National TAB

Project Summary

Introduction

Purpose of the visit to Blue Sushi in Nashville TN was to evaluate cause of hood smoke containment complaints and uncomfortable space temperatures. Blue Sushi (BS) recently turned over and the issues were present since then. The systems were balanced by a contractor during the construction phase and multiple visits by OEM's and service companies had taken place since turnover.

National TAB performed an initial visit on 6/5/2022. And then a follow up visit was completed on 6/15/2022 and Rich Jones with National Engineering was present as well. This summary below is a combination of NT findings with comments from NE copied in as well. A summary of recommendations are provided at the bottom of the summary, but Blue Sushi should consult National Engineering for final recommendations.

Grease Duct/PCU/Smoke Concerns

After speaking with the manager, the major smoke complaint is in the patio area. The space has a PCU but there is more smoke and odor that was anticipated. The PCU discharges directly over the patio area. The smoke also migrates into the space when the large doors are open.
Grease cleanout door was initially found missing on the discharge of the PCU. There is also another door that appears to be loose. The missing cleanout door was not found above the ceiling anywhere. Airflow was initially 2662 CFM out of 2600 CFM design. The hood filters on the right side above the grill are dirty and impacting flow and need to be cleaned. These probably should be cleaned every night. The filter velocity was much lower on this side of the hood (130 FPM vs 170 FPM) which is causing worse performance. Recommend cleaning and keeping on a schedule.

One of the cooks stated that from time to time the PCU fan would shut off and this would cause a lot of smoke to escape the hood. During a period of slower cooking, The technician checked the temperatures on the hood control panel. It was stating that the room temperature was 74.1 but the duct temp sensor was 87.4. The offset temperature setting in the hood was 15 degrees. This means if the hoods are "on by temperature" and not manually pressed on by button, that they would have shut off. He lowered this to 11 degrees which should keep the hoods on even during periods of slow cooking

There are some doors/windows that open up to the patio that can be fully opened. These are also right below the discharge of the PCU. PCU's are really good at removing most grease from the air but they cannot remove all odor. It will probably always be the case that odor will be drawn into the space when these doors are open. The building pressure was measured to be negative (see below)and resolving this could help the issue some.

A smoke test was performed and was capturing well. The cooks also cooked a very smokey dish and it captured everything. The smoke is a little lazy but it was all contained. They stated that smoke would escape when they cooked multiple smokey dishes at high volumes—but we did not get to witness that.

A 2nd visit was completed it was verified that the missing and loose cleanout doors were now properly installed. The Mechanical did not fix the first cleanout door that was loose and only halfway on, so NT fixed it as well as checked all cleanout doors for tightness and air leaks. Some cleanout doors were fully tight and still had trace amounts of air blowing through the gasket. At this point knowing we have fully sealed the duct, we checked the exhaust flow and found it was reduced by 40%. Completed various checks to make sure fan was operating correctly and it was determined that the additional 5 90-degree bends are causing the restriction in the duct.

Smoke coming from the louvers is being blasted directly onto couches that are located on the patio. The grease duct currently butts up right to the louver without any transition which is creating a nozzle effect with

exhaust having a high velocity and is of course directed down to the couch. Adding a full-size transition from grease duct to the full louver size and flipping the louvers upside down will lower the exhaust velocity and direct the air upwards. The louvers are underneath a 2' overhang so water infiltration should not be a concern and upstairs tenants are air sealed to the outside with no balconies so they would not be affected.

It was confirmed that there is noticeable odor and smoke from the louver. Verified that there are two banks of carbon filters with model numbers matching the submittals, 2 banks of HEPA filters, and then one banks of the SS captrate Solo filters. PCU's while effective at reducing odor and smoke will not ever fully remove all odor. However, it should be re-evaluated once the exhaust flow is within design.

The PCU Fan has a drive belt that has been thrown off. Found that the inner motor sheave has come off its threads which caused the belt to become loose. Tried to fix by removing the key but unfortunately the key was seized in the pulley, so I was not able to fix. Recommend getting a new motor pulley and ensure that all setscrews are tightened down. Should the one remaining belt fail then the store or cooking will likely be shut down until it can be fixed since there is no redundant safety of the second belt.

The right end panel of the hood is held on by clamps and there is an inch gap from the panel to the end of the hood. Currently smoke does escape through that gap, (mostly due to the low exhaust flow) we looked at the cooking equipment and it appears that all the equipment could be slid to the left an inch which would allow for the proper end panel installation.

