Water Conservation Efforts In University of Colorado-Boulder Laboratories

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Learning Objectives

- Green Labs practices a campus wide, collaborative team approach
- Specific examples of water conservation efforts
- The quantitative water savings that resulted from these specific water conservation efforts
- Incentives that were used to motivate labs to conserve water

CU Boulder Green Labs Program

Created in 2009

Energy Conservation

Water Conservation

Material Waste Reduction

Hazardous Waste Reduction

Aim to be a resource to labs

A benefit to labs and conservation

Not compromising safety or research integrity

Utilize expertise of lab members, EH&S, Facilities Management

An Important Focus → Engaging Scientists

LAB ECO-LEADER

a volunteer interested in encouraging the efficient use of resources in his/her lab and department

BENEFITS:

- Insider
- Knowledgeable about their particular lab
- Always present in lab

Graduate Students Leading Inside Departments

GREEN LABS TEAM LEAD

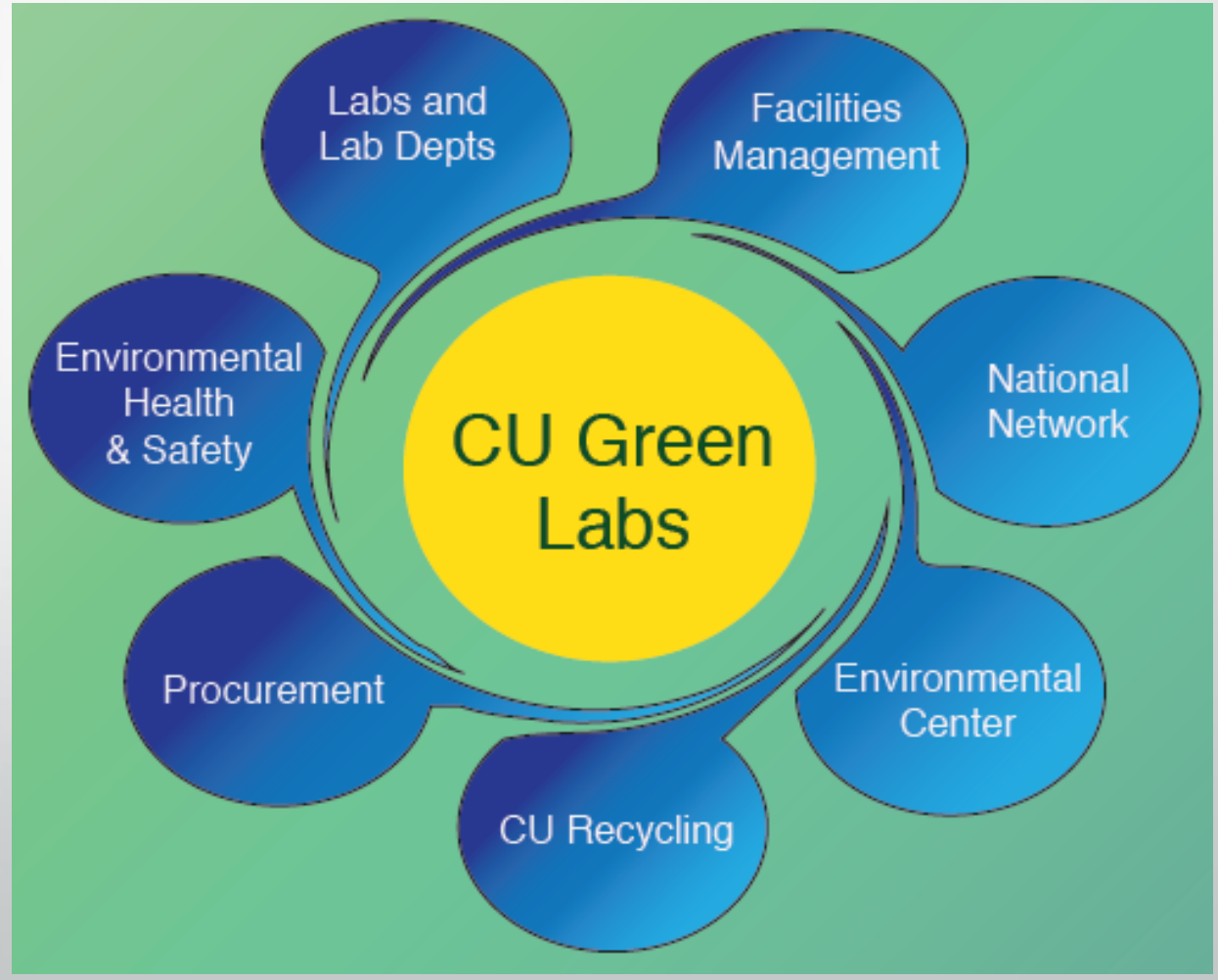
Paid grad student leading Eco-Leaders & working on green efforts within his/her own department or building

