Worth the Trouble?

Wastewater Energy Recovery Case Study

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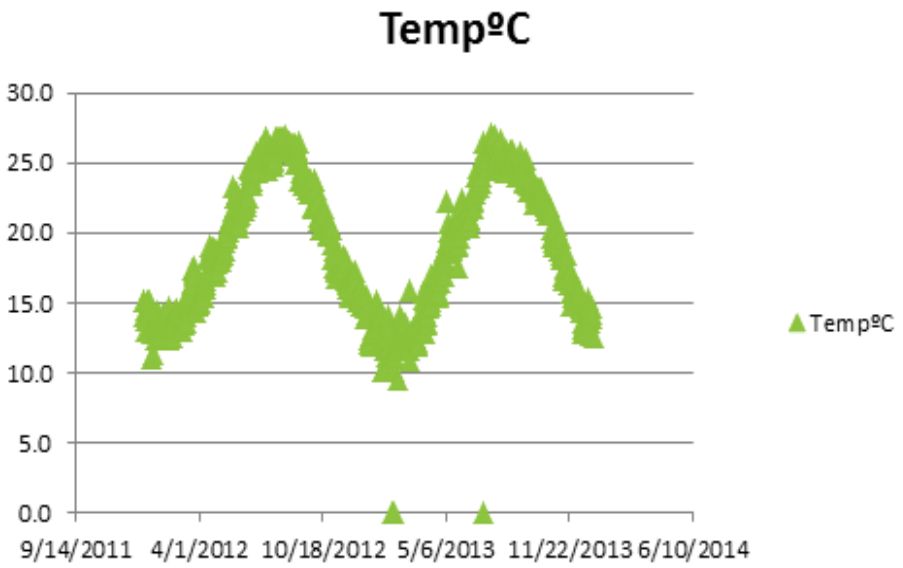
Presentation overview

- Wastewater energy recovery overview
  - WWER at a wastewater treatment facility (effluent)
  - WWER in the wastewater collection system (raw wastewater)
- Hyannis, MA pilot project
- Results

