

CEE 243 Predicting Building Energy Final Presentation

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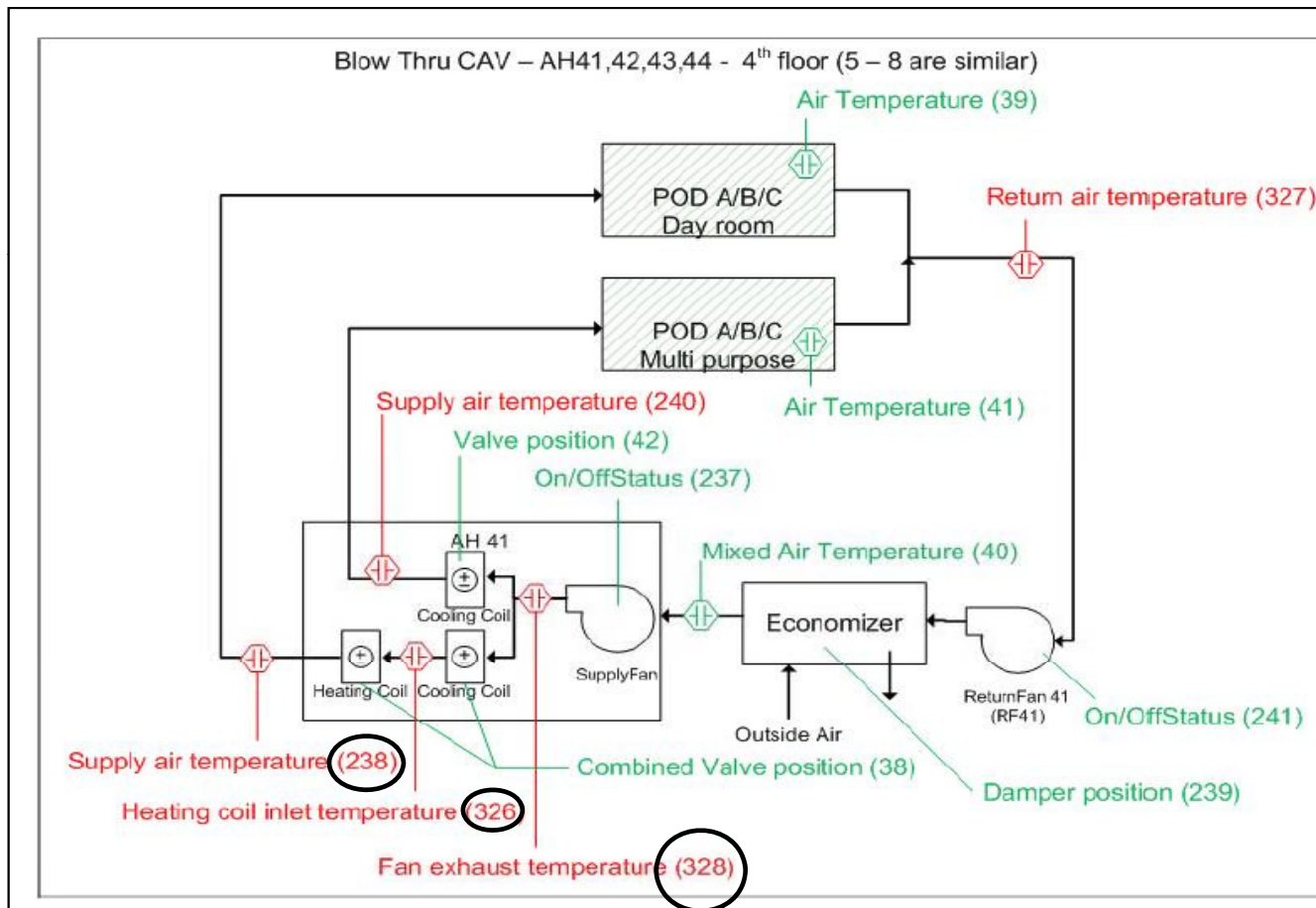
Introduction

Systems analyzed:

