New Standards for Wastewater Recycle and Reuse Treatment Systems for Non-Potable Applications

California Onsite Wastewater Association

NSF International
November 15, 2011

Outline

- **NSF International**
- **Consensus Standards Development**
- **Need for Onsite Reuse Treatment Systems**
- **Wastewater Treatment System Standards**
- **Drinking Water Treatment System Standards**
- **Water Reuse Treatment System Standards**
- **EPA ETV Program**

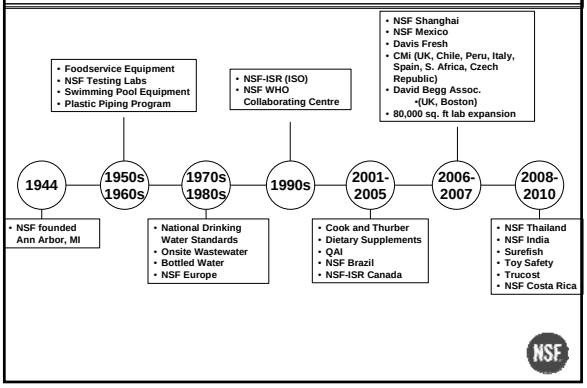
NSF Is A Global Leader In Public Health And Safety

- **Independent, Not-for-profit organization**
- **Developer of over 72 national consensus standards**
- **Steadfast ties with key associations and govt. agencies**
- **Service provider to over 12,000 companies in 100 countries**

INDEPENDENTLY CERTIFIED NSF SYSTEM

Core Public Health Activities

NSF Chronology



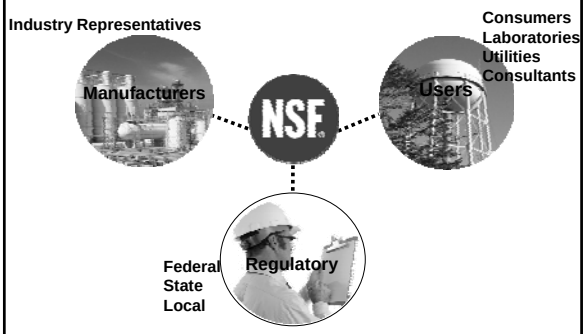
NSF Collaborations

- NSF is a World Health Organization Collaborating Centre for:
  - Food Safety
  - Water Safety
    - Drinking Water Quality Guidelines
    - Recreational Water Safety Guidelines
  - Indoor Environment
- Work closely with International, Federal State and Local Regulators:
  - FDA
  - USDA
  - EPA
  - U.S. Government/Legislature
  - And many more…

USDA

FDA

NSF Standards Development Process



Universal Acceptance

- Manufacturers
- Distributors
- Retailers
- Regulators
- Code Officials
- Engineers
- Architects
- Consumers

What are the Water Supply Challenges of Today?

- **Current centralized infrastructure.**
  - Aging
  - Undersized
  - Expensive to repair and expand
  - Designed around one high level of treatment for drinking water quality
- **Available sources of water dwindling.**
- **Quality of available sources declining.**

What are the Barriers to Reuse?

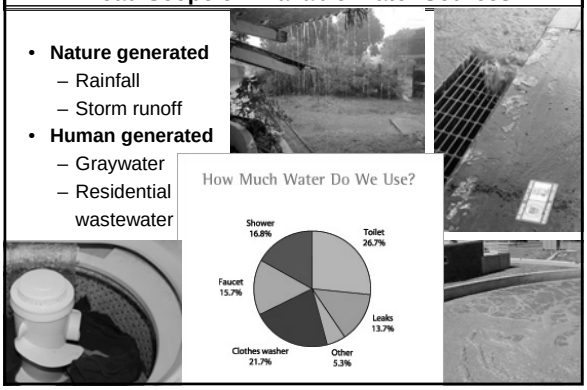
- **Consumer perception with use of lower quality water.**
- **Inexpensive cost of potable water for many regions.**
- **Lack of residential plumbing infrastructure to accommodate partially treated water.**
- **Lack of enabling regulatory codes.**
- **Lack of product evaluation standards.**

What are the Opportunities?

