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Ten Tips for Reluctant Zones

(Part 2 of 2)

One of my least favorite situations in Class II BSC certification is setting the downflow on zoned (AKA non-uniform) downflow cabinets. The most common example of zoned downflows is when you have the typical downflow measurement grid with three rows (front, center, and rear) and each row has a different specification. Thankfully, these seem to be less common these days. But in the NSF listing from July 2008, there is a B2 with a specification for the back row of 42 to 52 fpm, center row at 50 to 60 fpm, and the front row at 58 to 68 fpm. In the same listing, an A2 from a different manufacturer had a four zoned BSC (though the specification for the back two rows was the same).

These are techniques for dealing with a zoned BSC where the zones are misaligned. One or more zones are too high or at the very edge of the upper limit on their downflow velocity specification **AND** one or more zones are too low or at the very edge of the lower limit on their downflow velocity specification.

Of equal or greater importance, we have a responsibility as BSC certifiers to properly test the BSC. We cannot falsify data or incorrectly use test equipment to achieve a result. These ten tips are intended to use every allowed technique to address the challenge of misaligned downflow zones. But if at the end of the day, the BSC cannot be certified – it fails.

These tips are what I have been able to put together. In the previous Cert Note, we covered:

1. **Take the Complete Grid**
2. **Establish the Correct Inflow**
3. **Make Sure That the Measurement Locations and Zones are Correct**
4. **Make Sure That the Proper Equipment is Removed or In Place**
5. **Make Sure That the Downflow Diffuser is Correctly Positioned**

Completing this exciting list, we have . . .

6. **Verify Locations**

   The location of the probe, particularly in the locations closest to the edges of the downflow area can affect readings. If the average of one zone seems to be inconsistent with the averages from the other zones, verify that the measurement locations are correct.

7. **Change the Probe Orientation**

   The opening of the velocity probe for the thermal anemometer must be oriented to face the direction of airflow. But most biological safety cabinet manufacturers do not specify whether the long axis of the probe should point from front to back or left to right. A change from one to the other will often result in a different reading which may bring the average or uniformity into specification.

8. Assess the Airflow Patterns in the Room

Under normal conditions, the inflow is drawn into the front half of the front grille of the BSC. The forward portion of the downflow is drawn into the back half of the front grille and the rear portion of the downflow is drawn into the rear grille. Just as incorrect inflow in the second tip can shift the downflow more forward or backward, a strong and misplaced air current can also unbalance the downflow.

For example, there is a strong, cool (because cooler air is denser), air current blowing toward one side of the front opening. More of the total inflow could enter there, which means less of the downflow air from that side of the cabinet goes into the front grille. In that case, the downflow reading at that forward corner might be lower. Shifting or blocking that room air current could restore a more balanced downflow.

To assess the airflow patterns, use a safe source of visible smoke in the area of the BSC to look for cross drafts. If you find any, consider the strength of the air current and the problem you are having with the downflow to determine whether changing the current could help the BSC performance.

9. Selective Remeasurement of the Extremes

NSF/ANSI 49 does not place any limitations on multiple velocity readings at the same location. We can take as many fair readings as desired and select the most desired fair reading. A fair reading results when the probe is located properly, it is allowed to measure the velocity for five seconds or more, a fair estimate of the displayed and air density corrected velocity is taken. By selecting the most desired fair reading, I mean removing and repositioning properly the ringstand mounted anemometer.

As a certifier measures downflow there is some statistical likelihood that the velocity reading they determine is not the true reading. Better technique reduces this likelihood but does not completely eliminate it. This is usually not a big concern, as it is unlikely the error is biased, i.e. it is equally likely to be a little high as it is to be a little low and since we are usually more interested in averages, the small errors would tend to cancel each other out.

When looking at a group of downflow velocities, the extremes are more likely to be in error. They really might be the highest (or lowest) point reading in the set, or they might have been a little high (or low) and then mismeasured an even higher (or lower). Often remeasuring the highest or lowest reading will result in a less extreme reading and move the zone average in the needed direction.

10. Consider Whether the Proper Filters are Installed

Proper filter selection is very important. Some BSCs will have a downflow filter with a 6 inch frame but the filter media is only a 3 inch pack. That upper portion of the frame is actually part of the downflow plenum. Replacing that filter with one having 6 inch frame (so it fits) and a 6 inch pack, could result in less uniform downflow and loading.

But how can the certifier check for this? First, it is more likely on a BSC with a recent filter change and very unlikely on a BSC with the original factory installed filters. If the filters have been changed recently, it might be possible to check filter part numbers and determine if a change was made.

Secondly, this might be worth looking into as if we do end up replacing the filters to address the misaligned downflow zones (certainly a last resort), we will want to be very sure the replacement filters are correct.

We welcome your comments and suggestions for this and future CertNotes. Please visit www.thermoscientific.com/certnotes to make suggestions or to view additional resources for certifiers.

Proper certified biological safety cabinets – vanquishing evil, one clean and contained work space at a time.

Best Regards,

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