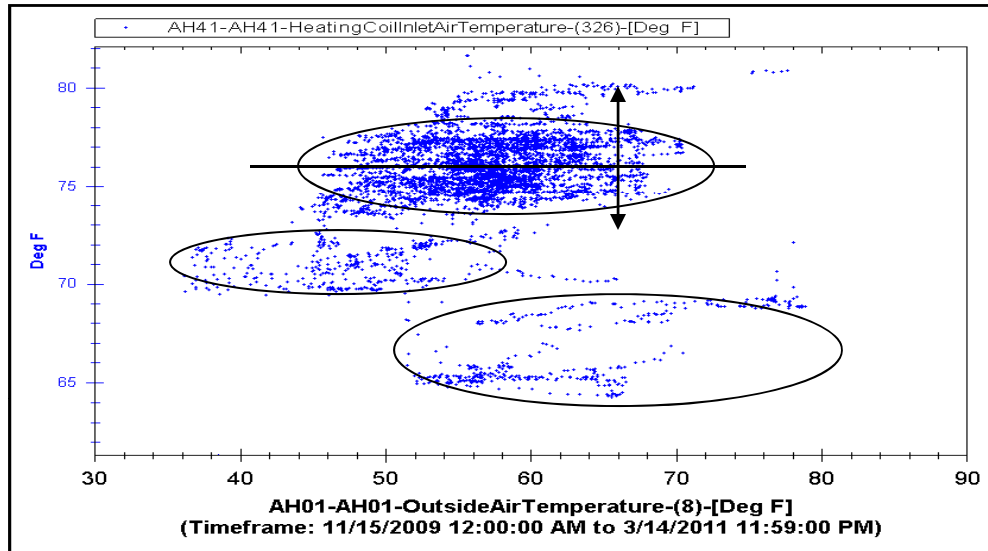
- AH 41
- AH 11
- Condenser Loop

At SCC Jail, Santa Clara

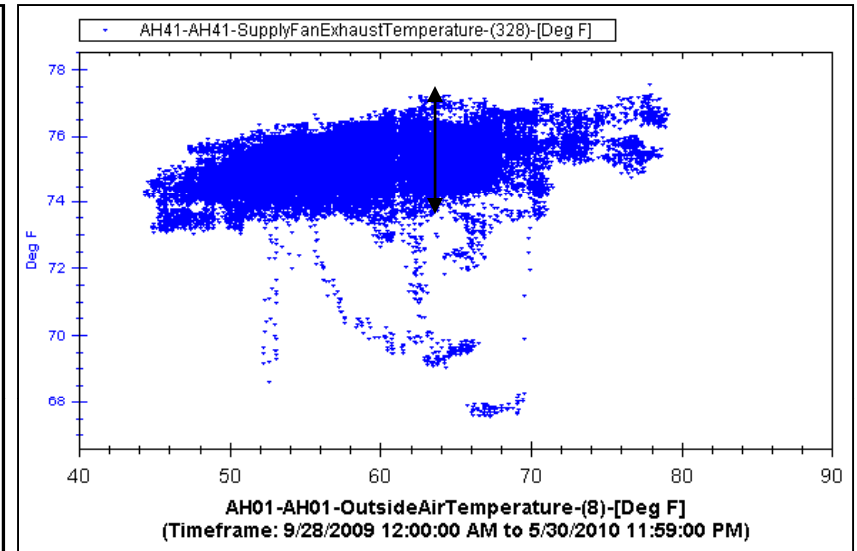
AH 41 System Diagram



Day Room: Heating Coil Inlet Temperature



X-axis: OAT ($^{\circ}$ F); Y-axis: Heating Coil Inlet Temp. ($^{\circ}$ F)



Hypothesis:

The cooling coil is not functioning properly since it's not cooling the air from the supply fan.

