Greater than the Sum of Parts: Combining Occupant Engagement and Data Analytics to Maximize Lab Energy Efficiency

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1. Learn what **metrics to measure for key performance indicators**, and how to measure those points in a laboratory energy-saving program.

2. Learn why **developing standard sustainability practices**, regardless of impact, is critical.

3. Understand **common participation barriers** to lab sustainability programs, and techniques to minimize barriers while maximizing benefits.

4. Discover key considerations and pathways to **forming an effective implementation team**.
Background

- >120 Buildings
- 6,000 Students
- 2.65 Million GSF Campus Building Area
- +225 Fume hoods across 10 buildings
- 6.5 MW Campus Electrical Demand
- > $5 Million Annual Utility Budget
Mines Sustainability

**ACADEMICS AND RESEARCH**
- Energy Engineering
- Humanitarian Engineering
- Public Affairs
- Green Chemistry
- Environmental Engineering

**OPERATIONS**
- Facilities Improvements
- Food Services
- Green Cleaning
- Recycling
- New Building Technologies

**GET INVOLVED**
- Green Team
- Sustainability Committee
- Student Groups

**CAMPUS INITIATIVES**
- People.Power.Planet
- Green Labs
- Recycling & Compost
- Green Buildings
powerED Program Approach

**PEOPLE**
Awareness & education

**PROCESS**
Efficient operations & operators

**PERFORMANCE**
Reporting & communication
• There was never a coordinated hood management program. How do we know? We looked:
KPIs & Measuring Success

What does success look like?

How can we measure savings?

How can we measure engagement?

Verify with a mix of data and audits
Collecting Data

- Initially we are only analyzing sash hood position
- We have hood position or flow data for most of 230 hoods
- We also have data from repeat visual audits
- Our main objective is to get students and staff to close hoods and lower them when in use. Our aim is not to troubleshoot low and high flow hoods
Our first attempts at data visualization were clunky and not very useful.
Visualizing Data

Data for over 50 individual hood exhaust flow rates one of largest lab buildings (Brown)

Note shift to "cooler" colors on heat map indicating lower flow rates starting not long after start of Shut the Sash campaign in late March (red line).

Use data: calculate energy savings, positive feed-back to occupants, areas to improve.
Data for over 35 individual hood sash positions in another large lab building (Coolbaugh)

Note shift on heat map indicating lower sash positions starting not long after start of Shut the Sash campaign in late March and secondary shift in late June.
What did our first pass teach us?

• Stories about the *urban legends* on how fume hoods are used, e.g. “they aren’t supposed to be closed” “the alarm goes off all the time and can’t be fixed” (yes, they can be fixed, if you tell the right people)

• We needed a simple, standard naming convention *(this was done by a student over the summer)*

• A number of hoods were malfunctioning but were not getting reported (including shattered glass!)
Be Safe. Save Energy.

Shut the Sash

An open fume hood wastes $1,100 in energy per year – roughly the amount needed for an entire home.

Protect yourself, keep the hood as low as comfortable, and SHUT THE SASH when not in use.

Step 1: Grip the sash handle

Step 2: Shut the sash

Help us reach our goal of 100% hood closure.

Find more ways to save energy at Mines.PeoplePowerPlanet.com
Student Engagement

- Student participation in fume hood audits
- Social norming through commitment posters, lab training and social media
What About Non-VAV Labs?

- Almost 1/3 of the hoods are on constant volume exhaust systems.
- We felt it is just as important to include these hoods although there is no $ or energy savings
- Culture change to support future VAV systems is important.
Behavior Change Best Practices

- Reinforce good behavior
- Offer small rewards
- Give recognition
- Keep checking to make sure what we are doing is working
- Keep it relevant
- Share results with users
Using the same principals to move beyond shutting the sash

- Mines is implemented a number of lab sustainability best practices
- Nitrile glove, block Styrofoam, pipette box recycling
- Coordination of “shut the sash” with existing EH&S Hazardous Waste Trainings
Key Takeaways

1. Data collection and analysis was more complex than anticipated. Deciding on **how to measure success**, different for any campaign: i.e. visual inspections, energy savings month over month.

2. Engagement is difficult and time-consuming, but yields the greatest lasting impact. Utilizing best practices from **Community Based Social Marketing**.
3. The barriers to compliance are not typically the obvious reasons. **Address head-on**, i.e. broken hoods, false alarms, urban myths, community silos.

4. Ensure a diverse group of stakeholders: purchasing, EH&S, lab coordinators, lab users, facilities management, energy manager, sustainability coordinators. **Engaging** the entire community.
Thank You – Questions?

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