## Static Pressure Reset

### Author

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### Description

When a building's supply fan(s) system is operational, the supply fan's static pressure set point can be automatically adjusted to load conditions that will allow the supply fan to operate more efficiently. The variable frequency drive (VFD) of the supply fan is modulated to maintain a dynamically reset static pressure set point. This can be done by sorting all variable-air-volume (VAV) box dampers by position; if the average of the highest (most open) 10% of VAV boxes are open less that 70%, the reset control will decrease the static pressure set point in 0.1 W.C. (inches of water column) increments until the set point achieves the low operation limit (30% of the original value). If the average of the highest 10% of VAV boxes is greater than 90% open, the reset control will increase the static pressure set point in 0.1 W.C. increments until the set point achieves the original set point.

### Modeler Description

At each simulation time step, check the damper position for each VAV terminal on the airloop. Reset the fan pressure rise to the max damper position divided by 0.95, down to a minimum of 50% of the design pressure rise.

### Use Case Types

Retrofit, New Construction

### Arguments

No arguments

### Initial Condition Message

The initial model contained at least one multi-zone VAV system.

### Final Condition Message

The following systems had static pressure reset control applied: #{sys\_1}, #{sys\_2}...

### Not Applicable Messages

Not applicable if no multi-zone VAV system was found.

### Warning Messages

### Information Messages

### Error Messages

### Code Outline

Modeling strategy taken from “Energy Savings Modeling of Standard Commercial Building Retuning Measures: Large Office Buildings” (1).

* Check each AirLoopHVAC to determine whether it is a multi-zone VAV system or not.
  + First, check if the airloop.supplyFan is a FanVariableVolume
  + Second, count the number of thermal zones and make sure > 1
  + Third, make sure that the airloop.demandComponents contains at least one AirTerminalSingleDuctVAVReheat terminal

If the system is a multi-zone VAV system:

* For each VAV terminal on the airloop, create a sensor for the damper position

EnergyManagementSystem:Sensor,

VAV{#\_#}, !- Name

{NAME OF VAV TERMINAL}, !- Output:Variable or Output:Meter Index Key Name

Zone Air Terminal VAV Damper Position; !- Output:Variable or Output:Meter Name

* Create a single actuator for the fan pressure rise

EnergyManagementSystem:Actuator,

FANPRESS\_[#}, !- Name

{NAME OF FAN}, !- Actuated Component Unique Name

Fan, !- Actuated Component Type

Fan Pressure Rise; !- Actuated Component Control Type

* Create the program and calling manager

EnergyManagementSystem:ProgramCallingManager,

SP\_Reset\_Manager\_{#], !- Name

InsideHVACSystemIterationLoop, !- EnergyPlus Model Calling Point

SP\_Reset\_{#}; !- Program Name 1

EnergyManagementSystem:Program,

SP\_Reset\_{#},

SET FPRMax={fan.pressureRise},

SET VAVMax= 0,

SET VAVMax= @Max VAVMax VAV{#}\_1,

SET VAVMax= @Max VAVMax VAV{#}\_2,

SET VAVMax= @Max VAVMax VAV{#}\_3,

SET VAVMax= @Max VAVMax VAV{#}\_4,

SET VAVMax= @Max VAVMax VAV{#}\_5,

…

SET FANPRESS\_[#}= FPRMax\*VAVMax/0.95, ! Reset the fan power

SET FANPRESS\_[#}= @Max FANPRESS\_[#} FPRMax \*0.5, ! Limit to 50% reduction

SET FANPRESS\_[#}= @Min FANPRESS\_[#} FPRMax; ! Don’t reset upward beyond design

### Tests

**This measure applies to:**

1. Large Office
2. Medium Office
3. Primary School
4. Secondary School
5. Large Hotel
6. Hospital

**This measure does not apply to:**

1. Small Office
2. Stand-Alone Retail
3. Strip Mall
4. Supermarket
5. Quick Service Restaurant
6. Full Service Restaurant
7. Small Hotel
8. Outpatient Healthcare
9. Warehouse
10. Midrise Apartment

**Test results:**

### References

1. Energy Savings Modeling of Standard Commercial Building Re-tuning Measures: Large Office Buildings, PNNL 2012, Fernandez, Katipamula, Wang, Huang, Liu