Water and Sludge Reduction

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Driven to Discover℠

Company Overview

- Electroplating job shop w/ 60,000 sq. ft.
- 100 employees, 3 shifts
- Over 20 finishes
- 12 process lines

Motivations for Change

- Looking to expand
  - Avoid future Service Availability Charges (SAC)
  - Savings now → Easier expansion later
- "Two Greens"
  - Reduce impact on environment
  - Save money

Reasons for MnTAP Assistance

- Investigate/research water and sludge reduction opportunities
  - Host intern to work specifically on these opportunities
- Perform economic analysis for feasibility of process changes
- Oversee implementation of approved changes

Approach

- Analyze and understand process lines
- Identify key sources of water use and sludge generation
- Case study reviews
- Collect data to determine scope of problem
- Identify feasible solutions
- Propose solutions for company approval
- Oversee implementation

Identifying Improvement Areas

- Gathered baseline data
  - Water usage
  - Dragout
  - Sludge
- Visual Observations
  - Continuous water flow with discrete part immersion
  - Operator behavior

Rinse Tanks

- Removes plating solution from parts
- Continuous water flow through tanks
  - Some lines only operate 1 shift per day
  - Varying workloads throughout day
- Not all lines operated 24/7
  - Water not rinsing parts
- Solution: Conductivity Control

Conductivity Control

- Monitors contamination level using conductivity
- Only uses water when contaminants exceed the “set point”
  - Adjustable set point for increase in savings

Current Status

- One system purchased/installed on a chromate rinse
  - 90% water reduction to date
- Planning to expand use if results hold
- Potential Savings
  - 5,200,000 gal water, $30,000
  - Payback: 6 months

Dragout Reduction

- Dragout is the plating solution that gets carried by the part into the rinse tank
- Responsible for >50% of sludge generated
- Solution: Increase drip time on parts

Dragout Reduction (cont.)

- Gathered baseline dragout values
- Asked operator to hold rack for 5 sec
- Result: 5 second drip time → 25% dragout reduction
- Chemical savings
- Training program implemented
- 100,000 lb sludge reduced
- $27,000 in sludge and chemical savings

Cleaning Baths

- Removes dirt/smut from parts
- Sludge generation
- Chemical costs
- Solution: Replace city water with soft water for bath make-up and evaporative losses

