The Vision for NH Wastewater Treatment Facilities: Full Resource Recovery

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Where does wastewater come from?

Weather

Homes

Businesses

Slide courtesy
NHWPCA / George Neill
Where does wastewater come from?

Septic Systems

- About 65% of New Hampshire residents depend on septic systems
- Nearly 80% of new development has taken place in non-sewered areas

Most septage goes to WWTFs

Slide courtesy of NHDES
Wastewater treatment began as a way to clean up rivers...

Wastewater causes harm to surface water because of nutrients (N, P), metals, and synthetic chemicals. Modern pretreatment and pollution prevention (P2) mean that most of today’s wastewater is a challenge because of nutrients (N, P).
Cleaning water became major national issue in 1960s – 1970s

- Congress passed the Clean Water Act
- Promoted construction of wastewater treatment plants & provided funding
- Improved the collection of solids from the wastewater treatment process
- Wastewater treatment facilities mimic the natural aeration action of streams and rivers

After 40 years, new sustainable funding for upgrading infrastructure is needed!
The Clean Water Act gave us...

- Cleaner rivers, streams and lakes
- Increased removal of nutrients & organic matter from the wastewater for use as fertilizer for growing crops
- Restoration of the natural cycle that captures nutrients & organic matter and returns them to the soil
- But all with increased energy costs...
Wastewater Treatment Facilities in NH

- 85 Publicly Owned Treatment Works (POTW)
- 27 Private Facilities
- 180 Industrial Facilities
- 755 Certified Operators

(Nationwide: ~17,000 WWTFs that use 3% of U. S. electricity)
Focus = cleaning the water

Dover, NH WWTF effluent

Franklin, NH WWTF clarifier
The solids (sludge) were just disposed of...

*Old sludge monofill, Waco, TX (actually an Audubon-valued & managed bird habitat)*

...and the energy used was not much of a concern (energy was cheap).

*Aeration requires a lot of energy!* Franklin, NH
### How important is energy use at WWTPs?

<table>
<thead>
<tr>
<th>%</th>
<th>Description of Energy Use at WWTPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>Approximate total of U.S. electricity consumption used by water and wastewater operations (~100 billion kWh annually)</td>
</tr>
<tr>
<td>35%</td>
<td>Amount of municipal energy consumption used by water / wastewater systems</td>
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<tr>
<td>~17,000</td>
<td>POTWs in the U.S.</td>
</tr>
<tr>
<td>40,000,000,000</td>
<td>Gallons of wastewater treated in the U.S. every day</td>
</tr>
<tr>
<td>8,000,000</td>
<td>Approximate amount of dry tons of biosolids generated per year by U.S. POTWs</td>
</tr>
<tr>
<td>730,000</td>
<td>Amount of cars equivalent to offset emissions if digestion facilities installed energy recovery*</td>
</tr>
<tr>
<td>600</td>
<td>MW of CHP Potential from POTWs over 1 MGD*</td>
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</tbody>
</table>

*EPA CHPP, January 2011 (Draft)*
Finding the sweet spot for clean water, nutrient recycling, and energy: Nashua Wastewater Treatment Facility

- Original Plant in 1965
- Small Primary Plant (no aeration, just settling of solids)
- Discharged directly to the Merrimack River.
Nashua Wastewater Treatment Facility

- Staffing of 25 people.
- 24-7 Facility.
- 2nd largest plant in New Hampshire. (Manchester is the largest.)
- Secondary Treatment with Anaerobic Digestion & Cogeneration
- Average daily Flow 13-14 MGD. Combined storm flow 52 MGD maximum. (Four 200 hp pumps)
- Addition of Wet Weather Facility for large storm flows. Maximum flow of 60 MGD.
Nashua’s Energy Efficiency Progress: 5 projects = saving$

- Nashua tries to be proactive in saving energy.
- Annual electrical costs were approximately $690,000.
- Replaced all lighting with high efficiency T-8 light bulbs.
- New lighting provides 30% more light at a savings of 30% on lighting cost.
- Motion detectors for lighting in hallways and rooms.

