Energy Efficiency and the BAS

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Agenda

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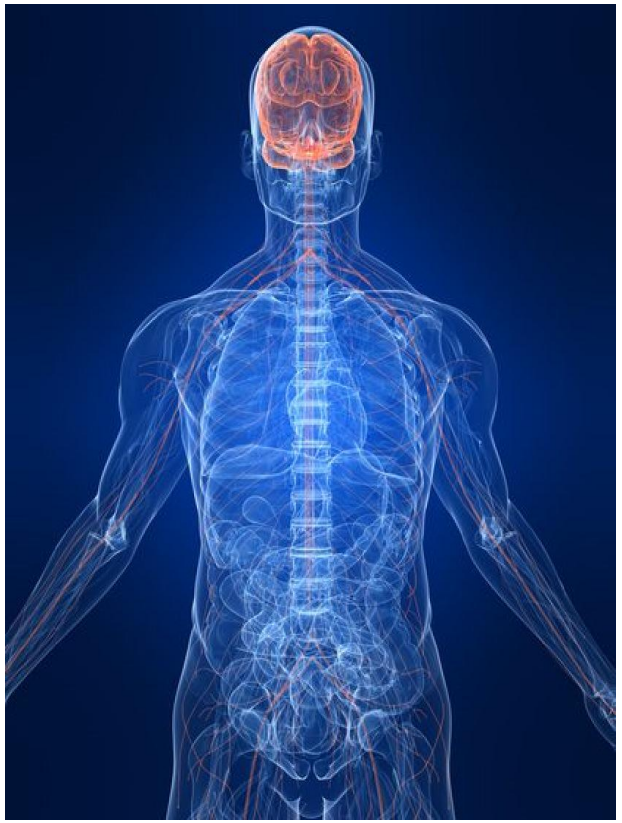
- What is the BAS?
- Energy Efficiency and the BAS
- Helpful Components of the BAS
- Using Schedules
- Leveraging VFDs
- Maintaining Alarms
- Reviewing Graphics
- Fume Hood Awareness
- Operator Override
- Trending
- Training

What is the BAS

- Automatic Centralized Control of the Buildings Heating, Ventilation and Air Conditioning, and Other Building Systems

- Works to:
  - Maintain Occupant Comfort
  - Integrate Systems
  - Ensure Efficient Operation
  - Reduce Energy Consumption
  - Reduce Operating Costs

- Acts as the Central Nervous System of the Building



Energy Efficiency and the BAS

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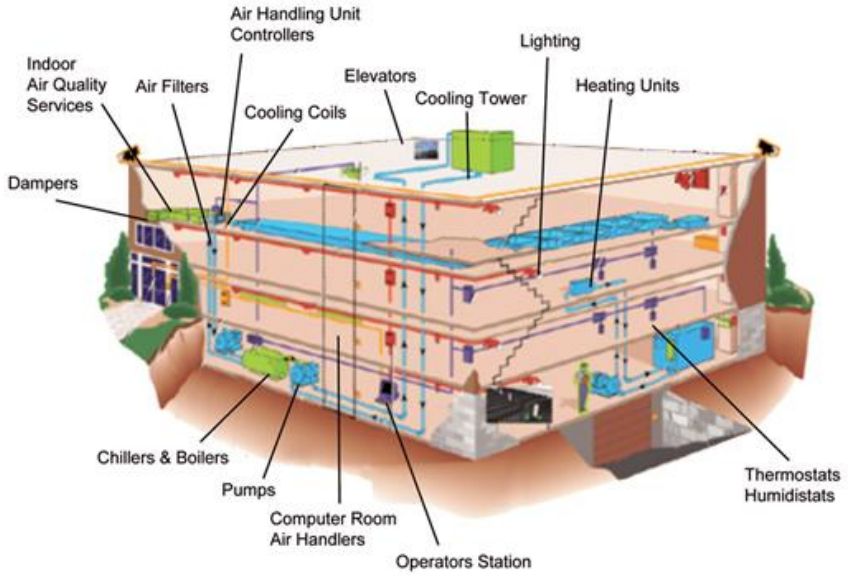
- Powerful Tool to Reduce and Maintain Energy Consumption
- Connected to and Controls Major Sources of Energy Consumption
- Built in tools that can be used to tweak performance and spot problems
- Can be used to track performance for reporting



