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Filters and Installations in Safety Cabinets

Excerpt from the GMP Compliance Adviser, Chapter 3.G

by Andreas Nuhn

Filters in safety cabinets

The filters are the most important part of a safety cabinet. To ensure comprehensive protection of the product and personnel, HEPA filters of at least class H13 must be used, usually H14 filters are used.

These filters can only achieve their full filtering potential when they are leak-tight and undamaged after installation. For this reason, the filters are checked after installation and then at regular intervals. This is done using a *fit test* and a *leak test*. Because DEHS (di-ethylhexyl sebacate) is normally used as the test aerosol, the test is also referred to as the DEHS test.

The procedure and acceptance criteria for the filter test are described in EN ISO 14644-3. The DEHS test is carried out after the installation of a new filter or after a filter replacement. Additional regular testing is normally not required. However, it can be carried out to ensure that the filter is not damaged, e.g. during annual requalification.

How can the filter be damaged?

Damage to the filter through normal use – i.e. the filtration of clean air – is very unlikely. However, the filter may be damaged by metal splinters or chips, particularly when it is first installed.

Damage can also occur during operation. On the one hand, damage can be caused directly by the user, e.g. during the transfer of material within the workbench or during maintenance. On the other hand, the filter may be damaged if leaked liquid enters the filter, e.g. as a result of carelessness on the part of the user.

Installations inside safety cabinets

The proper operation of a safety cabinet must be continuously ensured and monitored. The air velocity is monitored on the system side, and the operator must also monitor the particle count and bacterial count. Special installations and precautions are required for this. Sampling should be representative without interfering with ongoing operation.

Monitoring air velocity

As previously explained, a specific air velocity is required for cleanroom class A. In accordance with the requirements of the EU GMP Guidelines, this must be monitored continuously. Hot-wire anemometers are normally used for monitoring because of their compact design. Alternatively, the air velocity can also be monitored via differential pressure measurement. An alarm is triggered if the air velocity drops below 0.36 m/s for an extended period of time (e.g. > 2 min). When this occurs, neither personnel nor product safety can be guaranteed (the ratio of *inflow* to *downflow* no longer meets the tested and certified value).

Isokinetic particle sampling

Particle measurement is a key factor in assessing the purity of the air. For this reason, continuous monitoring of air purity during pharmaceutical production is required for cleanroom class A, for example. This is carried out within a low-turbulence displacement flow using appropriately designed samplers that do not disturb the laminar air flow. The installation of mobile devices within the workbench is difficult in most cases due to the limited space available.

For this reason, the sampler should be permanently installed in the back of the workbench and connected to the evaluation unit via a suitable hose with an extremely smooth inner surface that is suitable for transporting airborne particles. It is important to ensure that the hoses are as short as possible.

According to the new Annex 1, the hose should only be 1 m long. Exceptions are permitted but must be justified. Otherwise, particles can be deposited in the hose and be carried along in batches, falsifying the measurement result.

In practice, the required hose length of 1 m can mean that the usual centered positioning of the sampler is not feasible, especially with larger workbenches (with a width of 1.9 m, for example). In such cases, the positions for both the sampler and the sensor must be selected very carefully in order to fulfil both the process requirements and the hose length requirements. As most safety cabinets today are equipped with a monitor, it makes sense to install the isokinetic sampler at the edge of the monitor to ensure a clear field of view. This also allows the hose length to be reduced accordingly. However, it must be ensured that the position is selected in such a way that representative measurements are possible. An example is shown in figure 1.

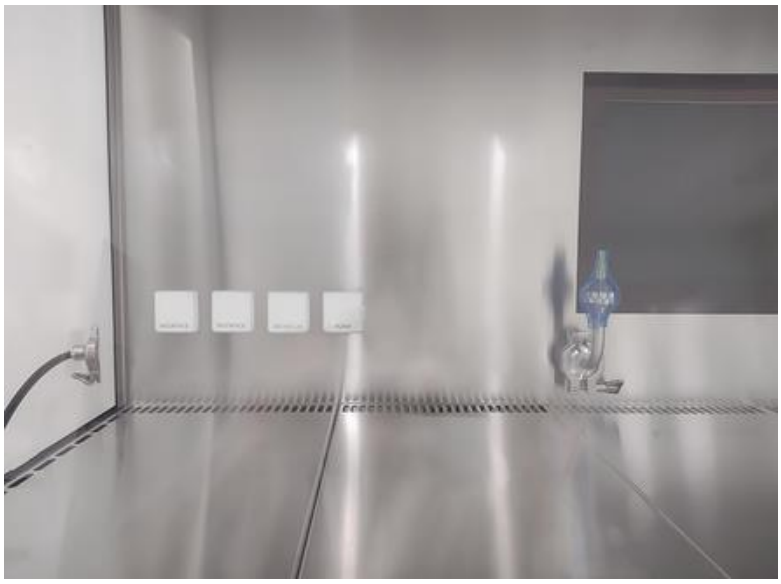

Figure 1 Isokinetic sampler in a safety cabinet

Air sampler

In the active air sampler method, air is applied to the culture medium by a fan. It may be useful to have the probe for the air sampler permanently installed in order to avoid

having to set up a mobile device in the workbench during production. However, this has an influence on the air flow due to the high air exchange rate and must be taken into account during production when taking samples at the same time.

Positioning of settle plates

In passive air sampling, germs from the air are transferred to culture media by sedimentation during a defined exposure period. The sedimentation plates are usually placed on the worktop inside the workbench, where they take up valuable space.

Fixed surfaces can also be provided for this monitoring measure, on which the plates are then placed. This also ensures that samples are always taken at the same place and are therefore comparable.

Author

Andreas Nuhn
Consultant / GMP Beratung Nuhn, Niederneisen, Germany
e-mail: a.nuhn@db-pharmadesign.de