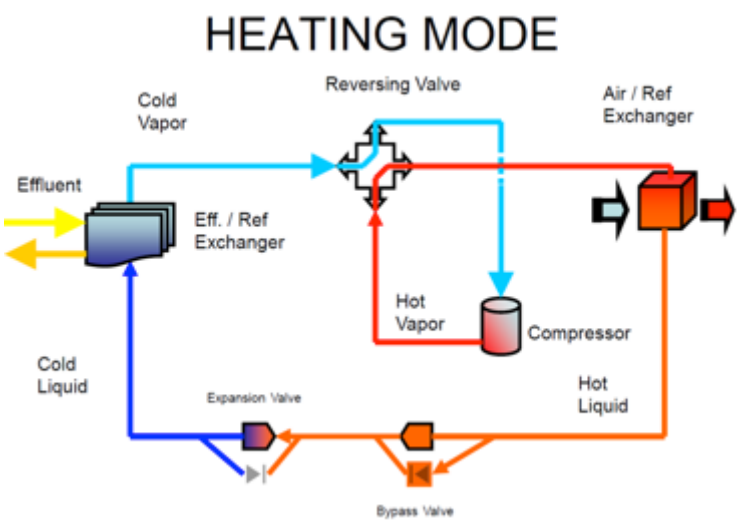
Wastewater energy recovery

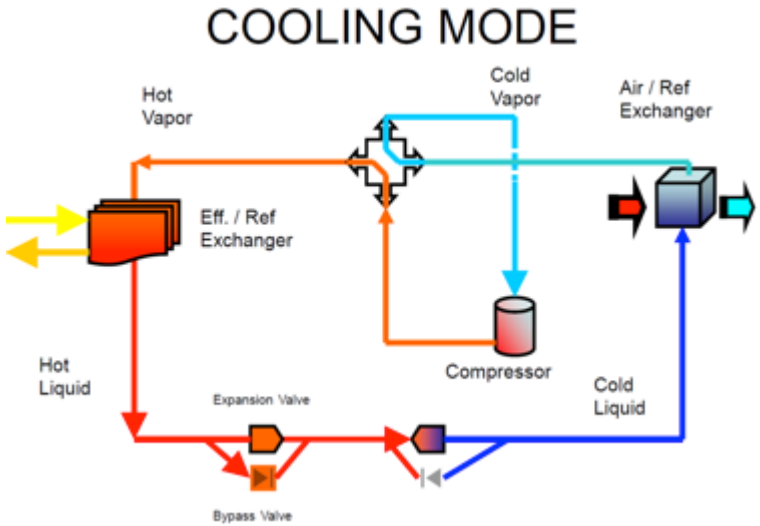
- Wastewater composition
- Toilet flushing
- Hot water from showers, dishwashers, washing machines, etc.
- Typically greater than 60ºF (15.6ºC) year round



Wastewater energy recovery

- Low grade heat
- Closed-loop system - heat pump transfers heat from WW to clean water
- In winter can be used for space and water heating
- In summer can be used to dissipate excess building heat





WWER at the wastewater treatment facility

Advantages

- Potential for high quality, low nutrient, effluent
- Heating/cooling can be used at WWTF or nearby buildings

Disadvantages

- WWTF usually located away from population center

WWER in the collection system

Advantages

- Collection system infrastructure often in close proximity to heating/cooling needs

Disadvantages

- Large amount of solids and other constituents need to be screened out

Questions to answer during pilot

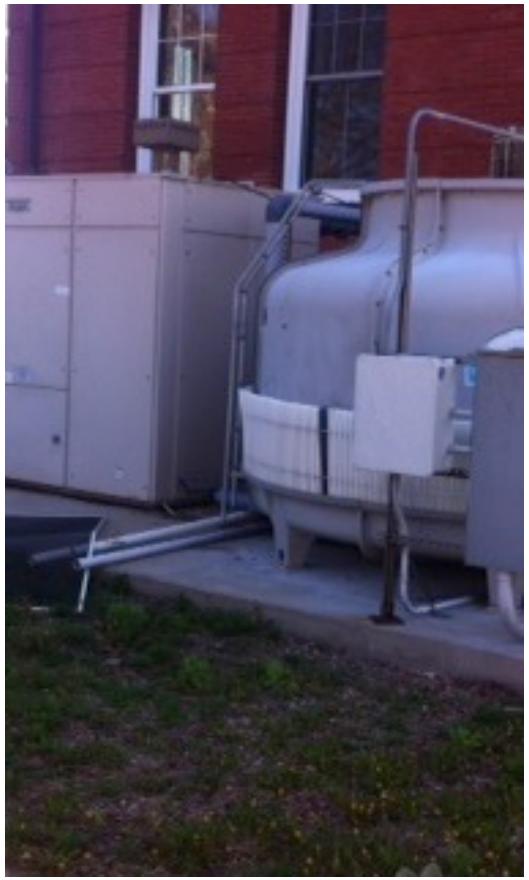
- Will heat exchanger plates foul rapidly?
- Flow will need to be screened and screenings removed from site – what quantity of screenings will be collected at un-centralized locations?

Barnstable pilot

- Massachusetts Wastewater Energy Recovery Assistance Program (DOER)
- Huber ThermWin raw sewage heat recovery unit
- Town heating and cooling
  - Heating – natural gas
  - Cooling – electricity, water
  - Pilot for cooling potential

Goals of pilot

- Evaluate unit as potential source of cooling to nearby municipal buildings
- Use as a heat sink to improve the cooling efficiency of the buildings 80 ton chillers and eliminate the cooling towers
- Decrease domestic water usage by eliminating cooling tower demand
- How well will pilot function with raw wastewater?
  - Types of maintenance required



Operating collection system installations

Huber

- Ten installations in Europe (Germany, Switzerland and France)
- One under construction in Quebec, CA