Helpful Components of the BAS

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- Scheduling – Application to control the scheduling of equipment, set points and events
- Reporting – Generates custom reports to track information
- Trending – Automatic gathers information on set intervals
- Graphics – Visual depiction of systems

Effective Schedules

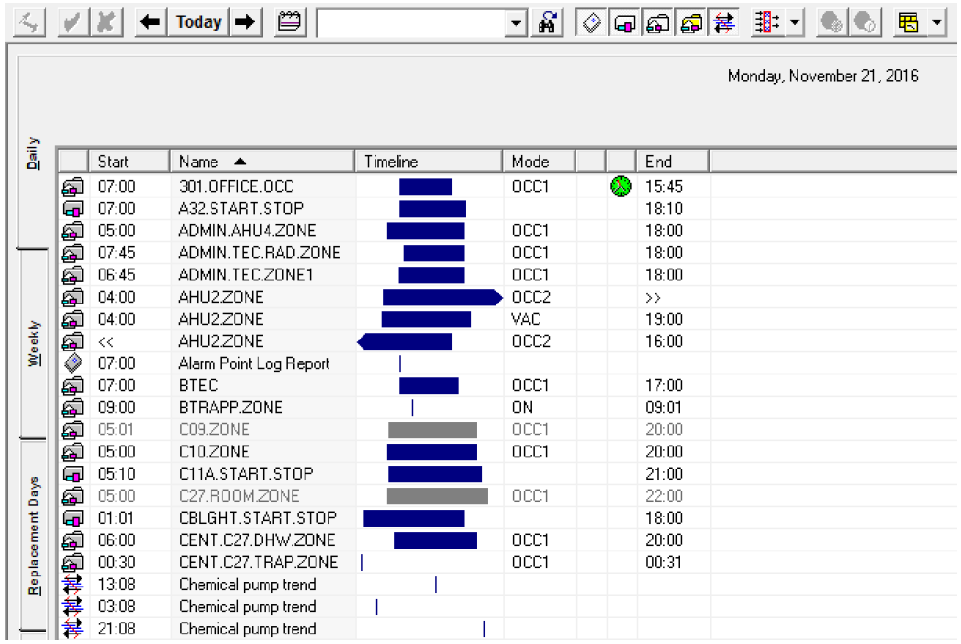
- Scheduling equipment can provide drastic energy savings

- Units that can be shut down at night:
  - Duty cycle to maintain temperature and change air over
  - Warm up cycle to ensure proper temperature then staff returns

- Schedule night set backs for temperature

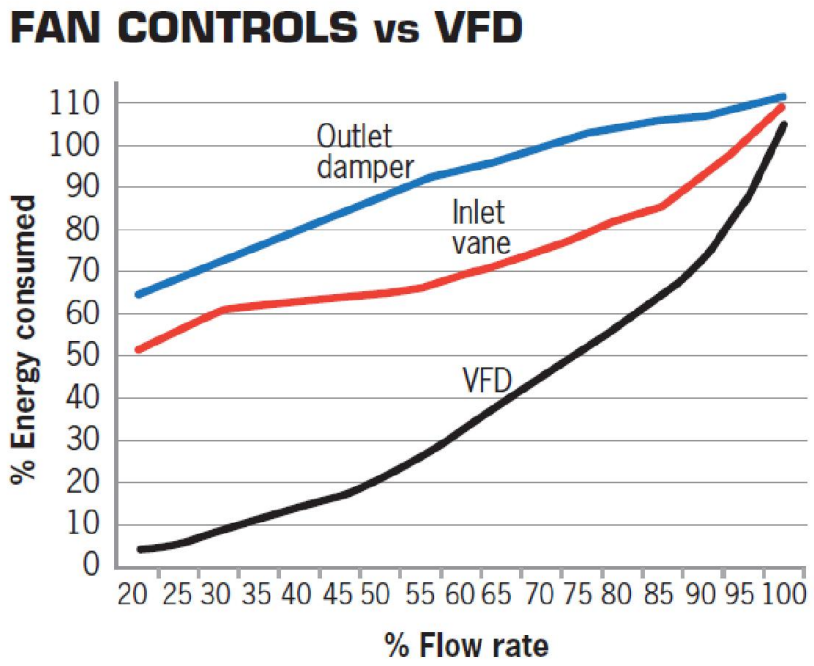
- Schedule occupied and unoccupied modes