- Passionate
- Have chair support
- Point of contact
- Help identify project
- Help lead Eco-Leaders within department

Program Has Grown Into: Campus-wide, collaborative team approach

CU Green Labs Networks:

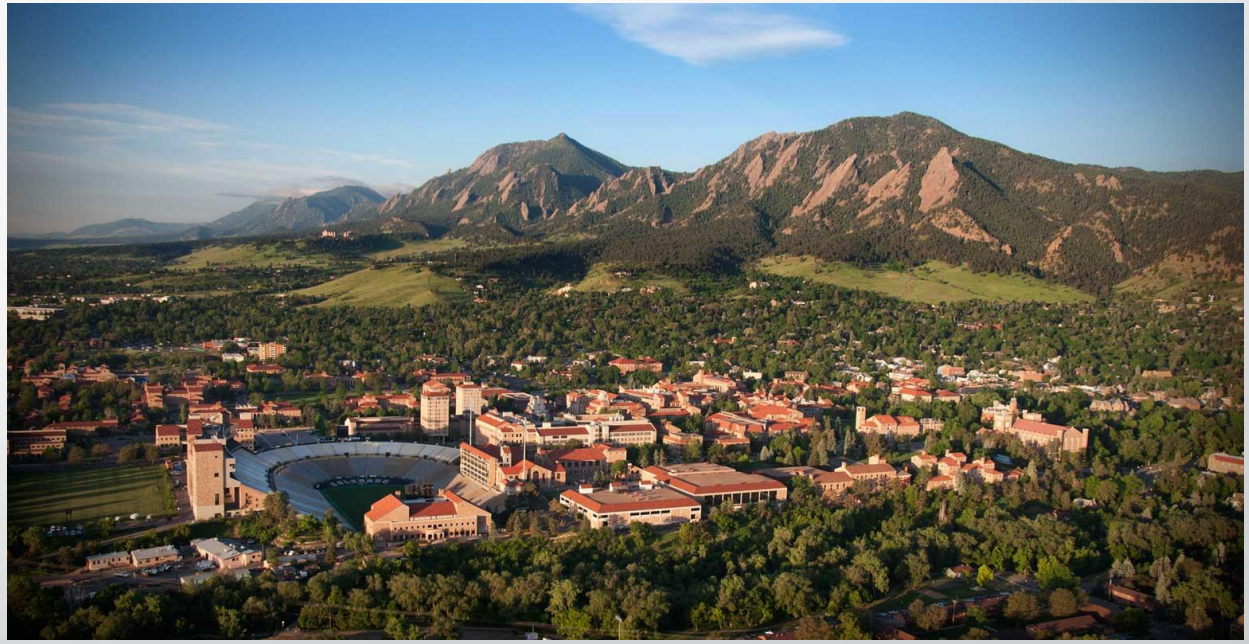
- Receive ideas
- Make suggestions
- Connect partners
- Use them as expertise for the benefit of conservation in labs



