Water and Energy Efficiency at Fulton Beer Company

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Company Overview

- **History**
  - Founded in 2009 out of Minneapolis garage
  - Purchased 20 bbl taproom/brewery in 2010
  - Built 80 bbl production facility in 2013

- **Current Status**
  - Ranked 100th largest craft brewery
  - 43 employees
  - Produce 33,000 bbl/year

Motivations for Change

- **Brewing is water intensive**
  - Takes 4-9 barrel of water per barrel beer
- **Breweries produce strong effluent**
  - ~ 10,000 mg/L COD
  - ~1,000 mg/L TSS
- **Costly strength charges to treat wastewater**

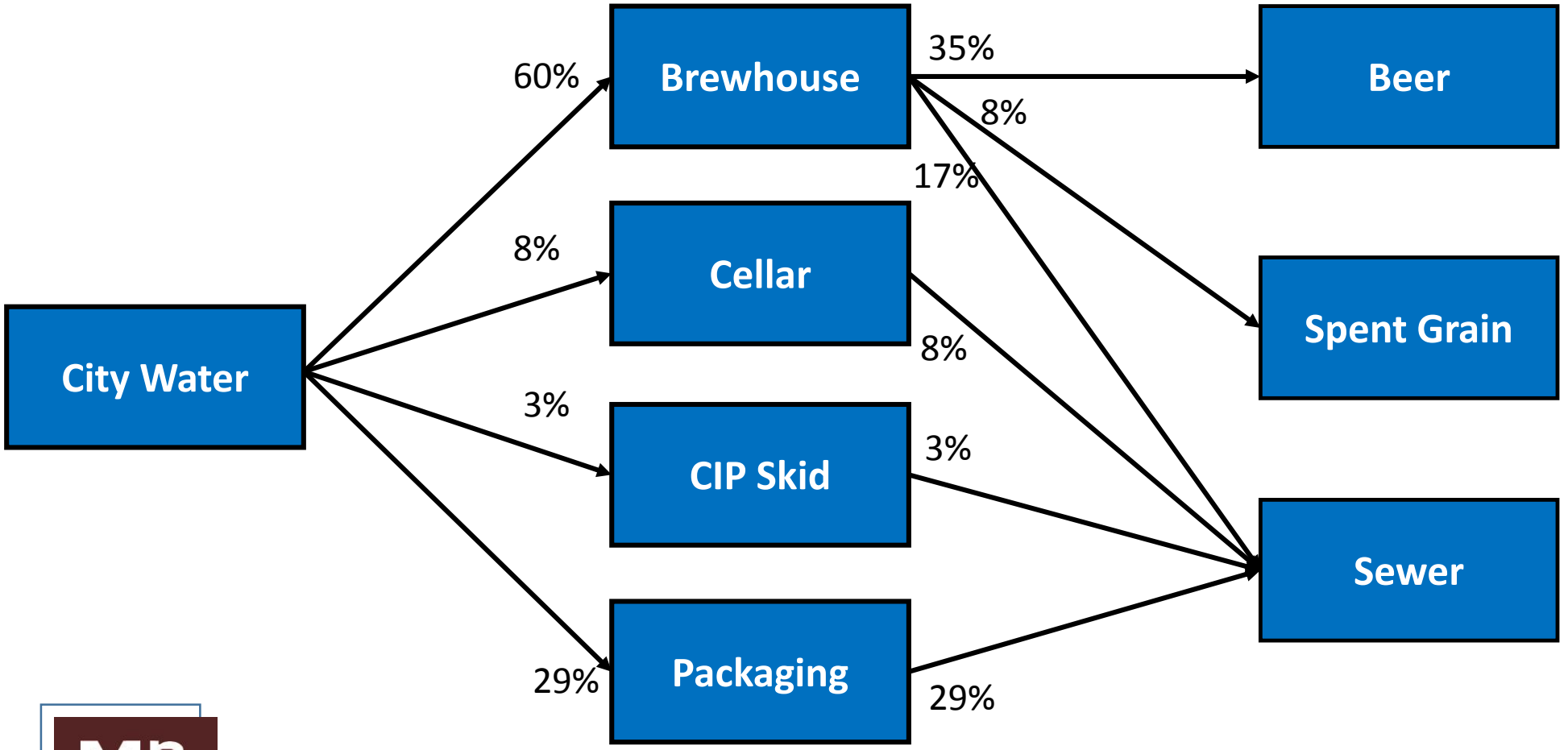
Reasons for MnTAP Assistance

- **Audit energy and water usage**
- **Identify opportunities for reduction**
  - Water consumption
  - Energy consumption
  - Wastewater strength
- **Give recommendations with associated savings and ROI**

