Potable Water Treatment System

A residential senior living facility in Maryland experienced periodic “Boil Water” requirements due to surface water intrusion into the facility’s wells. When this intrusion occurred during periods of high rainfall, small but significant amounts of fecal contamination were detected.

Two wells are used to provide water to the facility. The treatment system and wells have the capacity to treat up to 100,000 gallons per day to accommodate any future development and still have 100% redundancy. Previously, the water was treated using sodium-cycle softening to reduce hardness. The existing facility was not designed to remove fecal contamination.

Membrane Selected

The membrane selected is a low energy system with 0.03 μm pore size. This membrane has documented removal to 4-log of virus and 5-log of bacteria, thereby providing the necessary treatment for removal of the fecal contamination as well as any other possible contaminants.

The membrane system operates in “dead-end” mode, whereby well water is introduced to the membrane and permeate (filtrate) passes through the membrane and out of the system. Any contamination is therefore retained on the feed side of the membrane. Periodically, the concentrate is purged from the system, flushing out the retained contaminants. This process is automatically controlled based on the design parameters.
System Cleaning (Clean-in-Place)

Contaminants, such as algae, organic slime and scale to accumulate on the membrane surface that cannot be removed by the normal flushing procedure. When this occurs, an automatic cleaning process is initiated by the plant operator. This process introduces commodity chemicals, such as sodium hypochlorite and citric acid to the system to remove the contaminants. After a period of soaking, the chemicals are automatically flushed from the system and the system is then brought back on line.

Controls

Since this system is used to provide drinking water to the residents, ensuring the membrane integrity is critical. Two processes provide this requirement:

- Treated water turbidity is continuously monitored. Levels significantly below 0.1 NTU are produced at all times with inlet levels as high as 3 NTU.
- A daily integrity test whereby air is used to pressurize the inlet side of the membrane and the pressure decline over a period is measured.

These two tests provide assurance that the membrane is operating with full integrity and that no breaches have occurred.

Further Treatment

In addition to fecal contamination, the well water at this facility contains significant levels of hardness. In order to reduce levels of hardness thereby reducing maintenance costs within the facility, a portion of the effluent from the ultrafiltration system is treated by reverse osmosis. This removes essentially all dissolved solids and the combined discharge from the ultrafilter and reverse osmosis systems consistently provide the high quality water required by the residents of the facility.