University of California San Francisco: Bulk Sterilizer Replacement

Don Mabunga
Laboratory Animal Resource Center

Eliahu Perszyk
Facilities Services-Infrastructure and Utilities

6/16/2017
Sterilizer Water Consumption

- New University of California Policy requires the elimination of once-through water cooling
- Data from sterilizer water meters was tracked
- Findings indicate that laboratory sterilizers (2’ x 3’ chamber) set up with water cooling and operation can consume between 150,000-1,000,000 gallons per year
- Majority of sterilizers are left on 24/7, and water consumption during sterilization cycles is only a small portion of total consumption. Constant once-through water cooling.

- How Are Sterilizers Configured to Consume Water?
Sterilizer Chamber Operation:
Extract sterilized contents and send to drain <140°F
Sterilizer Jacket Operation:
Steam heats jacket, then becomes condensate

No Water Consumption
+ Return Heat Energy
Steam

Condensate Return to Central Heating Plant
Mixing Valve
Condensate to Drain
Temp <140F
Condensate to Quench Tank

Direct to Drain: High Water Consumption
Quench Tank Passive Cooling: Medium Water Consumption

Chamber
Jacket
Water
Helen Diller 5th floor LARC sterilization facility had two poorly operating bulk sterilizers (7’ x 7’ x 4’ chamber).

The equipment was installed with once-through water cooling.

Water meters indicated the sterilizers had a combined consumption of 10-12 Million gallons per year.

The old sterilizers broke down frequently, impacting research.

Water Meter Data was used to develop the financial justification to replace the two bulk sterilizers, and connect to efficient utilities.

Working with San Francisco Water Department Incentive Program. Projected savings exceed maximum rebate amount of $75,000.
Sterilizer Replacement Scope

Replacement of old bulk sterilizers with new bulk sterilizers

- Getinge is the preferred vendor and maintenance provider for UCSF sterilizers and glass wash equipment
  - High quality equipment
  - Equipment connected to chilled water instead of once-through water cooling
  - Steam condensate from jacket connected to condensate return
  - Reduced maintenance cost to LARC
  - Getinge provided a Utilities Performance Guarantee on the equipment
### Original Project Cost/Deficit Payback

- **Total Original Project Cost Estimate:** $1,248,000

- **Water Utilities Payback** includes projected rate increase of 6% per year

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight line over 5 years</td>
<td></td>
<td>$124,800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight line over 4 years</td>
<td></td>
<td></td>
<td>$280,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight line over 3 years</td>
<td></td>
<td></td>
<td></td>
<td>$280,800</td>
<td></td>
</tr>
<tr>
<td>Straight line over 2 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$280,800</td>
</tr>
<tr>
<td>Straight line over 1 year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total** $1,248,000
Once-through Water Facility vs. Chilled Water Facility Water Billing from SFPUC

Drops in consumption at Helen Diller are due to equipment failure

Helen Diller Total= 15,419,314 Gallons or $329,824
Neuroscience Total= 2,691,746 Gallons or $57,577

Water Cost
Delta=$272,247
Building & Bulk Sterilizer Water Consumption Detail

Sterilizer 1 Breaks Down

Sterilizer 1 Running Again

Gallons of Water per Day

HelenDiller
TotalSterilizer

15-Jan 25-Jan 4-Feb 14-Feb 24-Feb 6-Mar 16-Mar
Sterilizer Project Energy Savings

- Worked with PG&E Savings by Design program, which identified savings from higher efficiency equipment.
- Total kWh savings of 1,292/Total Therms savings of 4,043
- Total Incentive Amount: $4353.40

- Additional Energy Savings (Not yet Quantified):
  - Reduced building steam pressure from 80psi to 50psi
  - Condensate return to central plant
  - Reduced HVAC air changes at sterilizers
**Construction Overview: Success**

- Project Team met with research community to review the construction process and schedule.

- Acoustic engineers were hired to mitigate construction noise, as the project location was in the middle of sensitive research animals.

- Researchers requested dB levels in the 40s, demolition noise levels are in the 90s.

- Acoustic barriers were built, and measurements taken during construction verified dB levels in the 40s.
Construction Overview: Lessons Learned

▪ Project Management mistakes led to significant cost increases on the project.

▪ *When developing cost estimates of mechanical systems, check with an actual engineer. Proposed chilled water service was not big enough.*

▪ *Get the general contractor on board well ahead of the project start schedule. Finalize Design and Engineering to bid out the project.*

▪ *As-built drawings may not be accurate, always get field verification. The general contractor can do this ahead of time if well directed and informed.*
Sterilizer Rigging into Building
Crane was too small, a larger one had to be brought in, one day delay, added cost
Roof Lift Slab Weight Miscalculation

Rebar Shown in Drawing not included in weight calculation!
Other Construction Issues

- Work delay of the installation crew due to not field verifying existing conditions

- *Steam isolation valves shown on the as-built drawings did not exist, this resulted in a three day work crew delay, and significant additional costs.*

- *Electrical breaker indicated in the submittal drawings was of incorrect voltage, requiring the installation team to rent different equipment, delaying work and adding cost.*
Conclusion

- Equipment scheduled for turnover to LARC on 6/30/2017
- Replacement of the two LARC bulk sterilizers will result in significantly improved sterilization processing
- The new sterilizers will be programmed to shut down utilities when not in use
- Even with additional costs, the project deficit still has a six-year pay back

- Install water meters, track the data, and develop the financial justification