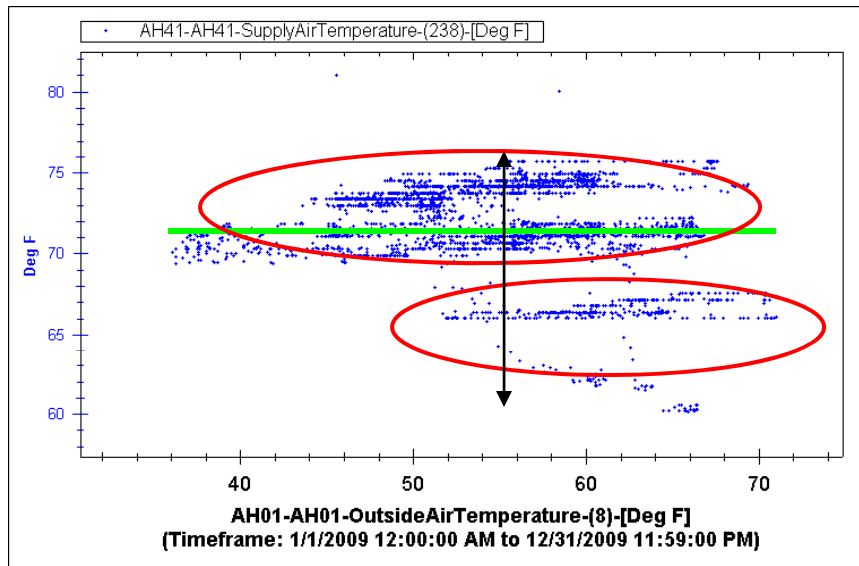
Since there are 2 subclusters, the heating coil is likely controlled for 3 situations - one with the fewest people, one with a lot of people and one with an intermediate number of users.

- Different uses of Day room (i.e. weekend visitors) cause the cooling coil to produce wide variance.
- Dense v. less dense clusters maybe proportional to weekdays v. weekends.

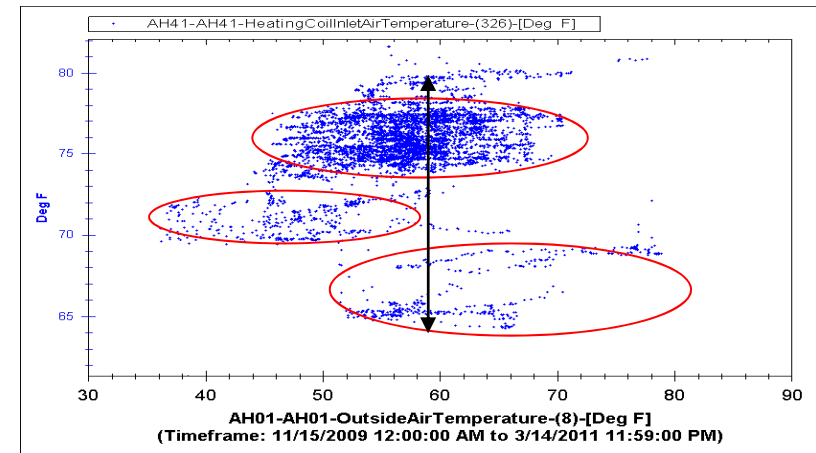
Suggestions:

- In the end, the air supplied to the room is acceptable, so this is not a major problem but should be pursued.
- Inspect cooling coil for physical problems and proper valve control; study occupancy and room usage; compare to next air temperature in path; evaluate sensor function.
-

Day Room: Supply Air Temperature



X-axis: OAT (degrees F); Y-axis: Supply Air Temp. (degrees F)



Hypotheses:

We hazard that the supply air temperature and the inlet temperature sensors are switched.

