

2015 Annual Conference

SIEMENS

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Seminar 11: Upgrading Ventilation in Existing Laboratories

New Life for Old Lab Ventilation Systems

Atlanta, Georgia

Learning Objectives

1. Plan renovation projects where energy conservation pays for improved ventilation and safety
2. Plan renovation projects that add today's BAS technology to existing mechanical equipment, enhancing access to information needed to manage safety, energy use and mechanical maintenance.
3. Extend the capacity of existing primary systems by upgrading constant volume labs to VAV.
4. Reduce the potential for chemical exposure in labs by bringing today's aerodynamic design

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Acknowledgements

Joseph Hayden – University of Florida

Outline/Agenda

Problems and Ways to Improve Old Lab Systems

Some project experiences:

- Project 1: add controls to automate constant volume system
- Project 2: upgrade controls to restore function, improve integration, and reduce ventilation
- Project 3: replace failing controls to restore user confidence
- Project 4: upgrade controls to optimize ventilation
- Adding flow feedback

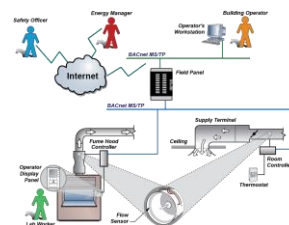
Conclusions

Problems with Old Lab Ventilation

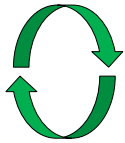
- Constant Volume valves
 - unable to change flows or applications easily
- Pneumatic Actuation
 - Limited supply of spare parts
 - Limited supply of experience labor
- Analog Controls
 - Limited supply of spare parts
 - Difficult to maintain without special tools and training
 - Requires analog interface to communicate
- Early Digital Controls
 - Limited supply of spare parts
 - Limited interface capabilities

Ways to improve

- New controls, with spare parts and support services
- Dynamic air flow, responsive to lab users and hazards
- Better interfaces for various users
- State of the art access to data
 - Flow measurement
 - Occupancy data
 - Contaminant measurement



Remedies – what to replace, what to keep



- Reuse the valves if possible, or necessary to limit research disruption
- Actuators: could be usable, might be obsolete
- Wiring sometimes stays in place
- Some sensors reusable

Project 1: Constant Volume to

- Constant volume ventilation system brought up to date
- Air valves were mechanically locked in place
- Wanted VAV fume hood operation



Project 1: ...variable volume

- Added actuators to enable flow modulation
- Added air flow sensors
- Added face velocity control to hoods
- Turn off snorkels and other exhaust
- Cut air flow significantly, pays for the project



Project 2: Pneumatic Actuation to...

- Facilities staff actively manages other buildings
- No data on lab building from pneumatic system
- Labs built for VAV, but air flow never drops
- Reassess dilution ventilation rate.
- EHS ready to:
 - Reduce flow rates all day
 - Apply lower rates for unoccupied period using BAS schedules and occupancy sensors



Project 2: ...full digital electronic

- Keep mechanical valves
- Fast electronic actuators replace pneumatic
- New controllers
- Add air flow sensors
- Add occupancy sensors



- This facility has lots of unoccupied time
- Air flow reductions paid off in 2 years

Project 3: Bring back user confidence

- Old FH control system components failing.
- FH Certifier measured lower values than were being displayed.
- Some adjusted to right flow, with wrong display

- Added airflow measurement to valves
- Reused sash sensors
- New controllers calculated true average face velocity and displayed in real time
- BACnet controllers interfaced directly to BAS
- Confidence building strategy:

Demonstrated solution in one room to gain buy-in from Safety and Science teams before tackling 135 hoods in 38 spaces.



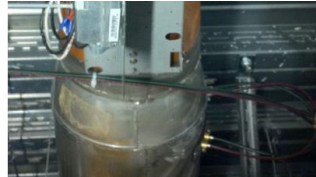
Project 4: Enable optimization

- Fairly new lab flow control system
- Owners wanted better integration
 - Better ability to adapt ventilation programs
 - Want to integrate new DCV functions
 - Eliminated the third BACnet server
- Kept mechanical parts in place
- New sensors, controllers
 - Add air flow sensing
 - Add air contaminant sensing for DCV
 - New air valve actuators
 - New lab control layer in BAS network



Adding Airflow Feedback

- The peace of mind is worth the effort
- Airflow sensing works even in unconventional and "tortured" configurations
- (Clockwise)
 - Downstream of venturi and elbow
 - Downstream of venturi, before transition
 - Immediately in front of venturi



Conclusions

- Old laboratory ventilation systems can be cost-effectively improved without major disruption to lab operations by reusing the "metal" and replacing or renewing the controls.
- Short-term and long-term savings available from air flow reduction, lower cost of spare parts and specialty labor.

Questions?

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