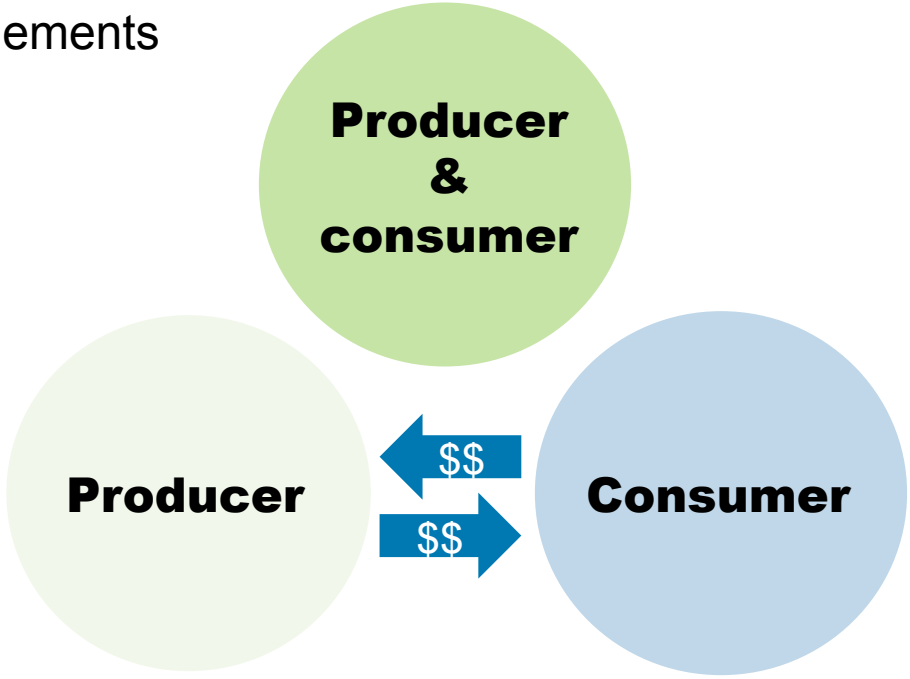
Rate structures

Grant looking to explore sharing arrangements between entities

- Internal use
- Inter-department agreements
- Utility/district energy system
- Private entity

Reliability

- Two units
- One unit and traditional backup



Barnstable Pilot

- Pilot installed at the Town's largest raw wastewater pumping station
- Across the street from Town Hall and the School Administration Building
- One of the largest pump stations on Cape Cod

