

Removing Arsenic to Non-Detect

Vertical Pressure Filters

CASE STUDY

Location: Lone, Washington
Owner: City of Lone
Engineer: Esvelt Environmental Engineering
Contractor: TML Construction

Tightening Regulations

The Chippewa Water and Sewer District provides water distribution and sewer collection for the City of Lone, Washington. Raw water for the drinking water distribution system is supplied through two production wells and is treated with chlorination.

This water complied with all primary drinking water standards but continually fell short of the EPA's secondary drinking water standards for iron and manganese. Seasonal peaks of iron and manganese clogged pipes and frequently produced aesthetic and odor issues, resulting in customer complaints.

In addition to iron and manganese, moderate levels of arsenic were also in the water. In 2003, Lone began planning for a new treatment plant to be in compliance with the anticipated requirement to increase arsenic removal. In 2006, EPA regulations for arsenic levels were reduced from 50 µg/L to 10 µg/L, compounding compliance issues.

Water Quality

| | MCL | Well 1 Raw Water | Well 2 Raw Water |
|-----------|-----------|------------------|------------------|
| Iron | 0.3 mg/L | 0.63 mg/L | 0.06 mg/L |
| Manganese | 0.05 mg/L | 0.32 mg/L | 0.46 mg/L |
| Arsenic | 10 µg/L | 15-25 µg/L | 15-25 µg/L |

Equipment Selection

A comprehensive pilot study was completed to determine the best treatment method to remove arsenic, iron, and manganese. After comparing pressure filters to cartridge filters, bag filters, and other filtration methods, the engineer, in conjunction with the town council, selected a granular media pressure filtration system as the best available technology.

In 2008, WesTech was selected to provide three 50%-capacity vertical pressure filters, a complete chemical feed system, and a PLC control system.

Vertical Pressure Filters

| | |
|-----------------------|-----------------------|
| Quantity | 3 filters |
| Size | 10 ft diameter |
| Area per Filter | 78.5 ft ² |
| Total Filtration Rate | 3 gpm/ft ² |
| Backwash Flow Rate | 9 gpm/ft ² |

WesTech's granular media vertical pressure filters effectively remove iron, manganese, and arsenic to meet primary and secondary standards. Individual, parallel operating vessels satisfy redundancy requirements and offer a design that is easily expanded to meet future needs.

To remove these contaminants most efficiently, WesTech customized the depth and type of granular media. The customized design allows Lone to improve water quality while keeping costs low. Due to the levels of naturally occurring iron, both the iron and arsenic coprecipitate without the addition of an iron-based coagulant such as ferric chloride or ferric sulfate.

Pressure Filter Media

| Anthracite Coal Media | |
|-----------------------|-------------|
| Depth | 18 in |
| Effective Size | 0.6-0.8 mm |
| Greensand Plus™ Media | |
| Depth | 18 in |
| Effective Size | 0.3-0.35 mm |
| Support Gravel Media | |
| Depth | 16 in |
| Total Media Depth | 52 in |

WesTech®

 SWIRE WATER

Treated Water Quality

| | |
|-----------|------------|
| Iron | 0.15 mg/L |
| Manganese | 0.01 mg/L |
| Arsenic | Non-Detect |

The plant was designed so that water can be pumped directly from the well, through the pressure filters, and have enough residual pressure to lift the treated water to the elevated storage tank. By doing this, repumping was not required after treatment.

Before the new system was installed, the majority of homes used cartridge filters to reduce the negative aesthetic effects of the iron and manganese. Residents of Lone are pleased with the quality of water produced from the new treatment plant. They no longer need to worry about clogged pipes or brown laundry.

Since the installation of WesTech's pressure filters, maintenance and residents' individual treatment costs have been greatly reduced.



Pressure Vessels

Customer Satisfaction

Plant operators are impressed with the ease of operation provided by the WesTech PLC controls. Automatic backwashes can be controlled and plant adjustments made from the central control computer. Chris Chaney, the chief operator, said, "It's a complex plant, but the way WesTech's PLC is programed, it requires very little operator intervention."

Low maintenance and operator friendly features were important aspects of the treatment system selection since Chaney has many other responsibilities in addition to maintaining the treatment plant. Operators and residents alike were impressed with the inexpensive operation costs and the "perfect water" that was produced.



Chris Chaney, Chief Plant Operator

Treatment Plant Flow Diagram

