

DUCTLESS FILTERING FUME ENCLOSURE OR DUCTED FUME HOOD?

Advice and analysis for making a qualified and impartial decision

Truthfully, it is quite impossible to give an answer in favour of either concept without objectively analysing the disadvantages and advantages of both systems.

The goal of this article is to eliminate any preconceived negative notions against one system or the other so as to allow users to find the best solution in terms of cost and adaptability of use, without losing sight of the fact that the solution retained should ultimately insure their safety.

Ducted Fume Hoods:

All laboratory personnel are knowledgeable about ducted fume hoods. In fact, the basic concept dates back to the middle ages when the alchemists used the chimneys of their own homes to perform experiments. Since then this concept, which never ceased to evolve, has finally turned into the modern ducted fume hoods of today's laboratories.

Ductless Filtering Fume Enclosures:

Far more recent, ductless filtering fume enclosures have only been around for about 40 years. Created in 1968, their technology is directly inspired from the activated carbon technology found in the modern gas mask. Today, ductless filtering fume enclosures are using the properties of activated carbon combined with catalysts and certain neutralizers in order to filter toxic molecules, therefore eliminating their dependency upon HVAC and the need to be connected to external ductwork.

The Disadvantages and Advantages of Ducted Fume Hoods.

The Disadvantages:

The installation of a ducted fume hood is complex. Extensive engineering studies are needed before hand to determine proper roof top ventilation and ductwork requirements along with the make-up air system that will be necessary to compensate for the air consumed by one or more fume hoods.

Since a ducted fume hood consumes more energy per year than an average house, the consumption of heated or cooled air is high and can represent for a modern fume hood an average of 20,000 cubic feet (600 m³) per hour and per fume hood. (See official studies such as the Lawrence Berkeley National Laboratory Report on High-Performance Laboratory Fume Hood Field Test at the University of California, San Francisco. Final Report for Pacific Gas and Electric Company, October 2001).

Lastly, their working principle forces them to reject toxic substances directly in the atmosphere and their tie-in to fixed ductwork renders them immobile.

The Advantages:

Today, ducted fume hoods have reached a high level of sophistication with regards to saving the air exhausted into the atmosphere and containing the fumes around the work area.



They do not require a pre-verification of the chemicals intended for use aside from those prohibited by laws and regulations, which as of today do not limit ducted fume hoods on the amount of chemicals that they can exhaust into the atmosphere.

Traditional fume hoods have been recognized for a long time as an effective means of protection for laboratory personnel, although recently identified as a large consumer of energy that cannot be ignored

The Disadvantages and Advantages of Ductless Filtering Fume Enclosures.

The Disadvantages:

The frame of use of a ductless filtering fume enclosure is limited to certain chemicals. This limitation can vary between manufacturers, which is why it is important to consult each manufacturer's guide of retained chemicals or chemical listing. As an example, companies like ERLAB, a leading manufacturer of ductless filtering fume enclosures, publishes a listing of 600 chemicals.

There is a quantitative limitation of chemicals dependent upon filter retention capacity.

The allowable front sash opening available for handlings is limited by the volume of air treated and is directly linked to filter design. Again, this can vary between manufacturers.

There is a necessity to monitor filter saturation in case a reliable detector is not present.

There is a need to periodically replace the filter after saturation.

The Advantages:

IMPORTANT NOTICE: The advantages described here under are only valid if the manufacturer certifies that their ductless filtering fume enclosure is in compliance with the requirements of a serious standard developed by specialists in molecular filtration, ventilation and general fume hood design and in collaboration with end users and industrial hygienists responsible for the publishing of official threshold limit values. This is for example the case of the very stringent NFX 15-211 standard whose committee was made up of such recognized specialists.

Ductless fume hoods do not consume any air since they filter and recycle the air back into the room in which they are set-up.

Please note: If in compliance with the NFX 15-211 standard, the air exhausted by the ductless filtering fume enclosure is free of chemical substances and filtered at an efficiency level that is 100 times below official permissible exposure limits. (This 100 times below the official permissible exposure limit concentration level is required since basic limit values are set for one chemical at a time and cannot be cumulated).

Ductless filtering fume enclosures do not require rooftop exhaust ducts or make-up air systems as they recycle and filter the laboratory air at an average rate of 6,000 cubic feet per hour.

Ductless filtering fume enclosures do not exhaust chemical pollutants in the atmosphere.

They are mobile and can evolve along with their changing laboratory environment.

Ductless filtering fume enclosures are immediately available for use without lengthy or costly installation requirements.

They can be temporarily stored and dispatched where needed by a safety officer for a scheduled class or project and also at a moment's notice to protect users in cases when an impromptu need suddenly arises.

A Few Words of Caution:

The fact is that when an application falls within the intended frame of usage, as set by the manufacturer, one cannot help but be drawn to the advantages of a ductless filtering fume enclosure. However, it is very important at this moment to verify that the manufacturer has answered all the necessary questions that must be asked prior to making a final decision, such as:

- 1) Is the chemical or groups of chemicals, which I am using retained by the filter under the conditions set by the AFNOR NFX 15-211 standard?
- 2) If yes, what will be the lifetime of the filter in relation to the frequency of my handlings and their evaporation rate?
- 3) Will I have access to a reliable automatic filter saturation detector?
- 4) If not, what will be the detection methods provided?
- 5) Will the manufacturer provide me with a sustainable cost saving study concerning the advantages of using a ductless filtering fume enclosure over time comparing energy savings against filter replacement cost?

6) Will the manufacturer keep me safe by offering services or programs that will monitor my application changes and preserve the intended usage of my ductless filtering fume enclosure?

7) Finally, is the manufacturer willing to provide answers to these questions in writing?

If each and every one of these questions receives a positive response, your decision is documented and should now be easy to make. However, I must bring to your attention the fact that certain ductless filtering fume enclosure manufacturers do not hesitate to provide positive answers to all these questions for the sole purpose of making a sale. I therefore advise you to deal strictly with manufacturers who are able to show official proof of compliance with the NFX 15-211 standard and who commit in writing to provide a ductless filtering fume enclosure that will comply with the answers of the aforementioned questionnaire.

This indispensable precaution will help protect you from certain companies stemming out of this emerging profession, which you must realize is still in need of more rigorous product designs and sales approaches. The necessity to comply with a stringent safety standard can only benefit all parties involved and primarily guarantees the safety of end-users.

Conclusion:

In the event that satisfactory responses cannot be provided to insure the safe usage of a ductless filtering fume enclosure, a decision should certainly be made in favour of selecting a ducted fume hood.

I however strongly advise anyone contemplating this decision to follow these recommendations as a certain number of users, who have hastily purchased a ductless filtering fume enclosure based solely on the attributes put forth skilfully by some manufacturers without a thorough prior examination of the usage boundaries, have been completely disappointed. Such failures have fuelled the negative arguments of some detractors who are fiercely against the idea of ductless filtering fume enclosures on principle alone. Unfortunately, this attitude ignores a modern solution, which under the right conditions, has its place in the protection of laboratory personnel, the environment and the saving of energy.

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