



IDEA 2021

Powering the Future: District Energy/CHP/Microgrids
Sept. 27-29 | Austin Convention Center | Austin, Texas



Utilizing Lake Water Geothermal Cooling for Process Needs

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Garlock

an EnPro Industries family of companies



Garlock Facility Overview

- Makes seals and gaskets
- Campus dates to 1880's
- Mix of new and old buildings



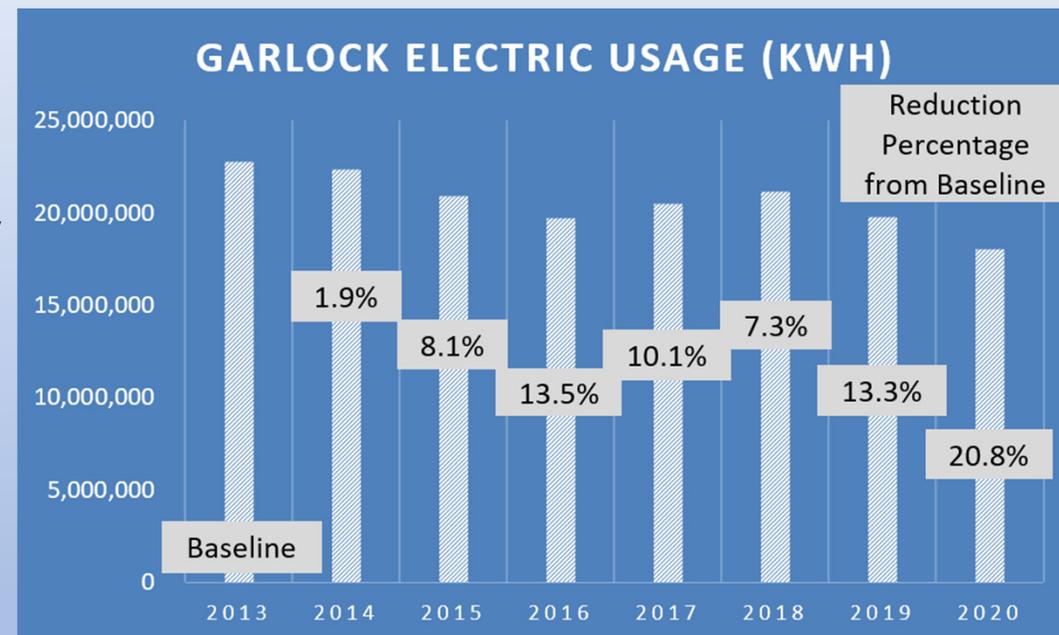
Campus Utility Systems Overview

Garlock has a “Powerhouse” with central utilities for the campus.

- Steam boilers
 - (2) 12,000 lbs/hr and (1) 2,000 lbs/hr boilers
 - All firetube – replaced much larger water tubes
 - Process and heat
- Compressed Air
 - (2) 150 HP air compressors
- Water Hydraulic System
- Chilled Water
- Lake Water

Campus Electrical Systems Overview

- Garlock has a 4 MW electric demand
 - Started focusing on & implementing electric efficiency projects around ~2014
 - Annual electric usage has decreased with implementation of energy efficiency projects
 - Must continue to monitor or may get regression years (2017 and 2018)



Existing Chilled Water System

- Provides CHW service to 9 buildings on campus – mostly process equipment loads
- Steam absorption chillers failed – site was temporarily on rental chillers
- Prior to project:
 - No water treatment
 - No flow control
 - “Open” system that drained to a central cistern