- Approximate energy savings.....$40,000 per year.
Nashua’s Energy Efficiency Progress (2)

- **Variable-frequency drive units** installed for many pumps.
- They provide soft start and stop for lower energy spikes.
- Power factor is the key to savings. Most treatment facilities have a low power factor. Working with PSNH to install capacitors to increase power factor.

- Energy savings... over $40,000 per year.
Nashua’s Energy Efficiency Progress (3)

- Nashua heats digester and buildings with methane boilers and one waste oil heat burner
- 20,000,000 cu. ft. “free” biogas used for heat each year.
- Estimated savings of $20,000 per year.
- Currently looking into increasing gas production of digester by taking in outside wastes. This increase could be used to off-set more of the facility’s heating costs.
Egg-shaped anaerobic digester produces methane-rich biogas
Biogas is used to run Waukeshaw generator.
Produces ~ 1900 kWh/day & heat
Net metering allows reduction in electric bill by getting credit for electricity generated onsite.

$157,000 in savings per year.
Nashua’s Energy Efficiency Progress (5)

- **Improving biosolids dewatering efficiency** with Huber Screw Presses.

- Estimated cost savings for electricity about $10,000 / year.
- Estimated cost savings for biosolids utilization will be 33% or $300,000.
- Lower trucking costs, reduced carbon footprint, better environmental impact.
- Installation planned to start June of 2012.
Recycling Nashua’s biosolids...

- 2001 – Construction of egg-shaped digester (“just like a great big stomach”)
- Digestion reduces solids production close to 60%.
- Solids generation without digestion 22,000 wet tons/year.
- Solids generation with digestion 9,000 wet tons/year.
- Biosolids are managed by Resource Management Inc. – and have been for more than 10 years.

BIOSOLIDS are wastewater solids that have been treated and tested and meet strict federal and state standards for metals, reduction of pathogens, and vector attraction reduction.
Why Use Biosolids?

Biosolids are cost effective alternative to commercial fertilizer and provide:

- **Nutrients for crop production**
  - Nitrogen
  - Phosphorus
  - Potassium
  - Lime (if stabilized with lime)
- **Increases organic matter**
- **Increases water holding capacity**
- **Improves crop growth**
Biosolids Use and Disposal Practices
2004 U.S. Totals

Land Reclamation Program
Biosolids are land applied using conventional farm equipment. Crop yields increase from using residuals to improve the soil tilth.

The economic value of using biosolids instead of commercial chemical fertilizer is approximately $140 - $210 per acre
For more details about biosolids management, see...

www.nebiosolids.org

www.rmirecycles.com
Why is wastewater & biosolids recycling necessary?

- Uses local renewable resources (water, biosolids, energy)
- Saves finite natural resources (water, mined fertilizers, peat)
- Supports local jobs
- Increases nutrient cycling by adding valuable nutrients to the land, not the landfill
- Provides economic benefit to public and farmers by avoiding fertilizer costs & landflling or incineration
- Responsible recycling is always win-win
Sustainability requires that WWTFs be Resource Recovery Facilities

- Treating and recycling water
- Treating and recycling organic matter & nutrients in solids (biosolids)
- Continued energy efficiency improvements = lower energy demand.
- Generating electricity to offset plant energy use.
- Potential for increased community service by taking in hard-to-manage wastes (fats, oils, grease, septage, glycols, food waste, etc.)

Nashua’s WWTF is a community resource recovery facility!
Working toward full resource recovery....

Thanks and kudos:

- Nashua Wastewater Treatment Facility Staff
- Walker Wellington – Huber Presses
- David Sullivan and Associates – Turblex Blowers
- Resource Management Inc. – Biosolids Management
- GHD Engineering – Enercon Project
- Woodard and Curran Engineering – Aeration Project
- Wright Pierce Engineering – Dewatering Project