FILMTEC Membranes
Water Chemistry and Pretreatment: Colloidal and Particulate Fouling Prevention

**Oxidation-Filtration**

Some well waters, usually brackish waters, are in a reduced state. Typically, such waters contain divalent iron and manganese, sometimes hydrogen sulfide and ammonium, but no oxygen; therefore, they are also called anoxic. Often the oxygen has been used up (e.g., by microbiological processes) because the water is contaminated with biodegradable organic substances, or the water is from a very old aquifer.

One method of handling anoxic waters is to oxidize iron and manganese by air, sodium hypochlorite or potassium permanganate (KMnO₄). The hydroxides formed can then be removed by media filtration. Hydrogen sulfide will be oxidized to elemental sulfur that can be removed by media filtration as well.

Oxidation and filtration can be accomplished in one step by using a filter media with the ability to oxidize divalent iron and manganese by electron transfer. Greensand is such a granular medium, which is a green (when dry) mineral glauconite. It can be regenerated with KMnO₄ when its oxidizing capability is exhausted. After regeneration, the residual KMnO₄ has to be thoroughly rinsed out to avoid oxidation damage of the membranes. This technique is used when <2 mg/L Fe²⁺ is present in the raw water. For higher Fe²⁺ concentrations, KMnO₄ can be continuously dosed into the inlet stream of the filter. In this case, however, measures have to be taken to ensure that no permanganate can reach the membranes (e.g., by installation of a carbon filter) - see Chlorination/Dechlorination (Section 2.6.3).

Birm filtration has also been used effectively for Fe²⁺ removal from RO feed water. With birm filtration a pH increase and consequently a shift in the LSI value might occur, so care should be taken to avoid CaCO₃ precipitation in the filter and in the RO system.

Instead of media filtration, microfiltration or ultrafiltration (see Microfiltration/Ultrafiltration, Section 2.5.6) can be used to remove small iron and manganese hydroxide particles formed from an oxidation process. This is a rather new technology for iron and manganese removal.

The pretreatment of anoxic waters is described in more detail in Prevention of Iron and Manganese Fouling (Section 2.9) and Prevention of Aluminum Fouling (Section 2.10).
FILMTEC™ Membranes
For more information about FILMTEC membranes, call the Dow Liquid Separations business:
North America: 1-800-447-4369
Latin America: (+55) 11-5188-9222
Europe: (+32) 3-450-2240
Pacific (ex. China): +800-7776-7776
China: +10-800-600-0015
http://www.filmtec.com

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