

# Small Package Plant Systems—Research

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



Package Plant Area

in-house research takes place at the U.S. EPA Test and Evaluation (T&E) Facility in Cincinnati, Ohio.

## Background:

Tens-of-thousands of small community and non-community drinking water systems have difficulty complying with the ever increasing number of regulated contaminants. It has been estimated that over 100,000 violations of the Safe Drinking Water Act and Amendments (SDWAA) of 1996 occur annually. Nearly half of these are for Maximum Contamination Level (MCL) violations. There are approximately 50,000 small community systems and 140,000 non-community systems in the United States accounting for over 25 million people. The Disinfection/Disinfection By-Product Rule promulgated in 1996 set new MCLs for all systems serving down to 25 consumers and further burdened the Small System operators. These small systems normally do not have the large pool of trained engineers and scientists to deal with the evaluation and testing of complex equipment or deal with constantly changing treatment standards and needs. Also, there has been little or no systematic evaluations regarding factory-built, skid mounted “Package Plants” in regards to meeting the Surface Water Treatment Rule, Ground Water Disinfection Rule, and Disinfection/Disinfection By-Product Rule.

## Purpose & Goal:

The Water Quality Management Branch (WQMB) Small Systems research group has been coordinating in-house and field-scale research projects. Most state regulators and available data indicate that current small system drinking water treatment technology is not always adequate to meet current regulations. This also includes the current Surface Water Treatment Rule, Disinfection/Disinfection By-Product Rule, and pending Enhanced Surface Water Treatment Rule and Ground Water Disinfection Rule. Conventional treatment technologies require substantial water chemistry experience and known water characteristics to properly provide potable water. For this reason it was not prudent for EPA to simply conduct “paper studies” looking at treatment technology blueprints and operating parameters prior to State approval. EPA also wanted to understand package plant technology that could be poorly designed, operated, and ignored leaving people unknowingly at risk. It is the goal of the WQMB to develop a scientifically justifiable evaluation protocol on small systems technology and performance. 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. This

## Research Objective:

The most significant requirements for small systems are low construction and operating costs, simple operation, adaptability to part-time operations, low maintenance, and no serious residual problems. EPA determined that package plants, point-of-use/point-of-entry (POU/POE) units could be potentially the best solution for many small system crisis. Various package plants and POU/POE devices are purchased, donated, and designed/fabricated and then installed at the U.S.

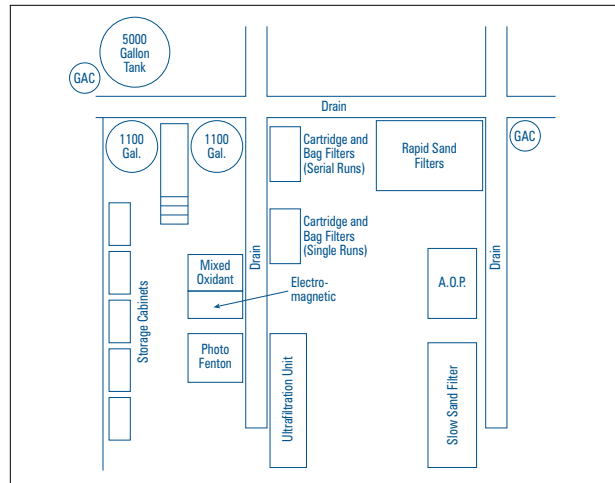
EPA T&E Facility in Cincinnati, Ohio. The research treatment technology objectives evaluate and focus on the following evaluation parameters:

- Removal of precursor material and debris
- Disinfectant dose and efficiency
- By-product formation and mineralization
- Hybrid package plant design, development, and evaluation
- Remote telemetry for monitoring, control, and data acquisition
- Technology Cost
- Performance and Reliability

## Package Plants and Point-of-Use/Point-of-Entry Units:

The U.S. EPA is currently operating and evaluating several small system package plants and point-of-use/point-of-entry (POU/POE) units. Tests and experiments are designed to sufficiently challenge the treatment technology to evaluate performance and reliability. The following are a list of the technologies in operation at the T&E Facility.

1. Filtration Systems
  - a. Slow Sand
  - b. Rapid Sand
  - c. Ultrafiltration
  - d. Bag
  - e. Cartridge
2. Disinfection Systems
  - a. Ozone
  - b. Ultra Violet Light
  - c. Hydrogen Peroxide



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- d. Photo-Fenton and UV/H<sub>2</sub>O<sub>2</sub>
- e. Electrochemical Oxidant Generator

The EPA also conducts *Cryptosporidium* challenges and viability tests as needed of the various technologies after completing a thorough investigation of the operation and maintenance of the technology.

## Remote Telemetry and Control

The U.S. EPA is currently evaluating remote telemetry as an option for monitoring and controlling maintenance and operation and thus water quality of various small drinking water treatment package plants. Various package plants at the facility and in the field in rural West Virginia are equipped with telemetry.

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