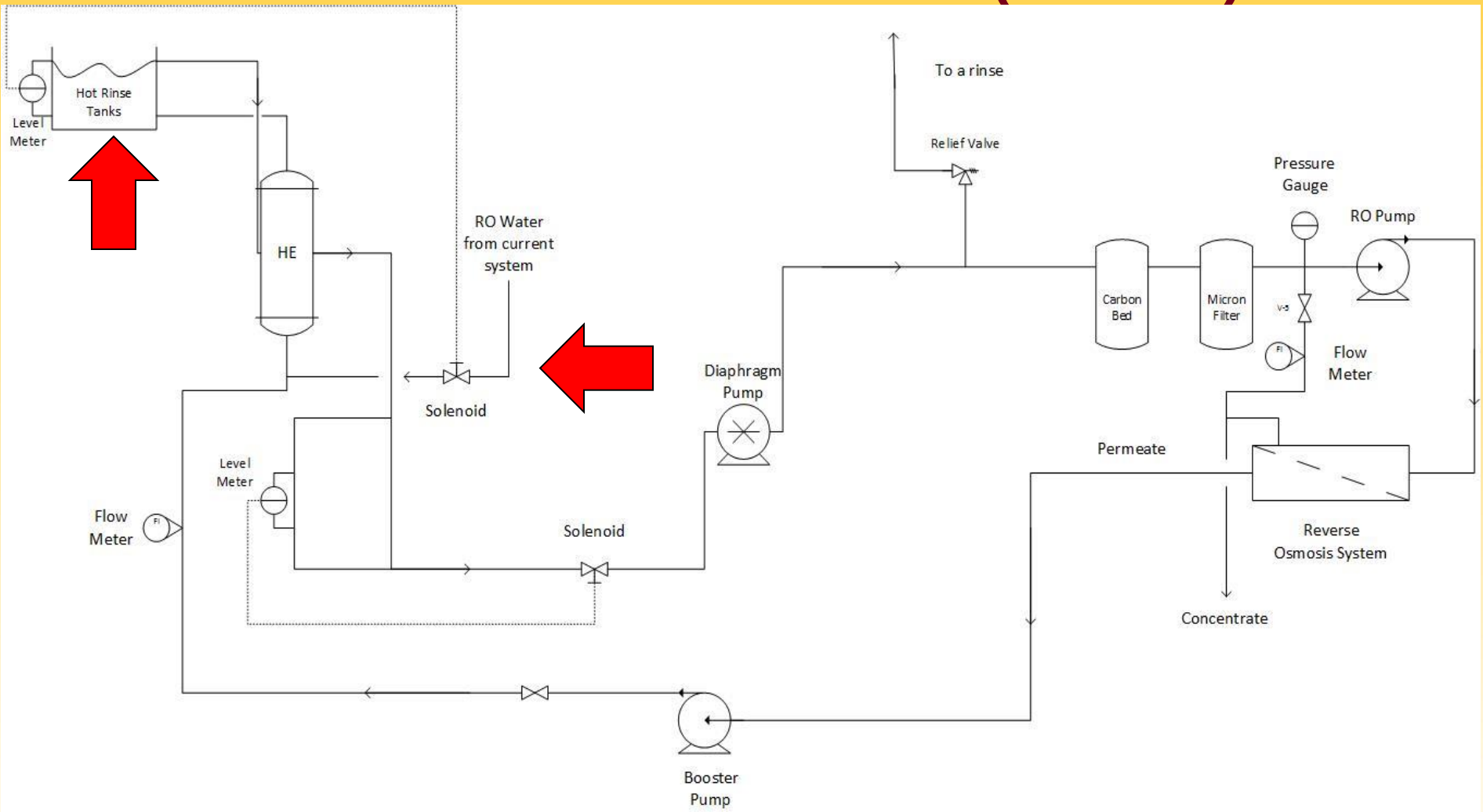
Cleaning Baths (cont.)

- Soft Water
  - Prevents chemical from falling out of solution
    - 85% less (small scale)
  - Offers better cleaning
  - Reduces sludge from water contaminants

