+}, Fe^{3+})

H: hydrogen atom or ion (H+)

OH: hydroxide, or hydroxyl anion (OH-)

H2O, water molecule shown as tangent circles

Fe (OH)2, ferrous hydroxide is shown as tangent circles

Fe (OH)3, ferric hydroxide, shown as tangent circles, brown colour

O2, oxygen molecule, atoms shown at covalent bonding distance, blue colour

Dissolved ferrous bicarbonate is attracted with the Fe end towards the lattice oxygen of the catalytic material. This brings the Fe in the proximity of covalent bonding with the hydroxide ion of a neighbouring site and the ferrous bicarbonate changes into insoluble ferric hydroxide which precipitates in crystalline form aggregates of size from 3 nanometre and larger. The aggregates coagulate in larger flocks and are retained in the catalytic bed.

As the ferrous bicarbonate is converted into ferric hydroxide, its concentration at the catalytic surface decreases. In the bulk of the water, away from the catalytic surface, the concentration of ferrous bicarbonate is higher resulting in it diffusing towards the lower concentration according to diffusion law. Diffusion flux is linearly dependent with concentration gradient over distance.

Dissolved oxygen contributes to production of hydroxide ions through direct oxidation of hydrogen in combination with Fe splitting the water molecule and by reacting with the hydrogen at the catalytic surface

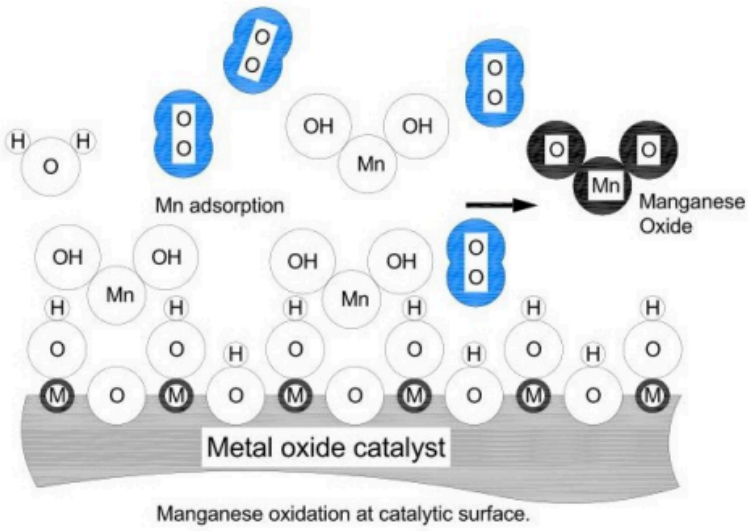
It is important to note that although a source of oxygen is needed oxidation and precipitation of Fe is driven by the hydroxide ion. Even under relatively acidic conditions hydroxide ions (a very strong anion) are easier available for binding to Fe than oxygen. Thus, Fe is not very difficult to oxidise and precipitate around neutral pH condition. In addition, concentration of hydroxyl ions increases with pH value exponentially and so does the rate of oxidation and precipitation of Fe.

Chlorine (usually in the form of NaOCl) is a source of oxygen more reactive than molecular oxygen. The ideal residual to be maintained downstream of the catalytic filter is 0.2 mg/l (0.1 to 0.3) free chlorine. A higher residual of free chlorine and therefore higher sodium hypochlorite level in the catalytic filter does not always help. It could have an adverse effect due to venting of chlorine and an increase of competing sodium ions, Na+. The catalytic surface has to be clean so that ions in water could come in contact with it so the chlorine injected also prevents bacteria growth and blinding of the catalytic surface with slime

Manganese, Mn precipitation and removal using DMI 65

DMI-65 is a catalytic material specifically tailored to the oxidation and removal of manganese. The catalytic surface contains manganese oxide for brining into proximity of covalent bonding manganese and oxygen atoms from water. However, oxidation and removal of manganese (Mn) is vastly different from that of Fe. A major difference is caused by the solubility of manganese oxyhydroxide, MnO(OH)2

$$Mn(HCO_3)_2 + NaOCl \rightarrow MnO(OH)_2 + NaCl + 2CO_2$$



Manganese oxidation at catalytic surface.

Manganese does not precipitate as oxyhydroxide but as oxide, MnO2 and higher valency oxides. Presence and concentration of hydroxide anions does not help much in the precipitation and removal of manganese. Manganese hydroxide will be attracted with the manganese end to the oxygen in catalytic lattice surface. An Oxygen molecule has to be available in the proximity for facilitating oxidation through the oxygen from lattice and swapping to the lattice with molecular oxygen.

