

Massachusetts Alternative Septic System Test Center Technology Fact Sheet -Interim Findings

MicroFAST®
Model 0.5

The Massachusetts Alternative Septic System Test Center is a collaborative project of the Buzzards Bay Project National Estuary Program, Massachusetts Office of Coastal Zone Management, Massachusetts Department of Environmental Protection, Barnstable County Department of Health and the Environment, and UMass Dartmouth School for Marine Science and Technology. The Test Center was established in recognition of the need in Massachusetts for cost-effective wastewater disposal systems suitable for sites with limited space, poor soils, high groundwater elevations, or where advanced pollutant removal is required. Its mission is twofold. First, to evaluate the performance and operation costs of new and innovative wastewater disposal technologies in a carefully controlled and unbiased manner, and provide this information to regulators and consumers. Second, to assist vendors in getting their technologies more quickly approved for use in Massachusetts, and at a lesser cost.

Technology Name: MicroFAST®- residential unit, Model 0.5

Technology Type: Fixed Activated Sludge Treatment System

Manufacturer: Bio-Microbics Inc.
8450 Cole Parkway
Shawnee, KS 66227
913-422-0707 or 1-800-753-3278 (FAST)

Contact: Robert J. Rebori, President

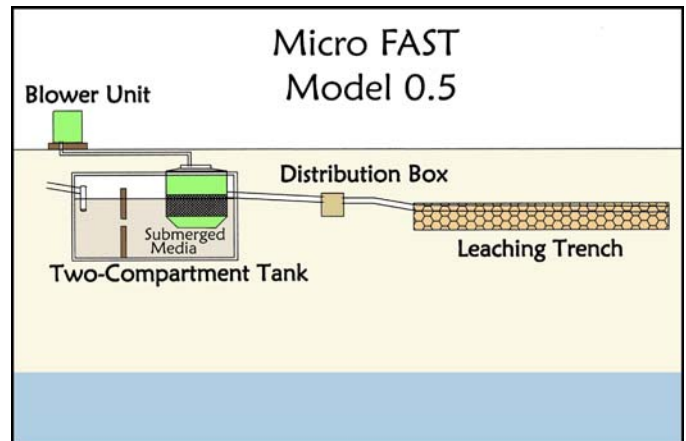
Company Website: www.biomicrobics.com

Performance & Permitting info at MA DEP and BCHED Websites:
www.state.ma.us/dep/brp/www/t5pubs.htm#it
www.barnstablecountyhealth.org/AlternativeWebpage/

Testing Objectives: Demonstrate N removal for use in N-sensitive watersheds. Obtain approval for reductions in SAS size or high groundwater elevation separation distance.

Testing Period: Testing began 5/99 and is ongoing. Results shown for 7/99 to 7/00.

Test Loadings: System loading was 330 gpd, (in 15 doses AM/PM), SAS was 0.74 gallons per sq. ft per day.



Generalized schematic of the MicroFAST Model 0.5.



MicroFAST during construction.



MicroFAST after installation.

Siting Considerations and Installation Notes

MicroFAST system component installation is similar to a standard Title 5 system. Installers should have training and oversight from the manufacturer. Above ground components include a blower with housing (approximately 2' x 2' x 2'), and an electrical control panel with an audio and visual alarm. Designer should consider situating the blower to minimize possibility for noise disturbance. Alternately, the blower can be installed in a belowground vault. Alarm and panel box should be accessible for inspection and maintenance.

Actual and Manufacturer's Estimated Costs (3-bedroom home) and Labor Non-Title 5 Components: \$2,995 suggested retail, this model (claim).

Components + Installation: \$3,500 more than conventional (claim).

Electrical: \$337 per year actual (local rates, annual kWh= 3,273).

O&M: Quarterly inspection of motors, air flow, effluent and sludge. A service contract is required in Massachusetts (Approximately \$400 per year minimum, but varies). Septic tank pumping averages \$60 per year.

Other Costs: Quarterly effluent quality monitoring is required for some permits (\$300 or more annually). Design and permitting costs vary.

Replacement: Blowers (\$300) have a 2-year warranty by Bio-Microbics, extended 10 year warranty available, UL-CE-CSA certified electrical parts. No corrodible parts claimed to be in the unit.

