2015 Annual Conference

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Seminar 40 – Energy Efficient Labs: Case Studies

Finding the Low Hanging Fruit of Energy Savings in Existing Laboratories

Atlanta, Georgia

Learning Objectives

- Learning the "back of the napkin" calculations for energy saving opportunities in laboratories
- Recognize the EHS drivers that enable change

Acknowledgments

- David Faircloth
- Chuck Hanning – Rosser Intl Savanah
- Dan Vastyan – Common Ground

Outline/Agenda

Review of the Armstrong State University Science Building

How to: qualification calculations

–Existing Challenges

200,000 sq. ft. Science Building

-Savannah, GA

36 Laboratories

2001

–Existing Challenges

High density of fume hoods per/ sq. ft.

(72) Fume Hoods

(36) Rooms

–Existing Challenges

"Latest in laboratory control technology"

– *Blade dampers*
– *Air flow measurement*
– *High speed actuators*

– *OEM service contract*

–Existing Challenges

System drifted to a constant volume state

Ambient noise Lab 2102 was 72dBA
Spaces were not usable for teaching

Building- 10% of campus sq. footage
Building- 25% of campus tonnage
Building- 40% of campus energy

–Finding a fix

USG BOR funded a (1) room (12) fume hood project in 2006.

Replaced all lab control equipment with functioning VAV venturi valves, sash sensors, and FH occupancy sensors.

–Shovel Ready

Based on the success of the pilot project

ARRA funded $1.4M to replace the remainder of the lab controls +

May 2011 to November 2011

–Results

M&V report in 2012 showed ~$237,000 in savings per year.

36% reduction in energy consumption for the building

11% campus reduction

Conditioning the great outdoors

Make it cold - heat it back up – send it back out.

@ a rate of $2 to $7 / CFM / per year

$5 x 10,000 CFM it will cost $50,000 in utilities

Low hanging fruit

Constant Volume Spaces
-Reducing Air Change Rate (AC/H or ACR)

Spaces without set back
-Adding set back

More than 1 fume hood per 1000 sqft
-Going VAV / replacing VAV

"We have a new EHS director"

Add up the exhaust flow on a per room basis.

$$\frac{EF\ x\ 60}{L\ x\ W\ x\ H} = \text{Designed ACR}$$

$$\text{Allowable ACR}\ \frac{L\ x\ W\ x\ H}{60} = Setback\ flow$$

Hey let's go look at a lab!

Room with a CV Hood @ 785 CFM

The room is programmed for 500 of additional general exhaust

$$\frac{1285\ x\ 60}{25.3\ x\ 25.4\ x\ 10} = 12\ Air\ hanges\ per\ hour$$

$$8\ Air\ hanges\ per\ hour\ \frac{25.3\ x\ 25.4\ x\ 10}{60} = 860\ CFM$$

Hey let's go look at a lab!

Room with a CV Hood @ 785 CFM

The Room is re-programmed for 75 cfm general exhaust

Reducing the general exhaust by 425 CFM

At $5 per cfm per year will yield a $2,125 per year saving.

Value of turn down

$$10{,}000\ x\ \$5\ x\ 1\ year = \$50{,}000$$

$$10{,}000\ x\ \$5\ x\ {}^{40}/_{168} = \$11{,}905$$

$$6{,}000\ x\ \$5\ x\ {}^{128}/_{168} = \$22{,}860$$

$$\$50{,}000 - \$11{,}905 - \$22{,}860$$

$$=$$

$$\$15{,}235.00 \text{ in savings}$$

What about static pressure

The cost of static pressure is $.01 to $.03 per CFM per year PER tenth of an inch WC

Assuming power cost $.1/KWhr

Adding 1" to a 10,000 CFM would cost $1,000-$3,000 per year.

Back of the napkin

Value of set back: assuming a 40 hour occupancy week

EF = Exhaust Flow

SB = Exhaust Flow at setback

$$.75(EF - SB)\ x\ {}^{\$}/_{CFM} = Savings$$

$$.75\ (10{,}000 - 6{,}000)\ x\ \$5\ =\ \$15{,}000$$

Conclusions

- Conditioning OA COT
- Lab$ are an ea$y target for saving$

Bibliography

- For more information on the ASU project:
- College Planning & Management Magazine
- 02/01/2013 “Quiet in the Lab”
- Dan Vastyan.

Questions?

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