Conditions for this to happen are statistically less probable and reaction is of much slower rate than the oxidation of Fe via hydroxide.

While increases in pH to alkaline levels facilitates oxidation and removal of manganese, under these conditions the oxidised manganese could also dissolve back into the water. Consequently, regardless of the target contaminant to be removed, anoxic conditions have always to be avoided to protect the catalytic layer against leaching into water. When oxidising manganese the recommended pH is close to 8.

Manganese oxide has good autocatalytic effect. When backwashing it is better to stop the process before the water becomes very clear. Manganese oxide residue in the filter bed will enhance manganese oxidation.

Key DMI-65 operating conditions

Treatment processes have to be conducted in such manner so that the catalytic surface of the material is kept clean and available to ion from water to contact.

Water with a large amount of suspended solids has to be clarified before passing it through the catalytic filter with DMI-65. Acceptable levels of suspended solids depends on their nature. A larger amount of mineral suspended solids than organic suspended solids could be handled.

Bacteria could grow and deposit slime on DMI-65. Thus disinfectant and oxidation conditions have to be maintained.

Water containing clays and large organic molecules may result in deposition of such material on the surface of DMI 65 and blinding of the catalytic surface. Treatment for removal of such contaminant before the catalytic filter is needed.

Polymer flocculent could also stick to the DMI-65 and blind catalytic surface.

Hard, unstable groundwater could cause scale deposition in the catalytic filter and blind the material in a solid mono bloc. In such case the DMI-65 material in the bed is lost and would have to be replaced. Treatment for stabilizing the water to prevent scale formation in the catalytic filter has to be carried out.

Both low acidic pH and anoxic conditions could cause dissolution of manganese from catalytic layer of DMI-65 and loss of its capacity. Excessively high pH means excessive concentration of hydroxyl ions (corrosive to metals) and could also cause dissolution of manganese from the catalytic layer.

Do not use demineralized water, distilled water or water known to be strongly corrosive to metals for initial soaking and activation of DMI-65.

SETUP & ACTIVATION OF DMI-65 FILTER

Sodium hypochlorite is used to activate and condition the catalytic surfaces of DMI-65 filter medium. The method is described below followed by a step by step guide. The chemical process of curing of the DMI-65 catalytic surfaces – is done by soaking the media for at least 3 hours prior to its use. Ideally the longer the soaking and conditioning period is, the stronger and harder the catalytic surfaces become.

Clean water is added to fill the filtration unit, fill until 50% of the free board is submerged. Typically a solution of 12.5% sodium hypochlorite is then introduced into the unit in a ratio of 10 liters of 12.5% solution sodium hypochlorite to 1m3 of DMI-65. DMI-65 is poured into the filter unit, with the allowance of sufficient support media such as filter quartz, so that the bottom of the DMI-65 bed sits above the lowest backwash laterals. The mixture is then lightly agitated and the wash valve opened to drain off the water until the water is at the level of the surface of the filtration medium. The wash valve is then closed. The DMI-65 is then soaked for at least 3 hours. The longer the soaking, the better.

The wash valve is then opened and all the water is drained from the system. The sodium hypochlorite of the soak water will be concentrated to several hundred ppm and discharge must be considered. The DMI-65 is then continuously backwashed while sodium hypochlorite is continually injected, maintaining a chlorine residual level of at least 0.1 – 0.3 mg/L (ppm) in the backwash water. This process should continue until the residual manganese level in the backwash water reduces to a value that is "three times the times the maximum contaminant limit" of manganese in your region. Typically the manganese level should be reduced to about 0.15mg/L (or ppm). In this process, the excess manganese dioxides left over from the proprietary infusion manufacturing process, that have not cured to the DMI-65 catalytic layers need to be backwashed washed into waste. The time taken for this to occur is usually between 20 and 40 minutes and up to a number of hours for larger applications, depending on backwash velocity and filter volume.

Once the manganese concentration has fallen to 0.15 ppm or less, the injection of hypochlorite or chlorine is adjusted to bring the level of residual chlorine to between 0.1 and 0.3 ppm in the filtrate. The use of a reducing agent such as sodium thiosulphate may be necessary to neutralise high levels of residual chlorine when discharge of the backwash water is not allowable.

