Starting A Green Lab

Lisa Anderson, Prather Lab, ChemE
Niamh Kelly, EHS Office
What is a Green Lab?

Overview:

Resource Conservation
- Energy
- Cold Storage
- Water
- Materials Management
- Waste Management

Efficiency & Organization

Safety Culture

Small Changes, Big Impacts

Institute climate goal of reducing emissions 32% by 2030
Laboratories have a BIG Footprint

Labs account for up to 2/3 of campus energy yet occupy less than 1/4 of the space

Courtesy of Allen Doyle, UC Davis Sustainability Manager
How does one balance research and sustainable practices?
Green Lab Assessment Program

The Prather Lab saved:

- >6,000 kWh/year in electricity
- 10kg of plastic film, 4kg of gloves, 5kg of Styrofoam, 40 ice boxes, 40 ice packs
- >50,000 gal water

For a savings of 4,000 lbs/GHGs & $1500
What is the energy footprint of an Ultra-Low Temperature Freezer?

<table>
<thead>
<tr>
<th>ULT</th>
<th>Freezer kWh/Day</th>
<th>HVAC Cooling kWh/Day</th>
<th>Total kWh / Year</th>
<th>Cost per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>New ULT</td>
<td>16</td>
<td>3.2</td>
<td>19</td>
<td>$725</td>
</tr>
<tr>
<td>New ULT</td>
<td>22</td>
<td>4.4</td>
<td>26</td>
<td>$998</td>
</tr>
<tr>
<td>Old ULT</td>
<td>30</td>
<td>6.0</td>
<td>36</td>
<td>$1,360</td>
</tr>
</tbody>
</table>

**Graph:**
- **New ULT:** Freezer kWh/Day = 16, HVAC Cooling kWh/Day = 3.2, Total kWh / Year = 19, Cost per Year = $725
- **New ULT:** Freezer kWh/Day = 22, HVAC Cooling kWh/Day = 4.4, Total kWh / Year = 26, Cost per Year = $998
- **Old ULT:** Freezer kWh/Day = 30, HVAC Cooling kWh/Day = 6.0, Total kWh / Year = 36, Cost per Year = $1,360

**Legend:**
- Freezer kWh/Day
- HVAC Cooling kWh/Day

**Image:**
- Ultra-Low Temperature Freezer
- House exterior

**Logos:**
- MIT
- MIT Office of Sustainability
- MIT Department of Facilities
- EHS.MIT.EDU
Ultra Low Temperature Freezer Setpoint and Energy Use

Raising setpoint to \(-70{\degree}C\) can reduce energy by up to 40%!
Raising setpoint to \(-20{\degree}C\) can reduce energy by up to 80%!
CU-Boulder has 60% of their ultra-low freezers set to -70.
Greening the Lab – Implementing a Glove Recycling Program at UC Davis

22% of lab waste is composed of gloves*

UC Davis collection over 2 tons in 2015 (primarily from teaching labs)

UC Davis
Office of the Vice Chancellor and Chief Financial Officer
Environmental Stewardship and Sustainability

*lab waste audit by the University of Washington
Greening the Lab – Implementing a Glove Recycling Program at MIT

- Over 400 lbs of gloves, from 10 labs and 30 researchers, were collected from July to December 2016.
- Uncontaminated nitrile and latex gloves are collected in a cubic yard box and sent to Terracycle for “upcycling.”
- If half the researchers at MIT (3500/7000 people) recycled one pair of gloves per day, over 10 tons would accumulate!
Greening the Lab – Implementing a Glove Recycling Program at MIT

Life Cycle Assessment
Green Labs Logistics

- Assessment Tool
- Resources
- LEAC
- Lab Recycling
- Educational Seminars
- Reassessments
- Certification Awards Ceremony
8 Labs in 6 DLC’s Certified - 2016

