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Best Practice for Shutting Down a Class II Biosafety Cabinet (BSC)

Background

With the emergence of the SARS-CoV-2 virus and the associated COVID-19 pandemic, many research institutes are reducing work or even temporarily closing their facilities. For cell culture laboratories, this requires not just halting experiments and freezing cultured cells, but also taking care in properly switching off and putting laboratory equipment in hibernation.

Here we provide our best practice for shutting down a Class II BSC for a period of weeks or even months. These tips are designed to avoid the growth of microorganisms in an empty BSC which was previously in use.

Procedure for Shutdown of a BSC

1. Remove all supplies and equipment from the BSC work area. A bare work area will be more easily cleaned and prepared for storage.
2. Close any media valves within the cabinet for gas, vacuum or other. The shut off of any combustible gas must be assured. It may be advisable to disconnect combustible gas connections.
3. Safely and thoroughly surface decontaminate the interior work area of the cabinet with an appropriate decontaminant. Remove any residue from the surface decontaminant by wiping twice with distilled water. Safely and thoroughly surface decontaminate the drain trough under the work surface of the cabinet with an appropriate surface decontaminant. Remove any residue from the surface decontaminant by wiping twice with distilled water.

4. Make sure the valve for the drain trough is closed. This is typically found under the cabinet. The location is circled in the photo to the right.



5. Fumigation is typically not necessary unless the cabinet may not be secure. For example, if the cabinet remains in an unused and locked laboratory, fumigation probably is not necessary. But if the cabinet must be moved to a storage area with many items packed in, the cabinet might be damaged in transit or in storage and the integrity breached. In these cases, a fumigation should be considered.

6. Switch off the BSC fans, lights, UV lights and disconnect the power cord from the power supply/wall outlet. Coil the cord and secure it.

7. For cabinets connected to external exhaust systems with a direct or canopy connection.

a. **Direct connected** cabinets are Class II, Type B1, B2 and some variants of Type C1 and some are traditional Class II BSCs under EN12469. This can also include externally exhausted Type A1 and A2 units that do not follow the NSF/ANSI 49 recommendation to connect to external exhaust with canopy or thimble connections but instead use a direct connection. The external exhaust must be shut off and any airtight damper in the exhaust duct should be closed. In some cases, this is just de-energizing a dedicated fan on the facility's roof. It may require physically disconnecting the exhaust connection from the cabinet. Continuing flow through a BSC's exhaust filter while the BSC internal fan is off can cause exhaust filter loading and/or unbalanced loading between the downflow and exhaust fan. If this happens it may be necessary to replace the exhaust filter or both the downflow and exhaust filter.

b. **Canopy or thimble connected** cabinets are traditional Class II BSCs under EN12469 or Class II, Type A1 or A2 BSCs under NSF/ANSI 49. For these units, no additional provisions must be made. If the external exhaust remains on, air is drawn from the room into the gap at the thimble and not drawn through the BSC. It also does not affect the BSC in storage if the external exhaust does not remain on.

8. Cover the exhaust opening of the BSC. This will prevent dust from accumulating on top of the BSC exhaust filter and help in visually determining if the exhaust filter was damaged during the storage period.
9. Cover the front opening of the BSC. This will prevent dust from accumulating in the BSC work area and keep the BSC work area from being used as a storage area.
10. BSCs capture airborne contaminants including airborne mold spores. Normally the frequent flow of air and lack of moisture and support for growth found in HEPA filters do not allow mold growth in the BSC filters. We suggest where possible to store the cabinet in an area where the relative humidity is between 30 to 50% to reduce the opportunity for growth in cabinets not used for extended periods of time.



Procedure for Restart of a BSC

1. Before removing the covering you installed on the exhaust opening of the BSC, visually inspect it to determine if the exhaust filter was potentially damaged during the storage period.
2. Remove the covering you installed on the front opening of the BSC.
3. Clean the BSC exterior.
4. Inspect the BSC work area. It should be relatively dust free, but surface clean the BSC interior.
5. Reconnect the BSC power cord to the power supply/wall outlet. Switch on the BSC fans and lights.
6. For cabinets connected to external exhaust.
 - a. **Direct connected** cabinets are Class II, Type B1, B2 and some variants of Type C1 and some traditional Class II BSCs under EN12469. This can also include externally exhausted Type A1 and A2 units that do not follow the NSF/ANSI 49 recommendation to connect to external exhaust with canopy or thimble connections but instead use a direct connection. For these units, the external exhaust must be

turned on and applicable dampers in the exhaust system repositioned. In some cases, this is just re-energizing a dedicated fan on the facility's roof. In other cases, it may require physically reconnecting the exhaust connection from the cabinet. It is critical with these cabinets that the exhaust flow measurement is verified to be correct.

- b. **Canopy or thimble connected** cabinets are traditional Class II BSCs under EN12469 or Class II, Type A1 or A2 BSCs under NSF/ANSI 49. If the exhaust was shut down or closed off, the exhaust flow measurement should be verified to be correct. These systems are more “forgiving” than direct connected systems, but still reassessment should be done to assure proper function has returned.
7. Reconnect any previously disconnected media such as combustible gas if applicable.
8. Verify operation of
 - a. Media valves for gas, vacuum or other.
 - b. Drain valve if present
 - c. UV lights within the cabinet. Do they turn on and off? Does the UV light automatically turn off when the sliding window is opened?
9. Prepare the cabinet for work as described in the manual including surface decontamination of the BSC interior work area.
10. If the cabinet was not moved or disturbed (included the exhaust flow as described in step 6 if applicable) and is within the certification interval from the last annual or semi-annual field certification, the cabinet is ready for use. If there is any doubt or the cabinet is due for field certification, have the cabinet tested and recertified by a qualified field service engineer.
11. In most cases, there will be no odor indicating mold or mildew within the cabinet. If this is NOT the case, first try running the cabinet at full operational airflow for 24 hours or more. If the odor remains, it may be necessary to change the HEPA filters after fumigation.