Hypochlorite and chlorine are in a chemical equilibrium in water; the position of the equilibrium is pH dependent and low pH (acidic) favors chlorine. Therefore the prescribed ratio of: 12.5% solution of chlorine, at a ratio 10 litres per 1m3 of DMI-65, which is used to condition the DMI-65 will naturally be at a low pH.

Addition of chlorine to water gives both hydrochloric acid (HCl) and hypochlorous acid and inevitably will lower pH. Because the pH scale is logarithmic, pH 6 is 10 times more acidic than neutral pH 7.

And pH 5 is 100 times more acidic than neutral. This means during the soaking and conditioning procedure when 10 liters of chlorine (12.5%) per 1m3 of DMI-65 is lowering pH to less than pH 3, we can estimate the solution is more than 10,000 times more acidic than neutral.

During service filter mode, strong chlorine dosing causes highly acidic conditions that are less than pH

5.8. This should never be allowed to occur with a programmed chemical dosing pumps fitted for regulated dosing to maintain operation in a neutral to basic pH range. It's definitely wise to have monitoring system and alarm in place to maintain free chlorine residual level 0.1 - 0.3 ppm and a neutral to basic pH. This will encourage high oxidation rates of target heavy metals and a long whole of life.

Activating DMI-65 Step by Step Procedure

1.Fill the filter vessel half of its height or internal volume, or a little more, with clean water and add a minimum of 10 liters of a sodium hypochlorite (12.5% NaClO) per cubic meter of DMI-65. This is about the same as 10 fl oz of chlorine (12.5%) per cubic foot of DMI-65. See the supplied calculator named "Initial Chlorine Required for Soaking DMI-65 at Set up Stage"

2.Pour the support media followed by DMI-65 into the upper hole of filter. Bed depth has to be according to filter bed design depth (For example 750mm – 1000mm or 30" to 40") plus approximately 5%. A 40% free board above the DMI-65 is needed for bed expansion during backwash. If the water level is not well above the DMI-65 bed add more clean water. See the supplied calculator named "LV- SV Calculator" to calculate volume and bed depth required.

3.Let the DMI-65 filter bed soak in the chlorine solution for 3 hours or more. The longer the DMI-65 is left to soak the better. The DMI-65 may be left to soak overnight or even perhaps over the weekend.

4.The chlorine in the solution used for soaking and conditioning the DMI-65 is at several hundred ppm. Where discharge is not permissible a reducing agent such as sodium thiosulphate should be used to neutralize the chlorine before discarding to waste.

5.Backwash the DMI-65 while continually injecting chlorine solution. The backwash velocity should be about 30 to 40 m3 / m2 / hour depending on the bed depth. This is about 12 – 15 gpm / square foot. Ensure that the residual chlorine level in the backwash water is minimum 0.1 – 0.3 ppm but not higher than maximum intended concentration for treated water. Keep backwashing the DMI-65 until the residual manganese (Mn) in the backwash water reduces in value to less than 3 times the Maximum Contaminant Limit (MCL) of your region. For example, in the USA the MCL for Mn is 0.05 mg/L. Therefore the DMI-65 needs to be backwashed until the residual Mn reads less than 0.15 ppm
(0.05 x 3= 0.15 mg/L).

6.Ensure that the back wash velocity is sufficient enough to expand and raise the DMI-65 so that the very fine material is removed from the bed. During the early stages of the backwash there will be many fine black particles removed and the backwash water will be of a dark colour. During the later stages of the backwash, the water will become clearer, depending on the volume of DMI-65, the time this takes can be some number of hours. Monitor the residual Mn level until it has fallen below, “three times the MCL”.

7.Turn the filter to Rinse Mode. The same concentration of chlorine must be injected during rinse so to maintain the free chlorine residual of 0.1 – 0.3 ppm. This water must be discharged to waste until the residual Mn levels fall below the MCL. This limit may vary from country to country.

8.Once the residual Mn level of water has fallen below the local MCL in the Rinse Mode turn the filter to Service Mode. Start the Service Mode while at the same time continually injecting chlorine. Total free chlorine may be reduced if needed. However, ensure that there is always free chlorine residual in the treated water. Running with residual free chlorine of less than 0.1 ppm is not recommended. Service flow rate will be in the range of about 5 m3 – 20 m3 / m2 / hour or 2 – 8 gpm per square foot. This depends on filter bed depth and water quality.