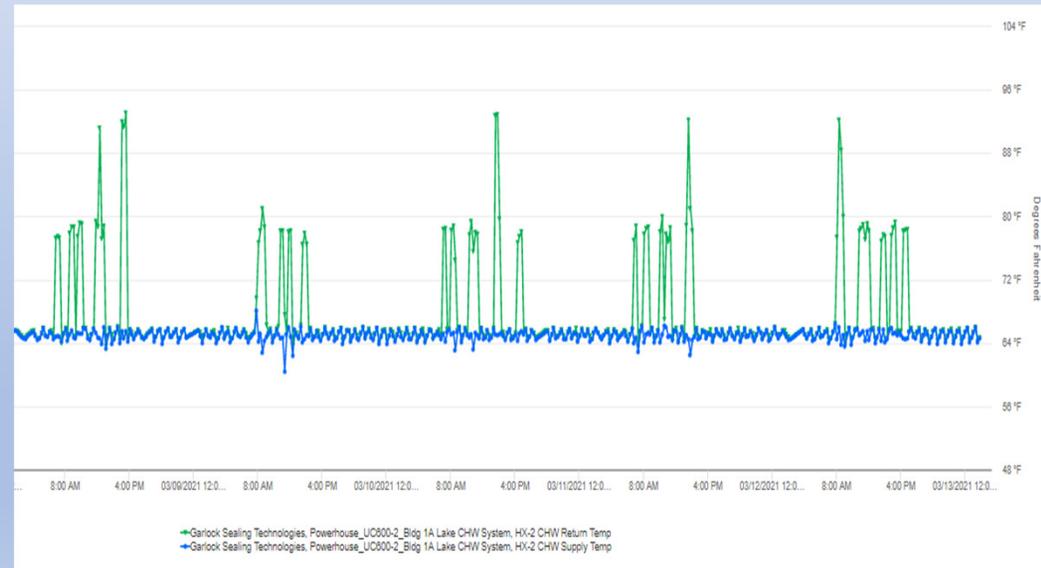


Inefficient Chilled Water System

- Wanted to be replaced with a better overall “system”
- Existing system study
 - Existing CHW efficiency over 2.0 kW/ton (including all chillers, pumps, etc.)
 - Resulted partially from poor turndown of chillers and pumps to match load
- Also, look closely at loads:
 - Not all processes require **CHILLED** water: 38-44°F
 - Some processes require simply **COOLING** water: 70°F

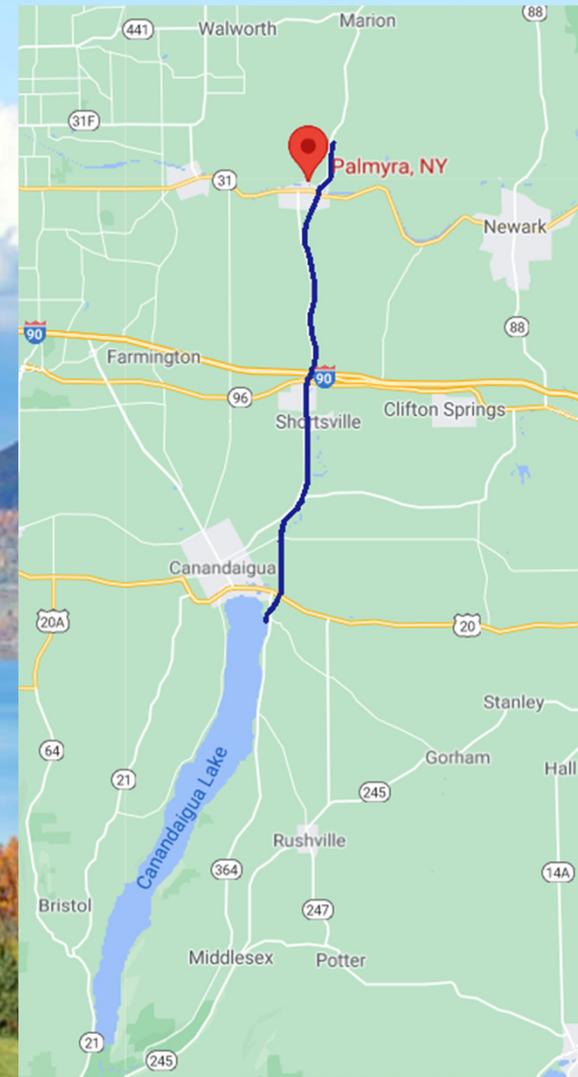
Inventorying Chilled Water Loads

- How did we inventory loads?
 - Tested and logged loads using temperature sensors and ultrasonic flow meters
- Largest load, HPS gasket manufacturing, needs cooling water only to be 70°F.
- This load fluctuates substantially (see graph) – when running, the peak is 220 tons.
 - This load has major impact on needed chiller size.

