

TEL FSI, INC.



David Binstock
Mechanical Engineering,
Washington University in St. Louis

Company Background

TEL FSI, INC. designs and manufactures semiconductor capital equipment. The company specializes in wafer cleaning tools, both dry and wet, single and batch. Products include a single wafer cleaning system, a batch spray system, and a single wafer cryokinetic cleaning system. The company is located in Chaska and employs approximately 245 employees.



TEL FSI, INC.

“With the MnTAP internship I was able to work with a real company and develop real solutions to real issues that I care about – environmental issues of waste, energy and water – which made the end result that much more satisfying.”

Project Background

There were two components to this project. The primary objective was to investigate water usage in the facility and make recommendations for reducing water consumption. The deliverables for this portion of the project were an up-to-date facility water schematic and a list of suggested actions for reducing water usage. The secondary consideration of this project was a similar investigation into energy reductions. The deliverable for this portion was simply a list of recommended actions.

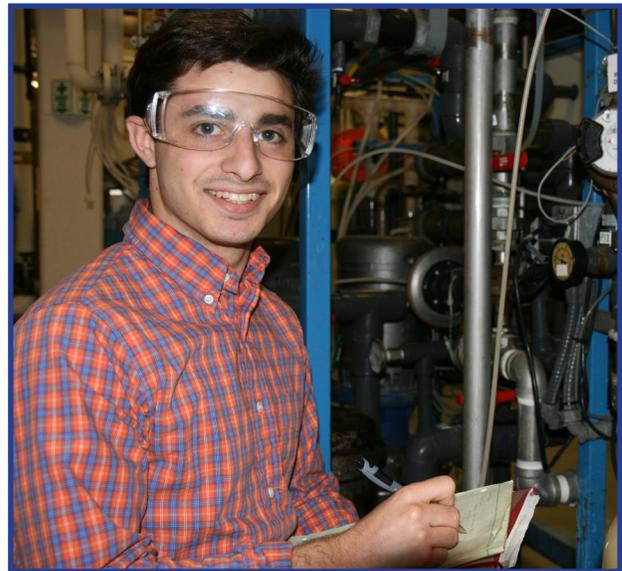
Incentives To Change

There were three main incentives for this project. The first was to comply with Tokyo Electron Group’s corporate goals of reducing their global environmental impact. The second was financial savings and the final incentive was a desire to reduce SAC (sewer availability charge) units in order to avoid incurring future charges.

Solutions

Reclaim Non-CO₂ DI Water Bypasses

There are a number of de-ionized water bypass lines in the Research and Development (or “Process”) Lab that were not being reclaimed. My suggestion was to re-plumb these lines so they are being sent to reclaim instead of the sewer. Estimated savings would be between 2.5 and 4.4 million gallons of DI water per year.



Degas and Reclaim CO₂-Laden DI Bypasses

There are several water lines in the Process Lab injected with CO₂ which cannot be reclaimed by the DI water system. These flows are currently sent to the sewer. My suggestion was to connect these CO₂ water lines through a degasser to remove the residual gas and reclaim the DI water. Approximately 2.2 to 4.7 million additional gallons of DI water could be saved per year.

Disconnect Or Reclaim Unused Equipment DI Water Bypass

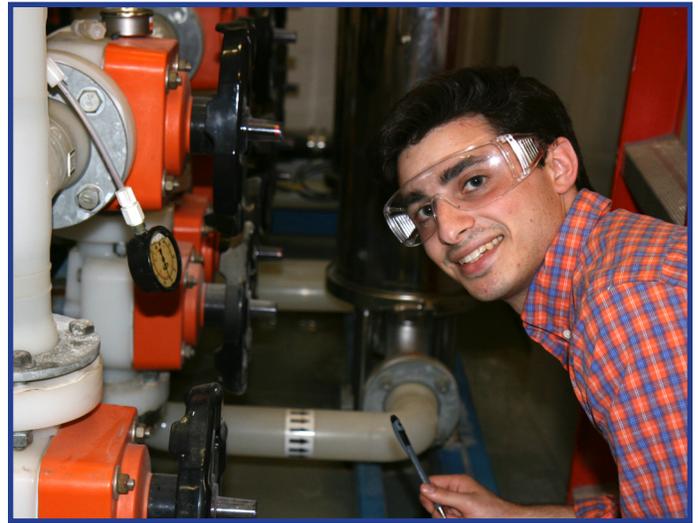
A specific piece of equipment in the process lab is not being utilized, yet a constant flow of hot DI water is still directed to it, bypassed and sewerred. My suggestion was to first determine if it could be disconnected completely or reclaimed. Water consumption reduction was estimated at 55,000 gallons of DI water per year.

Use City Water For Cooling Water

One piece of equipment is fed with a DI water cooling line. In other similar pieces of equipment, this cooling water is supplied by city water, not DI. My recommendation was to determine if city water could be used instead of DI water. This would save about 275,000 gallons of DI water, which in turn would save 90,000 gallons of city water.

Send Heater Pressure Relief To Reclaim

The pressure relief from the DI hot water heaters in the process lab is also directed to the sewer. This water, though very small in volume, is clean DI water and could be reclaimed through re-plumbing. Savings are estimated at about 25,000 gallons of DI water per year.



Send Production RO-Reject To Pond

While the larger of the two reverse osmosis systems does send its reject water to a retention pond, one of the systems directs its RO-reject to the sewer. By directing this rejected water to the retention pond, no water is saved, but 100,000 gallons are diverted from the drain, avoiding sewer charges and reducing SAC units.

Fix Compressed Air Leaks

Forty-eight leaks were detected in the compressed air system. Fixing these leaks could cut energy use and costs of the system by 30-50%.

Reduce Compressed Air System Pressure

Currently, compressed air pressure is 124 psi coming off of the compressor. Preliminary investigations revealed that compressed air users may not need pressure this high. Reducing this by 10 psi could save 60,000 kWh per year.

Table reflects total water reduction from creating DI water

Recommendation	Reduction	Annual Savings	Status
Reclaim DI water bypasses (non-CO2)	3,300,000 - 5,700,000 gallons	\$14,500 - \$25,000	Planned
Degas and reclaim CO2-laden DI bypasses	2,900,000 - 6,100,000 gallons	\$10,400 - \$25,000	Recommended
Disconnect or reclaim unused equipment DI water bypass	73,000 gallons	\$320	Under review
Use city water for "cooling water"	90,000 gallons	\$145	Recommended
Send heater pressure relief to reclaim	32,000 gallons	\$150	Recommended
Send production RO reject to pond	100,000 gallons diverted from drain	\$355	Recommended
Fix compressed air leaks	640,000 kWh	\$35,000	Under Review
Reduce compressed air pressure	60,000 kWh	\$3,000	Under Review