9.Monitoring Raw Water Quality

If residual Iron (Fe) and Manganese (Mn) is found to “break through” the DMI-65 media bed at greater concentrations than your areas MCL, check the following:

- Is there a free chlorine residual?
- Is the pH abnormally low?
- Is the DMI-65 filter bed being backwashed adequately?
- Is the DMI-65 old?
- Is there an equipment failure such as chemical dosing system?

10.Please check to make sure that the following elements below are not in high concentrations in the raw water. If these elements are high in concentrations please contact Quantum Filtration Medium or your local DMI-65 agent.

- Salt
- Ammonia
- Silica
- Calcium and Magnesium (excessive hardness)

TECHNICAL DATA SHEET

Physical Properties		Operating Conditions	
Colour	Brown to Black	pH Range	5.8 – 8.6
Bulk Density	91.0 lbs/ft^3 1.46 gr/m^3 1.46 tonne/m^3	Maximum Water Temperature	113° F (45° C)
Specific Gravity	2.69	Minimum Bed Depth	24 Inches (600mm)
Effective Size	0.3 – 0.6mm	Freeboard	40% minimum
Uniformity Coefficient	1.4	Service Flow Rate	5 – 30 m^3/m^2 per hr
Mesh Size	20 - 40	Backwash Flow Rate	25 – 40 m^3/m^2 per hr
Annual Attrition	1% - 5%	Backwash Expansion	20% - 50%

Infusion Technology: Powerful oxidizing agents are chemically infused to the microporous sub- structure of the matrix material. Infusion Technology increases the catalytic surface and gives DMI-65 the highest oxidation rate and load capacity of any other catalytic media.

Infusion Technology allows for very small attrition loss and displays no decaying effect or loss or catalysis for up to 5 – 10 years of continuous performance.

DMI-65 protects and pre-treats all other water treatment systems from iron and manganese bio- fouling, effectively longer filter run times, and with the benefit of reduced oxidant demand and because DMI-65 Infusion Technology requires no chemical regeneration

DMI-65 is the lowest cost of whole life iron and manganese removal media

Optimum Range of Water Chemistry for up to 10 Years Continuous Use	
pH	5.8 – 8.6
Turbidity	<2 NTU
Iron (Fe)	<15 ppm
Manganese (Mn)	<3 ppm
Calcium ($CaCO_3$)	<250 ppm
Salt (NaCl)	<1000 ppm
TDS	<2000 ppm
Ammonia (NH_3)	<1 ppm
Silica (SiO_2)	<70 ppm

DMI-65 CERTIFICATION:

Tested and Certified Under Industry Standards: NSF / ANSI 61 by the Water Quality Association of USA Gold Seal Program

For safety and health effects for drinking water components.

Authorized by the Drinking Water Inspectorate safe to use according to:

Regulation 31(4)(a) of the water supply (Water Quality) regulations 2010 for UK, England and Wales

Engineering (Hydraulic) Data

Bed Depth and Water Velocity

Filter media depth needed increases with the decrease in the amount of residual iron and manganese allowed in the filtered water. Maximum bed depth could be just over 1 meter and relates also to the flow capacity of the system and effective height of available filters.

Water velocity through the filter should be selected in accordance with the usage of the filtered water, size of water treatment plant, water quality and other factors.

For large drinking water treatment plants the depth of the bed should be selected towards the maximum and the water velocity around 5 m3/m2/hour in any case not more than 10 m3/m2 /hour. This maximizes performance in removing iron and manganese, reduces the frequency of backwashing, reduces power consumption because average pressure drop is lower, and could provide redundancy in case one of the filters is out of order and higher flow rate has to be put through the remaining filters.