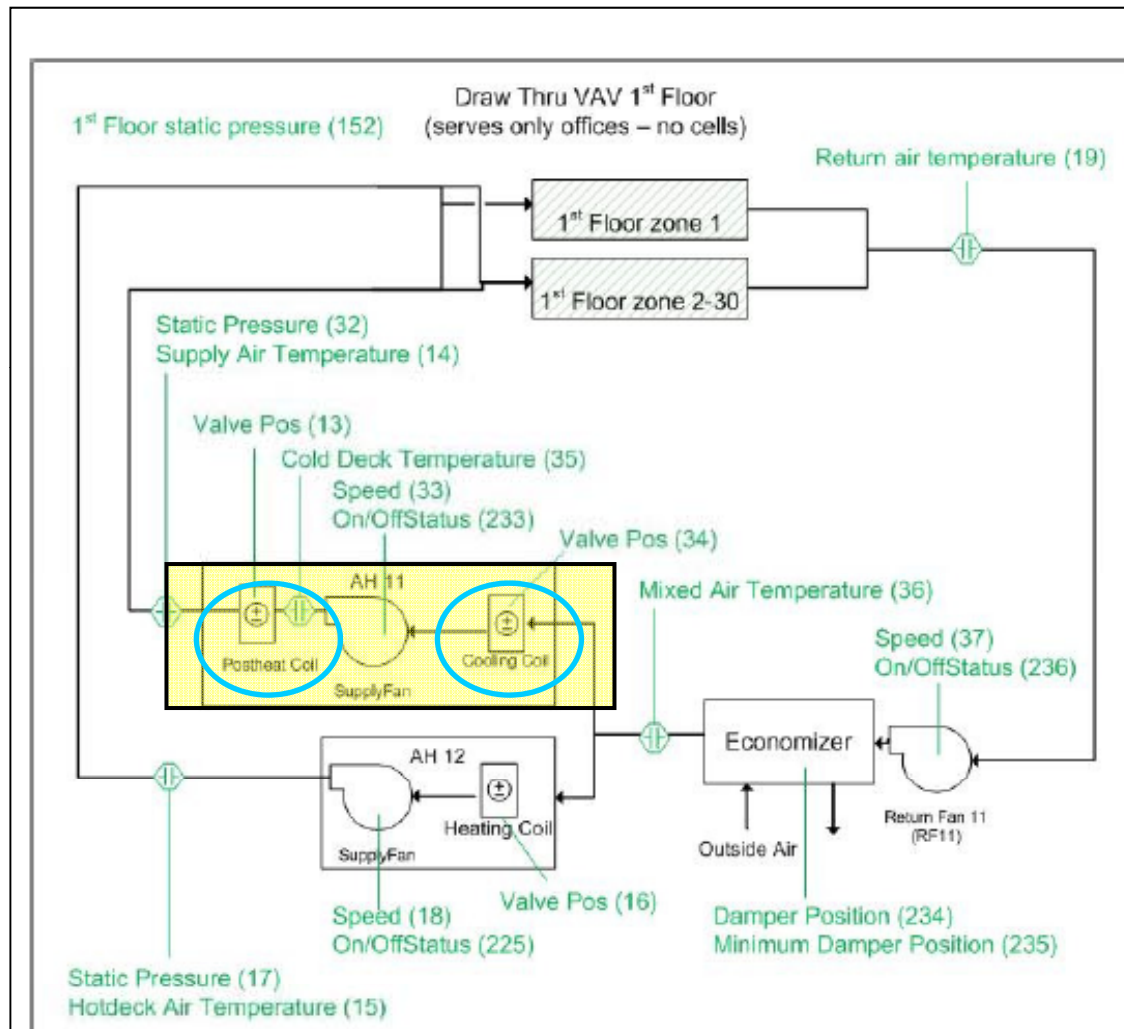
- does not explain inlet temperature's lack of pattern.

If not the case, the heating coil is turned off or malfunctioning such that it appears off.

