Energy Conservation and HVAC Controls in Laboratories

Engaging Lab Faculty and Staff in the "Safe Sustainable Labs" Effort

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Energy Education: A Bridge Between Operations and Outreach

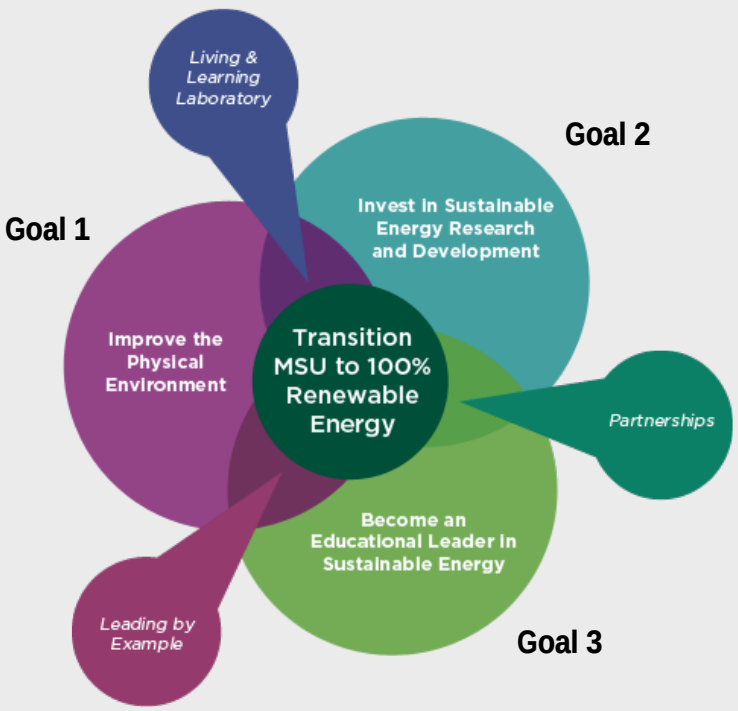
Principles of Occupant Engagement:

- **Reciprocity -** *Treat others as you want to be treated.*
- **Scarcity –** *Explain what will be lost, what can be gained.*
- **Authority -** *Tap leadership and influence but know your audience.*
- **Commitment -** *Invite partnership upfront and listen!*
- **Relationships -** *Build mutual understanding and respect.*
- **Consensus -** *Link to specific communal ideals and goals.*

Based on Cialdini, McKenzie-Mohr

A good reputation takes a long time to build, but you can lose it in a moment!

Energy Education: Supporting MSU's Energy Transition Plan



- Existing Building Commissioning
- Advising Student Initiatives
- Evaluating New Approaches
- Making Connections
- Campus Sustainability
- Promoting Solutions

Adopted by the MSU Board of Trustees in April 2012, the Energy Transition Plan **sets the standards that guide future energy decisions** in a way similar to how the Master Plan guides the University's growth.

Building Partnerships Through Educational Engagement

- One size doesn't fit all
- We all have problems
- Keep it simple
- Mind the gap
- Don't drop the ball

Infrastructure Planning and Facilities and Environmental Health and Safety present....

February 10

SAFE SUSTAINABLE LABS

Brown Bag Presentation

Find out more about this integrated approach to energy reduction in intensive research spaces.

We Provide Dessert!
Bring your lunch and your questions to this informational event. Enjoy sweet treats from MSU Bakers!

Tell a colleague
Do you know someone who may be interested in this event? Please share with your peers at MPS.

Questions?
Contact **Cathy Huddy** at: *chuddy@ipf.msu.edu* or 517-844-6741 from 8 a.m. to 5 p.m., Monday through Thursday

Monday, February 10 – 11:30 a.m. to 12:30 p.m.
Molecular Plant Science Building, Room 1200

Learn About the New Laboratory Ventilation Control System and Emergency Purge Button

The event features a short presentation by IPF and EHS staff about the OptiNet system that was installed in selected laboratories at **Molecular Plant Sciences** to reduce excessive airflow. It will also cover how the **room purge button** works and when to use it. Ample time will be available for questions.