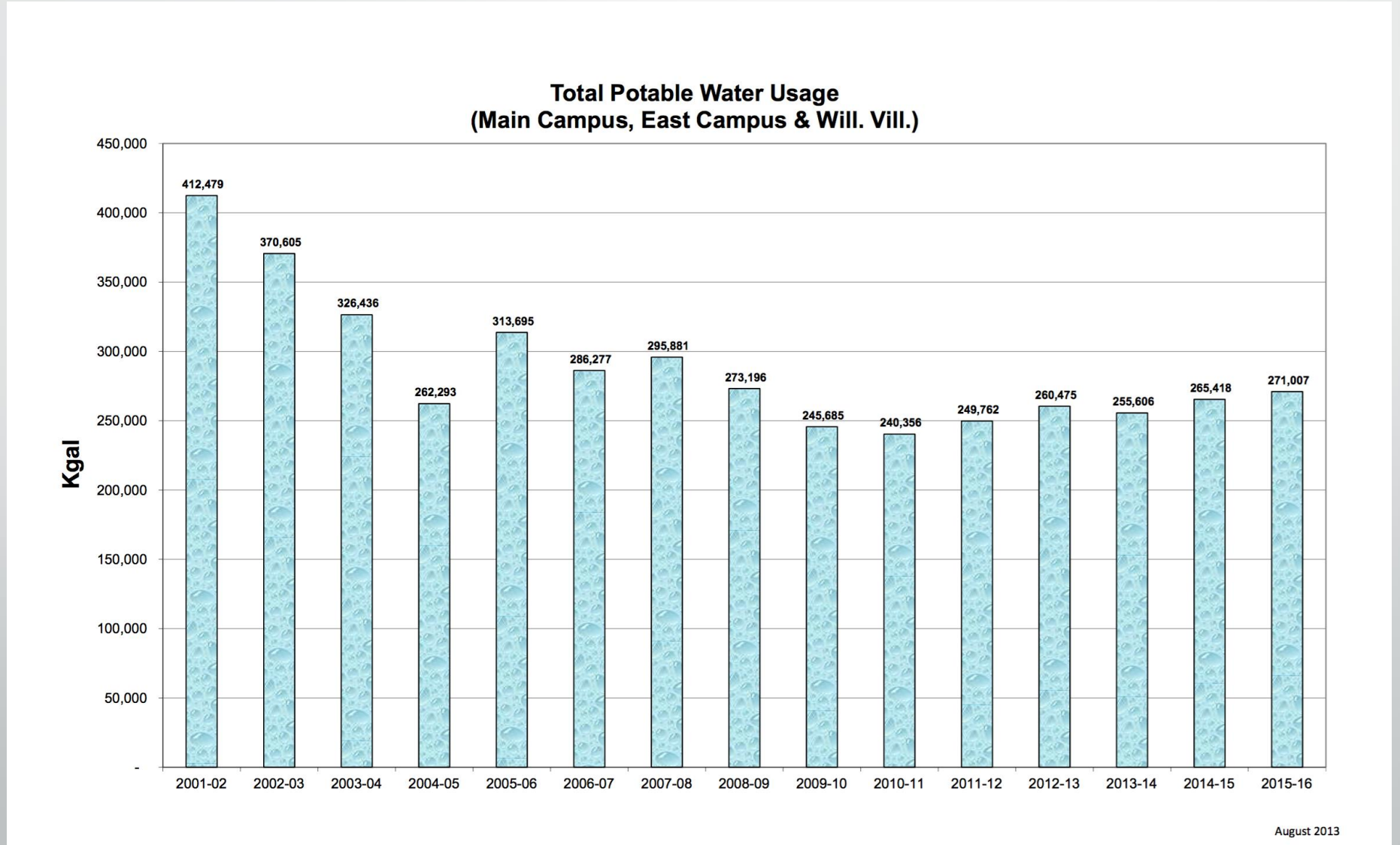
Why laboratories??

