2K12108494 RCx
RETRO-COMMISSIONING: VERIFICATION REPORT

ED Review
February 8, 2013

Background

This project involved installing wireless pneumatic thermostats (WPTs) in the office building. The WPTs are digital thermostats that interface pneumatically with existing VAV duct boxes and communicate wirelessly with a building management system (BMS), providing zone level information.

The building had single set-point, pneumatic, thermostats. The measure included installing the WPTs and providing controls integration with the existing BMS. Proposed energy savings were based on reduced loads on building conditioning equipment. Engineering calculations, utilizing temperature bin simulations, were used to determine the energy savings and incentive for this project.

While this project consists of only one actual measure, the installation of the WPTs, it is understood that there were three (3) energy management strategies that could be implemented as a result of the new thermostats and their ability to communicate with the EMCS. These measures are as follows:
- optimum building start/stop
- dead-band implementation
- reduced airflow to unoccupied zones

Electrical savings were calculated to be 125,633 kWh and 25.18 kW. Gas savings were calculated to be 10,709 therms.

ED Comments

A crtitical assumption in the analysis is that the floor-by-floor systems are constant volume reheat. ED questioned this assumption in their previous review, and was assured that the system was indeed constant volume. But, based on information provided in the retrocommissioning verification report, ED is again raising this question. Consider the following items discussed in the RCx report:
- Reduced airflow to unoccupied zones – This is one of the measures for which energy savings are claimed. But, for a thermostat to reduce airflow, there must be a VAV damper.
- WPTs are claimed to have dual setpoints (heating/cooling) and deadband enforcement – While VAV reheat terminals can have dual setpoints, constant volume reheat systems have only one setpoint; the temperature at which reheat is controlled. Therefore, a dual setpoint thermostat makes no sense. But the RCx report states "In order to get cooling and heating savings, the idea behind the dead-band is to raise the zone set-point when cooling and lower it when heating". In a constant-volume system, raising the (reheat) setpoint when cooling *increases* energy consumption.
- "Modutrol" variable-pitch pulleys exist on the supply fans – These devices were originally used to vary the fan speed, but apparently the building engineer doesn't use them, and the fans run at 100% speed. However, *the fact that the fans run at constant speed does NOT mean that the system is constant volume! It means that, as VAV terminals modulate, the fan rides the curve.*

In summary, it appears that the system is not constant-volume reheat, but instead is VAV reheat. Terminals still modulate the airflow. As airflow is reduced, the fan rides the curve; which is the least efficient way way to modulate.

ED modified the spreadsheet to incorporate variable-volume control with a 50% minimum flowrate. Fan control was changed from "None" to "DD" (discharge damper). A discharge damper produces identical performance to the fan riding the curve. Changes are highlighted in red in the "Input" tab in the file "█████████ Verification Calcs and Tables (SDG).xlsm".

With these modifications, the spreadsheet predicts savings of 66,769 kWh and 18.23 kW. Gas savings are 5459 therms.