Plan to attend? Please RSVP to *chuddy@ipf.msu.edu*

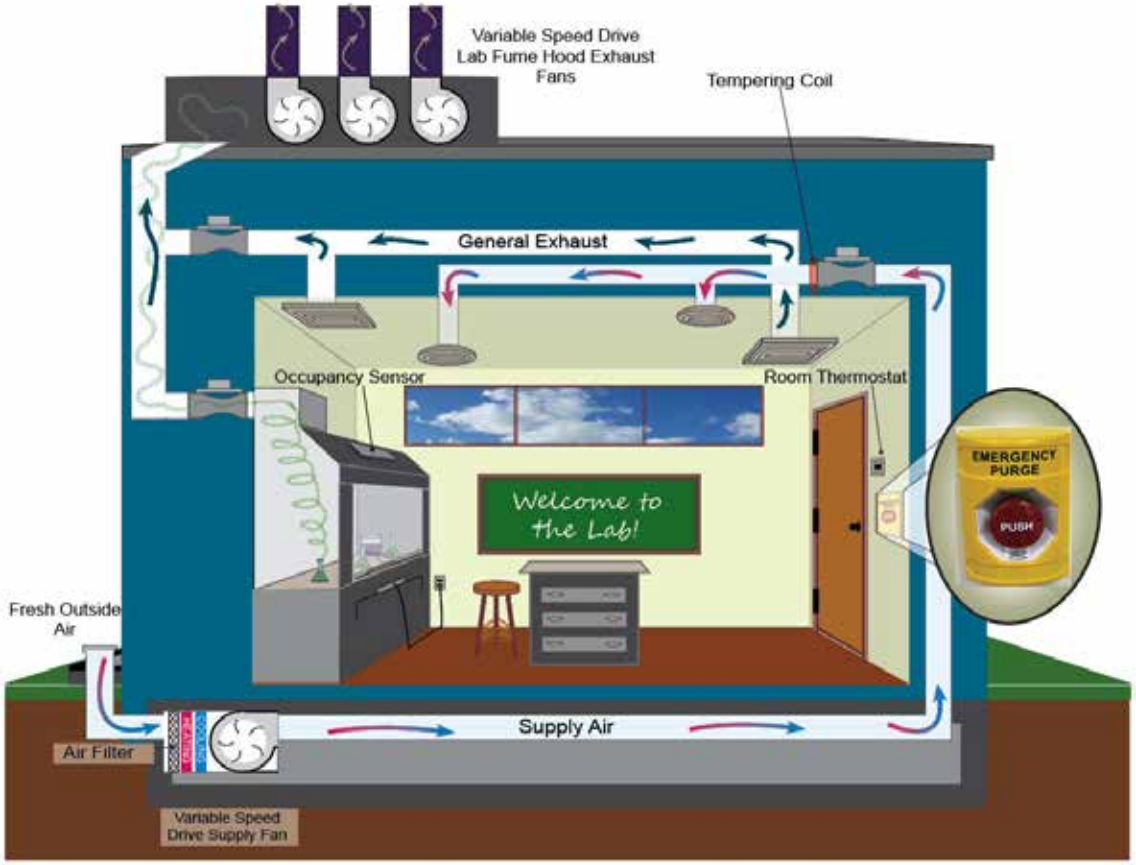
INFRASTRUCTURE PLANNING AND FACILITIES

EHS

Collaborating to Meet MSU Energy Goals.

Provide Building-Specific Information and Solutions

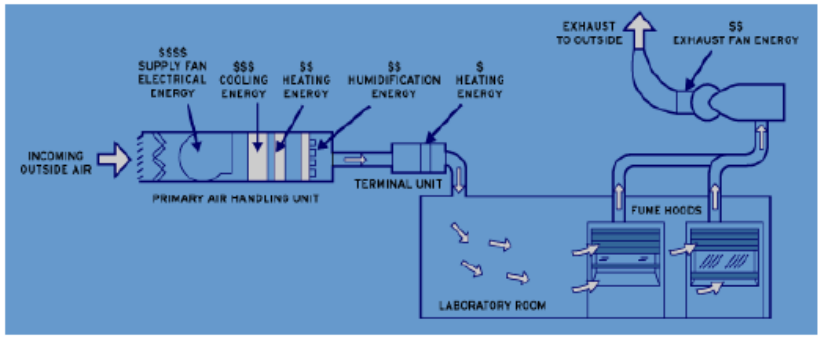
- Educate occupants about how their building works down to room level
- Remove barriers and enhance benefits to more sustainable behavior
- Promote case-specific benefits for saving energy



Verifying Energy-Efficient Equipment

DOE Fume Hood Study

Advanced Technologies for High Performance Laboratory Fume Hoods



Better Buildings
U.S. DEPARTMENT OF ENERGY

DOE Ultra Low Freezer Study

* Results are available from the Better Buildings Alliance Laboratories website

The Safe Sustainable Labs Concept

An integrated approach to energy reduction in intensive research spaces

- Centralized Demand Control Ventilation
- Emergency Purge Button
- Fume Hood Occupancy Sensor
- Energy Efficient Equipment

