

IDEA

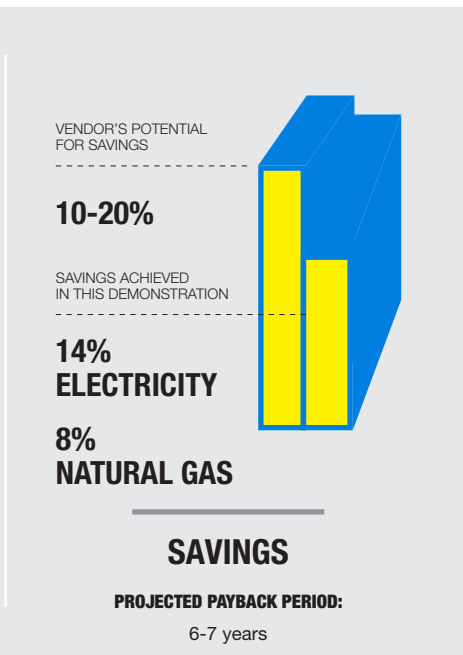
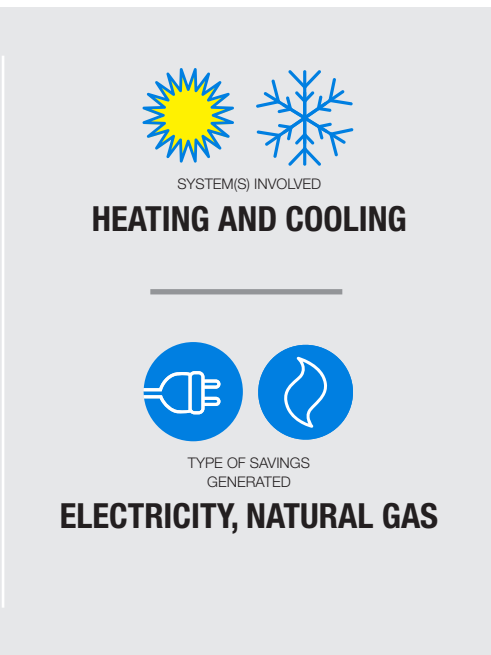
PHASE 3 TECHNOLOGY DEMONSTRATION HIGHLIGHT

COMPANY
TCT Nanotech

TECHNOLOGY
Heat Transfer Fluid (HTF) Compact

DEMONSTRATION SITE(S)
New York Botanical Gardens:
Pfizer Plant Research Laboratory,
Bronx, NY

DEMONSTRATION PERIOD
09/2017 - 08/2018



Technology Description

HTF Compact Nano Thermo Fluid (HTF Compact) developed by GWS Energy improves efficiency in HVAC/R systems when added to existing closed hot or chilled water loops. HTF Compact contains copper oxide nanoparticles in the 3- to 7-nanometer range, suspended in a transport fluid that consists of corrosion inhibitors and water. Until recently, water was the most efficient heat transfer fluid; propylene or ethylene glycol may need to be added to water for freeze protection, but glycols lower the efficiency of heat transfer of the fluid. Adding nanometer-sized particles provides enhanced heat transfer coefficients through improved thermal conductivity, reducing fuel use, costs, and GHGs. The Pfizer Plant Research Laboratory at the New York Botanical Garden (NYBG) was chosen in 2016 as a demonstration site to pilot this new technology to assess its relative effectiveness.

Optimal Facility Characteristics

- Facilities with chilled water loops, including loops that contain glycol-based antifreeze
- Systems must be leak-free prior to installation

- Facilities where the existing pipe network is well documented, or is visible for a filed survey to enable the accurate calculation of the total volume of liquid in the loop, to determine the appropriate volume of HTF Compact to add to the system

Demonstration Results

HTF Compact was introduced to the heat recovery glycol loop, chilled water loop, and hot water loop in June, July, and August of 2017, respectively. The final ratio of loop fluid to nanofluid was 20:1, equating to 5%. A whole-facility approach was taken to evaluate energy savings due to the interactive effects that HTF Compact has on the HVAC/R systems included in the project, and the vendor subtracted baseload electrical consumption from each month to isolate the seasonally dependent kWh consumption, making use of the heating and cooling degree day (DD) methodology.

The savings calculated by the vendor for the building's seasonally-dependent electrical consumption was found to be 14.1%, or 46,884 kWh, while the savings for the seasonally-dependent fuel consumption showed a 7.8% reduction, or 3,754 therms.

Recommendations for Implementation

- The manufacturer recommends HTF Compact primarily for chilled water loops
- If facility operators regularly drain some components of the system (e.g., coils that may be subject to freezing) the solution should be stored and reused, to reduce the cost of waste disposal, as well as the cost of additional nanofluid when the component is re-filled
- Some nanofluid should be held in reserve
 - o At this installation, 10% of the total gallons of HTF Compact introduced into the system was put in storage at the facility
- Facility operators at this demonstration site recommended adding the HTF Compact gradually, to evaluate any system implications (e.g., leaks), before adding the balance of the nanofluid
- HTF Compact is not safe for human consumption, and facility staff should be trained in spill containment
 - o HTF Compact must be disposed of according to manufacturer and EPA guidelines