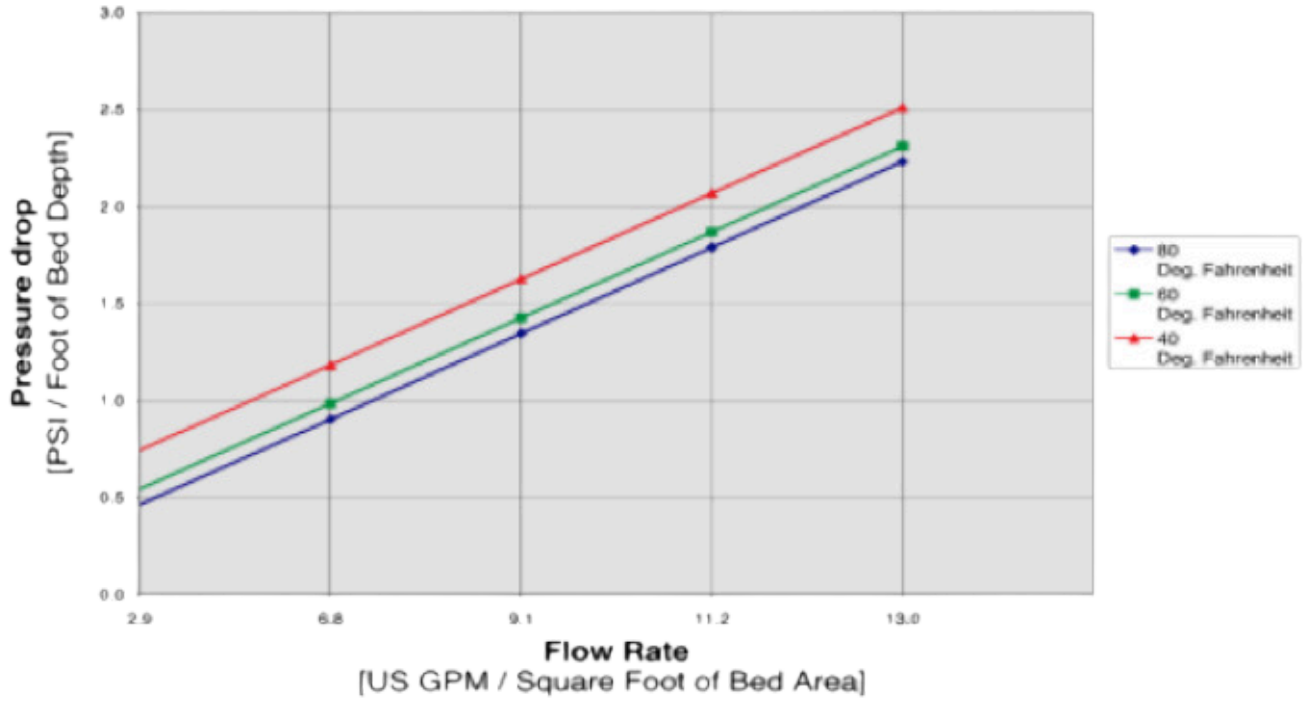
The upper limit of velocity, up to 30 m3/m2/hour should be used for small bed depth and larger allowed amount of residual iron and manganese in the filtered water.

Pressure drop

The pressure drop is related to the velocity of the water through the cross sectional area of the filter because its usefulness and the simplicity of relating the data to flow rate. The flow rat "Q" in cubic meters per hour can be calculated by multiplying the velocity 'v" in meters per hour by the filter area "A" in square meters.

$$Q = v \times A$$

The pressure drop for an initial clean filter depends on the depth of the filter media bed and the water velocity. The chart below shows the pressure drop for 1 meter (3.3. foot) bed depth. For other bed depth the pressure drop can be considered linearly dependent on the bed depth. Therefore, to calculate the pressure drop for 0.6m bed depth you multiply the value for pressure drop found in the chart by 0.6.