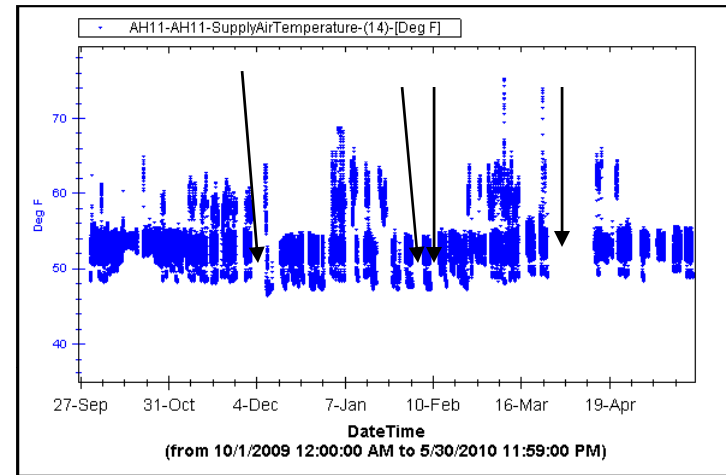
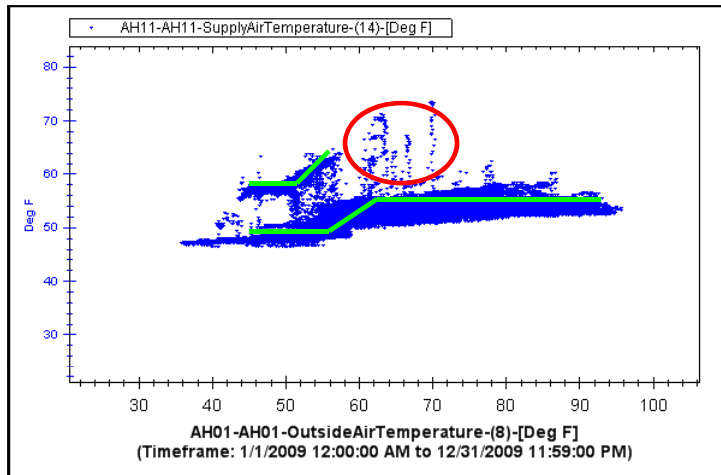
Suggestions:

- Like previous analysis, the overall system functions well, so this is not a looming problem.
- Inspect heating coil for physical problems and valve position control; evaluate sensors; see if data are missing;
- research occupancy and room schedule to determine if there are multiple, distinct uses.

AH 11 System Diagram



Day Room Space Air

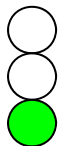


X-axis: OAT (degrees F); Y-axis: Day Room Space Air Temp. (degrees F)

Hypothesis:

Large Internal loads on the system seem to be of a little concern, but the system's overall behavior is good to go.

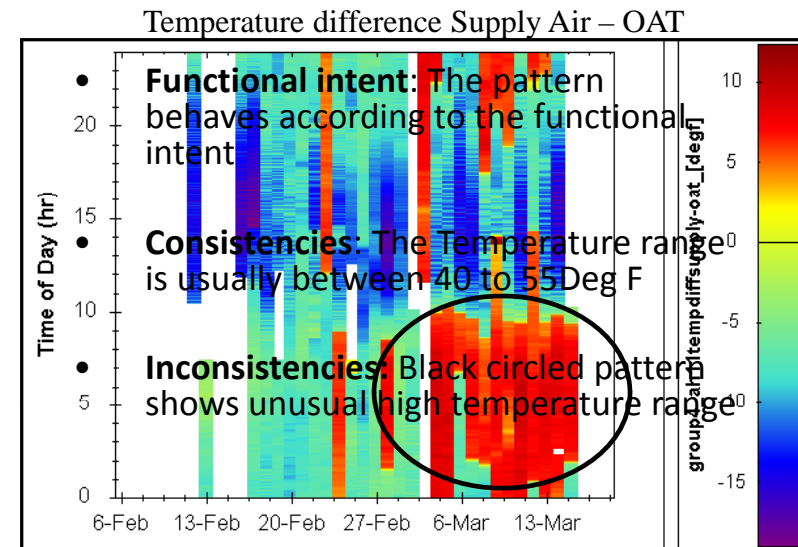
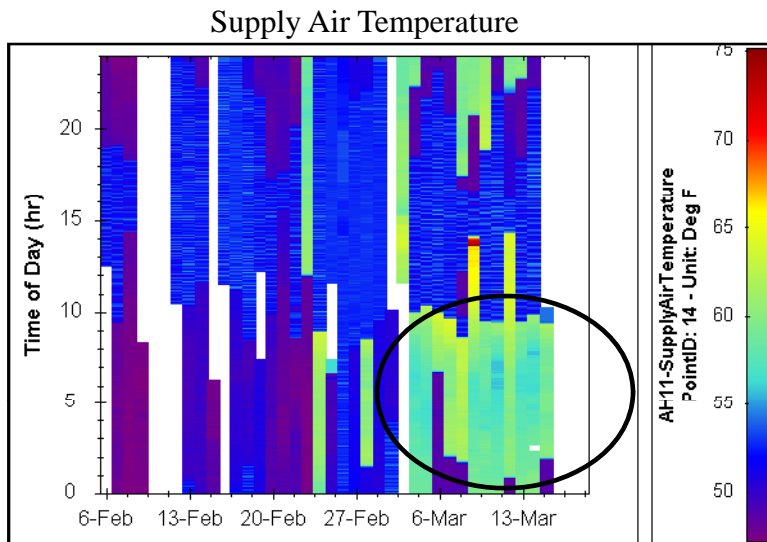
- Different uses of Day room (i.e. weekend visitors) cause the cooling coil to produce wide variance.
- The System was turned off at regular intervals which could be the maintenance or for the purpose of studying the system.



