FilmTec™ Reverse Osmosis Elements Help to Remove Fluoride from Drinking Water at Low Cost

The challenge

The natural fluoride level in the soil of southern Finland is relatively high and, as a result, the fluoride concentration in the water increases up to 1.8 ppm. The drinking water directives of the European Union limit fluoride concentration in drinking water to 1.5 ppm. Several treatment systems to remove fluoride from the water were pilot tested. One option was the treatment of the full stream with nanofiltration membranes. However, because of the good biological quality of the groundwater, the Kuivala Water Treatment Plant selected FilmTec™ XLE (extra low energy) reverse osmosis (RO) membranes to treat only a part of the artificial groundwater supply. By blending RO permeate with the groundwater, the required fluoride concentration can be adjusted while the capital costs of the plant are minimized.

The solution

The original plant consisted of five trains, each in 2-stage configuration with 6 vessels in 1st Stage and 3 vessels in 2nd Stage, with 6 elements FilmTec™ XLE-440 per vessel. The plant operates at 80% recovery without scaling inhibitor at an average water temperature of 8°C. About 30% of the groundwater feed is treated through RO and permeate is blended with feed to obtain Fluoride < 1.3 ppm. Based on this experience, three additional similar RO units were added in 2007 expanding the RO capacity up to 9,600 m^3/day.

The benefits

After more than 18 years of operation since start-up, the plant removes over 98% of Fluoride at a low cost of only 0.09 €/m3. Regardless regular cleanings at pH > 12 and temperature > 35°C, the permeate conductivity is low and has not changed much since plant start-up. TOC rejection is higher than 94%.

Fast Facts

Country: Finland

Technology: DuPont™ FilmTec™ Reverse Osmosis

Total # of elements: 432

Plant capacity: 9,600 m^3/day

Start-up date: 2003

Feed water quality: Conductivity 70-100 uS/cm; TOC 6.5 ppm; Fluoride -2 ppm

RO Product water quality: Fluoride <30 ppb; Conductivity < 10 uS/cm; TOC < 0.4 ppm

Average Temperature: 8 °C

Cost of permeate: 0.09 €/m^3

18+ Years **Removing fluoride from groundwater at low cost**

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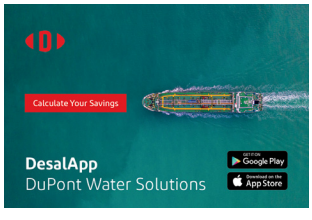

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