Theory of Operation

The MicroFAST consists of a modified two-compartment 1500-gallon septic tank, where the first compartment of 500-gallon capacity is used for primary settling of the household wastewater. The second compartment contains the submerged plastic media around which air, supplied by a blower, is diffused. This technology uses both attached and suspended growth in the second chamber to achieve the nitrification of wastewater (i.e., conversion of ammonium to nitrate) entering from the primary settling chamber. The recycling of a portion of the nitrified effluent back to the anoxic settling chamber makes possible the denitrification step of the process (i.e., conversion of nitrate to nitrogen gas).

Permitting and Use in Massachusetts (as of June 2001)

Certification for General Use: MicroFAST is Certified for General Use and can be installed wherever a conventional Title 5 system can be installed. **Remedial Use Approval:** MicroFAST has approval in remedial situations where a system is failed, failing or nonconforming where relief

is sought to construct an SAS within two feet (or three feet for percolation rates exceeding two minutes per inch) of the high groundwater elevation, or to construct an SAS reduced in size by up to 50 percent or in areas where at least 2 feet of suitable material is available beneath the SAS. Model 0.5 is approved for up to 440 gpd or four bedrooms. **Provisional Use Approval:** MicroFAST is approved for use in nitrogen sensitive areas for new construction for systems designed for less than 2000 gpd. For residential systems up to 660 gpd per acre, for nonresidential systems up to 550 gpd per acre. Model 0.5 is only approved for up to 330 gpd or three bedrooms.

Note: In this study, the model tested employed a 1/3 hp blower that operated continuously. The manufacturer is currently testing a unit with the blower with an on-off cycle to reduce electrical consumption. These results will be reported in the 2-year performance summary. The manufacturer has other models available, and their performance may not be identical to the results reported here.

Operation and Maintenance Issues

[This information will be included in the final report findings.]

Explanation of the Graphs

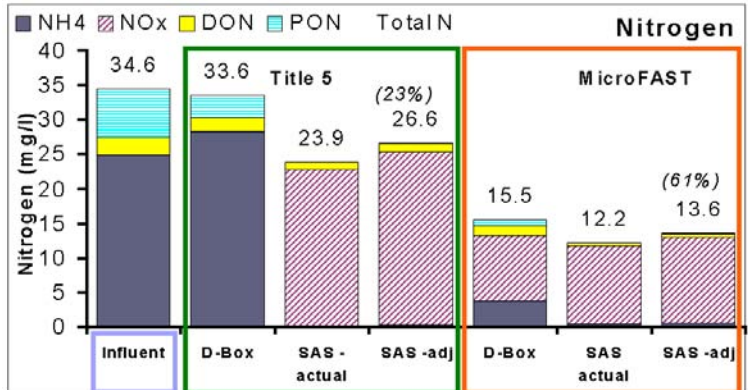
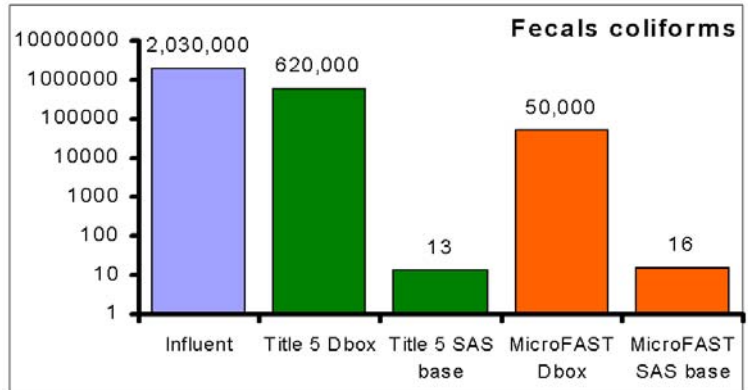
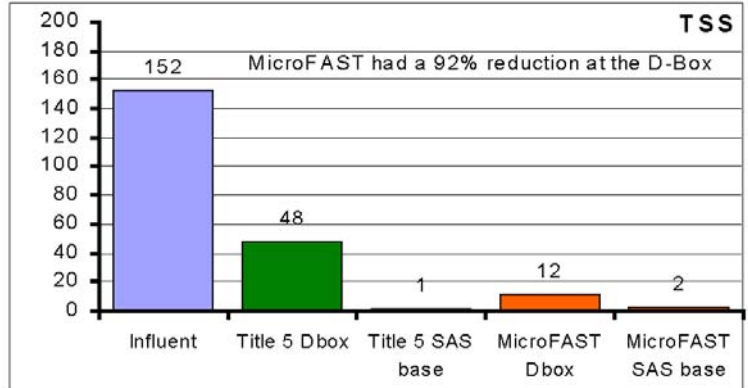
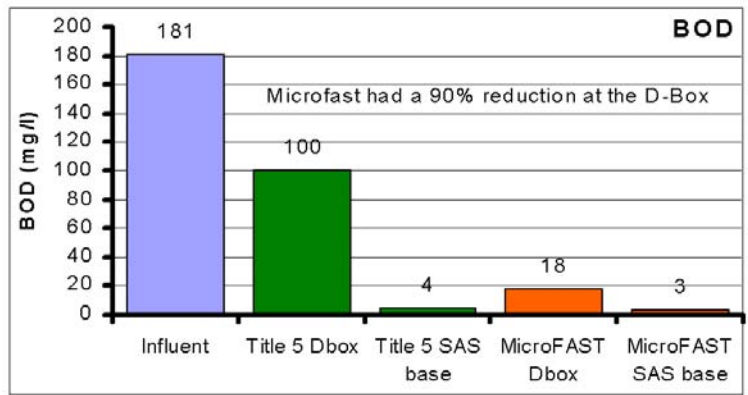
The graphs to the right show the mean of three replicates for each parameter over the testing period, compared to Title 5 performance and influent measured in parallel samples during the same period. Fecal coliform results are expressed as geometric means. In the nitrogen graph, NH4 represents ammonia, NOx represents nitrate + nitrite, DON is dissolved organic nitrogen, and PON is particulate organic nitrogen. Total nitrogen is the sum of these four parameters.