- **Reuse of Water Onsite**
  - Water already available onsite; no more cost or energy needed to transport water.
  - Large percentage has modest level of contamination.
  - Treated onsite to meet final application needs.
    - Non-potable uses
    - Indoor or outdoor uses

Broad Scope of Available Water Sources

- **Nature generated**
  - Rainfall
  - Storm runoff
- **Human generated**
  - Graywater
  - Residential wastewater



Broad Scope of Non-potable Reuse Applications

- **Use of treated effluent:**
  - Irrigation
  - Toilet/urinal flushing
  - Vehicle washing
  - Fire protection
  - Laundry
  - Fountains
  - Dust control
  - Construction

Leverage Existing Standards and Technologies

Onsite Wastewater Treatment Systems

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Onsite Reuse Treatment Systems

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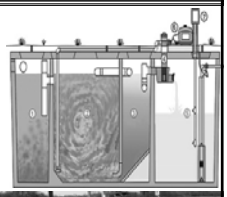
Onsite Drinking Water Treatment Systems

Current NSF/ANSI Onsite Wastewater Standards

- **Standard 41 (1978): *Non-Liquid Saturated Treatment Systems*** *(compost toilets)*
- **Standard 46 (1997): *Evaluation of Components and Devices Used in Wastewater Treatment Systems***
  - Septic tank filters
  - Pumps
  - Disinfection devices

Current NSF/ANSI Onsite Wastewater Standards

- **Standard 40 (1970): Complete residential treatment system with a capacity of 400 to 1500 gpd; $\underline{CBOD_5}$ and TSS reduction.**
- **Standard 245 (2007): Complete residential treatment system with a capacity of 400 to 1500 gpd; Nitrogen reduction.**



NSF/ANSI Standard 40 and 245

•Infiltration and exfiltration resistance.

•Noise level; 60 dbA at 6m.

•Mechanical components; no periodic maintenance or adjustment.

•Electrical compliance.

•Ground level access ports for routine maintenance, sampling and examination.

•Failure sensing and signaling; audible and visual, detection of malfunctions.

•Manuals.

NSF/ANSI Standard 40 and 245

- **Performance tested, installed per manufactures instructions.**
- **No Service or Maintenance for 6 months.**
- **All test data reported.**
- **Design loaded, 6-8am, 35%**
  - **11am -2pm, 25%**
  - **5-8pm, 40%**
- **24 hour composite samples**
- **Standard 40, Influent & Effluent, 5 days per week, 118 sample points.**
- **Standard 245, Influent & Effluent, 3 days per week, 70 sample points.**

NSF/ANSI Standard 40 and 245

- **Maximum 3 week start up period.**
- **26 week Minimum Evaluation Period.**

16 weeks of design loading

7.5 weeks of stress loading

2.5 weeks of design loading

- **Four stress sequences: wash-day, working-parent, power/equipment failure and vacation**

Influent Wastewater Characteristics

BOD_5	100 mg/L - 300 mg/L
TSS	100 mg/L - 350 mg/L
TKN	30 mg/L – 70 mg/L (as N)
Alkalinity	>175 mg/L
Temperature	10 – 30 C
	(sampling suspended below 10 C)
pH	6.5 – 9

Effluent Quality Criteria

•$CBOD_5$:	25 mg/L 30-day average 40 mg/L 7-day average
•TSS:	30 mg/L 30-day average 45 mg/L 7-day average
•Nitrogen:	minimum 50% reduction
•pH:	6.0 – 9.0

New Product Standards

NSF 350 *Onsite residential and commercial reuse treatment systems*

and

NSF 350-1 *Onsite residential and commercial graywater treatment systems for subsurface discharge*

NSF Committee

- **Initiated in 2007**
- **Members:**
  - Drinking water and wastewater treatment industry
  - Plumbing component manufacturers
  - Public health officials (EPA, state, local)
  - Other interested parties (NRDC, AWE, several trade associations)

New Product Standards

NSF 350 *Onsite residential and commercial reuse treatment systems*

Scope: Standard 350

- **Residential and commercial treatment systems**
- **Sources; graywater and combined wastewater**
  - Graywater: laundry and bathing, excluding toilet and kitchen.
  - Combined: blackwater and graywater.
- **Non-potable effluent uses**
  - Indoor; toilet and urinal flushing.
  - Outdoor; surface and subsurface irrigation.

System Sizes: Standard 350

- **Residential wastewater; Up to 1500 gpd**
  - Laboratory testing with actual wastewater.
- **Graywater; Up to 1500 gpd**
  - Laboratory testing with synthetic wastewater; bathing, laundry, or both
  - Exception; commercial laundry water
- **Systems exceeding 1500 gpd, and commercial laundry**
  - Field evaluation using actual building wastewater.

Commercial Facilities

"Businesses such as lodging establishments, business parks and campuses, shopping facilities, places of public assembly where no manufacturing, assembly, industrial or food processing is involved, and laundering facilities for hospitals, hotels, rental uniforms, and other facilities likely to handle high amounts of soiling or high strength commercial cleaners."

