

Promoting Water Conservation in Research Laboratories

The Program/Practice

As water conservation is a continuous priority in California and other drought stricken states, this program is particularly timely and applicable to institutions facing water conservation challenges. This best practice is not only easily transferable, but easily implemented and scalable!

Research Laboratories utilize significant quantities of water and energy, and at the University of California San Francisco (UCSF), research laboratories account for over 22% of the University's water consumption. Water is extremely essential in the research processes which require high volumes of water and steam use for sterilization, cage and rack washers and many other uses. Since research is core to the University's mission, the need to conserve water or any utility usage is typically ignored. As part of the system-wide sustainability initiatives, the University Of California Office Of the President directed all campuses to reduce their water consumption by 20% by the year 2020. The need to conserve water was elevated with the ongoing drought in California, as campuses were urged to identify and implement immediate to long-term solutions to conserve water. Conservation in most research labs is quite challenging; however, the Facilities Department at UCSF instituted a best practice program which has motivated and energized the research labs to adopt a process improvement strategy that includes water conservation.

Through effective collaboration with the research labs, facilities personnel, service contractors and the San Francisco Public Utilities Commission (SFPUC), this initiative has resulted in an annual water use reduction of over 3.6 million gallons with a simple payback of less one year and a total annual cost avoidance of over \$110,000 in associated repairs and maintenance in three research buildings. This successful practice was realized as an easily adopted innovation and recognized with the "Best Practice" award at the 2014 California Higher Education Sustainability Conference. The program was presented at this joint conference attended by all higher education institutions in California, and as a result many UC campuses are now engaging their research lab communities to promote this best practice.

Institutional Benefit

This water conservation initiative is expected to reduce water usage in the research labs by a minimum of 20% through the following measures:

1. Elimination of continuous flow of potable water used to cool down the condensate from sterilizers and autoclaves;
2. Identifying other waste generating processes;
3. Training opportunities to enforce sustainable best practices; and

4. Long term equipment retrofit and/or replacement strategies with innovative financing programs.

Estimated Savings in Water Use Reduction

	Annual Water Use Reduction (Gallons)	Annual Water Use Reduction (Cost)	Additional Annual Savings/Cost Avoidance (Labor/Time)	Total Cost Savings
Genentech Hall	626,000	\$10,000	\$45,000	\$55,000
HSIR	2,970,000	\$37,000	\$20,000	\$57,000
			TOTAL	<u>\$112,000</u>

If projected across the entire campus, this initiative is expected to save on an annual basis, over 13 million gallons of water equivalent to over \$265,000 in water savings, and an additional savings or cost avoidance of \$450,000 in maintenance and repairs. Note that the reduction in water use has a corresponding reduction in energy use.

Innovation, Creativity, Leadership

This initiative can easily be implemented on any campus as it only requires a thorough understanding of the research lab processes and needs in relation to conservation. The initial cost of assessing these processes and needs and the bottlenecks in the processes could be achieved through simple techniques such as sight observations and discussions with the lab managers and other researchers. At UCSF, most of the equipment is owned by the individual research labs and their maintenance is contracted out through service agreements to outside vendors. These outside vendors have records of repairs and maintenance, and such historic information is readily available to the campus. In addition, majority of the vendors have the capability and the technical knowledge and skills to provide insights on improving the functionality, performance and the water and energy efficiency of the equipment.