Barnstable Pilot

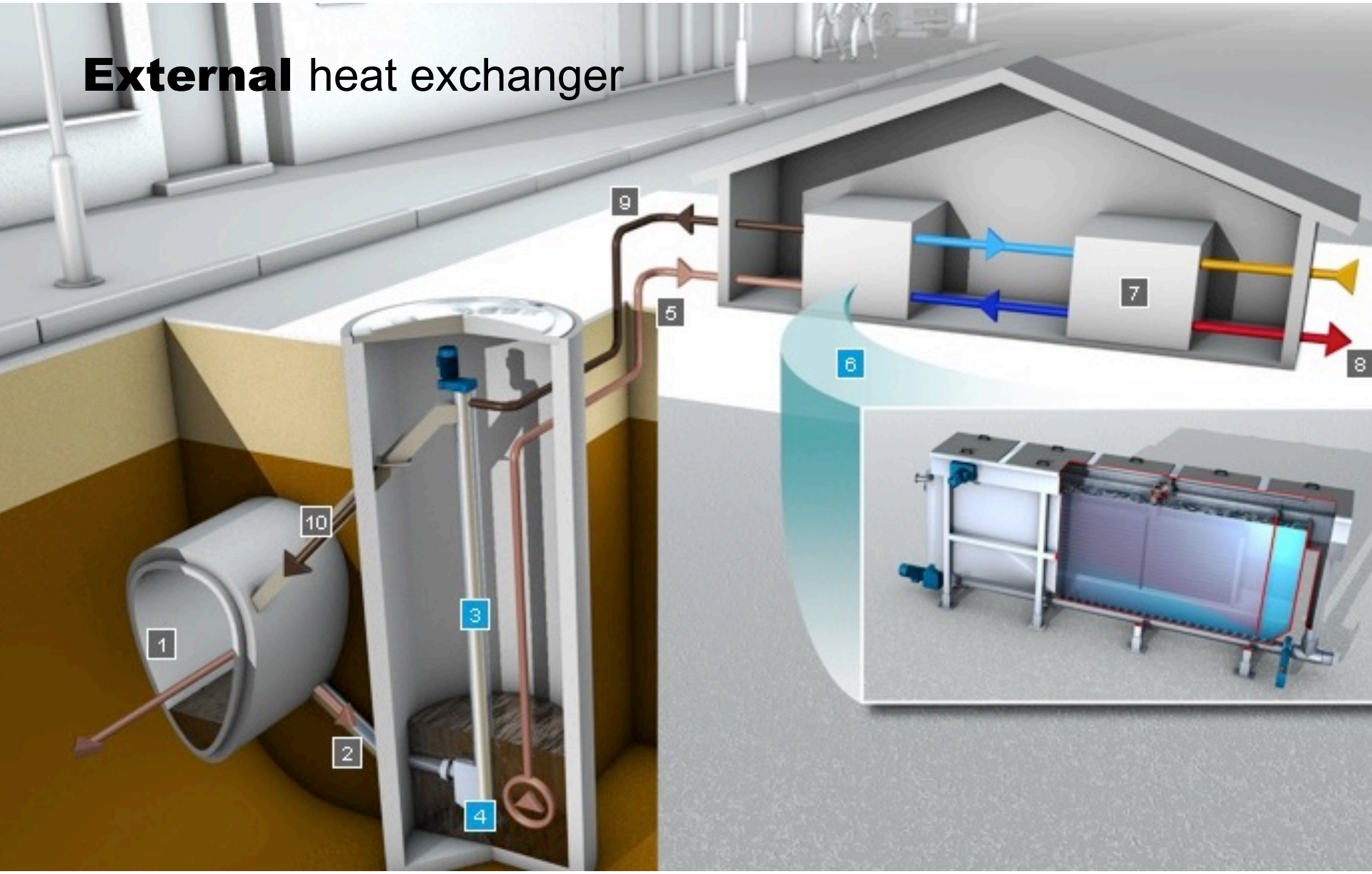
- Operate pilot and screenings unit for one month
  - Initially operate pilot for limited hours during work day
  - Increase length of operation as operators gain comfort with the unit
- Assess O&M requirements of running equipment with raw wastewater
- Conduct desktop cost-effectiveness analysis
  - Clean water heat exchange loop not connected (heat exchange established technology)
  - Gather temperature and flow rate data
  - If found to be cost-effective additional grant funding would be released for conceptual design

Huber ThermWin unit

Size	Energy (BTU)	Wastewater (gpm)	Clean Water (gpm)	Heat Exchange Surface (SF)
BG4S	307.080	174	87	20
BG4	426.500	238	127	31
BG6	682.400	380	190	45
BG8	921.240	507	254	60