Overall Test Requirements: Standard 350

- **Requirements for:**
  - Water tightness
  - Noise levels
  - Access ports
  - Failure sensing and signaling
    - Mechanical and electrical
    - High water
  - Bypass protection; malfunction, overflow
  - Product literature; owner, installation, operation, troubleshooting and repair manuals
  - Performance (effluent quality) evaluation

Performance Evaluation: Standard 350

- **Residential wastewater treatment systems; tested with actual wastewater**
  - BOD_5: 100 mg/L - 300 mg/L
  - TSS: 100 mg/L - 350 mg/L

Performance Evaluation: Standard 350

- **Graywater treatment systems; tested with synthetic challenge water:**
  - 52% Laundry; liquid detergent and softener, dirt.
  - 46% Bathing; shampoo, conditioner, deodorant, toothpaste, soap, cleaner.
  - 2% as secondary treated residential wastewater; source of total coliforms and E. coli

Graywater Influent Test Water: Standard 350

Parameter	Required range
TSS	80-160 mg/L
$CBOD_5$	130-180 mg/L
Temperature	25-35°C
pH	6.5-8.0
Turbidity	50-100 NTU
Total phosphorous	1.0-3.0 mg/L
Total nitrogen	3.0-5.0 mg/L
Total coliforms	10^3-10^4 CFU/100mL
E. coli	10^2-10^3 CFU/100mL

Product Test Conditions: Standard 350

- **Installed per manufacturer's instructions.**
- **No restriction for seasons.**
- **Operated in accordance with manufacturer's instruction.**
- **Minimum six month evaluation.**
- **No service or maintenance during entire test.**
- **All test data reported.**
- **No allowance for discard of any data, except if test facility fails to provide an acceptable test.**

Graywater Dosing Schedule: Standard 350

System design		Design loading				Stress tests				
	First 16 weeks	First 20 weeks	Last 4 weeks	Last 3.5 weeks	Last 2.5 weeks	Wash-day surge	Power/ equipment failure	Vacation	Water Efficiency	Cleaning solution
R–Bathing only	×			x			×	×	x	
R–Laundry only	×				x	×	×	×	x	
R– Combined	×				x	×	×	×	x	
C–Bathing only		×	×				×	×		
C–Laundry only		×	×				×	×		
C– Combined		×	×				×	×		×

Parameter	Sample type	Sample location	
		Raw influent	Treated effluent
BOD_5	24 h composite	X	
$CBOD_5$	24 h composite		X
Total suspended solids	24 h composite	X	X
pH	Grab	X	X
Temperature (°C)	Grab	X	
E. coli	Grab	X	X
Turbidity	24 h composite	X	X
TKN	24 h composite	X	
NO_2/NO_3	24 h composite	X	
Total phosphorous	24 h composite	X	
COD	24 h composite	X	
Total coliforms	Grab	X	
TOC	24 h composite	X	
Surfactants	24 h composite	X	
Fats, oil and grease	24 h composite	X	
Iron	24 h composite	X	

Effluent Criteria: Standard 350

Parameter	Class R	Class C
$CBOD_5$	10 mg/L (25)	10 mg/L (25)
TSS	10 mg/L (30)	10 mg/L (30)
Turbidity	5 NTU (10)	2 NTU (5)
E. coli	14 MPN/100 mL (240)	2.2 MPN/100 mL (200)
pH	6.0 – 9.0	6.0 – 9.0
Chlorine	0.5 - 2.5 mg/L	0.5 - 2.5 mg/L

No single sample shall exceed (value)

New Product Standards

NSF 350-1 *Onsite residential and commercial graywater treatment systems for subsurface discharge*

Scope: Standard 350-1

- **Residential and commercial treatment systems**
- **Source; graywater only**
  - Graywater: laundry and bathing, excluding toilet and kitchen.
- **Non-potable effluent use**
  - Outdoor; subsurface discharge.

System Sizes: Standard 350-1

- **Graywater; Up to 1500 gpd**
  - Laboratory testing with synthetic wastewater; bathing, laundry, or both
  - Exception; commercial laundry water
- **Systems exceeding 1500 gpd, and commercial laundry**
  - Field evaluation using actual building graywater.

Test Procedure: Standard 350-1

- **Identical to Standard 350**
  - Loading
  - Duration
  - Graywater characteristics
  - Sampling

Effluent Criteria: Standard 350-1

Parameter	Criteria
$CBOD_5$	25 mg/L
TSS	30 mg/L

NSF Published Test Report

A Final Report of the <u>complete test</u> is published with the following:

- **All data collected in accordance with the testing and evaluations specified within this Standard;**
  - Shows actual system performance
- **Copy of the current edition of the Owner's Manual; and process description and detailed dimensioned drawings of the tested system.**

A <u>supplemental report</u> shall be prepared for any system(s) approved under the performance classification option, including process description(s) and dimensioned drawing(s).