Approach

- **Map water usage throughout the facility**
  - Flow meters
  - Observe processes
- **Investigate brewery effluent strength and volume**
  - Wastewater reports (Volume, COD/TSS)
- **Determine highest strength discharges**
  - Perform COD/TSS analysis on discharges

Water Usage Map



Fulton Beer Yearly Waste Water	
Volume	3,500,000 gal
COD	8,000 mg/L
TSS	800 mg/L
COD Rate	$0.111/lb
TSS Rate	$0.222/lb
Cost	$25,000

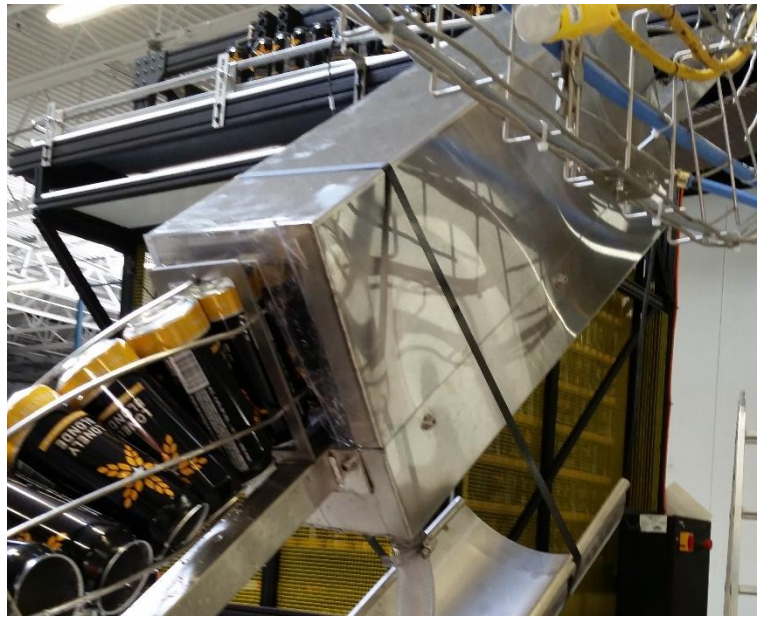
Investigation Strategies

- **Water Consumption**
  - Focused on highest consumption
    - Packaging lines, brewhouse
  - Talked with employees
    - Obvious waste or reduction ideas

- **Effluent Strength**
  - Focused highest TSS/COD level discharge
    - Yeast dumps in cellar
    - Hot trub in brewhouse

Recommendation: Canning Line

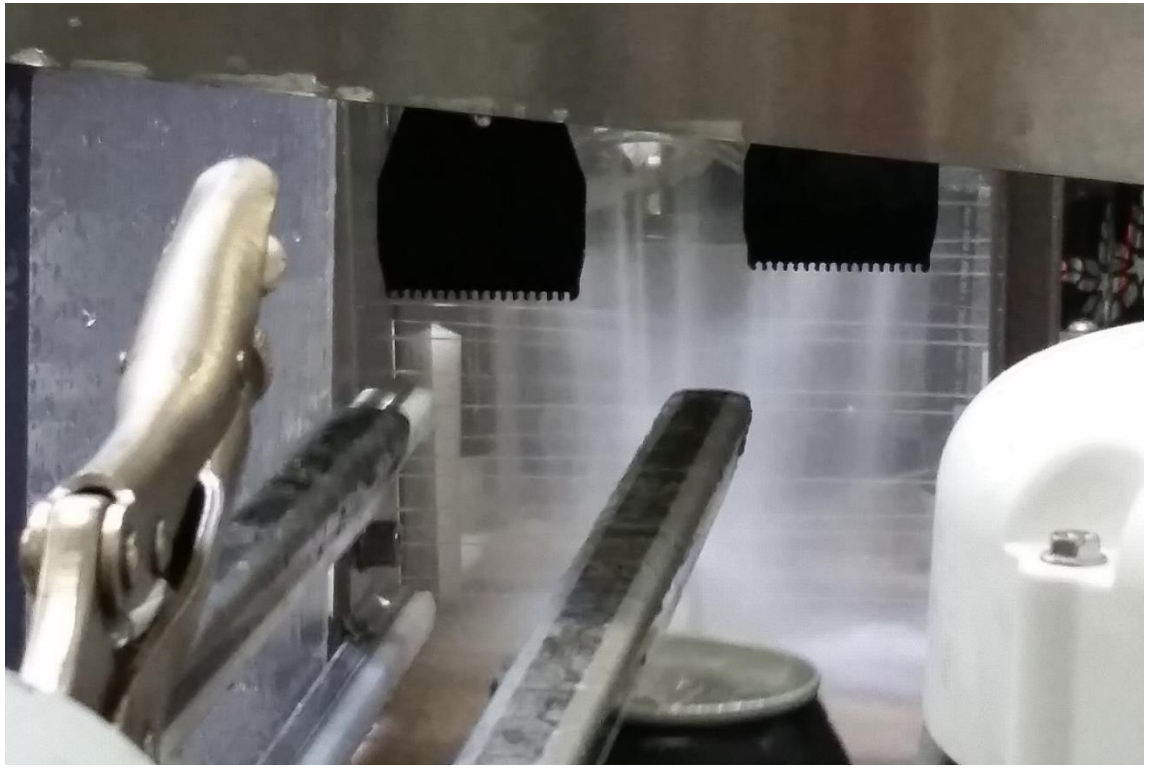
- **Reuse internal rinse water for external rinse and reduce flow**
  - Current State
    - City water used for internal/external rinse
  - Why
    - External rinse removes beer/foam
    - Internal rinse water should be suitable
  - Solution
    - Use internal rinse for external rinse