- CU has approximately 400 laboratories occupying more than 2 million square feet of lab space on its Boulder campus.

- Because labs are large consumers of water and energy, they present great opportunities for conservation!



CU-Boulder Potable Water Usage



Water Misers on Autoclaves

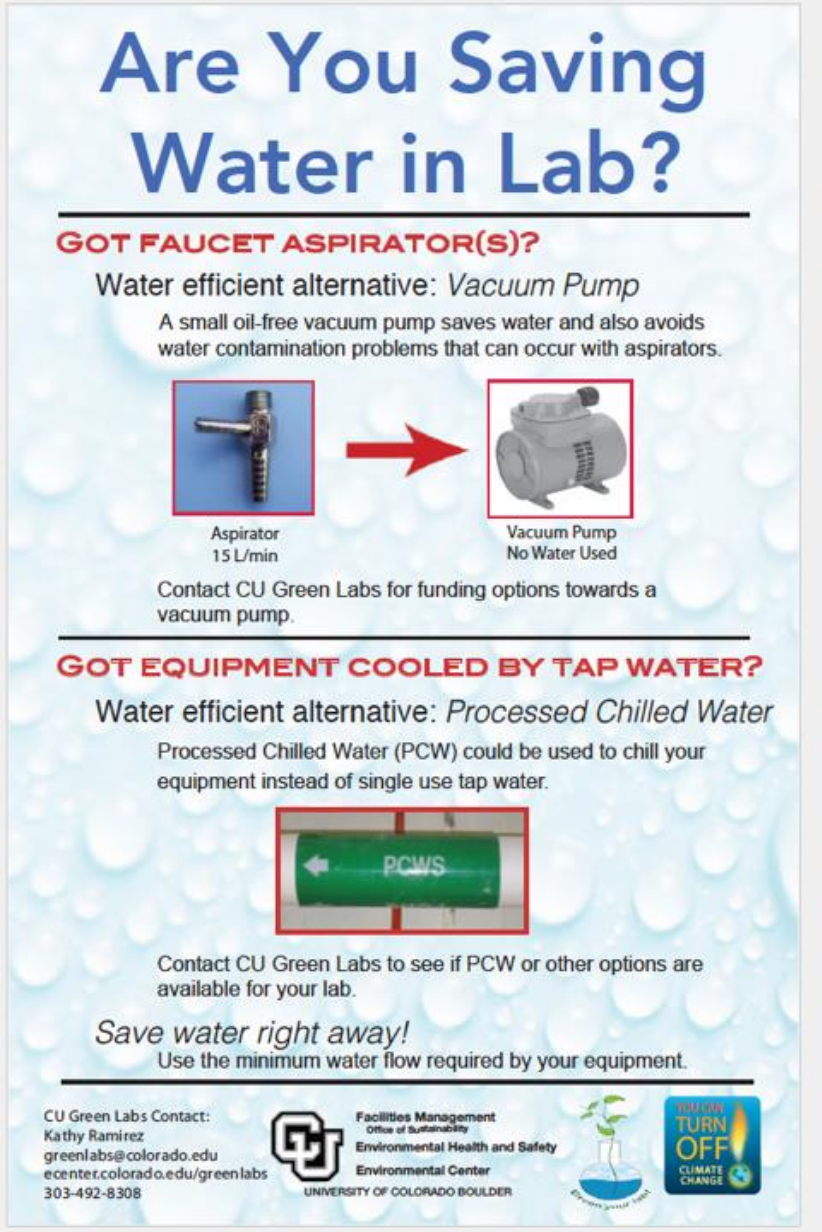
- Previously 45-50 gal/min, 24/7
- ~99% reduction