Approval of Alternate Sizes

- **Systems of similar design and specifications varying only in size proportionality and rated treatment capacity.**
- **Testing of one system can qualify a series of systems.**
  - Residential; (1) below 400 gpd and (2) 400 to 1500 gpd
  - Graywater; (1) below 400 gpd and (2) 400 to 1500 gpd
  - Commercial; 1500 gpd and larger
    - Wastewater characteristics
    - Loading conditions

Certification

- **Complete evaluation of treatment system(s) in accordance with the Standard.**
  - Requalification every seven years
  - Review and approval of all system modifications
- **Audit of the manufacturing facility and service providers**
  - Initial and annual
- **Enforcement action for non-compliance**
- **Complaint investigation policies**

Certified to NSF/ANSI Standard 350

NSF International

OFFICIAL LISTING

NSF International Certifies that the products appearing on this Listing conform to the requirements of NSF/ANSI Standard 350 - Onsite Residential and Commercial Water Reuse Treatment Systems

This is the Official Listing recorded on August 15, 2011.

ABC Company
1234 Main Street
Ann Arbor, MI 48105
800-888-8888
734-888-8888

Facility: Ann Arbor, MI

Model Number	Rated Capacity Gallons/Day	Classification	Type
Model 0500	500	Class R	Residential Wastewater
Model 0750	750	Class R	Residential Wastewater
Model 1000	1000	Class R	Residential Wastewater
Model 1500	1500	Class R	Residential Wastewater

NOTE: Class C - Multi-family residential units and commercial facilities
Class R - Single family residential dwellings

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OFFICIAL LISTING

NSF International Certifies that the products appearing on this Listing conform to the requirements of NSF/ANSI Standard 350 - Onsite Residential and Commercial Water Reuse Treatment Systems

This is the Official Listing recorded on August 15, 2011.

XYZ Company
6789 Main Street
Ann Arbor, MI 48105
800-999-9999
734-999-9999

Facility: Ann Arbor, MI

Model Number	Rated Capacity Gallons/Day	Classification	Type
Model 2500[1]	2,500	Class C	Graywater
Model 5000[1]	5,000	Class C	Graywater
Model 10000[1]	10,000	Class C	Graywater

[1] System performance tested and evaluated at a residential apartment building.
NOTE: Class C - Multi-family residential units and commercial facilities
Class R - Single family residential dwellings

ETV Water Quality Protection Center

Selected Technology Areas

- **Decentralized Wastewater Treatment**
  - Residential nutrient reduction
  - Wastewater treatment technologies
  - High strength wastewater (under development)
- **Watershed Protection**
  - Mercury amalgam separators
  - In-drain treatment technologies
- **Wet Weather Flows**
  - Stormwater treatment technologies

NSF International

ETV

ETV Program Goal

- **To verify the environmental performance characteristics of *commercial-ready technologies* through the evaluation of *objective and quality assured data*, so that potential purchasers and permitters are provided with an *independent and credible assessment* of what they are buying and permitting.**

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ETV

ETV Program Benifits

- **Assist entrance into market, technology selection and permitting by:**
  - technically sound, peer reviewed test protocols
  - objective, standardized testing
  - EPA reviewed, third-party test results
  - public availability of test results
- **Reduce financial risks**
- **Facilitate permit writing and authorization**
- **Verification Statement**
  - 3 to 5 page summary
  - For users, consultants, regulators, etc.
  - Signed by USEPA and NSF
- **Verification Report**
  - Testing protocol description
  - Technology description
  - Complete set of data

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ETV

Certification vs. Verification

	Certification	Verification
Standardized Method of Test	Yes	Yes
Independent Performance Evaluation	Yes	Yes
Report Preparation of Test Results	Yes	Yes
Broad Distribution of Test Report	Yes/No	Yes
Pass/Fail Criteria	Yes	No
Audit of Manufacturing Facilities	Yes	No
Periodic Retesting	Yes	No
Mandatory Review of Product Changes	Yes	No
Use of NSF Mark	Yes	No

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ETV

Summary

- **New NSF Standards will provide the proper testing and criteria to enable recognition and acceptance of reuse treatment technologies.**
- **Standards are one piece of a series of steps necessary to enable full use of reuse technologies, but a critical step in creating product safety and public health protection.**

Thank You for Your Participation

Live safer.™

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