Centralized Demand Controlled Ventilation

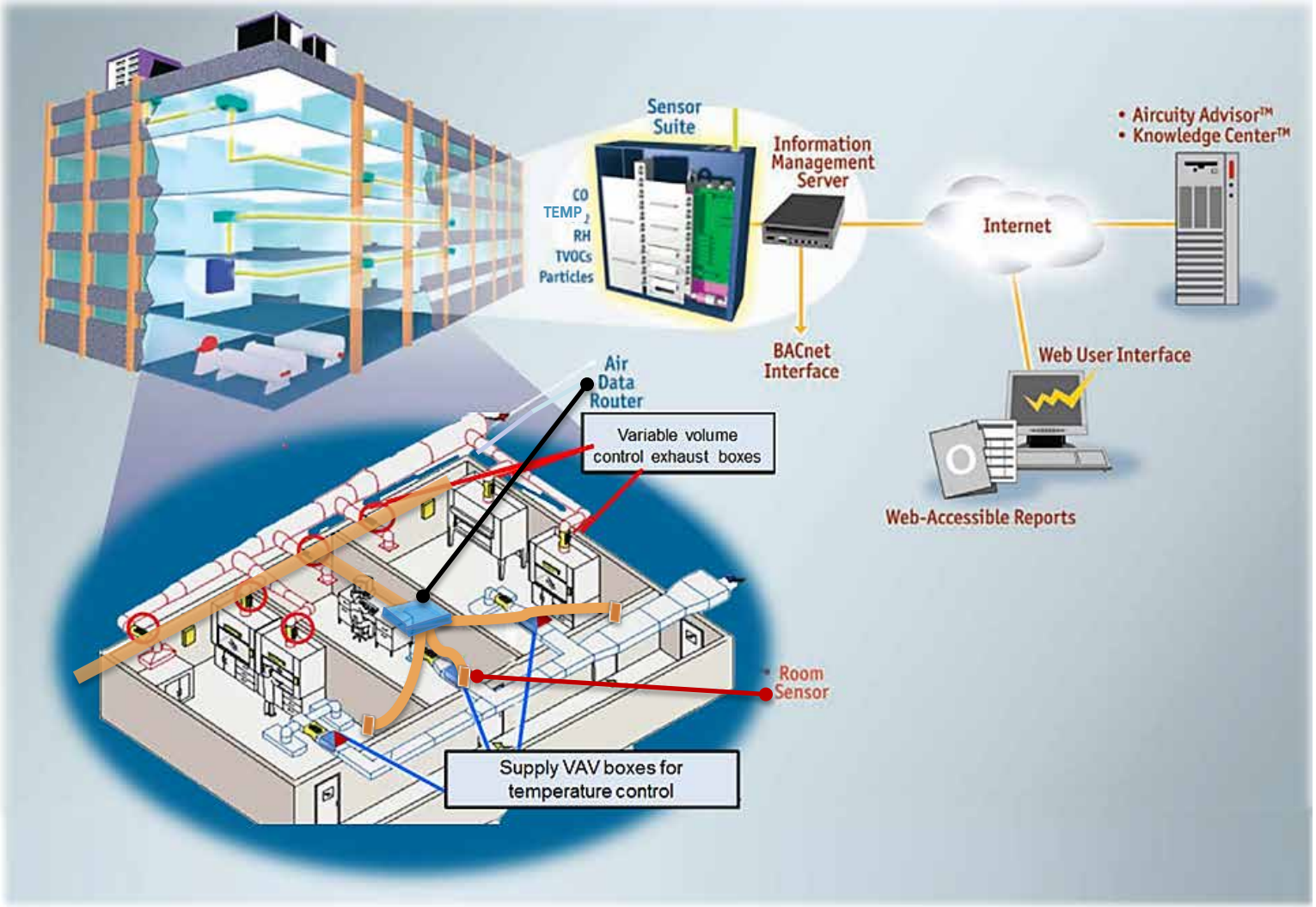
Integration of airflow systems with sophisticated occupancy and air-quality sensors.

