Analyzing Wastewater Treatment Systems Serving Residential and Commercial Facilities for Hydraulic and High Strength Loading Training Program

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Overview

- Problems concerning high strength wastewater
- Training Format
- Training Program Implementation and Development
- Pilot Trainings
- Training Results

Why was the Program Implemented?

Onsite Wastewater Treatment Systems (OWTS) have been improperly loaded with wastewater hydraulic and organic constituents that exceed their design and have caused a less than optimal performance

What is Causing Decreased Performance

- Variations among OWTS system performance
  - Changes in Flow
  - Different concentrations of organic contaminants (High Strength Wastewater)
  - Commercial or Institutional vs. Most Residential

Wastewater Loading

- Wastewater quantity
  - Hydraulic loading
  - Residential 100-150 gallons per bedroom
- Wastewater quality
  - Organic loading
  - Residential < 300 mg/L BOD_5
  - Oxygen demand
- Residential and commercial facilities

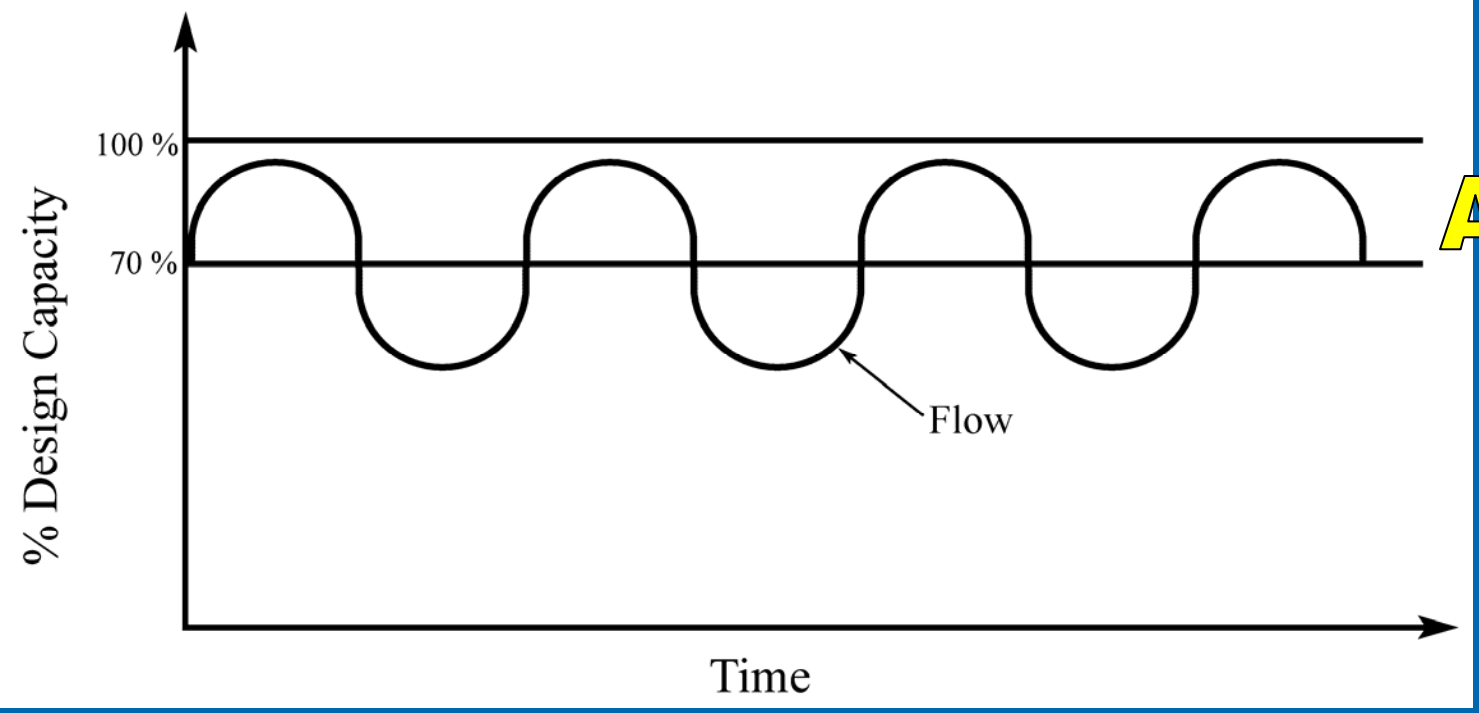
Wastewater Quantity

Types of Flow

- Residential
- Commercial

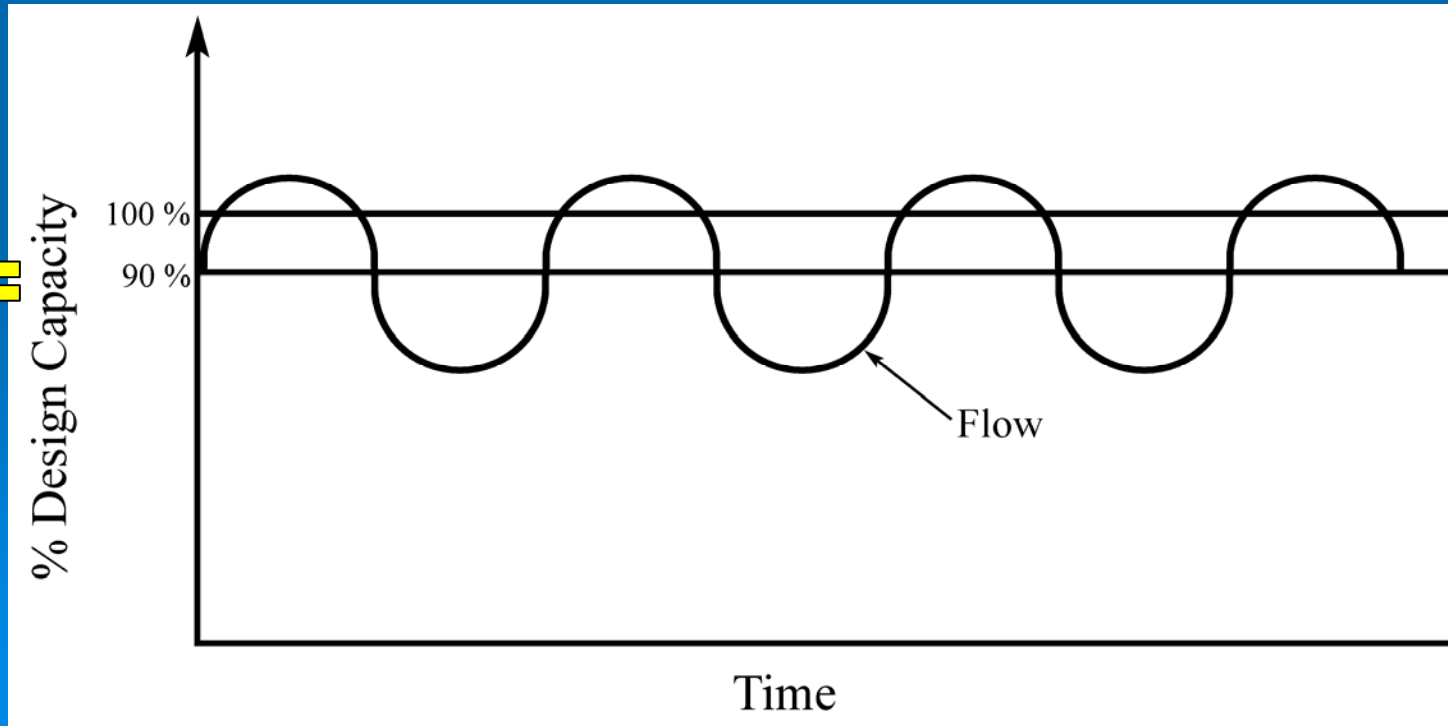
- Design
- Daily Flow

- Average
- Surge
- Peak
- Seasonal



Average = 70% Design

Average = 90% Design



Commercial Wastewater

- Flow - Peaks
- Strength
  - Usually greater than residential
  - Operation based
    - Food preparation
    - Restrooms
    - Laundry

What Needs to be Done

- OWTS serving areas that generate a higher strength waste must be designed as high strength systems.

