

Remote Water Quality Monitoring and Control of Small Drinking Water Treatment Systems

National Risk Management Research Laboratory
Water Supply and Water Resources Division
Water Quality Management Branch and Microbial Contaminants Branch

Objective:

Available data indicate that current small system drinking water treatment technology is not always adequate to meet current regulations. The regulations include the current Surface Water Treatment Rule, Disinfection/Disinfection By-Product Rule, and pending Enhanced Surface Water Treatment Rule and Ground Water Disinfection Rule. Thus, EPA initiated research studies to evaluate cost of technology, performance data, reliability for the small system package plants, and amenability to remote monitoring and control. McDowell County Public Service Department, Coalwood, WV was selected as a field evaluation site for remote monitoring and control technology.

The following is a summary overview of treatment technology and of remote monitoring/control system components. The design and implementation criteria and potential long-term benefits of a remote monitoring/control system is also presented.

Test Site Treatment Technology Overview - Packaged UF System

Based on water quality information obtained from the test site, a packaged ultra filtration (UF) system was selected for this site. The main components of the UF system are as follows:

- Three 8" x 40" spiral-wound UF membrane cartridge elements arranged in series and contained in a fiberglass vessel. The UF elements are polymeric spiral-wound type with a nominal molecular weight cut off of 10,000 daltons.
- The package UF system includes a control panel, feed pumps, recirculation pumps, 25-micron bag pre-filter, 30 gallon cleaning tank, a chlorine monitor, electrically actuated control valves, temperature and pressure gauges, and sight rotameters
- The unit is interconnected with Schedule 80 PVC piping. The UF system is designed to produce 10,000 gallons per day treated drinking water.

The packaged UF system was installed on a new cement slab and a 12' by 24' cinder block building constructed by the community to secure and protect the UF system

Monitoring/Control System Design and Implementation Criteria

The design of the system depends upon location, availability of existing electronic hardware for remote communication, types of communication media available at that location, parameters proposed to be monitored, system scalability and desired networking options. Costs vary significantly based on these requirements. Newer Windows-based systems are very user friendly and provide enhanced features including trends, alarms and summary reports. During implementation, it is essential to provide proper training to on-site personnel and ensure that periodic sensor/instrument calibrations are performed for data validation.

For this location, a micro processor-based smart Supervisory Control and Data Acquisition (SCADA) system was selected.



*Coalwood, WV
Treatment Plant
Location.*



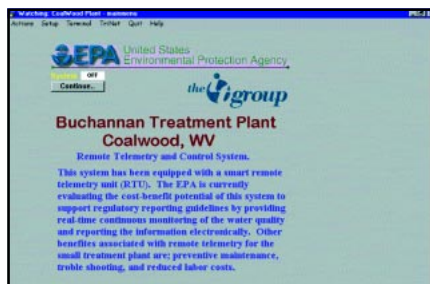
*Ultrafiltration
Treatment System.*

Typical Components of Remote Monitoring/Control System

System Component	Description
Online Sampling/Control Instrumentation	Electronic valves, pumps, switches and monitoring instruments/sensors.
Communication Media	Between main computer and remote monitoring unit using appropriate software via phone, cellular, radio or satellite systems.
Hardware and Software	Main computer (to act as a monitoring/control station). Remote monitoring or SCADA unit used for data collection and/or system control. Software interface to communicate with the hardware.

Remote Monitoring/Control System Benefits:

- Long-term real-time remote monitoring can provide data that can be used to significantly enhance treatment system operation and reduce system downtime.
- Can potentially lead to improved customer satisfaction and improved consumer relations.
- Can potentially be used to satisfy regulatory recordkeeping and reporting requirements.
- Can reduce labor costs (associated with time and travel) for small system operators.
- Provides the capability to instantly alert qualified operators of undesirable water quality and/or other changes in treatment system(s).
- Troubleshooting can be performed remotely, reducing downtime associated with repairs.
- Fully automated treatment systems can identify monitored parameter trends and adjust operating parameters accordingly.
- Can provide an attractive alternative to fixed sampling, operation and maintenance schedules.



Remote Communication Software Interface.



Remote Monitoring/Control Interface.

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