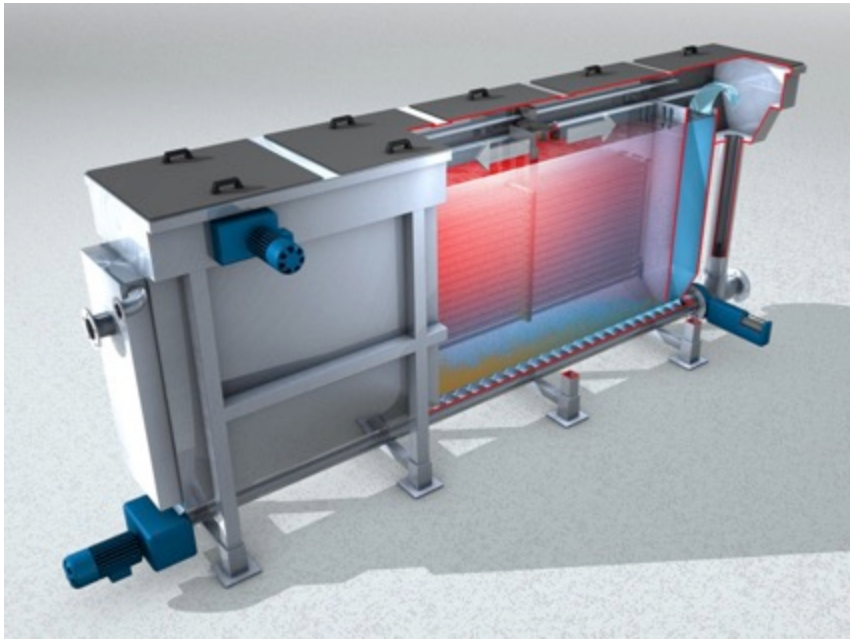
- Colony Pump Station = 4600 gpm
- ~ 5% of flow