- Ensure schedules are up to date and implemented



Leveraging VFDs

- Often systems are oversized
- Review existing flows and determine areas that can be reduced slightly
- Fan Affinity Laws
  - Flow is proportional to speed
  - Pressure is proportional to the square of the speed
  - Power is proportional to the cube of speed
- Slight reductions in speed can have drastic impact on energy



Leveraging VFDs - Example

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- 20 HP Supply Motor with VFD supplying 20,000 CFM @ 100%
- 5 HP Exhaust Motor with VFD exhausting 19,000 CFM @ 100%
- Review of drawings and current operation shows only 19,000 CFM of supply is required
- Turn back drives to 90%
- Results in ~29,500 kWh per year reduction in electrical consumption

Maintaining Alarms

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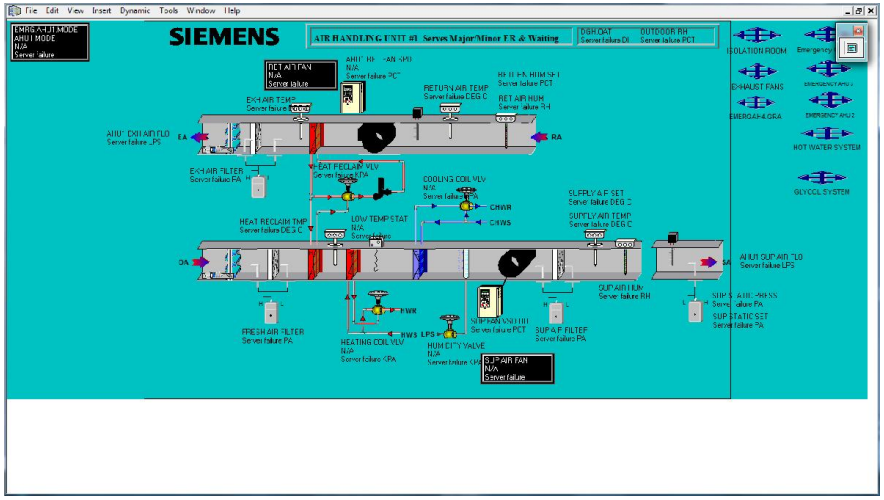
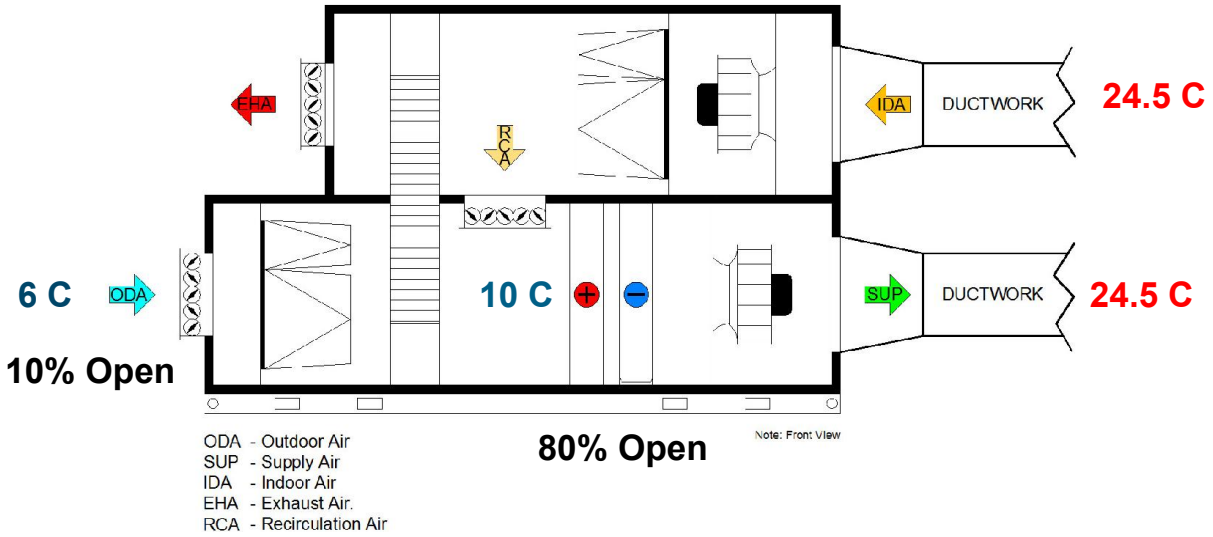
- Often Alarm screens are full of nuisance alarms
- Nuisance alarms hide real alarms that could be impacting energy performance
- Cleaning nuisance alarms
  1. Review alarms daily
  2. Adjust parameters to solve nuisance alarm as they arise
  3. Continue to review and make changes
  4. Eventually only “real” alarms will remain
- Dispatch staff to correct “real” alarms

