

# Steam System Solutions at Seneca Foods Corporation

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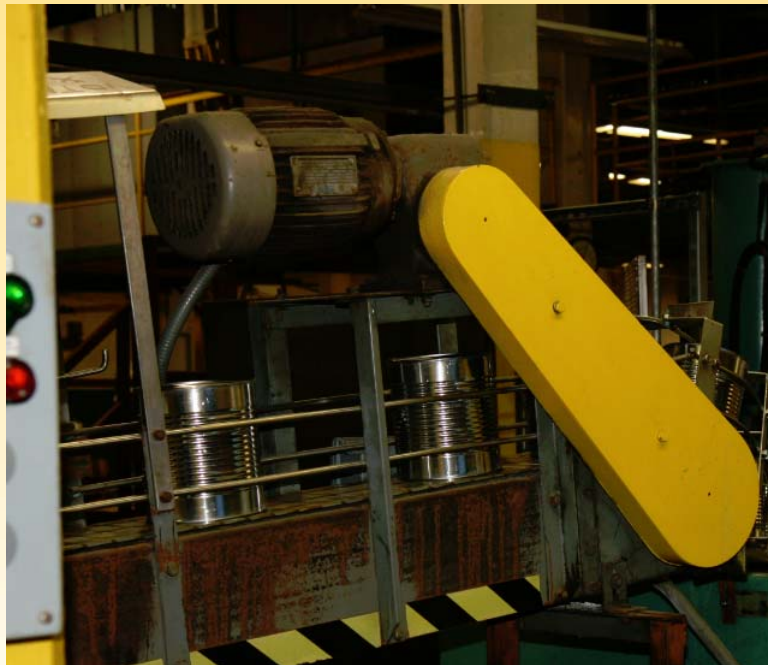


UNIVERSITY OF MINNESOTA

**Driven to Discover<sup>SM</sup>**

# Seneca Foods Corp. Rochester, MN

- A vegetable canning and freezing plant



- The only producer of cream-style corn in the U.S.



# A New Era of Energy Management at Seneca

- Changing consumer priorities and customer demands
- Cooperating resources
  - Utility companies (RPU, MERC)
  - Engineering consultants
  - Sales reps
- Growing interest in steam system improvements

# Reasons for MnTAP Assistance

- Intern needed to:
  - Assist management in understanding steam system
  - Evaluate energy conservation opportunities
  - Coordinate efforts between resource companies
- Seneca had specific interest in:
  - Accumulator project

# Approach

- Understand steam generation and use
- Listen to operators' and managers' frustrations with system
- Determine root causes
- Identify solutions
- Conduct economic analysis

