

Test Results On Filter Media Show Excellent Water Quality

*Cape Breton Regional
Municipality testing
new media to produce
high quality water*

By Harold Aronovitch

Cape Breton Regional Municipality, located in Sydney, Nova Scotia, has four 10-ft diameter 18.5 ft straight shell horizontal Hungerford & Terry manganese greensand filters to treat 1.8 million Imperial gallons per day. The water source is a well containing iron and manganese while the design water analysis has 0.2 mg/L iron and 0.35 mg/L manganese. The filters are designed to use the catalytic oxidation process with chlorine added prior to the filters followed by a reaction tank to allow added contact time for the chlorine.

"The water treatment results have met our expectations for iron and manganese removal," said Mike MacKeigan, utility manager for Cape Breton Regional Municipality (CBRM).

Over a five-year period of operation, the length of run between backwashes was gradually getting shorter. Investigation determined the reduced run length was caused by a breakdown of the manganese greensand media. After testing, it was determined the low silica level in the raw water contributed to this breakdown. A feed of sodium aluminate was instituted to help alleviate this problem. Sodium aluminate was fed at a rate of 0.2 mg/L to stabilize the media and enable the CBRM to handle the high summer demand.

A new media, GreensandPlus, was obtained from the Inversand Co. This media is more rugged than manganese greensand, but has identical operating characteristics and does not require sodium aluminate to prevent breakdown.

On the advice of Hungerford & Terry, Inc., a pilot plant was sent to CBRM for operation using the same feed as the full-scale units. After chlorine addition and reaction time, a 3.1 gpm flow was sent to the pilot plant.

This plant measured 9 in. ID with a V2 sq ft surface area. The filter bed consisted of 18 in. of 0.6-0.8 mm effective size anthracite and 18 in. of GreensandPlus. After conditioning with potassium permanganate, the pilot plant was ready for operation. The chlorine feed served to oxidize the iron and manganese in the feed water so that it would be filtered out in the media.

Greater capacity

Soluble manganese would be oxidized by the manganese oxide coating on the GreensandPlus. The free chlorine in the feed water would then oxidize the coating, which had temporarily been reduced. The limiting factor of the pilot plant was pressure drop across the bed. Feed water from CBRM was limited in pressure and flow because it was fed to the pilot plant through a garden hose.

The pilot plant operated at flow rates from 4.4 to 6.2 gpm/sq ft, and run lengths between backwashes of 120 to 200 hours were experienced. Influent manganese was 0.3 to 0.33 mg/L, while iron varied between 0.045 and 0.09 mg/L. With seven runs complete, an average loading of 1,200 grains/sq ft of filter area was obtained. Manganese greensand is expected to have a capacity of 500 to 700 grains/square ft of filter area.



Cape Breton Regional Municipality, Sydney, Nova Scotia, is currently testing a new filter media. The filter media test results are positive on the production of high quality water without detrimental effects.

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The normal pressure drop end point for the full-scale plant and the pilot plant was 10 psi. In an attempt to extend the run, the plant was operated on a 334 hour run with a pressure drop of 17.9 psi at the end of the run. The pilot plant was still producing good quality water with less than 0.005 mg/L manganese and 0.001 mg/L iron in the effluent. The only reason for terminating the run was a drop off in flowrate due to the high-pressure drop across the filter bed. After backwashing, there was no sign of damage to the media, and the pressure drop at the start of the next run was consistent with that of a clean bed.

"By reducing differential pressures across the filter bed and with a life expectancy of up to 20 years with the GreensandPlus filtration media, Cape Breton should save a considerable amount of money over the ordinary manganese greensand that has required replacement and filter rebedding every three to five years of in-service operation," said MacKeigan.

Averaged less

During the pilot testing, the water treated by the pilot plant consistently averaged less than 0.01 mg/L manganese and less than 0.01 mg/L iron. The effluent free chlorine averaged between 1.5 and 1.8 mg/L as determined by the chlorine feed to the full-scale plant and required for the distribution system.

The results of the pilot plant indicated that GreensandPlus filter media could treat the water at the Cape Breton Regional Municipality filter plant without breakdown due to the low silica level in the water. It can also be operated to higher pressure drops and longer filter runs without any detrimental effects. It also demonstrated that while being operated for longer periods of time to higher pressure drops, it could still produce extremely high quality water.

In November and December 2005, Cape Breton plans to begin retrofitting all of the water treatment beds with the engineering assistance of Hungerford & Terry using GreensandPlus.

MacKeigan emphasized the overall GreensandPlus project by concluding, "Based on the pilot test report and the overall project evaluation from Dillon Consulting of Sydney, we expect very positive results from the GreensandPlus media throughout the duration of the next 10 to 20 years." **WWD**

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