Low Flow Aerators on Lab Sink Faucets

- Benefit both the lab and water conservation:
  1. Reduces flow
  2. Stop the splashing!
- 1.5 gpm aerators were installed in research and and 1 gpm aerators in teaching labs
- Leaky sink were also fixed by plumbers at same time
- Conservative measurements indicated a 50% reduction in water usage for the 1.5 gpm aerators

Vacuum pumps in place of water faucet aspirators

- Labs use faucet aspirators to produce vacuum
- Replace with Oil-free membrane pump

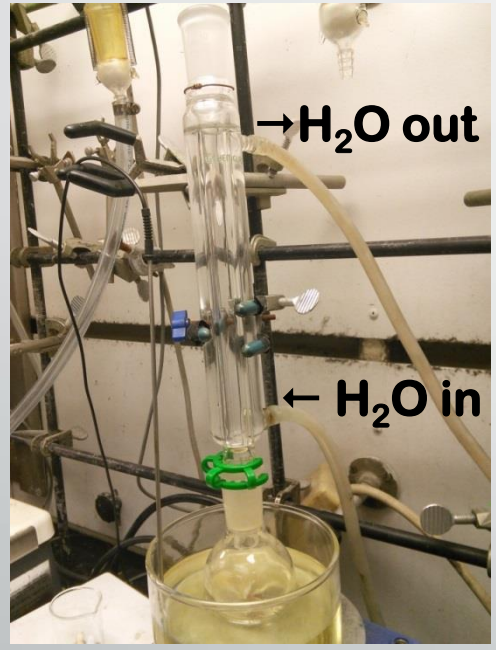


Gravity Filtration in teaching labs

Recirculating chillers & vacuum pumps for rotovaps

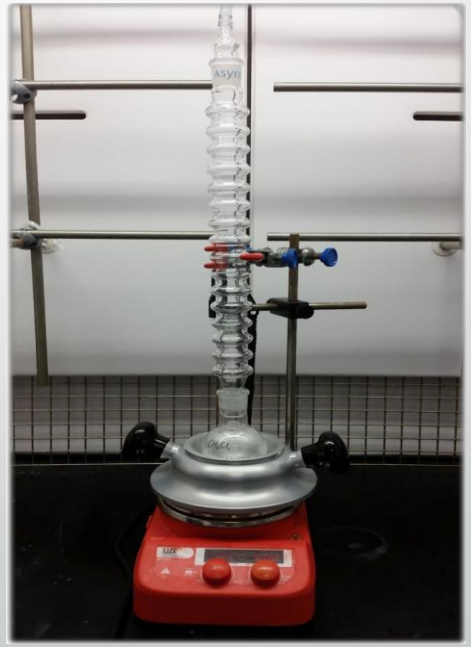
Water-Free Condensers for synthesis

- Reactions are often done in boiling solvents
- Condensers keep solvent volumes constant
- Waterless condensers save water, eliminate flooding risk



