This paper was published in the July 2008 issue of DOWRA News, the newsletter of the Delaware Onsite Wastewater Recycling Association.

Public Confidence in Onsite Systems Requires Field Testing and Field Standards for Performance

Nicholas Noble[1]

In May, Delaware approved Orenco Systems' AdvanTex® Treatment System for residential secondary wastewater treatment, joining the 40 other states where AdvanTex systems have been approved. Like a number of other states, Delaware based its approval on NSF Standard 40, which sets out requirements for evaluation of advanced treatment systems.

In 1970, when Standard 40 was developed, manufacturers, regulators and other industry stakeholders were chiefly concerned with preventing wastewater from surfacing onto the ground. They decided that a test-center protocol (bench test) was adequate for evaluating the onsite treatment systems that were available at the time. However, the needs of yesteryear are not the needs of today.

Today, jurisdictions must protect surface and ground water resources, limit nutrient inputs to sensitive ecosystems, and contemplate the effects of pharmaceuticals and pathogens, while dealing with demands from elected officials and wastewater system manufacturers. Today's regulator needs to be armed with data that can, with some level of confidence, indicate how a system will perform in the field, over a long period of time.

A bench test can be a useful tool for comparing performance of treatment technologies in a controlled setting and should be required of all treatment systems new to the market place. However, it has many limitations in assessing long-term performance under variable conditions. The most recent attempt to address the evolving needs of the industry is NSF Standard 245 for nutrient reduction. Many of the same limitations of Standard 40 are also inherent to Standard 245. Here are a few of the most significant ones:

- Bench tests often use a nontypical – and weaker – waste stream. For example, NSF/ANSI Standard 40 allows influent that is one-third the concentration of typical residential wastewater (Crites and Tchobanoglous, *Small and Decentralized Wastewater Management Systems*, Table 4-14, page 181).
- Bench tests also use "stress tests" that don't realistically simulate real stresses. For example, "wash-day stress" samples are not collected until 24-48 hours after the stress period, so the hydraulic loading is no higher than normal! These kinds of stress tests cannot be relied on to provide useful information about how a system will perform under real stress conditions.
- Bench tests are also performed under unrealistic temperature conditions. Under the guidelines for NSF Standard 245, for example, sampling is discontinued if the ambient

[1] Nicholas Noble is a Government Relations Representative with Orenco Systems®, Inc.

temperature drops below 10 degrees C or 50 degrees F. This does not adequately provide jurisdictions in cold climates with the data they need to approve or not approve systems. Moreover, test centers are located in different geographic regions of the country with different climates. Since temperature affects a system's ability to nitrify, performance results can be skewed, depending on the location.

- Bench test durations are too short. For example, NSF/ANSI Standard 40 and 245 are only six-month tests. Performance issues may not, and likely will not, become apparent in the first six months of operation.

In summary, bench tests evaluate systems under conditions that are not similar to what the system would experience in the real world. They are not capable of reliably gauging how a product will perform in multiple installations with highly variable, real-world conditions. To achieve statistical reliability, it is far more informative to evaluate performance based on testing a larger number of actual residential installations.

As evidence, studies show that many advanced treatment systems that have passed test center testing are failing in the field (Roeder and Brookman, "Performance of Aerobic Treatment Units," *Journal of Environmental Health*, 2006; Heufelder et al., "Performance of Innovative Alternative Onsite Septic Systems for the Removal of Nitrogen," Barnstable County Report, 2007). Some of these systems rely on finicky treatment technologies better suited to a treatment plant with round-the-clock operators than to a residential household. Others have poor equipment – moving parts that wear out or fragile parts that break. Still others fail because of inadequate maintenance, lack of real-time monitoring, or lack of incentive for homeowners to maintain service contracts.

Because test center testing doesn't evaluate these factors, states constantly approve advanced treatment systems that are bound to fail in use. These failures frustrate homeowners, endanger public health, and give the onsite treatment industry a black eye.

If the public loses confidence in onsite wastewater treatment, governments will start making unwise and expensive decisions, such as imposing construction moratoria and mandating centralized sewer systems that can be inefficient for the application. So the answer is simple: 1) require field testing in addition to test center testing, and 2) enforce field performance.

Decision-makers and stakeholders should formulate a field-testing protocol, which jurisdictions could adapt to their own requirements, taking local soils and climate into consideration. This would allow memoranda of understanding between jurisdictions that have similar soils, climates, and regulatory requirements, eliminating redundant testing. Qualified local laboratories would carry out sample analyses, reducing overall program costs. These costs would be borne by the manufacturer whose product is being tested.

To enforce field performance, local jurisdictions should adopt the following requirements:

- At a minimum, require sampling of turbidity, pH, and dissolved oxygen during scheduled service visits, as performance indicators. If one of these samples is outside a mandated threshold, further sampling should be required. If the problem persists, laboratory analysis, at the manufacturer's expense, should be required, as well as repair or alteration to the system to ensure compliance.

- Require mandatory random field audits to maintain approval status. At the manufacturer's expense, jurisdictions should audit some percentage of installed systems annually. Jurisdictions should also require a certain percentage of systems to be in compliance with the effluent quality standard under which they were approved. If manufacturers are out of compliance, their approval status should be suspended until further evaluations, at manufacturer's expense, can be conducted.
- Require online record-keeping so that records of service visits, sampling results, and the status of O&M contracts are available for regulators to view at any time.

A robust field test standard would allow governments and homeowners to feel confident about relying on advanced onsite treatment. Orenco and other manufacturers will benefit greatly from this, and we look forward to cooperating with other stakeholders on such an initiative. We hope that DOWRA and other state wastewater organizations will recognize the value of field testing and take a leadership role in developing this new approach.