Energy Savings at SKUWOter Brandon Noel

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UNIVERSITY OF MINNESOTA Driven to Discovers



Company Overview

- Employees and investors bought the Bloomington site in March 2017
- Designer and manufacturer of semiconductor products for a wide variety of applications
 - Military
 - Consumer Goods
 - Automotive
- 24/7 365 Operation





Motivation

Commitment to the Environment

- "SkyWater Technology Foundry is committed to the prevention of pollution and continual improvement of its environmental systems and controls." – Gary Obermiller, CEO
- Improved Maintenance
- Financial Savings
 - Electricity costs are the largest cost after labor



Motivation

Electricity Usage vs. Time





Goals

- Improve energy efficiency of air handling systems and related components
- Develop a regular maintenance schedule for make-up air unit coil cleaning



Approach

- Use previously made energy footprint to prioritize the largest opportunities
- Research ways to improve the efficiencies of those systems
- Determine feasibility
 - Talk with facility engineers, technicians, vendors
- Implement





Make-Up Air Unit (MAU)





Make-Up Air Unit (MAU)





Vane-Axial Fan

Final Filter

High-Pressure Humidification







Make-Up Air Energy Savings: Coils

- Coils transfer heat between the cold/hot water and the air
- Dirty coils increase the pressure drop and lower heat transfer efficiency







Make-Up Air Energy Savings: Coils

- Reduced Fan Speed
- Reduced Cold/Hot Water Pump Speed
 - Signal to noise ratio is too high
 - Need longer term data collection







Make-Up Air Energy Savings: Charcoal Filters

- Designed to adsorb volatile
 organic compounds (VOCs) and
 odors
- Typical expected lifetime 5 years
- 15 years old
- Reduced Fan Speed









Fab Air Handling Cost Metric

Estimated per unit cost of air handling

- Make-Up Air Fans
- Exhaust Fans (General and Scrubbed)
- Chillers
- Boilers
- Estimated Annual Cost
 - \$765,000 @ \$0.068/kWh
- Estimated Annual Cubic Feet of Air Handling
 - 125 billion cubic feet
- Can be used to estimate cost savings from reducing exhaust



Summary of Recommendations

Recommendation	Annual Energy Savings	Annual Cost Savings	Implementation Cost	Payback Period	Status
Clean MAU C1,C2,A,B Coils	41,000 kWh	\$2,700	\$2,900 + 50 Technician Man Hours	w/out Technicians: 1.05 years with Technicians: 1.87 years	Implemented
Remove Charcoal Filters	44,000 kWh	\$3,000	30 Technician Man Hours	w/out Technicians: Immediate with Technicians: 6 Months	Implemented, Under Review
Reduce Condenser Water Pump Speed in Fab C	520,000 kWh	\$35,600	60 Engineer Man Hours + Four Flow Meters	5 Months	Recommended
Total	605,000 kWh	\$41,300	\$2,900 + 140 Man Hours	4 Months	



Personal Benefits

- New areas of expertise
- Practice communicating with co-workers and vendors
- Experience solving real world problems



Future Work

- Look into pressure sensor that controls fab differential pressure
- Clean 3 remaining MAU A, MAU B coils in the winter
- Reduce remaining condenser/chilled water pump speeds





