Rocky Mountain Drinking Water Plant Removes Manganese and Improves Turbidity with Chlorine Dioxide

Challenge

This 10 million gallons per day drinking water plant gets its raw water source from a 151,000 acre-feet reservoir situated at an elevation of 5430 ft. The water intake is through a tunnel at a depth of 200 feet. The intake does not have provisions for the withdrawal of water from multiple levels in the reservoir. The plant has a problem with manganese: levels rise in the fall as the water temperatures in the reservoir drop until the turnover of the reservoir in summer. Implementation of a new pH adjustment system in 1992 increased the pH of the water leaving the plant, causing some of the soluble manganese to oxidize and precipitate out in the storage tanks and pipelines. Numerous 'brown water' complaints from city residents followed. Potassium permanganate was employed at dosages from 0.2 - 1.2 mg/L during 1993 and early 1994 but failed to adequately control the problem and the city still received complaints. The city began looking for an alternative treatment approach in 1994.

Solution

A recommendation was made to the municipality to treat the raw water with chlorine dioxide, produced using a two-chemical chlorine/ chlorite generator. A chlorine dioxide feed rate of 0.4 - 1.2 mg/L was recommended for treatment during the late spring and summer with a lower maintenance dose of 0.4 - 0.5 mg/L for the fall and winter months.

Results

Chlorine dioxide effectively removed manganese from the raw water at a ratio of 0.6 mg/L of manganese for every 1.0 mg/L of chlorine dioxide fed. The incidence of 'brown water' complaints has been reduced or eliminated. The addition of chlorine dioxide at the plant influent, as a pre-oxidant, under EPA guidelines allowed the plant to receive a CT credit through the plant basin.

The turbidity of the effluent was reduced from 0.04 in 1993 to < 0.01, and THM levels have also dropped by 20 µg/L since the program began in late 1994. Other benefits include improved taste and odor control, improved plant atmosphere, and a reduction in the chlorine demand in the effluent from 1.7 mg/L to 1.2 mg/L. The implementation of chlorine dioxide to the treatment train at this plant has exceeded expectations with respect to its effectiveness for manganese as well as improving overall treatment efficiencies.

Courtsey by : Siemens