Energy Efficient Indoor Air Quality
Preliminary Report
September 26, 2020

Progress to Date:

A. General

1. Bi-Weekly team meetings 9/8, 9/15
2. Monroe County COVID cases have not had a significant increase since school has started, and in fact have decreased since September 1st.

B. St. John Fisher

1. Completed existing conditions portion of draft report including HVAC, and general Indoor Air Quality deficiencies found among HVAC systems.
2. Analyzing available trended data, schedules, damper positions, and other control points within BMS on building by building basis.
3. Completed controls overview in existing conditions section in draft report.
4. Discussions with second UV vendor in progress to compare "on-the-fly" kill rate data.
5. Created two (2) excel calculation workbooks for buildings served by MAUs and buildings served by AHU/RTU units with return air. Calculations include:
    i. Scheduling
    ii. Pre- and Post-Occupancy Flush with UVGI
    iii. Pre- and Post-Occupancy Flush without UVGI
    iv. OA Damper Control
    v. Filter and Coil Static Pressure Decrease Due to UVGI
6. St. John Fisher reopening guidelines require masks, offer online classes, reduce people-load in classrooms (6ft distance), and 50% office area occupancy.
7. Held update meeting with St. John Fisher on 9/17 to discuss status and next steps.

C. The Harley School

1. Field work 8/25 to complete all room area and volume measurements. Calculations in process to generate 3 changeovers of OA within each space for pre- and post-occupancy purge. Requires coordination with VAV boxes and AHU schedules through BMS (ongoing). The calculation will allow The Harley School to safely meet air cleaning guidance without needing a 2 hour pre- and post-purge of the building, per ASHRAE.
2. Field work on 8/25 to spot check fan airflow performance of Unit Ventilators installed with MERV 8 versus MERV 13 filters. Results: The EC motors ramp up to overcome added static pressure resistance of the MERV 13 filters and has little to no impact on overall airflow. Starting static pressure difference of approximately 0.05"
3. MERV 13 filters have been installed throughout the building.
4. Harley has had a BMS contractor come to check sequence and scheduling to update any recommended changes.
5. Discussions with second UV vendor in progress to compare "on-the-fly" kill rate data.

6. Lower School and Middle School are currently having in-person classes daily. Upper School is utilizing a hybrid approach (50% in-person capacity every day).
7. Calculations are in the process of being set up to include:
    i. Scheduling
    ii. Pre- and Post-Occupancy Flush with UVGI (95% elimination of airborne contaminates per ASHRAE guidance)
    iii. Pre- and Post-Occupancy Flush without UVGI (95% elimination of airborne contaminates per ASHRAE guidance)
    iv. OA Damper Control
    v. Filter and Coil Static Pressure Decrease Due to UVGI

Study Findings to Date

A. Building Specific Opportunities
    1. St. John Fisher
        i. Most AHUs/RTU filters have been upgraded to MERV 13. Airflow performance across the MERV 13 filters is being evaluated. Units with VSDs installed have little to no impact on total airflow.
        ii. Over-pressurization issues in old Trane RTUs have caused filters to be dislodged, leaving gaps in the filter bank that will result in partially unfiltered airflow. This is a pre-existing condition and is not due to MERV 8 versus MERV 13 filter replacements.
        iii. Due to the condition of the cooling coils, the cooling capacity and airflow are likely reduced.
        iv. According to the BMS, several OA dampers on AHU/RTUs were found to be 100% closed or 100% open (RCx needed to verify current operation).
        v. All buildings are scheduled to have occupied hours 24/7. Limited opportunities to setback or change operation, will develop solutions with St. John Fisher.
        vi. Currently investigating the use of UVGI systems with AHUs and RTUs.
        vii. Currently investigating Pre-and Post-Occupancy Flush for 95% elimination of airborne contaminants per ASHRAE guidance.

    2. The Harley School
        i. DX condenser coils may have decreased cooling capacity due to the as-found condition. They have since been cleaned and do not have obstructed airflow.
        ii. Ventilation air ranges between 25% and 100%, depending on the AHU. Continued coordination with site to determine minimum recommended OA % (based on floor area, air changes per hour, and served zone) ongoing.
        iii. 2 of 5 energy recovery wheels not operating in summer, identified to The Harley School for further investigation.
        iv. Increasing AHU fan speed may require each downstream VAV box to have their settings modified to provide more airflow to zones.

B. Findings
    1. St. John Fisher
        i. Existing coil conditions are likely reducing cooling capacity and airflow performance
        ii. Several RTUs have filters that have been dislodged from the filter bank, significantly reducing the effectiveness of the filters that remain installed.

iii. Over pressurization issues exist within several other units derating the performance and capacity of the units
iv. Several OA damper positions were found to be 100% closed during occupied hours.
v. All HVAC systems on the campus are currently schedule 24/7 with no unoccupied schedule or temperature setbacks.

2. The Harley School
    i. Range of acceptable space temperatures has been expanded to allow for more flexibility in the volume of outside air delivered to each zone. This will be adjusted in summer/shoulder/heating season as needed.
    ii. Some sensors are not reading correct in air handling equipment (relative humidity, static pressure, temperature sensors, CO2 sensors). Deeper evaluation to occur during RCx.

C. Resources and Guidance Documents

1. ASHRAE Guidance
2. NYS Department of Health
3. NYS Education Department
4. Manufacturer's literature (UV, filters)
5. NIH Link for UV Kill Rate Reference https://pubmed.ncbi.nlm.nih.gov/32547908/

D. Lessons Learned

1. Updates and changes to COVID guidance from reputable sources need to be constantly monitored (NYSED, ASHRAE, NYDOH), as minor updates and release changes can happen without notification. For example, UV is now acceptable for P-12 schools, if they are not active in any occupied space. In AHU usage is also acceptable.
2. Leverage available electronic files and past reports
3. Have list of potential measures in mind during equipment survey
4. Current 24/7 operation of AHUs may limit the ability for savings. Will need to further evaluate opportunities with St. John Fisher, such as:
    i. Reduced OA at night
5. Wider temperature setpoints at night may be useful.
6. Vendors are regularly reaching out to The Harley School with products and information, some of which conflicts with NYSED guidance. We are offering our knowledge to assist in decision making.
7. Concerns from students, parents, and teachers about the steps The Harley School is undertaking speak to the urgency and timeliness of this project.
8. May be difficult to achieve savings given increased usage, need to optimize operating conditions.

E. Work Plan Adjustments

None

F. Next Steps

1. Airflow measurements and continue field work
2. Case analysis of potential measures.

3. Initiate RCx plans

G. Schedule
   1. St John Fisher Draft Report November 30, 2020
   2. The Harley School Draft Report November 15, 2020