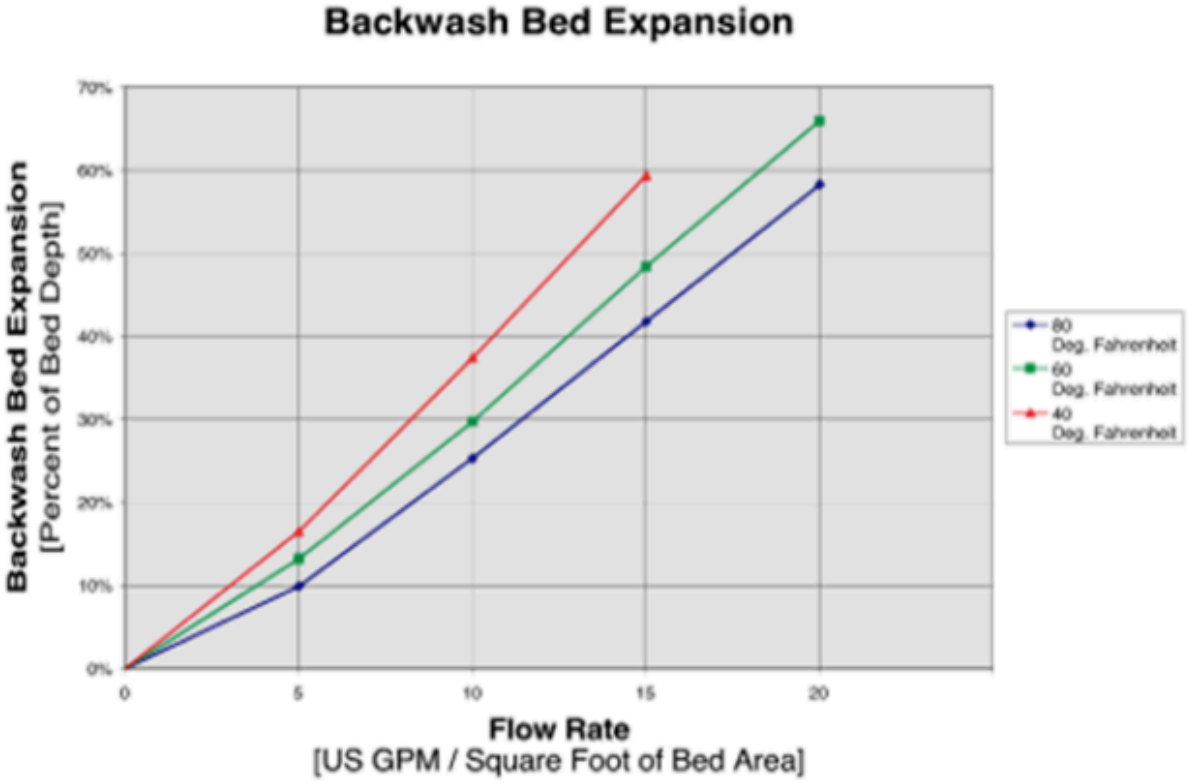
Backwashing Pressure Drop

The total pressure drop through the filter before backwashing is recommended to be 50kpa and up to a maximum 100 kPa The granules of DMI-65 filter media are micro - porous. The larger the pressure drop, the larger compaction forces are applied to the filter media. The interaction between filter media particles during alternated compaction under normal service and expansion of the bed during backwashing leads in time to deterioration of granules. Backwashing the filter when the pressure drop has increased by 50 kPa from the initial clean filter pressure drop is a good reference. Higher or lower values could be set depending on the application and how long the filter media has to last before changing it. Note that the filter media would not significantly loose the effectiveness in removing the iron and manganese but the loss in head pressure will increase as a clean media bed loads to capacity.

The water velocity for backwashing the filter is recommended to be limited to 40 – 50m3/m2/hour m/hr. This is the same as recommended for ordinary sand filtration. Although it is possible to use not filtered water for backwashing in general this is not a good idea unless the water is relatively clean and the system is set up with a rinse operating mode in addition to filtration and backwashing. At low backwashing velocity longer backwashing time is needed. In general backwashing velocity should be twice the filtration velocity.

Backwashing time should be determined by using a site glass on the discharge backwash line or in some other way observe when the backwash water discharged is satisfactorily clean. Backwashing time could vary from a few minutes to 15 minutes.

A rinse mode can follow backwashing to remove the contaminant solids that would exit the filter before the filter bed is compacted back and operates normally. This mode is not necessary to be implemented in all water treatment systems. Rinse time should be around 30 seconds for small bed depth and 1 minute or a little more for upper limit of bed depth. The required time could be found by checking the presence of contamination in the filtered water when restarting normal filtration operation



Suggested Operating Conditions

Linear Velocity and Iron and Manganese Concentrations.

The correct design based on Linear Velocity (LV) versus Iron (Fe) and Manganese (Mn) values is a little more complex to offer an explanation in formula or scale. Successful data provided to DMI-65 users is based on over 15 years of successful installations in over 40 countries worldwide.

For iron removal, flux, or linear velocity is allot higher than manganese. The reaction of iron and chlorine is almost instantaneous and is easily removed through silica sand alone. For example it possible to remove 20ppm of iron down to 0.5ppm. This can be done at a fairly neutral pH range of 7 –

7.5. Removing iron with normal silica sand alone can be done at Linear Velocity (LV) range of about LV8 – 9 m3/m2/hour.

Removing the remaining 0.5ppm of iron to below 0.3ppm or to an undetectable 0.001ppm is much more difficult than removing 20ppm down to 0.5ppm. This is where the DMI-65 advanced oxidation "booster" qualities come into play. DMI-65 has been coined a high performance "polisher" for removing the very smallest traces of iron and simultaneously manganese in the same filter bed.