# Locating Areas for Improvement



Generation

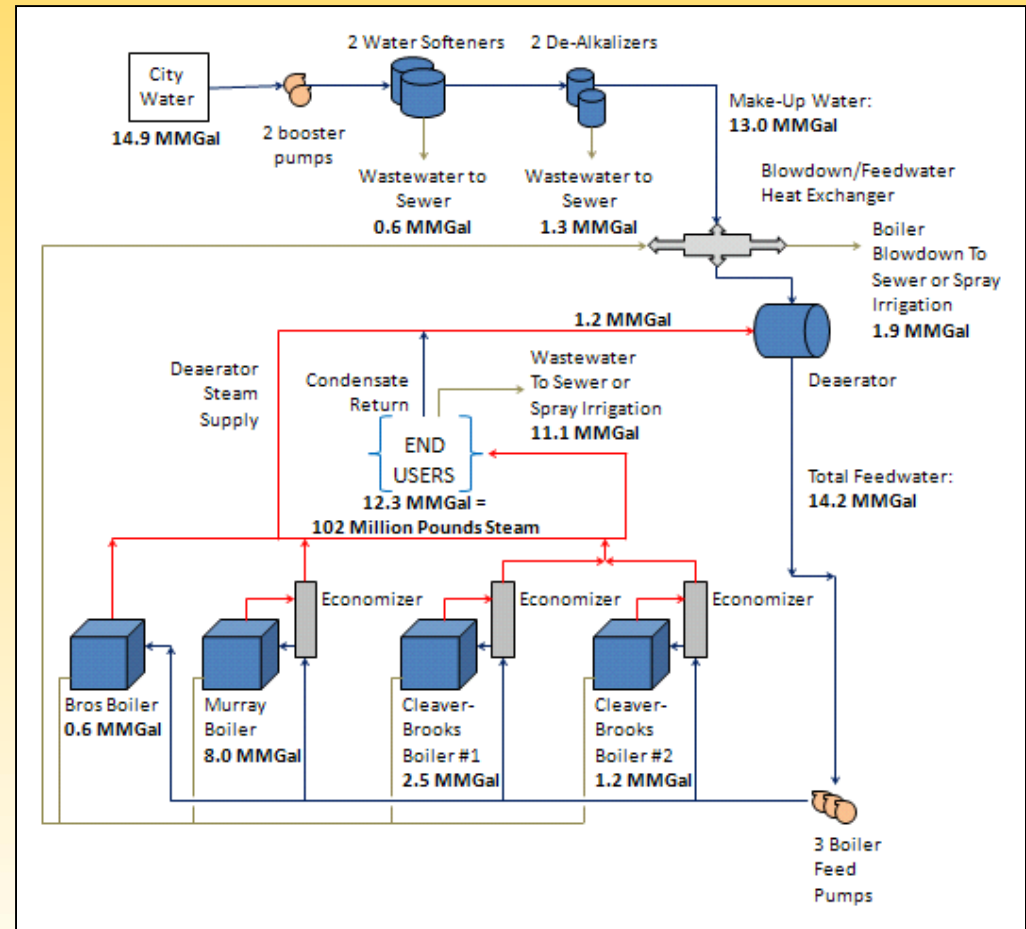
Distribution



End-Use

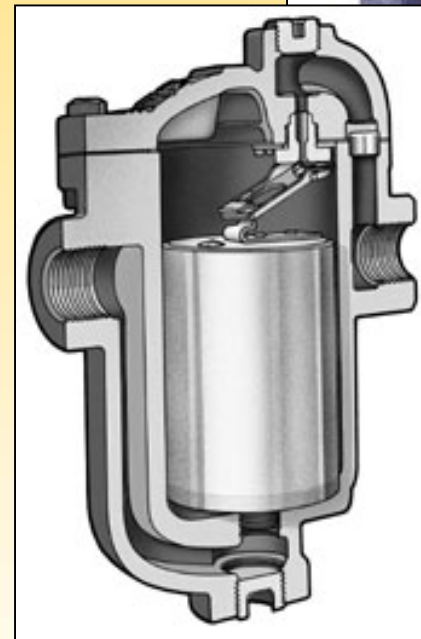
# Areas for Improvement: Generation

- Improve Economizer Operation



# Areas for Improvement: Distribution

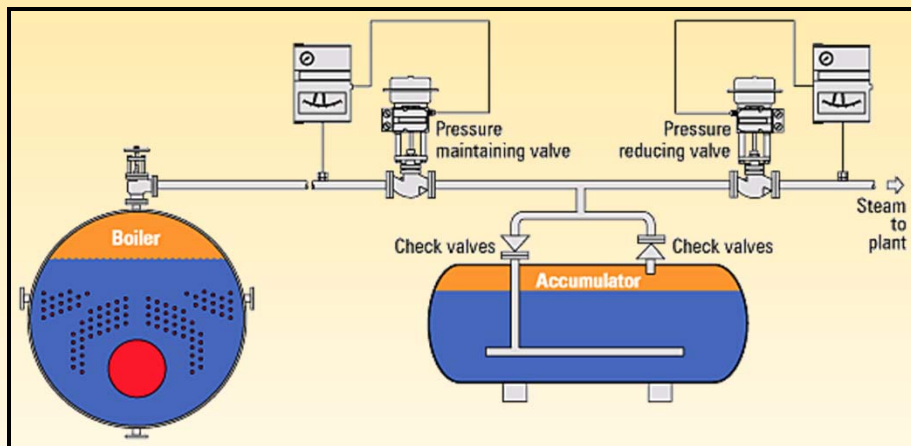
- Insulation
- Steam Trap Audit





# Areas for Improvement: End-Users

- Steam Accumulator
- Wastewater Heat Exchanger



# Economizer Operation



# Economizer Operation

- Situation: Economizers operating inefficiently
  - Murray economizer 63% of expected heat recovery
  - Cleaver-Brooks economizers ~10% of expected heat recovery
- Solution: Repair exhaust stacks
- Results: Improve safety and efficiency

# Economizer Operation

<b>Economizer</b>	<b>Natural Gas Savings</b>	<b>Cost Savings</b>
Murray	1,500 mcf/yr	\$7,500 /yr
Cleaver-Brooks #1	1,340 mcf/yr	\$6,900 /yr
Cleaver-Brooks #2	620 mcf/yr	\$3,000 /yr



# Wastewater Heat Exchanger



# Wastewater Heat Exchanger

- Situation: Contaminated water exits cookers at 150°F
- Solution: Clean and repair existing heat exchanger
- Results: Recover a portion of energy to preheat boiler water

# Wastewater Heat Exchanger

Implementation Cost	Natural Gas Savings	Cost Savings	Payback Period
\$1,900 <sup>1</sup>	6,630 mcf/yr <sup>2</sup>	\$33,100 /yr	3 weeks

<sup>1</sup>Assumed 50 man-hours of labor required.

<sup>2</sup>Heat exchanger allows make-up water to be heated from 60° F to 110° F.

# Steam Accumulator





# Steam Accumulator

- Situation: Equipment causes extreme fluctuations in steam demand
