Energy Efficiency at Faribault Mill

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Faribault Mill Background

FARIBAULT MILL
SINCE 1865

- **Company description**
  - 100 employees, began production in 1865.
  - Vertically integrated
  - Current building constructed in 1892
  - Oldest machinery from 1905
- **Intern project goals**
  - Explore energy efficiency
  - Determine water heating solution

Image source: faribaultmill.com

Incentives For Change

- **Rising Energy Costs**
  - Electricity: 65% increase from 1999 to 2018
  - Electricity: proposed 24% increase by 2024
  - Natural gas : 65% increase in last 4 months
- **Current Facility Improvement Projects**

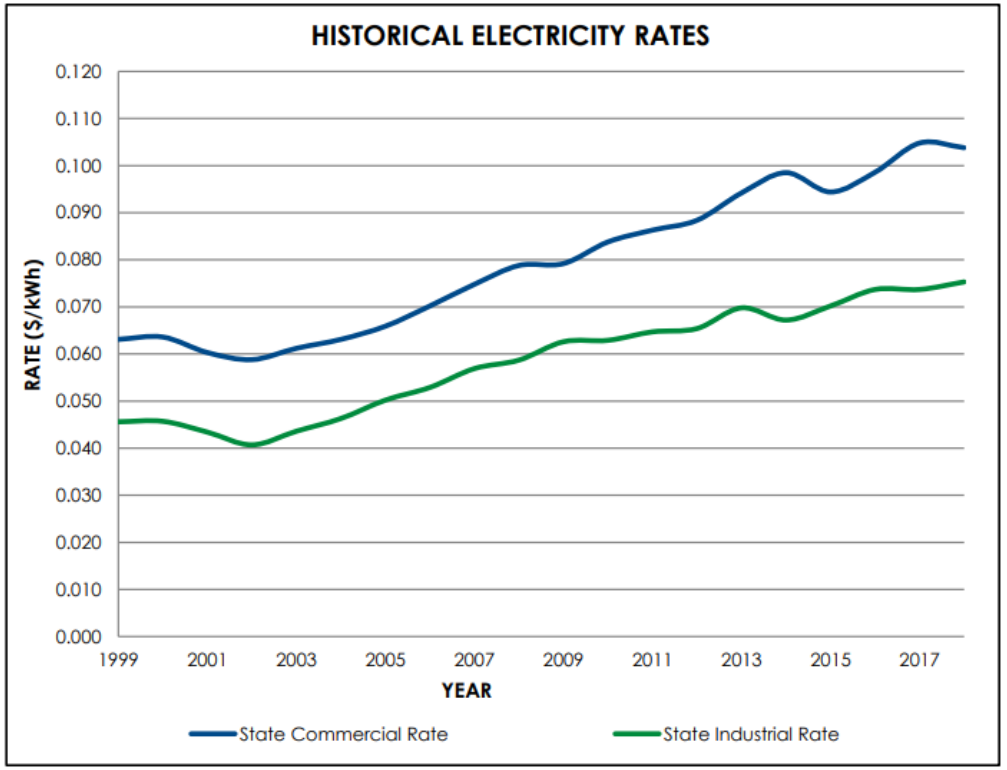


Image source: US EIA Report: 1999-2018 via One Energy

Project Overview

- Hot Water Requirements
- Fluorescent Lighting to LED Upgrades
- Compressed Air
- Electric Motors

