Query #1

Deliverables

- Your reproduced copies of three graphs that were generated in the 2011 class using 2012 data in SEE IT
  - Annotate each to draw comparisons between the two years.
  - Reexamine a set of pages from one of the 2011 reports, which are available at the bottom of this page: https://www.stanford.edu/group/CIFE/cgi-bin/energy/index.php/2011_Y2E2. Regraph one of your points using 2011 data to become comfortable with the process.
  - Create graphs for the same time period, e.g., winter quarter, 2012 graph and compare it with corresponding 2011 data.
  - The appropriate points to plot can be found in the graphs and the data tables.
- Place each of your three graphs next to copies of the original graphs and answer the questions below. We understand many of you are not yet very familiar with this process, so just answer as best you can based on your observations. An example is available at the end of this document.
  1) (1 point) comment on similarities between the two years?
  2) (1 point) comment on differences between the two years?
  3) (1 point) comment on any data that seem obviously appropriate or obviously inappropriate?
  4) (2 points) Comment on the clarity and accuracy the 2011 graphs and conclusions? Suggest any improvements.
  5) (2 points) Comment on the value and ease of use of the data manual in assisting you in these efforts? Suggest any improvements.

Due Date
Thursday, April 12th at 1:15pm
Example Comparison for Query 1

In this example, we are reexamining the graph in Part 1 from Group 3’s report. This group examined Air Handling Unit 1 (AHU1). This graph looks at the heating and cooling valve positions and the position of the heat recovery bypass damper. The points involved are the valve positions for the heating and cooling valves and the heat recovery bypass damper.

![Graph from Part 1 of Group 3’s 2011 Report. The cooling coil is no longer open when the heat recovery bypass damper is on.](image)

You can filter the results in the Y2E2 datasource in SEE IT by searching for “AHU1.” This will show all of the points associated with this air handling unit.
You can also look at the table in the beginning of the group’s report to determine the point number and Filter for each individual point. If you search for the number within parenthesis, only the desired point should appear.

**Figure 2:** Filtering using the search term “AHU1” yields all of the related points for AHU1, making it easier to sort through the points. However, there are still many points to sort through.

**Figure 3:** In Part 1 of the group’s report the Point number for each data point is provided.
Figure 4: The input screen to replicate the 2011 graph. Notice the filter term shown is "(221)" which is the point number for the Outside Air Temperature. The dates have been changed to match the original run.

Figure 5: The results of the rerun.
Figure 6: The input screen for the regraph. Since April 6, 2012 is not available, April 1, 2011 was used instead.

Figure 7: The output for the April 1, 2011 rerun. As we can see, the behavior is different to the 2011 graph. During the day, there are periods when the heat recovery bypass damper is open while the cooling coil is also open.

Example Responses

1) What are the similarities between the two years?
The cooling coil valve is opened during the day to provide cooling for the building. The heat recovery bypass damper is open during the night and closed for part of the day. There is only a limited amount of heating during the morning.

2) What are the differences between the two years?
The heat recovery bypass damper is closed much earlier (7:45 AM vs. 10:30 AM) and then opens
again around 10:30 AM for most of the day. The cooling valve is open for much longer (10 PM vs. 4 PM) and does not cycle as much as 2011.

3) Do you see any data that seem obviously appropriate or obviously inappropriate? It is hard to understand the appropriateness of the behavior of the damper without more sensor context. For example, with the outside air temperature and the exhaust temperature missing from this chart it is not possible to understand if the damper behaved correctly.

The control of the damper around 10 AM should be investigated further, as the fast cycling can indicate a control or measurement problem.

4) Were the 2011 graphs and conclusions easy to understand? How would you change them?

The report concludes that an observed problem in 2009 (cooling valve open and heat recovery bypass damper open at the same) does not occur in 2011, marking it a solved problem. Rerunning the analysis shows similar behavior to 2009, prompting a deeper analysis of the conclusions in the report. When adding the outside air temperature (1123), the heat recovery supply temperature (1106) and the heat recovery exhaust temperature (1128), it becomes apparent that there is good reason for the heat recovery bypass filter to be open: After 9 AM, the outside air temperature is higher than the exhaust temperature. At this point, opening the heat recovery bypass damper cools the outside air leading to a lower heat recovery supply temperature, reducing the need for cooling. This

![Graph of sensor data](image)

**Figure 8**: The same chart for April 2012 including the heat recovery supply temperature as well as the outside air temperature.

5) Was the data manual clear in assisting you in these efforts? What could be added?
The data manual contains a clear schematic of all the relevant sensor points for the air handlers. However, the manual does not go into the functional intent of the heat recovery bypass filter leading to the incorrect conclusions in 2009 and 2011.