Occupancy Sensor Lighting Control Breadth Study

Above this report discussed how the occupancy sensors would be used to control the air change rate for the laboratory air system. However, the original intent of these occupancy sensors was to control the lighting in the office area and laboratory spaces on levels 4-8. Occupancy sensors are put on lighting systems to eliminate the possibility of lights being left on when the space is unoccupied. The implementation of this lighting control strategy is an energy savings measure. Occupancy sensors have an adjustable delay on them. This delay is the amount of time that the occupancy sensor must sense no occupants before the lighting is shut off. The typical value for this delay is 15 minutes. However as stated before this value is adjustable. It is best not to set the value too low as turning the lights on and off can shorten the life of the lamps.

Since the occupancy sensor lighting control strategy is being utilized to save energy, it is natural to ask, “How much energy is being saved?” A simple study was set up to take a look at the energy savings associated with the existing occupancy sensor strategy for controlling the lights in the research tower. There are 4 spaces that utilize the occupancy sensor lighting control strategy; laboratories, open office, private offices and meeting rooms. Details on the specific occupancy sensors used could not be located so sensors were spec’d out for the project. For the laboratory spaces a passive infrared ceiling mounted sensor (Leviton Model #OSC04-I0W) was chosen. In the office spaces a wall mounted passive infrared (Leviton Model #PR180-1LW) light switch was chosen. These models were chosen because the amount of square feet that they covered best matched the layout provided on the electrical drawings. Pricing information was then found for each model. Approximate information on installation and labor cost was gathered from Penn State’s Office of the Physical Plant.

The calculations are based on the following information. There were two styles of lighting used in the offices and laboratory spaces. In the offices there was a suspended direct/indirect fixture that held 3 lamps at 28 watts a piece (referred to as FP1). In the laboratory spaces it was the same fixture however over lab benches it was 2 lamps at 32 watts a piece (referred to as FP2) while on the workstations on the outer part of the labs have the same configuration as the office spaces. Each laboratory area has 20 occupancy sensors, while the office and meeting room spaces have one occupancy sensor a piece. Since the building has yet to be constructed occupancy schedules have to be assumed. The spaces within the building are assumed to be used 50 weeks out of the year, 5 days a week. The building is assumed to be occupied 10 hours a day and without lighting controls it is assumed the lights would be on all 10 hours of the day. Since it is not known without logging the lighting data how much energy would actually be, the spreadsheet is takes into account different amounts of hours of lighting saved up to 4 hours in half hour time steps. The spreadsheet also calculates the payback period for the installation of occupancy sensors. The payback period for the entire building depends upon the number of lighting hours saved per day. Based off of the calculations done in the spreadsheet it seems that a conservative estimate for the payback period (with the assumed occupancy schedule) would be 7-14 years, but there are many factors that play into this number. The full spreadsheet of the calculations can be found in Appendix D of this report.