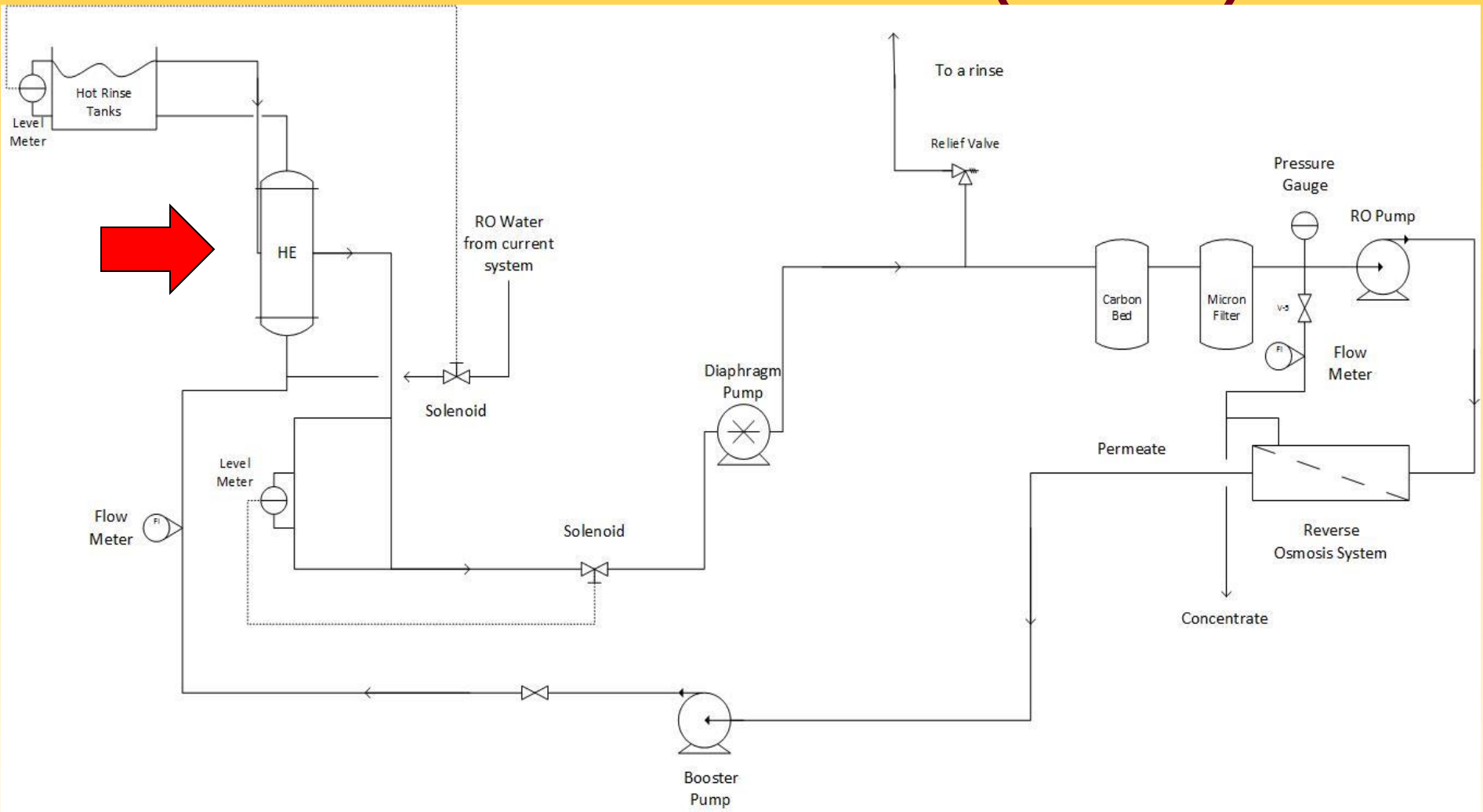
Reverse Osmosis

- Hot Rinses
  - Used on lines as the final rinse
  - Clean water being sent down to treatment
    - 50-400 uS/cm (city water ~500-600 uS/cm)
  - Reuse water to save water
  - Recover heat to save energy
- 1,700,000 gal water, 19,000 therms
- Payback: 8 months