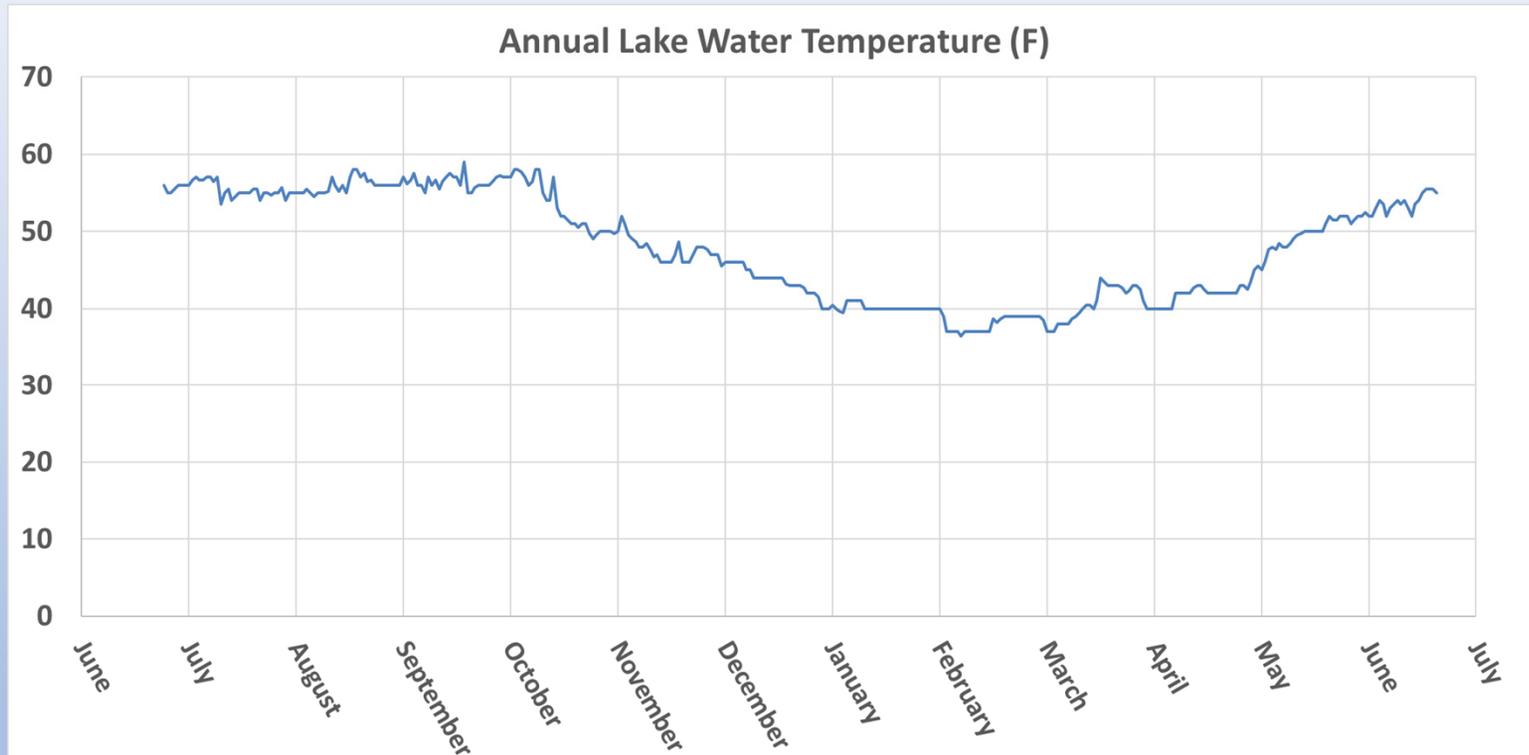


Lake Water

- 23 Mile pipeline partially funded by Garlock in 1920
- Water to the Town of Palmyra and to Garlock – line to Garlock is untreated water
- Draws from the bottom of the lake
- Near 60°F in summer and 40°F in winter