Normal condenser

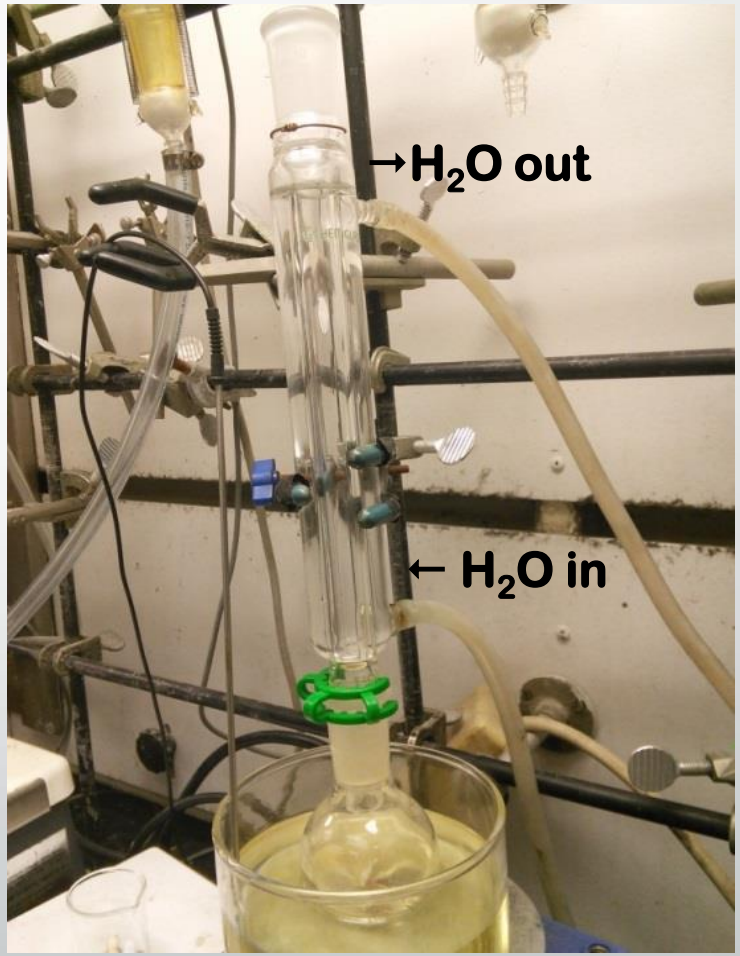
Water-free Condenser



Waterless Air Condenser

(slide by Lily Robertson- Green Labs Team Lead in Chemistry)

Recirculates for condensers



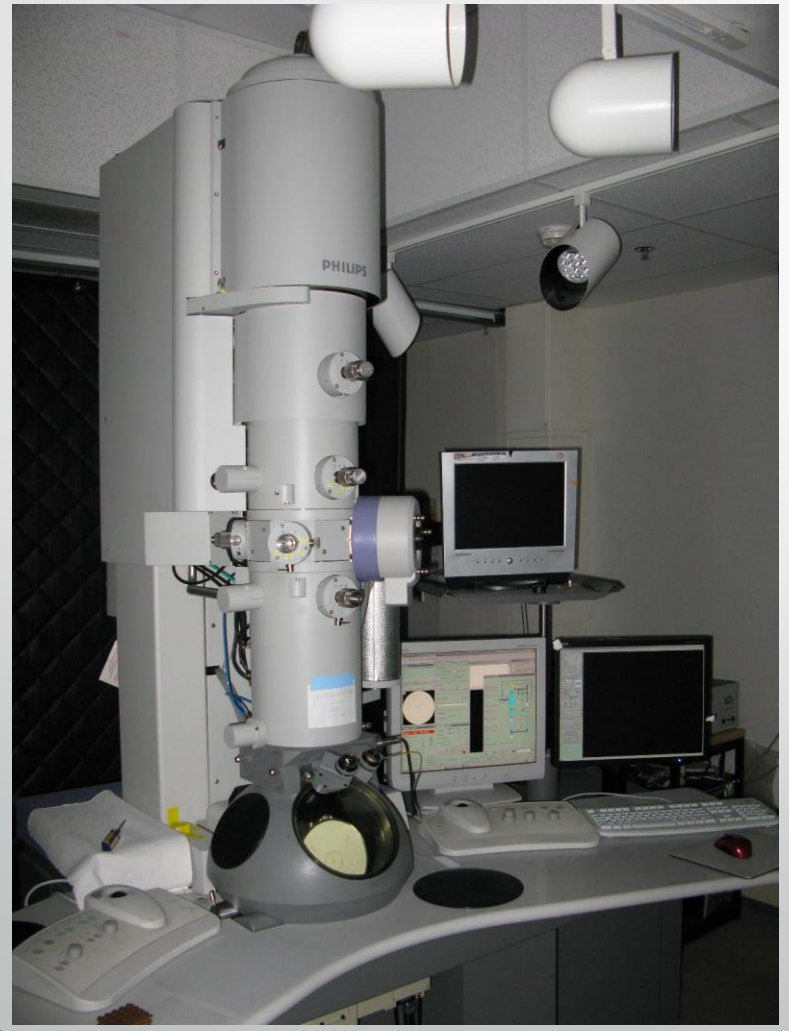
eVap

- Good alternative to waterless condensers
  - Waterless condensers have limitations when it comes to low boiling point solvents.
- The eVap device provides cooled recirculated water to condensers by useing a heat exchanger and the building PCW
  - Saves water
  - Reduces the risk of flooding