Soil absorption system samples include wastewater disposal system effluent and precipitation. The recharge of precipitation to groundwater is estimated to be between 8 and 16 percent of effluent discharge based on local rainfall, estimated groundwater recharge rates, SAS size and dosage rates. For all technologies, an interim dilution rate of 10 percent was employed based on precipitation and theoretical and measured dosage rates at the Test Center. The results for nitrogen removal include this estimated dilution factor (note bars labeled "SAS adj.") Results shown for biological oxygen demand (BOD), total suspended solids (TSS), and fecal coliforms were not adjusted for dilution by precipitation, because the adjustment was negligible in evaluating overall performance. This interim approach, is being compared to specific conductivity, chlorides, and bromide tracer to better refine this estimate, and develop system specific dilution factors. **Thus, the "SAS adjusted" values reported here for nitrogen discharge to groundwater should be considered preliminary.**

Summary of Interim Findings

This technology exceeds secondary treatment (i.e., TSS and BOD less than or equal to 30 mg per liter) to allow for the reduced separation to groundwater, or reduced soil absorption system size. BOD and TSS concentrations at the base of the SAS for this technology and the Title 5 system are similar. This technology discharged below the regulatory standard of 19 mg/l TN to allow for use in nitrogen sensitive areas. At the SAS base, this system was estimated to remove 60 percent of nitrogen inputs compared to 22 percent for a Title 5 system during the same period. This system was not tested at the Test Center for seasonal or intermittent use or for high hydraulic loading conditions.

The Technical Review Committee does not recommend adoption of nitrogen loading ratings for this technology until the two-year testing period is complete. Differences in nitrogen removal among technologies tested are not necessarily significant. Nitrogen removal performance may vary with soil types and other site differences. The Buzzards Bay Project will recommend nitrogen loading rates for this technology for planning purposes and watershed loading evaluations at a later date.



Funding for the Massachusetts Septic System Test Center was provided by the US EPA, through Cooperative Agreements x991657 and x981007, the Massachusetts Department of Environmental Protection (319-99-01, 319-00-02), Massachusetts Office of Coastal Zone Management, Massachusetts Environmental Trust, Barnstable County Department of Health and Environment, UMass Dartmouth SMAST, and other organizations. Other information on this initiative can be found at www.buzzardsbay.org. These fact sheets were reviewed by a multi-agency work group. The views or opinions expressed are not necessarily those of the Commonwealth of Massachusetts, the US EPA, or any of the funding organizations and agencies. The information presented here represents the technical findings of the Massachusetts Septic System Test Center after at least one year of system testing. Manufacturer claims of cost and longevity, warranties, or stated costs have not been verified. Modifications to system designs from those tested, or installation under other soil or climate conditions may result in different system performance. This fact sheet was prepared and printed by the Buzzards Bay Project.



Commonwealth of Massachusetts
 Jane Swift, Governor
 Executive Office of Environmental Affairs
 Bob Durand, Secretary
Buzzards Bay Project
 Dr. Joe Costa, Executive Director
 2870 Cranberry Highway East Wareham, MA 02538
 508.291.3625