- Solutions: Install accumulator to buffer boiler from demand
- Results: Better quality steam, safer operation, fewer boilers required

# Steam Accumulator

<b>Projected Annual Savings</b>	<b>3,570 mcf natural gas 17,000 kwh electricity 695,000 gallons water</b>	<b>\$23,400</b>
Improve Burner Efficiency	900 mcf natural gas <sup>1</sup>	\$4,500
Improve Steam Quality	2,130 mcf natural gas 695,000 gallons water	\$10,600 \$4,200
Decrease Boiler Use	540 mcf natural gas <sup>2</sup> 17,000 kwh electricity <sup>3</sup>	\$2,700 \$900
Decrease Equipment Damage		\$500

<sup>1</sup>Burner efficiency improved by 0.75%.

<sup>2</sup>900 hours of boiler operating time when all three boilers run simultaneously. 10 mcf/hr natural gas required to keep boiler 'on-line' without producing much steam.

<sup>3</sup>Electricity required for Cleaver-Brooks #2 burner air supply fan.

# Steam Accumulator

Implementation Cost	Natural Gas Savings	Cost Savings	Payback Period
\$184,000	3,570 mcf/yr	\$23,400 /yr	8 years

# Steam Piping Insulation

Implementation Cost	Natural Gas Savings	Cost Savings	Payback Period
\$1,340 <sup>1</sup>	390 mcf/yr	\$1,970 /yr	8 months

<sup>1</sup>Based on prices from McMaster-Carr 117. Cost includes 40 man-hours labor required.



# Steam Trap Audit

Implementation Cost	Natural Gas Savings	Cost Savings	Payback Period
\$9,100 <sup>1</sup>	2,510 mcf/yr	\$12,500 /yr	9 months

<sup>1</sup>Based on \$168 to replace 30 failed traps, plus 10% for shipping. Assuming 45 min labor per failed trap at \$38 per man-hour. Campbell-Sevey audit costs \$18/trap.



# Thank you!



# Questions?