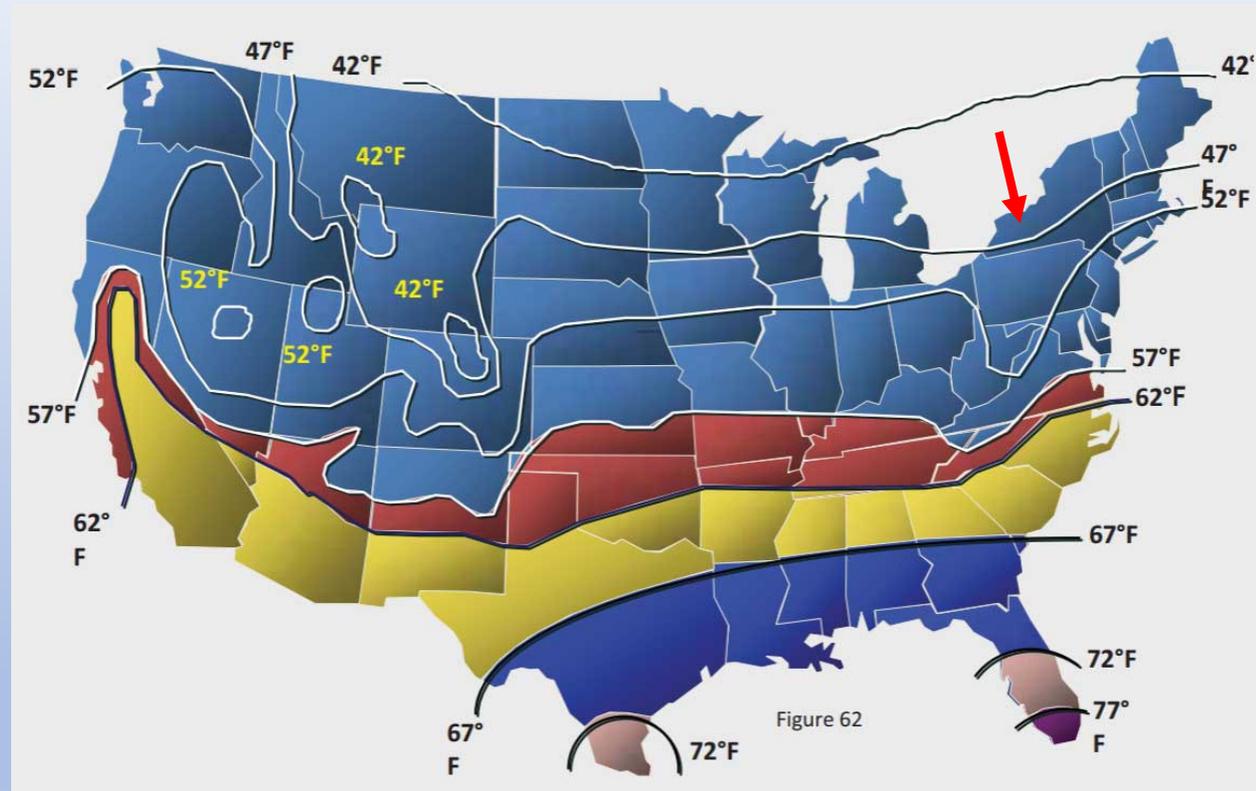
Lake Water Temperature Profile



- Note: HPS Manufacturing Process needs 70°F

Ground Water Temperature

- Typical well or groundwater temperature is mid-40°F's for groundwater in Western NY region
- Garlock lake water temperature fluctuates seasonally due to various pipe depths
 - Pipe is underground for many miles



Courtesy EPA

Garlock Lake Water Usage

- Prior to this project, lake water was underutilized on the campus
 - Main usages were as process makeup water and other non-cooling applications
- This project resulted in no change in lake water usage – still flows to pond, just through a HEX
- Use a heat exchanger to keep lake water isolated

Heat Exchanger Selection

- Peak lake water temperature of about 60°F
- Maintains maximum 65°F for HPS process on other side of HEX – relatively small approach
- (2) HEX's at 267 ton (3200 MBH) capacity – redundancy for occasional cleaning
- Control valve on lake water regulates temperature
- Option to use both during peak load periods



Benefits

- Allowed for a substantially smaller chiller – 135-ton size instead of over 400 tons to cover peak load
- For HPS, lake water only requires pumping energy – at 0.2 kW/ton
- Chillers replaced – new chillers improved remaining chilled water efficiency



System Improvements

- Transitioned the main CHW system to closed-loop
- Installed filtration – pipes up to 60 years old, rust and debris in pipes
 - Bag filters installed
 - Put in heat exchangers separating dirty processes
- Installed water treatment (none existed before) on each system
- Make up water metering



System Improvements

- CHW system suffered previously from a very low CHW ΔT
 - Installed balancing valves at various loads to help
 - Balance valves throttle back flow – loads only receive needed GPM
 - Reduces pump energy
- Installed new pumps on VFDs
 - Installed primary pump VFDs
 - Control pump speed off of ΔP – chiller modules shut off flow when they are not needed



Lake Water Quality

- Zebra mussel issue from the lake caused process water quality issues at site
- To address problem – an automated filtration system was installed with DP sensing backwash cycles
- System has a 140 mesh (105 micron) screen



What you can do

- Many facilities do not have ready access to lake water...
- However, you can still evaluate more efficient sources of cooling – pond water, geothermal, or tower water as examples
- Tower water is most frequently available

Tower Water

- We have successfully used tower water rather than CHW at other facilities (plastics plants for example) where previously all loads were on CHW
- Oil cooling and other extrusion equipment can be on tower water rather than CHW



Project Incentives

- Project received about \$137k in incentives from NYSERDA
- Also received incentives from local utility
- Investigate subsidies in your area

Garlock Sealing Technologies, LLC

Dear Andrew Geoghan:

The New York State Energy Research and Development Authority (NYSERDA) is pleased to have Garlock Sealing Technologies, LLC as a participant in Industrial and Process Efficiency Program. Based upon our review and approval of your application, we will set aside funds to provide an incentive award in the amount of \$137,725.68.

Thank You!

Questions and Answers

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