AIRCUITY®
Safe, Smart & Efficient Airside Solutions

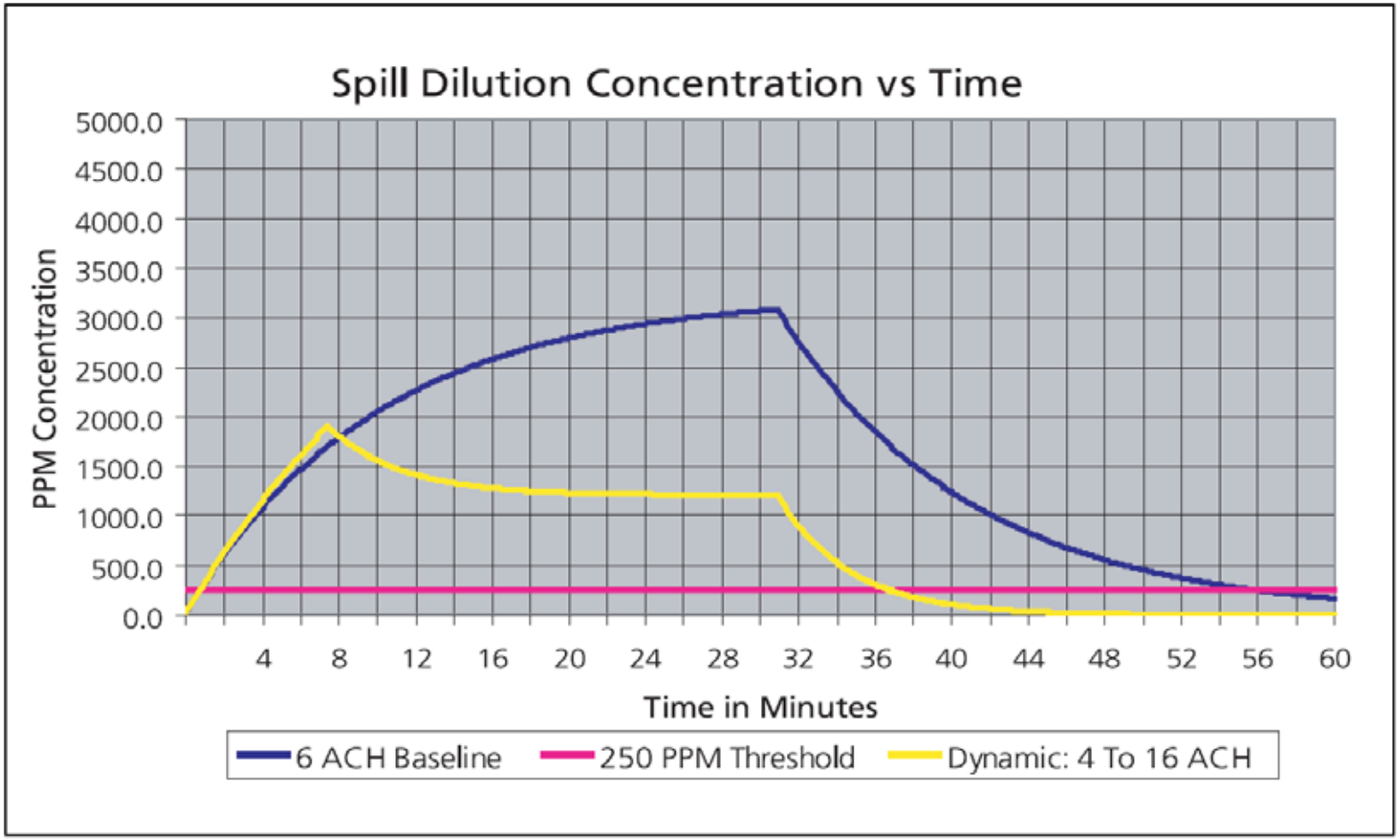
OPTINET™

- Real time air quality monitoring
- Sampled air analyzed for contaminants
  - ü Sensor Suite
- Responsive Ventilation
  - ü ACH setback based on occupancy
  - ü ACH increase in response to contaminants
  - ü Varies from 4 ACH to 18 ACH
- Emergency Purge button

Centralized Demand Controlled Ventilation



Comparison of Dilution Rates of Acetone as a Function of Air Change Rates



OptiNet Monitoring

- VOCs (2 sensors PID and MOS)
- Particulates
- CO2
- Temperature
- Humidity
- Supply and Exhaust Air Flow Rates
- Air Change Rate

Lab Assessments for OptiNet

- OptiNet NOT Suitable for some Labs
- High Solvent Use and Storage
- Cryogen Use in Smaller Space
- Biosafety Level 3
- Volatile Carcinogen Storage
- High Acute Toxicity by Inhalation
- High Hood Density

Lab Assessments for OptiNet-ODA

Liquid Nitrogen

Cryogen volume (liters)	230
Expansion rate	696
Number of cylinders	1
Release rate (CFM)	12
Room Volume (in ft³)	5000

$$\%O_2 = \frac{20.9}{Q+R}\left(Q + R * e^{-\frac{(Q+R)t}{V}}\right)$$

Room Volume	Cfm @ 0ACH	Cfm @ 2ACH	Cfm @ 4ACH	Cfm @ 6ACH	Release (min)	O_2% @ 0ACH	O_2% @ 2ACH	O_2% @ 4ACH	O_2% @ 6ACH
5000	0	167	333	500	471.10	6.78	19.59	20.27	20.51

Delayen, J. R.; Schlenker, R. A.; Shepard, K. W.; Specht, J. R.; and Young, L., (2002, March 7). *Physics Division Cryogenic Safety Manual.* http://www.phy.anl.gov/

FermiLab, (2009, September). *Oxygen Deficiency Hazards.* http://www-esh.fnal.gov/

Emergency Room Purge Button

For immediate use when there is a large chemical spill or hazardous release in the room.

Fume Hood Occupancy Sensor

A hood running at 60 fpm with no one present works as well or better than an occupied hood running at 100 fpm

Questions & Answers

Thank You!

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