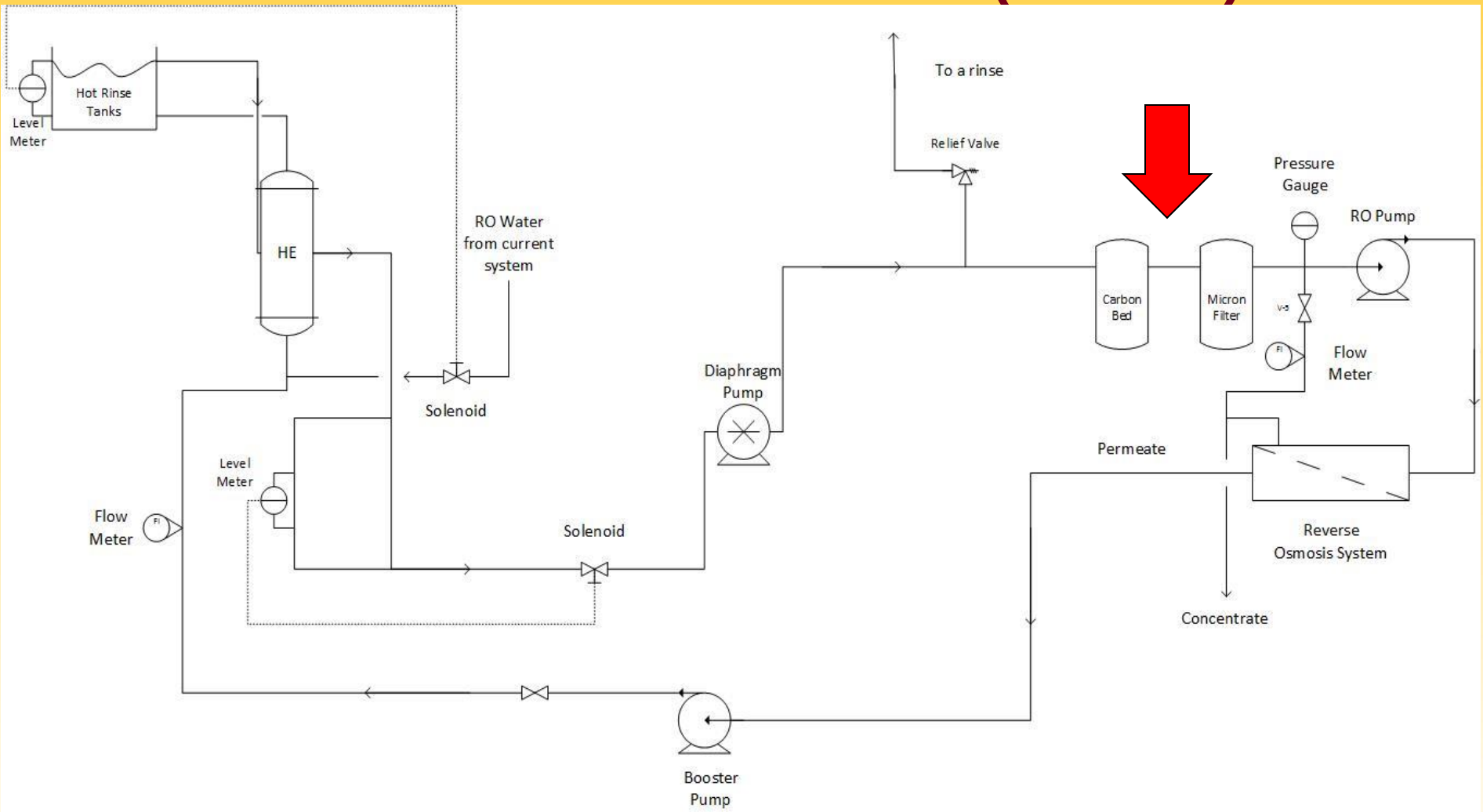
Reverse Osmosis (cont.)



Reverse Osmosis (cont.)



Reverse Osmosis (cont.)