The presentation and dissemination of the information and analyses not only challenged the lab managers to review their expenses and service contracts but also provided the platform for discussions, problem solving and identification of sustainable and long term solutions. To ensure a non-destructive and manageable approach to this initiative, the team agreed to categorize the lab equipment as follows:

- Category 1 – Fairly New (could be retrofitted to improve performance and conservation)
- Category 2 - Old (fairly functional but not cost effective to retrofit)
- Category 3 – Obsolete/Problematic (leaking, high repair costs, and marked for replacement)

The Category 1 units were retrofitted with a customized kit developed by the vendor. This retrofit was also carried out in additional buildings throughout the campus on equipment with similar characteristics. The research labs negotiated a flexible financing plan to replace all Category 3 equipment in the coming year. Category 2 equipment will be replaced following replacement of all Category 3 equipment. The lab managers took the initiative to engage Facilities in identifying the right equipment based on agreed performance measures, and solicited the assistance of Campus Procurement to negotiate the contract and financing to replace obsolete equipment through a lease-to-own financing strategy. This strategy allowed the labs to respond to their operational and conservation needs with less financial burden on tight budgetary constraints. The most fascinating part of the program was the emergence of efforts and development strategies adopted by the labs to implement a phasing plan to replace all obsolete equipment and the creative means of funding this plan. This initiative has delivered results beyond water conservation and has provided the platform for the labs to demonstrate creativity in meeting their business needs.

Portability and Sustainability

This program is simple and easy to implement in any research program based on available data and information on repair and maintenance records and recorded information on equipment downtime. Where such information is unavailable, they could be collected within a six- to twelve-month period by staff responsible for the repair and maintenance of the equipment. Equipment reliability is essential to research labs and so using the information on repairs, maintenance and downtime to assess and identify solutions for eliminating or reducing downtime will win the cooperation of the lab managers and administrators. The program also identified other bottlenecks in the processes such as improper load configuration and or cycle time, wrong type of glassware in sterilizers and autoclaves, and other actions that negatively impacted the processes and resulted in significant waste of water and energy. The collaboration with labs focused on improving their processes and guiding the discussions towards sustainable solutions. The goal was to generate a solution that was achievable and self driven by the lab. The engagement with SFPUC yielded additional financial incentives to deliver this initiative. SFPUC also provided baseline water use information for directly metered buildings and it continues to provide post implementation data on these buildings for tracking and problem solving. Other UC campuses are now using this same strategy to engage the research community as part of their water conservation efforts. Other higher institutions have expressed interests, and we are available and have offered to provide the necessary assistance to help initiate and implement this program successfully.

Management and Staff Engagement

This program is part of the UCSF's efforts to meet its water use reduction goal of 20% by Year 2020. The program was therefore partly funded by the UCSF Chancellor and the SFPUC provided financial incentives to augment the funding. The idea to engage the research community using the maintenance service providers was conceived by a member of the facilities team after the team was engaged to provide opinions on how to meet the ambitious goal of 20% reduction. The facilities team

played a vital role in assisting the labs with innovative solutions. Such engagement has strengthened the relationship between the facilities and research team, and also provided the opportunity for facilities to play a significant role in the review, selection and installation of the replacement equipment. In addition, both teams worked together to develop and provide training materials and presentation for current and future staff.

Documentation, Analysis, Customer Input and Benchmarking

The campus research community is taking the leading role on replacing inefficient equipment in the labs. Some of the research departments have also used this opportunity to renegotiate their service contracts to include performance measures that also promote water and energy conservation. The water usage data for buildings that are directly metered are ready available through SFPUC and the agency performs periodic reviews and provide feedback to the campus. The Campus has also installed an on-line Badger metering system to track the water use in all sub metered buildings. The availability of the metering data has allowed the campus to monitor and troubleshoot unexpected usage trends.

Summary

All UC campuses have been directed to develop a Water Action Plan with details measures to achieve 20% reduction by Year 2020. At UCSF, the research labs play significant part of meeting this goal. Over the past 4 years, UCSF has embarked on a campus wide water conservation program using many behavioral change outreach programs to encourage conservation. Such conservation measures were quite challenging to implement in the labs. Research is one the three main core pillars of the UCSF's mission and it is important to ensure that the research processes are not jeopardized in our efforts to save water. The collaboration and engagement of all stakeholders on this program and the successes achieved demonstrate the excitement of an engaged team working together to identify an effective and innovative approach towards a very challenging problem- water conservation in research labs.