Recommendations	Water Reductions Per Year	Implementation Cost	Net Savings Per Year	Payback Period	Status
Use Internal Rinse for External Rinse, reduce flow	115,000 gallons	$50	$1,100	1 month	Implemented

Recommendation: Canning Line

Before



After

Recommendation: Bottling Line

- **Recirculate vacuum pump cooling and sealing water**
  - Current state
    - 5.25 gal/min of city water dumped down drain
  - Why
    - Pump could reuse water if cooled
  - Solution
    - Add cooling coil, reclamation vessel and pump

Recommendations	Water Reductions Per Year	Implementation Cost	Net Savings Per Year	Payback Period	Status
Recycle Loop on Vacuum Pump	230,000 gallons	N/A	$2,100	N/A	Recommended

Recommendation: Kegging Line

- **Fix broken valve on kegging line**
  - Current state
    - Broken valve causes hot water overflow in caustic bay
  - Why
    - No need for water overflow
  - Solution
    - Replace broken valve

Recommendations	Water/Energy Reductions Per Year	Implementation Cost	Net Savings Per Year	Payback Period	Status
Fix Broken Valve on Caustic Bay	71,000 gallons 500 therms	$25	$1,000	1 month	Recommended

Recommendation: Brewhouse

- **Add spray nozzles kettle**
  - Current state
    - Brewers spent hop bed to remove trub
  - Why
    - Reduce water use
    - Reduce waste volume
  - Solution
    - Install Flatjet spray nozzles on side of kettle

Recommendations	Waste/Water/Energy Reductions Per Year	Implementation Cost	Net Savings Per Year	Payback Period	Status
Add Spray Nozzles to Kettle	42,000 gallons	$2,900	$450	6.5 years	Recommended

Recommendation: Effluent Strength

- **Evaporate high strength waste**
  - Current status
    - Yeast and cold trub goes to drain
    - Causes high COD/TSS
  - Why
    - Evaporator prevents waste from touching effluent
  - Solution
    - Dewater yeast and mix with spent grain

Recommendations	Waste/Water/Energy Reductions Per Year	Implementation Cost	Net Savings Per Year	Payback Period	Status
Evaporate yeast water	20,000 gallons	$50,000	$9,100	5 years	Recommended

Recommendation: Boilers

- **Insulate boiler head plates**
  - Current state
    - Uninsulated head plates
  - Why
    - 240F head plates radiate a lot of heat
  - Solution
    - Add removable thermal blanket insulation to head plates

Recommendations	Energy Reductions Per Year	Implementation Cost	Net Savings Per Year	Payback Period	Status
Install head boiler plates	700 therms	$3,000	$400	7.5 years	Recommended

Recommendation Summary

Recommendations	Waste/Water/Energy Reductions Per Year	Implementation Cost	Net Savings Per Year	Payback Period	Status
Canning line water recycle	115,000 gallons	$50	$1,100	1 month	Implemented
Vacuum Pump recycle loop	230,000 gallons	N/A	$2,100	N/A	Recommended
Fix valve on keg line	71,000 gallons 500 therms	$25	$1,000	1 month	Recommended
Add Spray Nozzles to Kettle	42,000 gallons	$2,900	$450	6.5 years	Recommended
Evaporate yeast water	20,000 gallons	$50,000	$9,100	5 years	Testing
Insulate boilers head plates	700 therms	3,000	$400	7.5 years	Recommended
Total Savings	478,000 gallons water 1,200 Therms				

Personal Benefits

- Gained valuable experience
- Built confidence
- Interface with variety of people
- Learned about the brewing process and waste
- Organizational skills

Questions