The extra oxidating quality of the DMI-65 catalytic surfaces allow iron to be effectively removed in pH range of 5.8 – 8.6, however best results again are at basic pH 7 – 7.5. In comparison to silica sand the DMI-65 could filter iron up to LV 16 – 18m3/m2/hour rather than 8 – 9m3/m2/hour.

Manganese removal is far more difficult to remove than iron removal. DMI-65 Infusion Technology is tailor made to maximise the ease of manganese removal and especially simultaneously with iron removal (In the same filter bed). Manganese requires far greater detention time and is very pH dependant for successful removal

DMI-65 is believed to be the highest performing product on the market for manganese removal, capable of removing 2 – 3ppm through a single filter if the pH is maintained and LV is suitable. Manganese is best removed with DMI-65 as close to pH 8 as possible and at an LV of about 5 – 10m3/ m2/hour, about half that of an LV used for iron removal.

The complicated thing to account for in every water matrix is the combination of iron and manganese as iron will be removed first in the upper part of the filter bed and then manganese will be removed latter in the bottom part of the filter bed. This is why some times using two filters in series allows greater linear passing of the raw water and greater polishing while halving the backwash velocity between two filter beds.

As a guide, all successful DMI-65 case studies have demonstrated, the higher the concentration of iron and manganese the slower the LV should be. If the is very low amounts of iron and particularly manganese then higher the LV can be – having a significant effect on the cost of the initial plant setup.

As a guide we recommend these conservative limits given that the water is under 5NTU TDS:

Iron

0.3ppm – 1ppm = LV 15 - 20m3/m2/hour is possible
1ppm – 5ppm = LV 10 - 15m3/m2/hour is acceptable and is a common standard. 5ppm – 10ppm = LV 10m3/m2/hour is acceptable and is a common standard.

10ppm – 15ppm = LV 7 – 9m3/m2/hour is acceptable and is a common standard Greater than 15ppm = LV 5 – 7m3/m2/hour

All at a neutral pH of 6.8 – 7.2 if possible
It is often the case as in the harsh Australian climate to have water sources with iron concentrations upward of 50ppm. In this instance is best to use a holding tank to pre-oxidise by aeration and let the iron coagulate and settle to the bottom of the tank this will knock out 90% of the iron leaving a much more accommodating water concentration of 5ppm to be polished out by the DMI-65 at a LV of 10 – 15m3/m2/hour.

Manganese
0.5ppm – 1ppm = LV 8 – 10m3/m2/hour 1ppm – 2ppm = LV 5 – 7m3/m2/hour
Greater than 2ppm would require the same technique above by dosing the holding tank with chlorine and allowing about 10 to 15 minutes detention time to oxidise the manganese, the remaining manganese that has not oxidised will be polished out the but the DMI-65.

All at a pH of as close pH8 as possible. Iron and Manganese
Typically iron and manganese exist together in ground water sources at low levels of under 2ppm and 1ppm respectively. In these sorts of conditions I recommend the following:

Iron 2ppm – Manganese 1ppm = LV 8 – 9m3/m2/hour as close to pH 7.5 – 8 as possible.
If the Iron concentration is higher than 2ppm and has some manganese, than slow LV down to between perhaps 7 – 8m3/m2 hour and maintain pH as close to 7.5 – 8 as possible.

If the manganese concentration is higher than 1ppm and there is considerable iron say 2 – 3ppm also, than the water matrix is very dependent on a slow LV of 5 – 7m3/m2/hour and pH 8 is highly necessary.
For any water matrix that contains high iron (considered to be above 15ppm) and high manganese (considered this to be 3ppm) than the same method of pre-treatment is recommended

PACKAGING NOTES:

DMI-65 Advanced Oxidation Catalytic Media

Net Bag Weight: 21kg (46.30lb)

Net Bag Volume: 14.38L (0.5ft3)

Bulk Density: 1.46 gl/cm3 (91lb/ft3)

Specific Gravity: 2.69gr/cm3

Porosity: 45.8%

Mesh 20:40

Pallets of 48 x DMI-65 (21kg) available = Net Weight 1008kg

Pallets of 56 x DMI-65 (21kg) available = Net Weight 1176kg

Whole 1 metric tonne (2,205 lbs / 24ft3) bulk bag Available

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