Model of the on-site water heater
Image source: Kemco Laundry Catalog

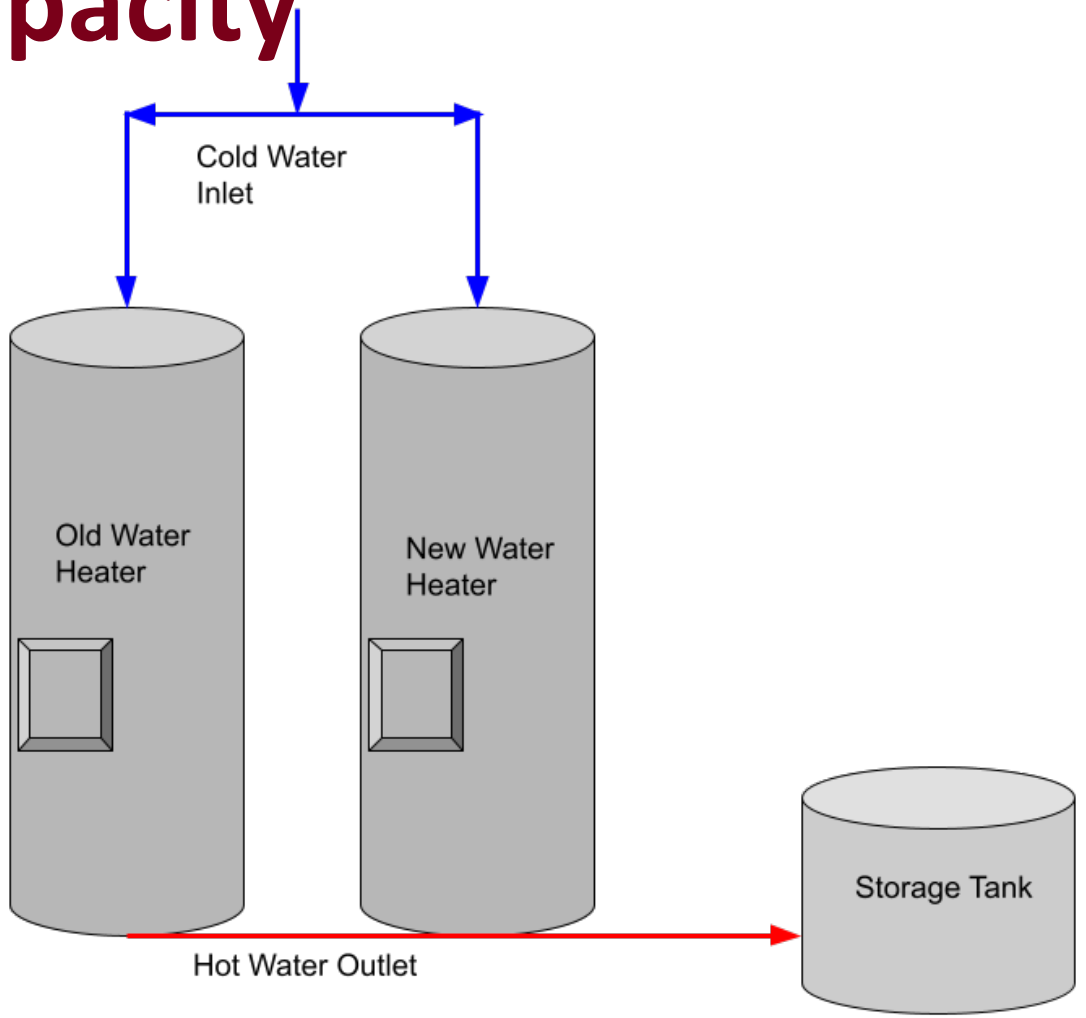
Increase Water Heating Capacity

- **Initial State**
  - 1 water heater
  - 3 washing/fulling machines
  - New dryer
  - 1 additional fuller coming soon

	New Demand	Current Supply
Hot Water GPM	223	90
Total Water GPM	385	150
Btu / h	8,800,000	4,500,000
Tank Size (gal)	–	2800

