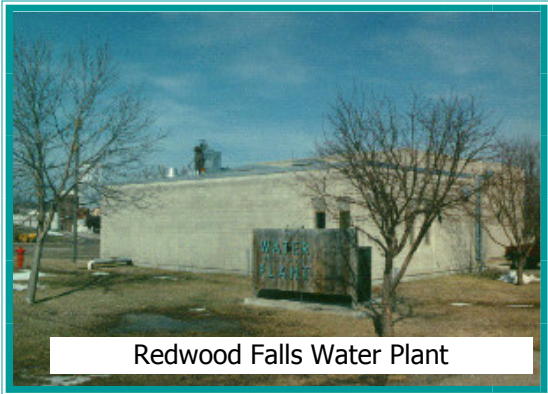


# Plant Meets Water Quality Standards While Saving Chemical Costs

The Redwood Falls Plant was constructed in 1958 for removal of iron and manganese from well water. The process involved oxidation of iron and manganese with potassium permanganate ( $\text{KMnO}_4$ ) and chlorine followed by filtration. The filters are dual media filters containing anthracite and manganese greensand.



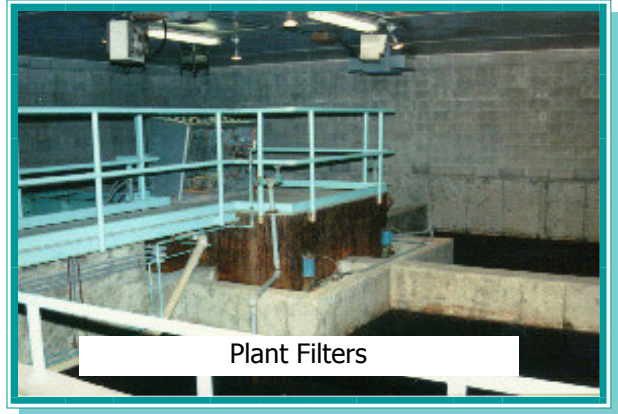
Redwood Falls Water Plant

In 1996, the plant was experiencing short filter runs and turbidity breakthrough. Progressive Consulting Engineers, Inc. (PCE) was selected to investigate the problem and propose an upgrade of the plant. The PCE team evaluated the water quality data and sequence of  $\text{KMnO}_4$  and chlorine addition. Media depth in the filters was measured and samples of media analyzed. A probe was used to determine the condition of the underdrain and a wooden box was used to dig down to visually inspect the underdrain. Filter backwash rates were measured.

The plant was adding  $\text{KMnO}_4$  and then chlorine. As  $\text{KMnO}_4$  is a much more potent oxidant than chlorine, almost all of the oxidation was being accomplished by  $\text{KMnO}_4$ .  $\text{KMnO}_4$  is about four times more expensive than chlorine and contains 67% more manganese. The manganese added by the use of  $\text{KMnO}_4$  had to be removed by the filters, reducing the filter run.

PCE recommendations included moving the feed point for chlorine to the head of the plant and  $\text{KMnO}_4$  to just upstream of the filter. The result was that most of the iron was oxidized by the chlorine prior to the oxidation of manganese by  $\text{KMnO}_4$ . The substantial reduction of  $\text{KMnO}_4$  dosage reduced the manganese loading on the filters, resulting in longer filter runs. Filter media was added to make up the lost media.

The plant is now saving in chemical costs, has longer filter runs, and is consistently producing water quality, which meets the standards for iron and manganese without turbidity breakthrough.



Plant Filters

**Client:** City of Redwood Falls  
**Client Contact:** Ron Mannz, City Engineer  
**Construction Year:** 1999  
**Fee:** \$8,500



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