Hot Water Recycling or Grey Water Heat

There Are Options!

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Agenda

• The Issue
• The Options
• The Results
Residential Domestic Water Heating Energy Use ~18%
The Options

- **Shower Recycling**
  - Built-in water treatment
  - New application for indoor water re-use
  - Easier retrofit application

- **Whole Home Water Recycling**
  - Larger waste heat and gray-water re-use potential
  - Indoor and outdoor water re-use applications
In Shower Recycling

- **Shower recycling**
  - Manufacturer claims:
    - ~80-90% water savings
  - $3,000-$5,000
In Shower Recycling

- 3-step filter process + pasteurization
- Cold water line connection
- 0.8 gal fresh on startup
In Shower Recycling

- Micro + nano purification capsule filters
- Contamination concentration sensor
- Higher flow at shower head
- 1.3 gal startup

https://orbital-systems.com
In Shower Recycling

- UV lamp + filter
- 0.8 gal start-up
- Higher flow at shower head
- No built-in heater
  - Rely on incoming hot water line

Refresh Cycles in steps

Purify
The UV lamp purifies all water in the cycle. This means all bacteria, viruses and other living things will be eliminated, 10 times a minute.

Replace
The e-Shower injects fresh water to keep itself nice and warm. Excess water overflows over the SmartStop™ and is drained.

Filter
The pump absorbs water through a microfilter that blocks all hairs, skin cells and other unwanted things from entering the system.

https://www.hamwells.com/refresh-cycles
Nexus eWater

- 34% less water
- 70% less sewage
- 75% less water heating

Continued Watering “Drought Proof”

Lower Consumption

Water and Heat Recycled
**Nexus eWater**

- **Efficiency**
  - COP 4+
  - EF – TBD
  - FHR – TBD

- **Storage Capacity**
  - 80 gallons

- **HP Heating Capacity**
  - 3160w (Average)
  - Input Power – 400-790w
  - Electric Resistance
  - 2500w
1. Hot refrigerant gas leaving the compressor enters the Jacket heat exchanger (HEX). Heat is directly transferred from the heat exchanger to the steel tank wall, which in turn, transfers heat to the mains water.

2. Leaving the jacket HEX, the cooler refrigerant gas is pushed through an expansion valve and into the evaporator, which is submerged in grey water. The HEX is in direct contact with the grey water.

3. After absorbing heat from the grey water, the warmer refrigerant returns to the compressor where it can start the loop again.
How it Works (Energy Balance)

- **550 Watts**: Energy added by the compressor operating @ COP 4
- **1650 Watts**: Energy taken from grey water, this reduces 20 gallons of grey water by 34°F
- **2200 Watts**: Energy needed to raise the temperature of 13.85 gallons by 65°F

- **20 gallons**: Grey water enters the collection tank at 95°F (accounting for some heat losses during showering and in the pipework)
- **13.85 Gallons**: Mains water enters the water heater at 60°F
- **6.15 Gallons**: Mains Water @ 60°F
- **13.85 Gallons**: Hot water @ 125°F
- **20 gallons**: Showering @ 105°F
- **20 gallons**: Grey water leaves the collection tank at 61°F to the sewer

- **80 Gallon Capacity**
- **75 Gallon Capacity**
Early Applications

- Several sites: Northern California, UC Davis, Sea Cliff
  - Currently data is not readily available, but is being gathered

- Northern California Home
  - Sporadic information because it is not regularly occupied
  - NEXheater and whole eWater system

- UC Davis Solar Decathlon Home
  - Still in the gathering process
  - NEXheater and whole eWater system
  - Additionally grant applications like UC Davis coming in now and projects will continue to have installations throughout the year

- Sea Cliff homes are being sold to new occupants
Early Applications

- Mostly new construction but they are moving into some retrofit applications this year
  - Next May there will be more substantive data at that point.

- New as of 2/22/2016
  - Gary McDonald homes will be installing the nexus systems in their new development in Fresno
  - 44 homes
  - 12 will have the full system
  - 32 will be recycle ready and have a system purchase cost of $7,500
Estimated Impacts

Combined Effects on Estimated Total Household Hot Water Savings

<table>
<thead>
<tr>
<th>% Savings</th>
<th>Shower Recycling</th>
<th>NEXHeater</th>
<th>Shower Recycling + NEXHeater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Household Hot Water Savings</td>
<td>20%</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>Total Household Hot Water Energy Savings</td>
<td>20%</td>
<td>45%</td>
<td>36%</td>
</tr>
</tbody>
</table>

- *Based off of manufacturer’s claims of 80% water savings based
- Does not account for pump, backup heating
- **Assuming COP of 4
Codes/Standards

- NSF/ANSI Standard 350
  - Onsite residential water reuse treatment systems
  - Water quality requirements
  - Restricted indoor re-use, unrestricted outdoor re-use

- NSF/ANSI Standard 53
  - Filtration for drinking water through adsorbent media
Thank You