Suggestions:

Study occupancy and room usage; compare to next air temperature in the path; evaluate sensor function.

Day Room: Supply Air Temperature



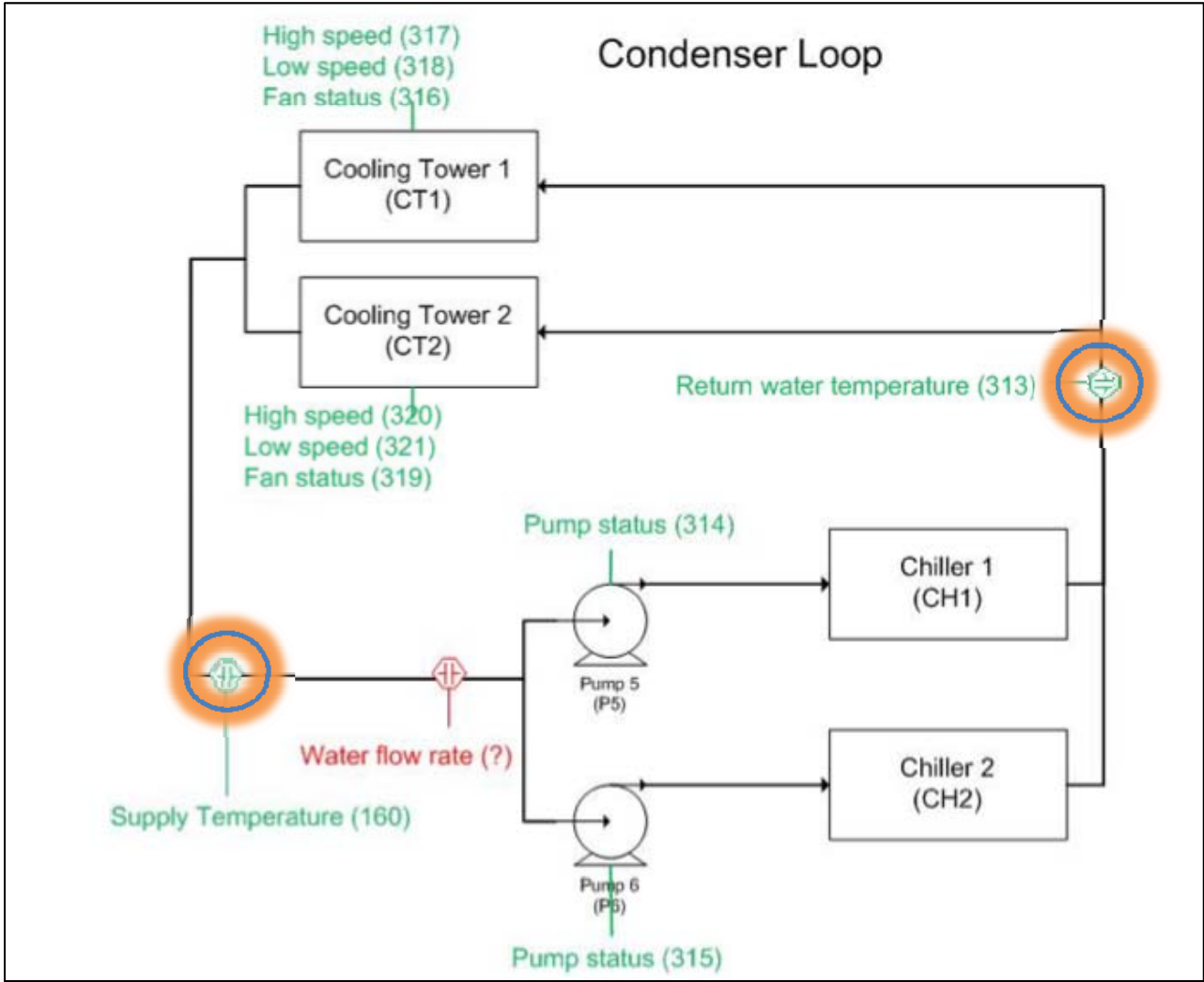
Hypotheses:

- Ventilation system not working properly
- Large internal loads, which is high number of occupants using the room

Suggestions:

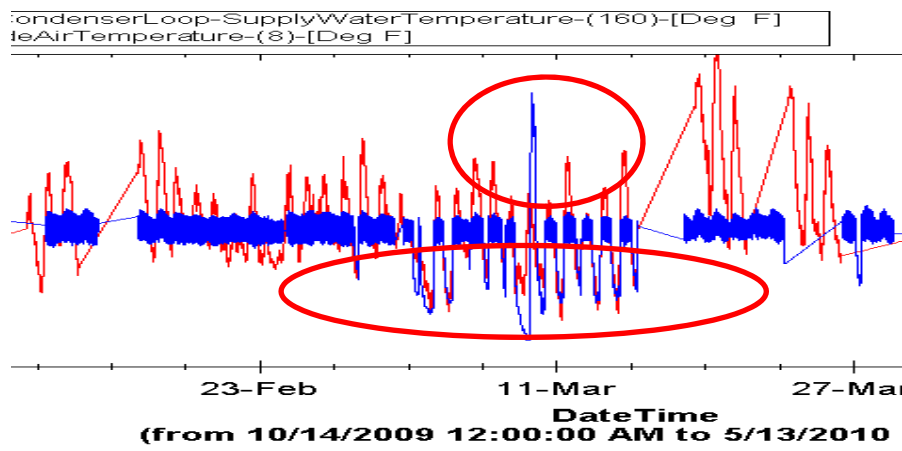
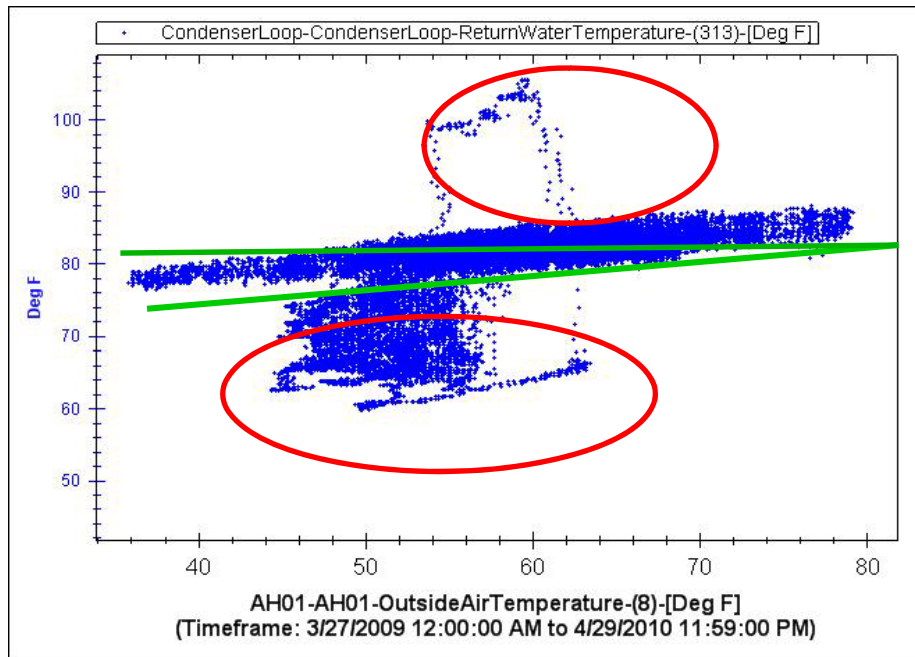
- Like previous analysis, the overall system functions well, so this is not a huge concern
- Inspect heating coil and Ventilation system for physical problems
- Installing Occupant sensors may be helpful

Condenser Water Loop



Condenser Water Loop

Return Water from Cooling Towers (313)



- The Functional Intent (green line) provide the chillers water at 85°F or bellow.

