PFL Premium Grade
Manganese Dioxide

Applications: Iron and Manganese removal from potable waters by catalytic oxidation.

Characteristics:
- Appearance: Black, granular mineral
- Specific Gravity: >3.5 < 4.1
- Bulk Density: 2.0 Tonnes/m³

Quality Control: Certified to BS5750 Part II, ISO 9000

Typical
- A natural crushed ore without additives and free from contamination.
- Manganese content 75% to 80% as MnO₂
- Moisture content less than 1% by weight
- Hardness: 5 to 6 Moh scale.

Chemical Analysis:

Grades Available:
- The standard size is BS16/30 (0.50 to 1.00 mm).
- Other grades are available upon request but at longer lead times.

Flow Rates:
- Typical filtration rate is 9 m³/m²/hr.
- Typical backwash rates are 15 to 25 m³/m²/hr.

Packaging:
- 1 Tonne bulk bags, 50 kg or 25 kg bags, palletised, shrink wrapped or banded.

Catalytic Activity:
- A mixture of manganese Dioxide and sand in a filter bed will normally reduce the concentration of Manganese and Iron in water from 0.5 mg/l and 3 mg/l to 0.02 mg/l and 0.05 mg/l respectively (given the correct conditions of alkalinity and pH).

Discussion: See page 2
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Iron and Manganese removal from potable waters by catalytic oxidation. Currently two types of catalytic media are used; Manganese Greensand, a treated zeolite and natural Manganese Dioxide. There are considerable differences in the economics and methods of use between these two materials. The application of Manganese Greensand requires the replacement of the whole filter bed, regeneration with potassium permanganate along with its storage and dosing facilities, monitoring and manning. Manganese Dioxide requires only partial replacement of the filter media with no chemical dosing and regeneration apart from chlorination, and no monitoring to ensure efficient working.

Normally, between 10% to 20% of MnO₂ by volume of the filter sand is added to the filter. This is usually placed on top of the sand bed until thoroughly mixed, as it is important that the water passing through the filter comes into contact with as much MnO₂ as possible for as long a period as possible. Any precipitated iron or manganese adheres firmly to the catalytic grains without impairing their activity. The manganese Dioxide particles thus act as a filter of suspended solids as well as catalytically absorbing toxic metals.

Manganese removal efficiency is a direct function of the surface MnO₂ concentration; its oxidation state and the pH of the filtered water. The sorption of Mn²⁺ by MnO₂ ore is very rapid. Both the sorption kinetics and sorption capacity increase with the increasing pH, from 7 to 8 and the surface MnO₂ concentration. In the absence of a filter applied oxidant i.e. chlorine, Mn²⁺ removal would be sorption alone. Maintenance of free chlorine residuals thorough the filter aid Mn²⁺ removal, with the chlorine promoting the oxidation of Mn²⁺ directly on the MnO₂ surface. The net result being the continuous regeneration of sorption sites for further Mn²⁺ adsorption. Hence, provided that there is sufficient Mn²⁺ concentration in the raw water influent to replace the small amounts of MnO₂ lost during backwashing, then the MnO₂ will continually regenerate itself without the resort to replacement or chemical dosing with permanganate.