Efforts with specialized Equipment: Diffusion Pumps on Timers

- Lab dampers off diffusion pumps from vacuum chamber at night
- But left pumps running overnight due to long warm-up & cool-down.
- 5 pumps on timers for nightly and weekend shutdown saves 800,000 gallons of water per year.
- Manual shutdown of electricity is saving about 58,000 kWh/yr

Efforts With Specialized Equipment: Electron Microscopes on PCW



- Three microscopes saving 500,000 gallons water/yr
- Better for the microscopes

EBIO lab Turns Off Electron Microscope Between Uses for Large Water Savings

- A scanning electron microscope (SEM) is a large electricity and water consumer
- Standard practice to leave SEM units on continuously to maintain the vacuum conditions but now it has been turned off between uses for the past several years.
- It is estimated that this action has resulted in electricity savings of 28,000 kWh/yr and water savings of 180,000 gallons/year.

Facilities Management Funding for Efficient Lab Equipment Purchases

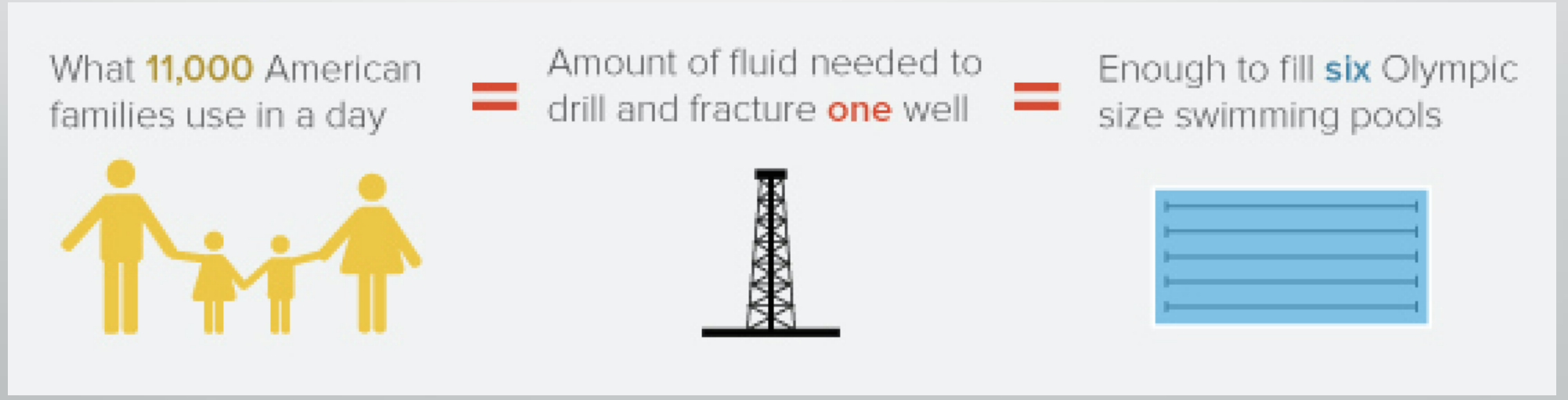
Up to 5 years of energy or water savings:

- Equipment replacements
- New equipment

Cumulative Impact: 2009-2015

- 5 million gallons of water saved per year
  - Excludes autoclaves and rotovaps
- Equivalent to $34,000 per year saved in water and wastewater costs

How much is 5 million gallons of water?



Questions?

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