AHU's

The space has major issues maintaining temperature setpoint. Portable AC units have been setup to help improve comfort.

Airflows were measured on all AHU's.1,2,4 were all found slightly low. Increased these units by 2-3% until motor amperage was maxed out. AHU 4 has some supply leakage at the discharge of the unit where canvas connector attaches two pieces of duct. Sealing the leakage will likely put the unit closer to 100% flow. AHUs 1,2,4 all have dirty air filters some are even starting to collapse. AHU-2 filters were particularly bad due to sucking in greasy smoke from to the capture issues. One diffuser that has pinched flex duct should switched to a 12x24" diffuser with three-way throw pattern so it can be installed against the wall, but ill add it should be placed closer to the center of the prep area and not towards the pass-through window where it currently is. Drawing shows it more centered in that area.

AHU-3 supply duct was traversed and around 500 cfm was measured but measuring air velocity of the return grille showed the unit was returning 1800cfm. The only access to the unit was removing a diffuser above the sushi bar but this is only visual access where we were able to feel supply leakage coming from the unit heater, the intended access doors were installed above the sushi counters so ladder placement is not possible. The unit heater was installed as an elbow meaning the fan discharges horizontally into the heater then the mechanical contractor installed their duct to the top of the heater, so it discharges vertically. Duct heaters should typically be installed with the same inlet and outlet configuration, meaning horizontal inlet and horizontal exit or vertical/vertical. Since the heater is currently used as an elbow it may be creating turbulence since there are no turning vanes in a duct heater, this would cause ununiform heating of the airstream and potentially be the cause of the leakage we are seeing. Again, better access to the unit is needed to be able to get to the filters and water balance valve.

On all AHU's, the OA damper and return damper motor is a power open motor that is supposed to have a mechanical stop on the motor, however self-tapping screws were used to physically stop the damper blades from opening. My concern is if the self-tapping screws eventually fail then the units will only be able to pull in outside air which will cause heating and cooling issues along with building pressure issues. Ideally 0-10v damper motor and controller should be installed or a proper motor mechanical stop should be used.

Outdoor air/Building pressure:

OA flow was measured with all OA dampers shut and MUA on as approx. 1550 CFM (with the MUA on). With the MUA on the airflow was approx. 1250 CFM. The MUA is fighting against OA ducts and based on the difference in airflow appears that it is pulling from the AHU returns. Briefly discussed with Rich and an inline supply fan may be necessary to ensure OA airflow at design. Building pressure is currently -0.06” wc and -1686 CFM which is highly negative.

Chilled Water:

Only AHUs 1,2,4 balance valves were able to be read out. AHU-3 is not accessible. Found that all Air handler balance valves are oversized, and all units were getting well above design GPM, so water flow is not a concern for the cooling issues. AHU control valves are open/close when cooling and not cooling, but the MUA valve was modulating and could not be fully opened to get a reading. Unit appeared to be cooling OK and not anticipated to be an issue.

Other Exhaust:

Dish exhaust is within design spec and is capturing the steam well. No adjustments were made. The restroom exhaust was just at 90% of design. Exhaust grille in the women’s restroom was not getting any flow. Recommend mechanical contractor verifying that there is flow.

Summary of Recommendations

1. Main cause of low airflow is the additional transitions that are added on the PCU discharge duct. These need to be reworked so that it is installed per design. This should increase airflow significantly as was observed when the grease cleanout door was not installed and airflow could bypass the transitions.
2. Recommend rotating the PCU discharge louvers 180 degrees so that smoke discharged upwards away from seating and not downwards.
3. Slide cooking equipment to the left and fully/permanently install the end panel so that smoke does not drift through the gap.
4. Building is currently net -1686 CFM and -0.06” wc which is very negative. This is likely the largest cause of discomfort in the building. The MUA is fighting against the AHU OA and is causing low overall outside air. Recommend adding a supply fan inline on the OA duct to improve the overall OA in the space. .
5. Replace the 24/24 diffuser in the prep area with a 12/24 and move it a one ceiling tile. This should improve airflow on AH-2.
6. Improve access to AH-3, and verify that OA damper is working properly (not full open or full closed). Low flow on this unit needs to be investigated further but it could not be accessed to inspect.
7. Locate and seal the duct leaks on AH-3 and AH-4
8. Redo the elbow/duct heater at AH-3
9. Replace all filters in the AHUs
10. OA/Return air damper motors for all AHU’s are missing a mechanical stop and are secured in place with sheet metal screws. Recommend repairing mechanical stop so that the sheet metal screws do not fail.