- Non-functional regions (red circle)

- One above the target temperature

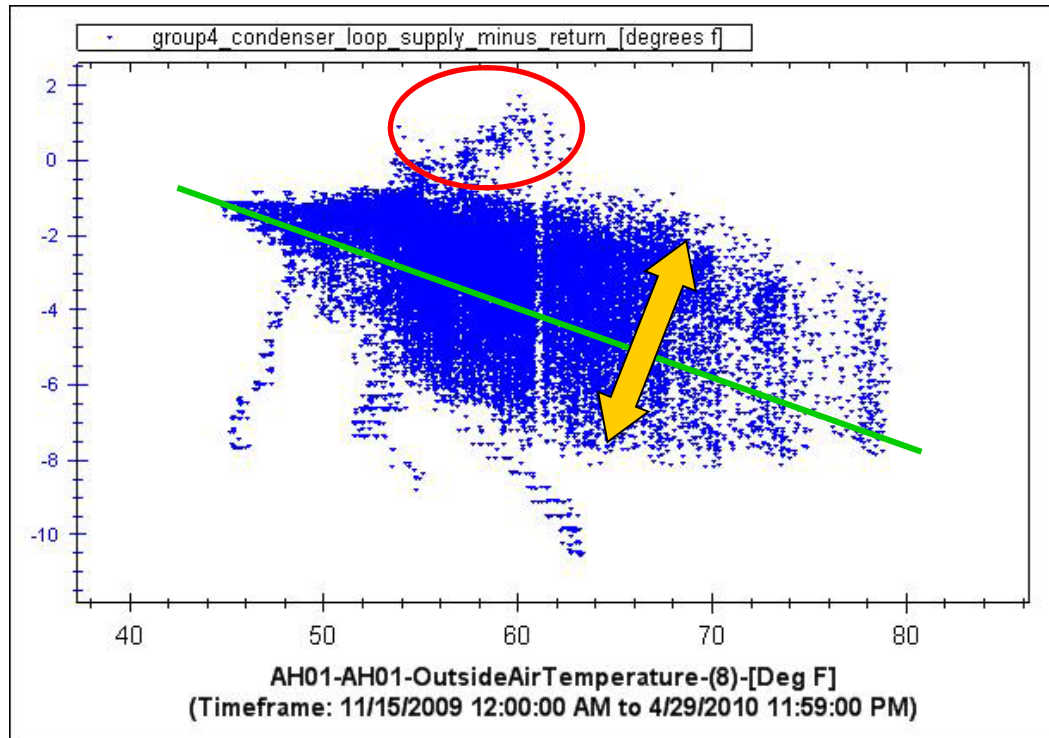
- One way bellow the target temperature

- Hypothesis using time series

- One time maintenance, cooling towers off for the upper region malfunction

- At low temperatures the chillers are turned off (control strategy) and the condenser water loop follows the outside temperature.

Cooling Tower efficiency: Supply and Return water difference



- **The Functional Intent** (green line)
Cool the water to be provided to the chillers, then difference of supply and return water temperature must be negative.

- **Non-functional regions** (red circle)

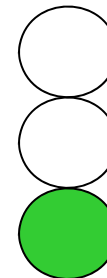
- One above the target temperature

- Big variability of cooling (Yellow arrow)

- **Hypothesis**

- One time maintenance, cooling towers off for the upper region malfunction

- Check the variability of the cooling tower



SYSTEM OVERALL:

- Check Manufacture Variability
- Further analysis may include fans and pumps status (now has poor data)

Conclusions and Recommendations

- Condenser Water Loop

Check Variability with the manufacture manual of the cooling towers

Further analysis may include fans and pumps status (now has poor data)

- AH 11

Check the functioning of the heating coil

Internal loads on the system

- AH 41

— Research room schedules and occupancy

Investigate heating and cooling coils, esp. valve positions

Questions