External heat exchanger

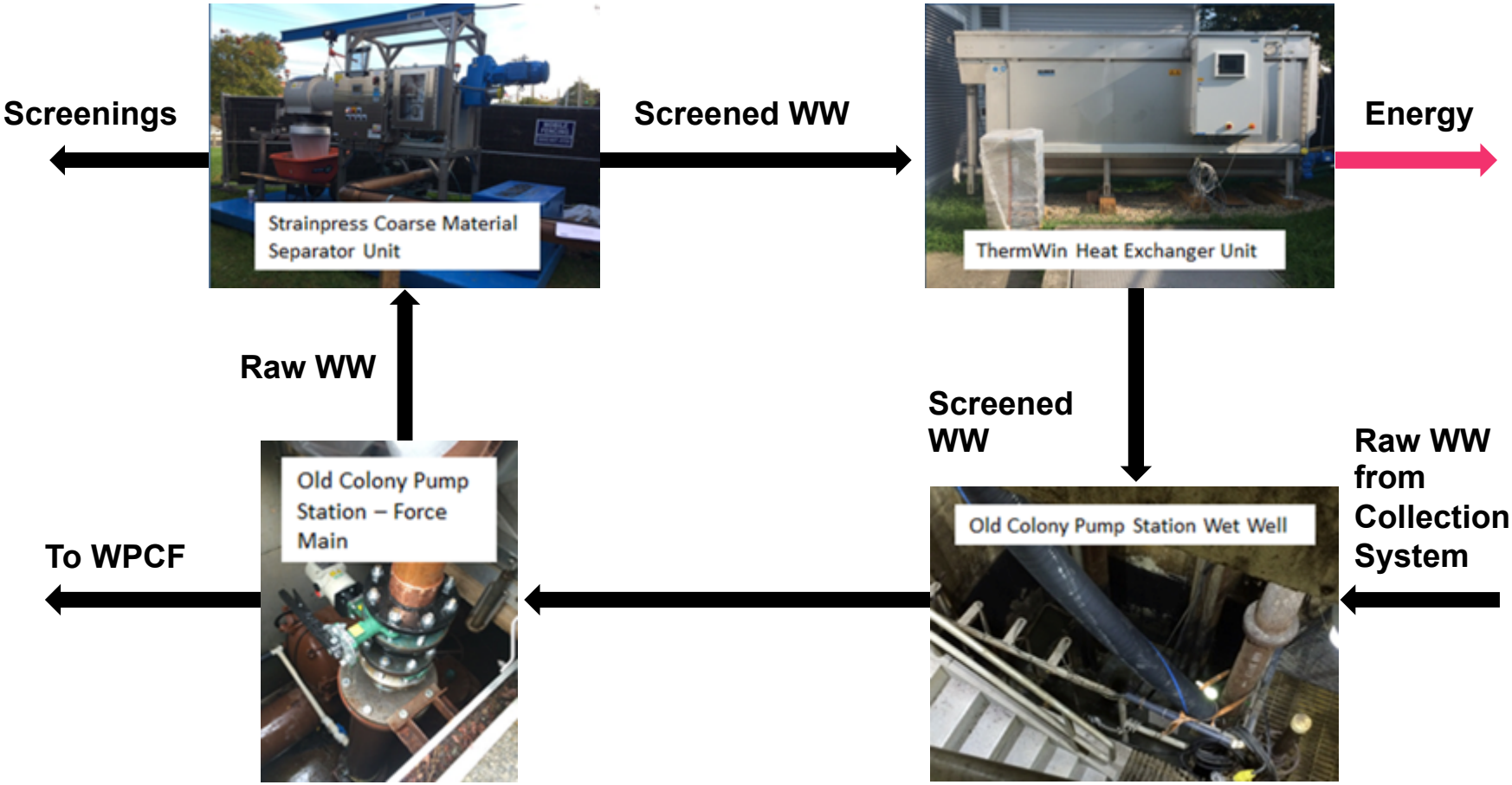


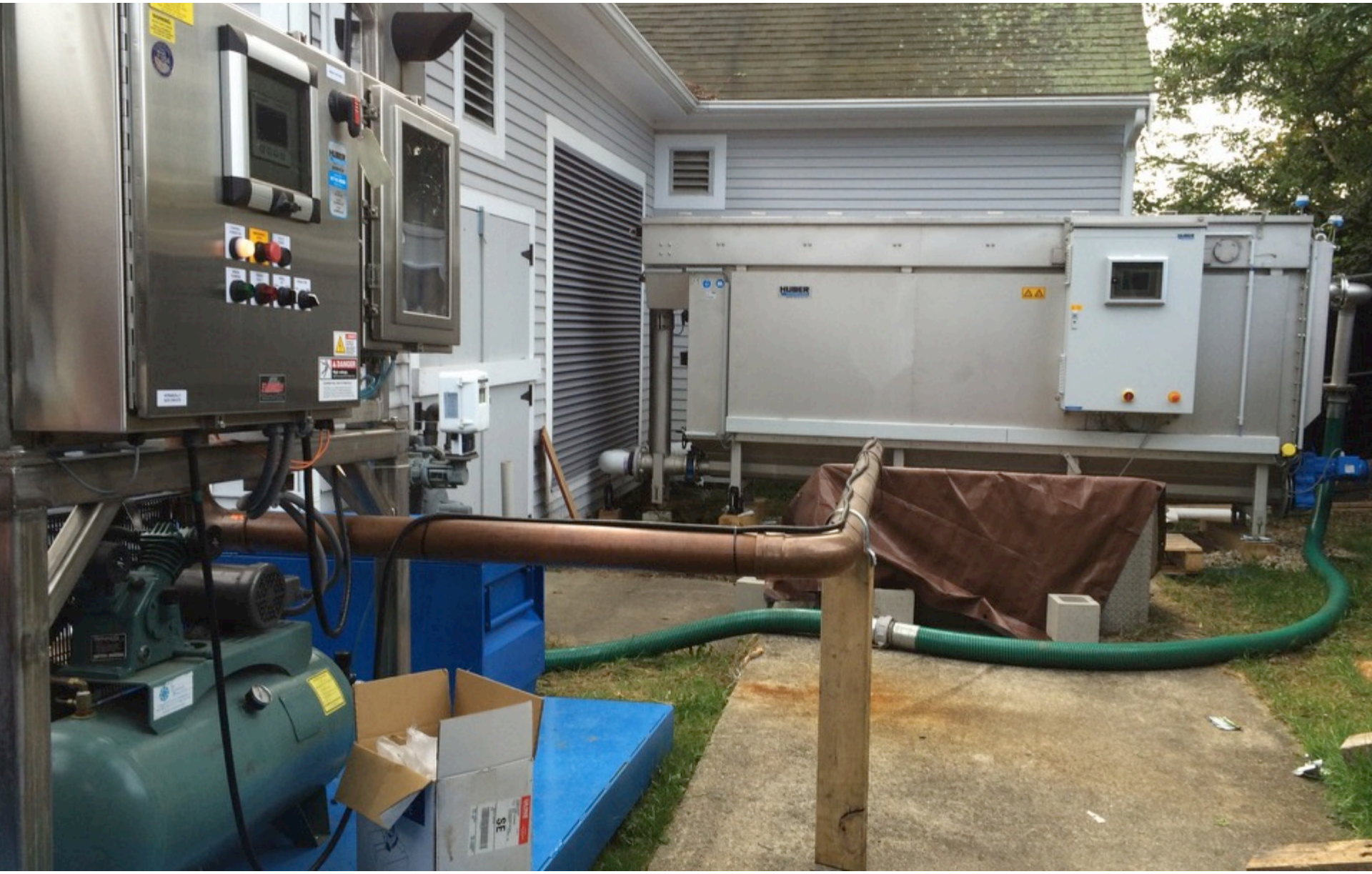
Huber heat exchanger RoWin

- Cleaning system for surface of exchanger pipes
- Solids removed from unit by screw conveyor and returned downstream to sewer along with cooled down wastewater



Pilot schematic

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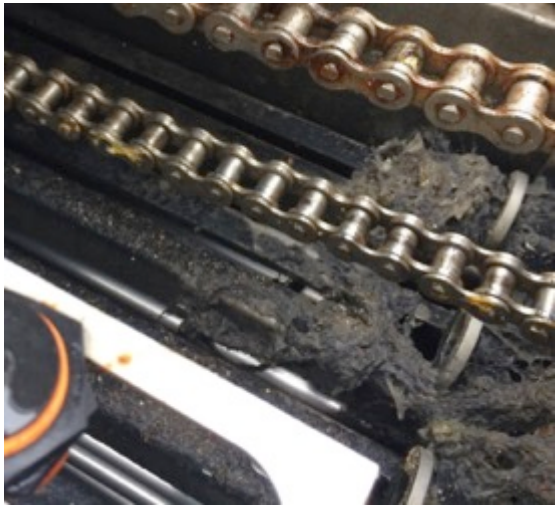
HUBER