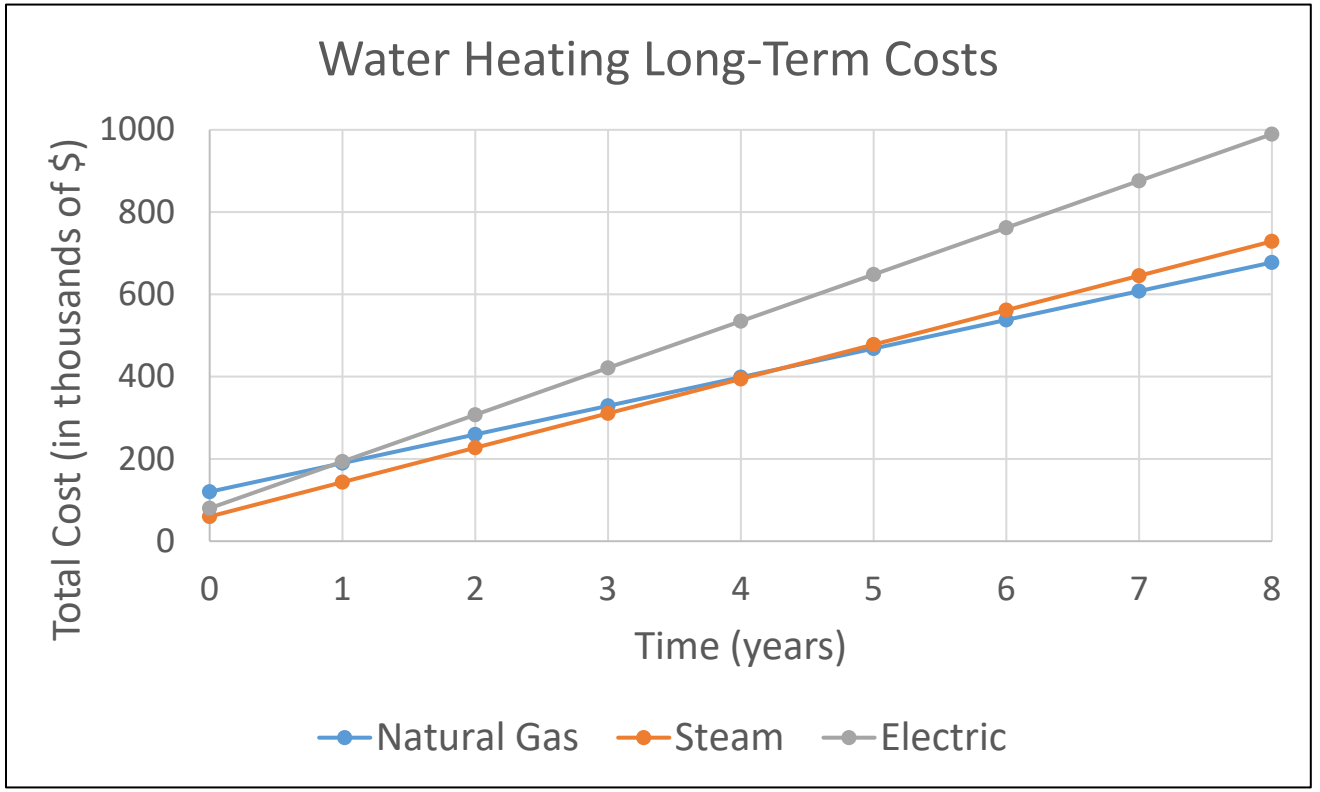
Increase Water Heating Capacity

- **How to find more heat?**
  - Increase tank set temp
  - Steal heat from somewhere else
  - Increase inlet temperature
  - Increase tank size
  - Purchase single unit to replace current unit
  - Purchase second unit to aid current unit



Increase Water Heating Capacity

- **Must acquire new water heater**
  - One large unit
  - **One additional, smaller unit**
- **3 methods**
  - Electricity
  - **Natural Gas direct-fired**
  - Natural Gas indirect-fired (steam)



Water Heating Recommendations

- **Efficiency & Long-Term Costs**

Type	Efficiency
Direct Contact Heater	98%
Tank-Type Heater	94%
Steam Heating System	83%
Electric	99%

- **What do we gain?**

A Water Heater Option
Image source: ogipe.com

Water Heating Recommendations

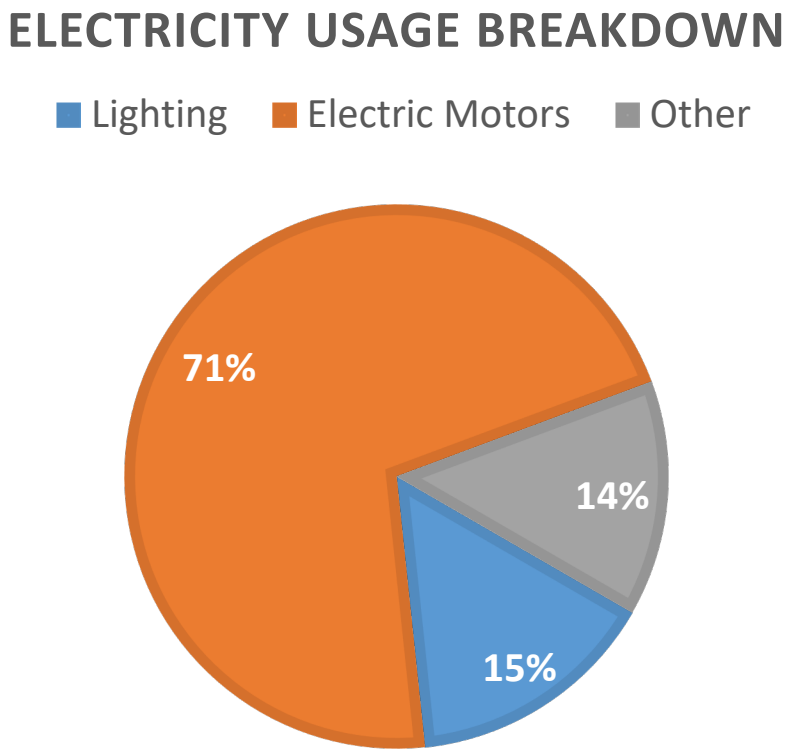
- **Recommendation**
  - Purchase additional Direct Contact Water Heater
  - Retain current controls, water heater, and storage tank
- **Benefits**
- **Drawbacks**

Summary of Recommendations

Recommendation	Annual reduction	Total cost	Annual savings	Payback period	Status
Upgrade Water Heater		$90,000 - $130,000	$600,000 in production	3-6 months	Recommended
Upgrade Production Lighting	80,000 kWh 33.5 kW demand	$36,400	$11,000	3.5 years	Recommended
Upgrade Storefront Lighting	14,300 kWh 5.8 kW demand	$700	$1,950	5 months	Recommended
Compressed Air Restoration	19,290 kWh	$960	$1,550	8 months	Implementing
Implement Motor Table	Motor dependent	-	-	-	Implemented
Upgrade Other Lighting Zones	17,000 kWh	TBD	$1,250	TBD	Recommended by 2030

Project Summary

- **Energy Efficiency**
  - Motors
  - Lighting
  - Compressed Air
  - Power Demand
  - Driven Equipment
- **Increased Production Capability**
  - Water Heater



Personal Experience

- **Acquired manufacturing experience**
  - Machine design
  - Facility layout
- **Pursued large and small optimizations**
  - Little improvements add up
  - Balancing supply with demand
- **Worked directly with vendors**
- **Found there are no “simple” systems**