- Collaboration between designers and operators for optimal performance must consider the:
  - Wastewater source
  - Treatment capability of technologies
  - Long-term operational and maintenance needs

Training Program

- Analyzing Wastewater Treatment Systems serving Residential and Commercial Facilities for Hydraulic and High Strength Loading Course
- Training Manual – describes WWTS, hydraulic loading, organic loading, facility evaluation forms, sustainability concepts
- Presentation materials – presentations with speaker notes
- Instructors Guide – describes the materials, homework, evaluation instrument and philosophy.

Pilot Trainings

- Participants
  - Health/EPA
  - Designers
  - Installers
  - Maintenance Providers

- Locations
  - Rhode Island, October 2006
  - Minnesota, May 2007
  - Illinois, June 2007

Training Evaluation

- Retrospective pre-post test given to participants
- Understanding was evaluated on a 1-4 scale
- Percent knowledge gain was calculated based on level of understanding prior to and following the course

Survey Questions and Results

- Understanding of wastewater constituents.
  - 32% Knowledge gain
- Understanding of hydraulic and organic loading to treatment systems.
  - 49% Knowledge gain
- Understanding of organic loading to commercial wastewater treatment systems.
  - 61% Knowledge gain

Survey Questions and Results

- Understanding of organic loading rate to soil treatment areas
  - 37% Knowledge gain
- Understanding of how to evaluate treatment train components to predict effluent quality
  - 40% Knowledge gain

Survey Questions and Results

- Understanding of how residential management practices impact organic loading
  - 20% Knowledge gain
- Understanding of how microscopic analysis assists in evaluating healthy microbial treatment conditions.
  - 73% Knowledge gain

Survey Questions and Results

- Understanding of how to incorporate flow equalization into treatment trains
  - 29% Knowledge gain
- Understanding of how to analyze commercial wastewater treatment systems
  - 67% Knowledge gain

Survey Questions and Results

- Understanding of how to evaluate commercial management practices for determining wastewater hydraulic and organic loading rates
  - 78% Knowledge Gain
- Understanding of sampling practices for monitoring wastewater treatment systems
  - 32% Knowledge Gain

Willingness to adopt

Question	Not	?	May be	Yes Now	Not Again
Utilize evaluation forms to review residential systems:	0	4	9	4	0
Utilize evaluation forms to evaluate commercial systems:	0	4	11	2	0

Willingness to adopt

Question	Not	?	May be	Yes Now	Not Again
Specify hydraulic loading rate for system components in the design:	0	3	6	7	0
Specify organic loading rate for system components in the design:	0	4	10	2	0

Willingness to adopt

Question	Not	?	May be	Yes Now	Not Again
Specify operation and maintenance requirements for system components in the design:	0	3	7	5	0
Utilize flow equalization in systems with peak flows:	0	3	5	7	0

Using the Materials

- Training Manual – Purchase bound manual at cost recovery basis – Spring 2008
- Potential Instructors:
  - CIDWT member
  - Attend CIDWT Installer Train-the-Trainer program
  - Instructors guide
  - Provided the latest version of Presentations with speaker notes

Summary

- Identify problems with wastewater treatment systems
- Training materials developed
- Pilot Trainings to develop materials
- Training Results
  - Influence of hydraulic and organic loading
  - Evaluation forms to assess loading to OWTS