Water and Energy Efficiency GE Power and Water Technologies

Nikola Trukov

Advisor: Jon Vanyo; Karl DeWahl

Minnesota Technical Assistance Program

UNIVERSITY OF MINNESOTA

Driven to Discover℠

Company Overview

Manufacturing/R&D | Hungary |

Manufacturing/R&D | Wuxi | China

Manufacturing/R&D | Oakville, ON | Canada

Manufacturing/R&D | Minnetonka, MN | USA

Headquarters | Trevose, PA | USA

R&D | Cotia | Brazil

Key

- CMS Manufacturing Sites
- ES Manufacturing Sites
- Technology Sites
- GE Global Research Centers
- Locations with 75+ Employees

Company Overview

- Provide water treatment products for businesses and homes
  - Depth Filters
  - Membranes
  - RO Systems

Depth Filters

RO System

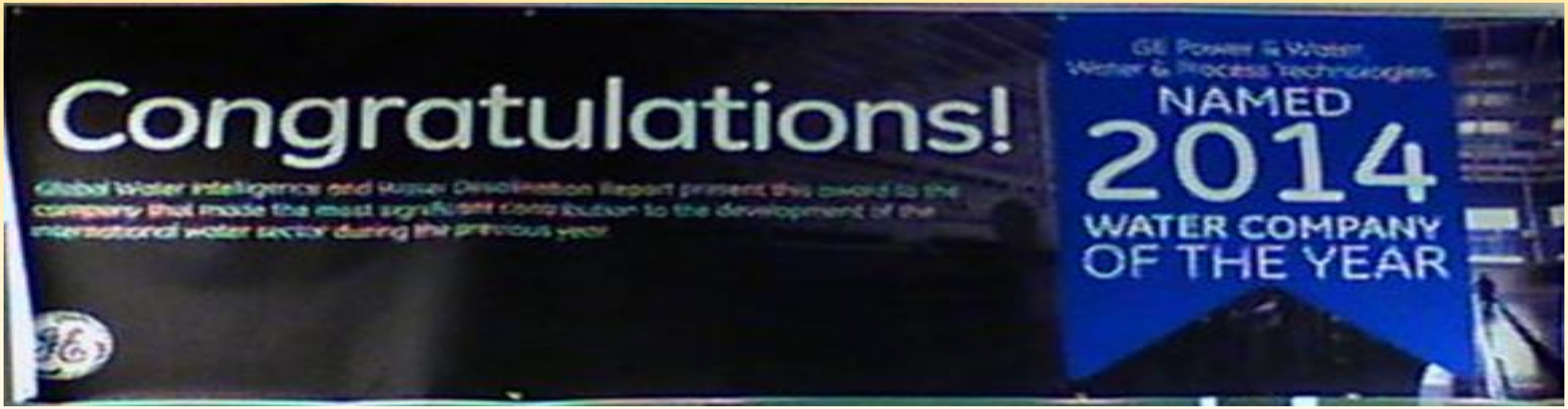
Membrane

Process Overview

- Non-contact cooling water
- Polypropylene
- Energy

Motivations for Change

- Optimize the use of water resources
- Reduce wastewater
- High energy costs



Reasons for MnTAP Assistance

- Analyze and understand water flow
- Quantify and reduce water use
- Understand the distribution of energy usage

Approach

- Understand cooling water effects throughout the process

- Develop relationship between water flow and temperature

Project Considerations

- Criteria:
  - Prevent overheating the hopper
    - Account for temperature fluctuations
    - Ensure the flow of cooling water during operation
  - Avoid hot surfaces
- Water and temperature data collection
- Interactions with the team

Flow Rates on Line 1 and 5

- Non-contact cooling water
- Temperature change

Flow Rates on Lines 1 and 5

- Opportunity
  - High water flow
- Solution
  - Adjust flow rate (metering valve, flow meter)

Line	Current Flow Rate (gal/min)	Recommended Flow Rate (gal/min)	Reduction in Water Consumption (gallons)	Financial Savings Per Year
1	3.2807	0.5	1,400,000	$3,000
5	1.8376	1.5	150,000	$300
Total	**5.1183**	**2.0**	**1,550,000**	**$3,300**

Surface Temperatures

- Exposed hot services
- Safety hazard

Surface Temperatures

- Opportunity
  - Surface temperatures on Lines 2 and 4 are above 120ºF
- Solution
  - Adjust flow rate (metering valve, flow meter)

Line	Current Flow Rate (gal/min)	Recommended Flow Rate (gal/min)	Increase in Water Consumption (gallons)	Financial Savings Per Year
2	0.3525	0.5	50,000	-$100
4	0.3709	0.5	50,000	-$100
Total	**0.7234**	**1.0**	**100,000**	**-$200**

Water Flow During Shutdown

- Continuous water flow
- Extruder shutdown

Water Flow During Shutdown

- Opportunity
  - Unable to automatically shut off water supply when a line is turned off
- Solution
  - Normally-open solenoid valve with interlock system

Line 6 Flow Rates

- In the process of measuring flow rates
- Low temperatures
- Opportunity for significant water flow reduction

Line	Estimated Flow Rate (gal/min)	Recommended Flow Rate (gal/min)	Estimated Water Savings Per Year (gal)	Estimated Financial Savings Per Year
6-1	1.10	0.5	315,360	$668
6-2	1.70	1.0	367,920	$779
6-3	1.10	0.3	420,480	$890
6-4	1.09	0.3	415,224	$878
6-5	1.10	0.3	420,480	$890
Total			**1,900,000**	**$4,100**

Energy

- Components:
  - 5 large extruders with heaters
  - 5 small extruders with heaters
  - 4 air compressors

Energy Demand Charge

- Opportunity
  - Energy spikes cause a substantial energy demand charge
- Possible Ideas
  - Adjust start-up schedule
  - Increase efficiency of electrical equipment

Successful Process Changes

Recommendation	Water reduction per year (gallons)	Net savings (per year)	Payback Period	Status
Install metering valve on Line 1-5	1,450,000	$3,100	~9 months	Proposed
Reduce flow rates on Line 6 extruders	1,900,000	$4,100	~3 months	Testing
Install solenoid valve and an interlock on all water supply pipes	>950,000	$2,000	~1.6 years	Proposed
Install thermocouple with display on all lines	-	-	-	Proposed
Adjust start-up schedule and improve efficiency of electrical equipment	-	-	-	Collecting Data
Totals	**4,300,000**	**$9,200**	**1.4 years**	-

Personal Benefits

- Experience working in an industrial environment
- Professional/technical development
- Better understanding of project planning and management
- Data collection and analysis
- Deeper understanding of safety/health policies
- Working alone and on a team

Thank you to everyone at MnTAP and GE

for making this project possible

Questions?