Reviewing Graphics

- Contain key information on system operation
- Can be used to spot issues quickly
- Should be reviewed periodically
- Examples
  - Using Return, Mixed and Outdoor Air Temps to spot problems with dampers
  - Using Mixed and Supply Air Temps to sport passing valves
- Fault Detection and Diagnosis

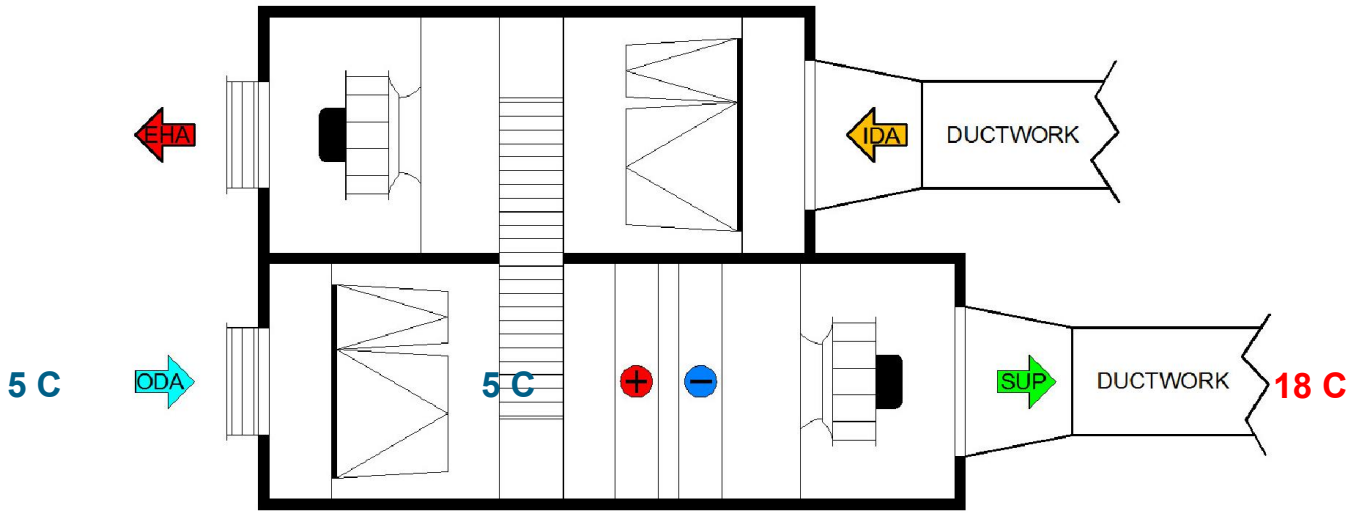


Reviewing Graphics - Example



$$\%OA = \frac{(RAT - MAT)}{(RAT - OAT)}\ x\ 100$$

Reviewing Graphics - Example

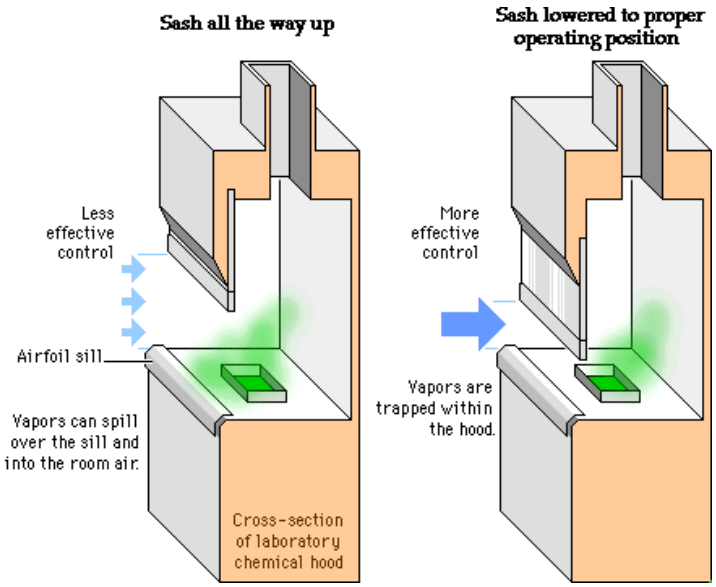


ODA - Outdoor Air
SUP - Supply Air
IDA - Indoor Air
EHA - Exhaust Air

Heating 60% Open
Cooling 25% Open

Fume Hood Awareness

- Fume Hoods are huge consumers of energy
- Labs often have 10-20 ACH (Air Changes Per Hour)
- Fume Hood should be at minimum when not in use
  - Open fume hood results in more make up air
  - More make up air means more cold air in winter being heated and more hot air in summer being cooled
- Fume Hood being used as storage can results in fumes escaping



It has been shown that average annual consumption of energy per fume hood is roughly equal to operating 3 average American homes

Operator Override

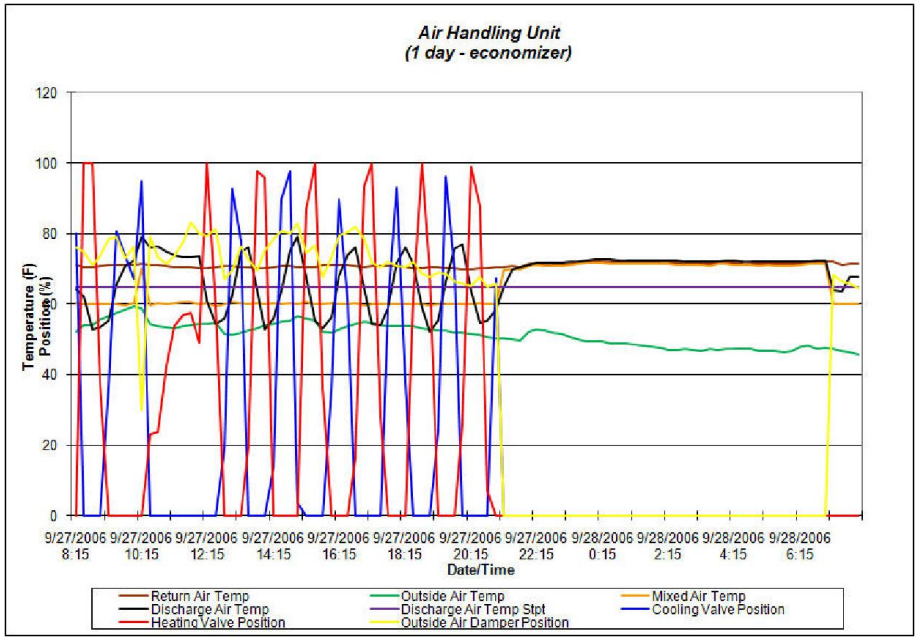
- Operator override should be used to temporarily correct issues or diagnose problems
- Make notes when putting points in override
- Points left in operator can kill the energy performance of a building
- Regularly run a report that lists all points in operator and correct deficiencies

Trending

- Trending in the BAS can be a powerful tool to track performance

- Any physical or virtual point can be trended
  - Examples:
  1. Sash position on fume hoods
  2. VFD speed
  3. Unit on/off state

- Make sure correct parameters are used
  - COV versus Interval
  - Interval time 15 mins versus 30 mins
  - Amount of date stored in panel



Training

- Keep building operators up to date on operation of the BAS
- Keep track of questions as they arise and bring them up with your BAS provider on a quarterly basis

Preventative Maintenance

- ASHRAE highlights that Preventative Maintenance programs can result in 10% energy savings
- These programs:

1. Ensure BAS components are properly maintained
2. Ensure valves are operating correctly
3. Ensure sensors are calibrated regularly
4. Periodically check for pneumatic air leaks
5. Spot problems before they impact performance

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Questions?

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