<table>
<thead>
<tr>
<th>Department, Lab or Center (DLC)</th>
<th>PI Group</th>
<th>Lab Contact</th>
<th>Certification Level</th>
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</thead>
<tbody>
<tr>
<td>Chemical Engineering (ChemE)</td>
<td>Fikile Brushett</td>
<td>Thomas Carney</td>
<td>Platinum</td>
</tr>
<tr>
<td>Chemical Engineering (ChemE)</td>
<td>Jean-Francois Hamel</td>
<td>Alex Kendrick</td>
<td>Silver</td>
</tr>
<tr>
<td>Biology</td>
<td>Barbara Imperiali</td>
<td>Jean-Marie Swieciicki</td>
<td>Gold</td>
</tr>
<tr>
<td>Koch Institute (KI)</td>
<td>Robert Langer</td>
<td>Connie Beal</td>
<td>Gold</td>
</tr>
<tr>
<td>Chemical Engineering (ChemE)</td>
<td>Kristala Prather</td>
<td>Kristina Haslinger</td>
<td>Gold</td>
</tr>
<tr>
<td>Dept. Material Science &amp; Engineering (DMSE)</td>
<td>Christopher Schuh</td>
<td>Kathrin Graetz</td>
<td>Platinum</td>
</tr>
<tr>
<td>Earth, Atmospheric &amp; Planetary Science (EAPS)</td>
<td>Roger Summons</td>
<td>Heather Throckmorton</td>
<td>Gold</td>
</tr>
<tr>
<td>Mechanical Engineering (MechE)</td>
<td>Evelyn Wang</td>
<td>Daniel Preston</td>
<td>Platinum</td>
</tr>
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8 labs saved: over 20,000 kWh of electricity, 80,000 gallons of water, 300 lbs of recycled material, for a reduction of over 18,000 lbs of GHGs!
## MIT Green Labs – Phase 2 Registered

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<tr>
<th>Department, Lab or Center (DLC)</th>
<th>PI Name</th>
<th>Point of Contact</th>
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<tbody>
<tr>
<td>Biology</td>
<td>Robert Horvitz</td>
<td>Na An</td>
</tr>
<tr>
<td>CMSE</td>
<td>Niels Holten-Andersen</td>
<td>Abigail Regitsky</td>
</tr>
<tr>
<td>Koch Institute</td>
<td>Aurora Connor</td>
<td>Noranne Enzer</td>
</tr>
<tr>
<td>Biological Engineering</td>
<td>Jacquin Niles</td>
<td>Sebastian Smick</td>
</tr>
<tr>
<td>CMSE</td>
<td>Riccardo Comin</td>
<td>Min Gu Kang</td>
</tr>
<tr>
<td>Parsons Lab</td>
<td>Martin Polz</td>
<td>Stefan Thiele</td>
</tr>
<tr>
<td>Biology</td>
<td>Dennis Kim</td>
<td>Deepshikha Dogra</td>
</tr>
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First Steps

Review the Assessment Tool

- Identifies current actions
- Provides guidance on potential actions
- Share with us the gaps in the system
- Filled with great ideas & resources
- Helps to track your progress over time
- Team to review original results with the lab in May
- Team to review final results with the lab in mid-late fall
Tools to Engage

Creating Sustainable Labs

My Green Lab is building a culture of sustainability through science.

Learn More
Communication

Web site
- Assessment tool
- Resources
- Educational Seminars
- Lab Energy Assessment Center (LEAC)
Lab Energy Assessment Center (LEAC)
LEAC Comes to You
Waste Management Improvements – Lab Recycling

**LAB RECYCLING**

- Plastics, paper, cardboard, aluminum
- Pipette tip boxes and plastic chemical bottles (#1-7)
- Metal cans used in shipping and aluminum foil
- Cardboard boxes and paper packing material

*Triple rinse your containers!*

**RECYCLING POSTERS**

- Lab Recycling Stations
- Improved signage
- Training for Custodial Services
- Training for Labs *(MIT EHS Office)*
- Lab Recycling Containers *(MIT Recycling)*

**Plastics, Paper, Cardboard, Aluminum**

- Lab Recycling
  - Lab Recycling Containers
  - Lab Recycling (MIT Recycling)

**Styrofoam**

- What gets recycled?
  - Cleanpolyethylene containers, boxes and lids
  - Styrofoam insulation

**Glassware**

- Gloves
  - Green Lab Glove Recycling Program
  - Toner and foam rubber

**Plastic Film**

- Cleanplastic film

**Cardboard**

- Cardboard

**Batteries**

- Batteries

**Gloves**

- Gloves

Download posters at [web.mit.edu/recycling](http://web.mit.edu/recycling)
Water Considerations

Autoclave Water Mizers
- Device that monitors system temp
- Saves 40-50 gallons of water/hour
- Consolidate loads

Low Flow Faucet Aerators
- Are they installed already?
- Place request through Atlas
- Flows less than 2.0gpm

Appropriate Water Quality
- Understand the different types
Outreach

- Monthly Educational Seminars
  - Starting a Green Lab – today’s
  - LEAC – Energy Assessments
  - Lab Recycling – how to’s & why’s
  - Water Conservation Ideas
  - Cold Storage Management
  - Other ideas??
- Group Meetings / Lab Visits
- Certification Ceremony
Quick Recap / Questions

Review the Assessment Tool
- pdf version on MIT Green Lab website
- Niamh to send to each lab after group meeting
- Greenlabs.mit.edu

Attend the Educational Seminars

Contact the team for details:
- green-lab-org@mit.edu

Visit one of the MIT Certified Labs to learn more
- Contact the team for locations