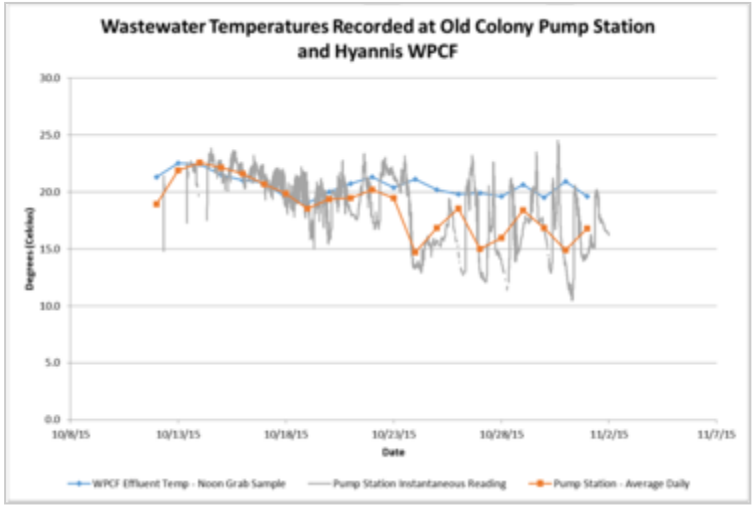
O&M findings

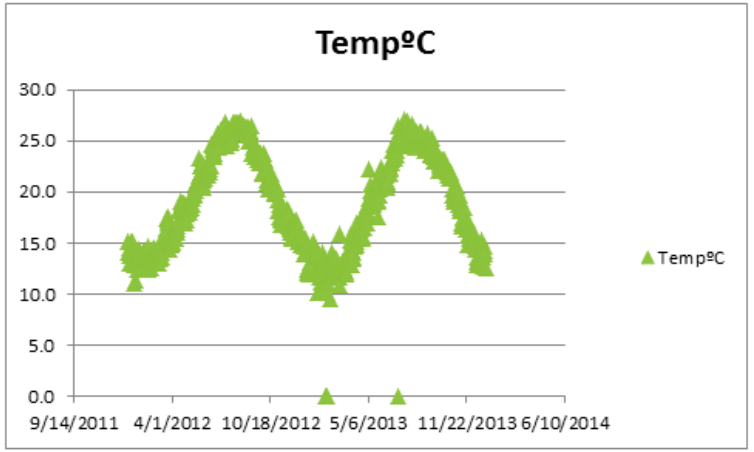
- Screenings made their way into ThermWin unit, would need a finer screen for permanent installation
- Visual inspection showed wipers worked well
- Minimal odors
- Low volume of screenings taken out by Strainpress (1 bag/wk)



Cost-effectiveness findings

- Due to high summer WW temperatures minimal cooling efficiency found in using Huber unit instead of the existing evaporative cooling tower
- Found not to be cost-effective for a cooling application
  - No electricity savings
  - Minimal potable water savings
- Application could be cost-effective in heating and cooling application if the Town were looking to replace their boiler due to age or known operational issues and the price of gas rose



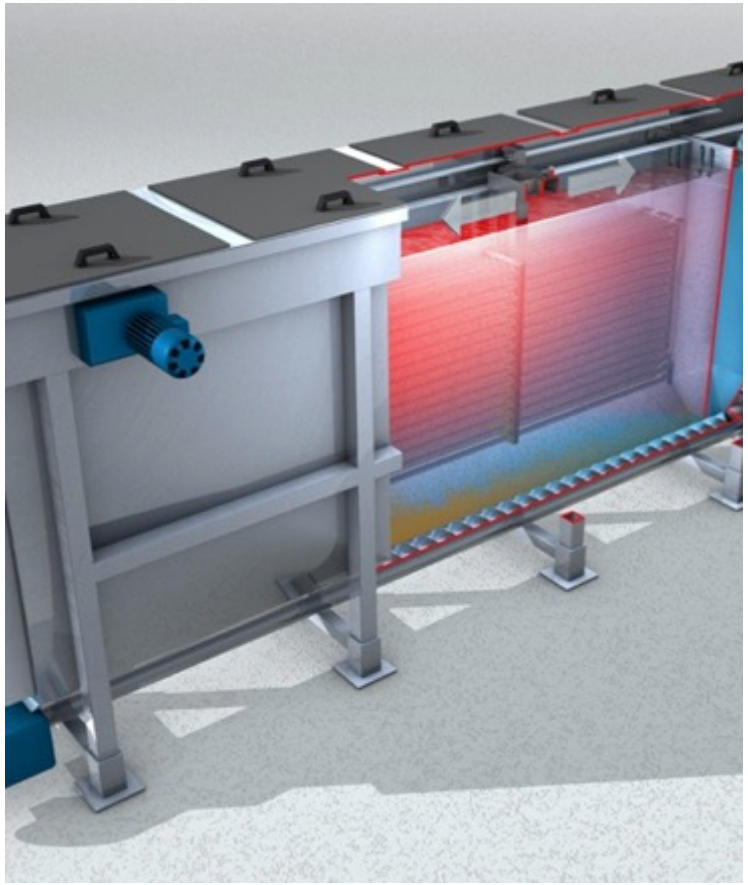


Where could this work?

- Higher power costs
- New construction
- Cooler wastewater temperatures (for a cooling application)
- Public/private partnership

Summary

- Unit found not to be cost-effective in this application (cooling)
- Minimal O&M requirement in a raw wastewater application




Thank you!
Questions?
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