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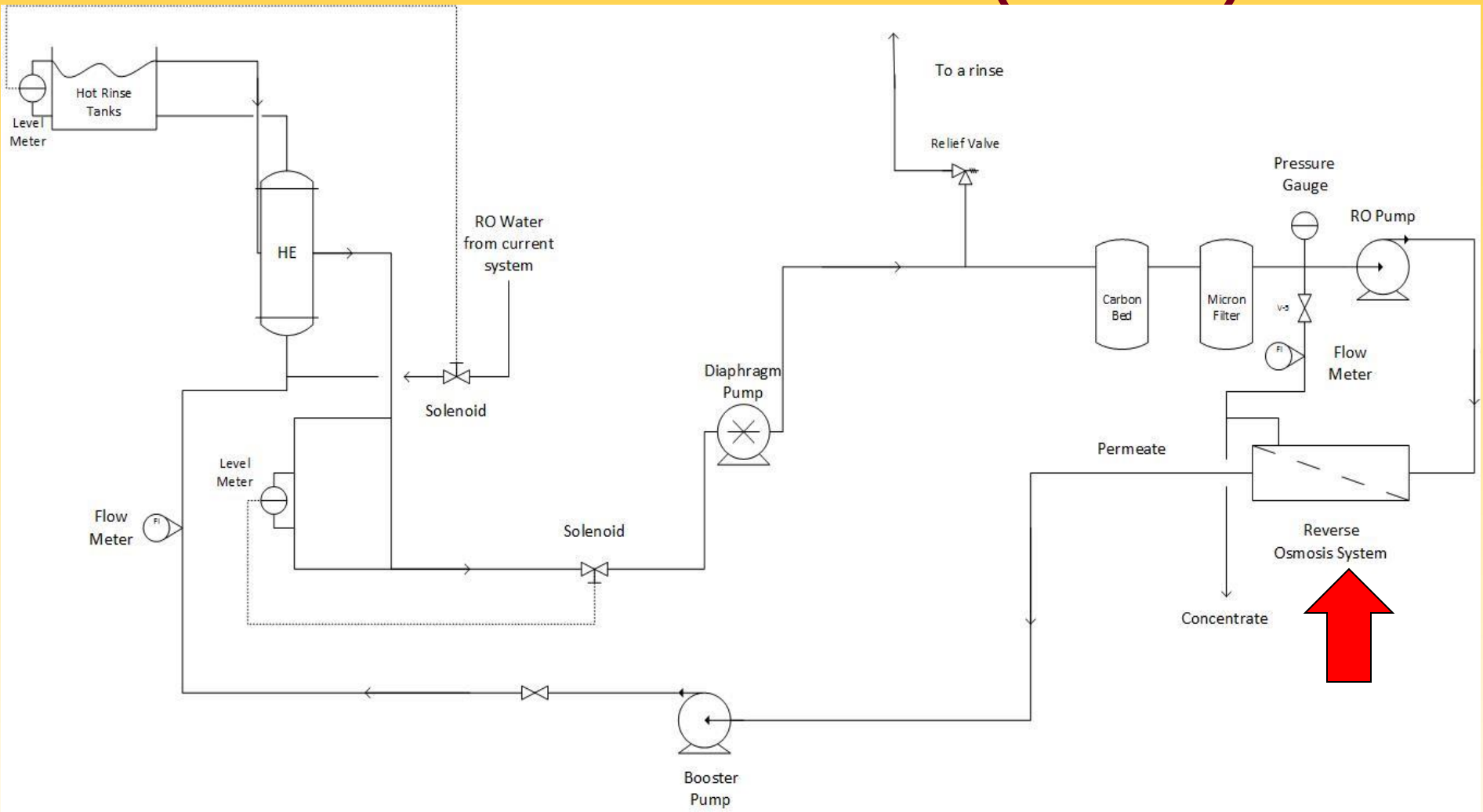

Other Ideas Explored

- Increasing Soft/RO water for rinses
  - Sludge savings<Added water costs
  - Rinsing quality could make this feasible in the future
- Replacing caustic with FloMag®
  - Magnesium hydroxide slurry
  - Produces thicker, higher quality sludge
  - No reduction in quantity, not economically feasible

Summary of Findings

Recommendation	Waste Reduced (per yr)	Capital Cost	Net Savings ($/yr)	Payback	Status
Install 13 Conductivity Control Systems	5,200,000 gal water	$16,000	$30,000	6 months	Testing
Convert Cleaner Baths and Rinses to Soft Water on 3 Lines	4,000 lb sludge	$1,200	$6,100	2 months	Implementing
Increase Driptime of Parts	100,000 lb sludge	N/A	$27,000	Immediate	Implementing
Recycle Hot RO rinses	1,700,000 gal water 19,000 therms	$14,640	$23,200	8 months	Under Review
Totals	6,900,000 gal water 104,000 lb sludge 19,000 therms	$31,840	$86,300		

Personal Benefits

- Used classroom knowledge in a real-world setting
- Communication skills
- Business climate exposure
- Helping the environment

Questions?