Creating Safer Workplaces

AIR SCIENCE FILTERS INFORMATION

HEPA/ULPA FILTRATION

Multiplex HEPA/ULPA filters provide a range of high performance protection. These self-contained filters are designed to physically capture particles larger than 0.3 microns (HEPA) or 0.12 microns (ULPA) with > 99.999% typical efficiency.

Manufactured by Camfill Farr, these mini-pleat filters are without aluminium separators to increase filter efficiency, minimise the chance of leakage, and to prolong filter life.

- Filters include a lightweight aluminium frame for structural stability and elimination of welling common to conventional wood frames.
- The Air Science "pour-in-place" silicone gasket outperforms traditional style stick-on "dove-tail" gaskets.

When used in a ductless fume cupboard, the cabinet is applied as a Class I Biological Safety Cabinet to protect the operator from particulates. When used in a laminar flow cabinet, the process/samples are protected from contamination by maintaining cleanliness within the work zone.

CARBON FILTERS

The main principle on which the filtration of gas molecules is based is the concept of adsorption. Two main processes by which adsorption takes place are physical adsorption and chemisorption.

- **Physical adsorption**

- Physical adsorption is non-specific and adsorption of the gas molecule is by diffusion (Brownian Movement) or adsorption/condensation using Van Der Waals' forces.
- The gas molecules move into an empty area and diffuse into the pore.
- Attracted and captured in the space by the Van Der Waals' force, the molecules penetrate into the pores, impact the walls and are trapped.
- The number of pores present in the carbon is vast and therefore the total surface area is extremely large.
- The specific surface is a measure of the surface area per unit of weight, which is m^2/g.
- Depending on the carbon is use and the type of filter, aggregate surface area is in the range if 2000 m^2/g. This represents a surface area roughly equivalent to about 4 football playing fields.

- **Chemisorption**

- The physical process of adsorption is followed by chemical adsorption (chemisorption).
- This is a chemical reaction in which the two substances react together and the resultant chemical is trapped on the filter material.
- The impregnation of filter media can greatly extend the range of gases that can be removed from the air stream.

ADSORPTION EFFICIENCY

The ability of a filter to function efficiently depends on a number of factors including temperature, humidity, residence time, filter age, evaporation rate and chemical concentration.

- **Temperature**

- The temperature of the gas is very important because the higher the temperature, the lower will be the adsorption capacity, especially for a gas with a low boiling point.
- A relatively high temperature can even generate desorption, with the filter releasing previously adsorbed gas molecules.
- Generally temperature must be kept below 40°C.

- **Humidity**

- Relative humidity is an important factor that can affect the efficiency of the filter.
- The molecules of gases with low boiling points will be less adsorbed, because the molecules of the water vapor will be adsorbed in their place, leaving less free surface in the pores for the gas molecules to impact the carbon.
- Generally, relative humidity must always be kept below 60%.

- **Residence Time**

- Residence time is the time needed by the air to cross the filter, during which it stays in contact with the carbon itself.
- This is the time during which gas molecules can be adsorbed by the pores of the carbon before leaving it.
- This time should be as long as possible.
- To maximise time, filter thickness must be sufficient and the air speed across the front opening of the fume cupboard (face velocity) must be kept at a rate sufficient to ensure containment of the fumes within the enclosure.

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- **Filter Age**

- Normally the filter, if not properly stored before use, becomes less efficient with time because of "poisoning" of the charcoal due to the presence of gasses in the atmosphere, as well as the effect of humidity in the environment.

- **Evaporation Rate and Concentration**

- The rate at which the chemical is being evaporated and the concentration of chemical vapours within the enclosure will likewise impact efficiency with the higher evaporation and concentration having a negative impact on efficiency.

- **Activated carbon filters are not recommended for use:**

- Where very large quantities of contaminates are produced, such as in acid digestions or evaporation of solvents to dryness,
- Where very highly toxic substances are in use,
- Or where unknown reactions are carried out.

multiplex

MULTIPLEX FILTRATION SYSTEM

The mechanical design enhances safety, convenience and overall value.

- The electrostatic pre-filter is accessible from within the cabinet.
- A patented filter clamping mechanism allows for the filter to be easily installed and ensures an even seal at the filter peripheral face at all times to prevent bypass leakage.
- The filter chamber prevents contaminated air from contacting internal cabinet mechanisms.
- The main filter number and installation date are displayed in a front-access window.

The carbon filtration technique is based on enhanced, activated carbon particle formulations from specially selected, naturally occuring raw material superior to wood or other organic sources. The carbon is treated to attain the proper porosity and aggregate surface area and to react with several ranges of aerosolised chemicals moved through the filter by an air handling blower.

- The multiplex option permits one or more filtration options to be combined to meet a wider range of multiple-use applications. Multiplexing permits configuration for the capture of acids, bases and particulates such as biological aerosols when paired with HEPA or ULPA filters.

- The carbon filter itself is a self-contained assembly sized to fit the specified product model number, and configured to optimise airflow across 100% of the filter surface area for maximum efficiency, prolonged filter life, optimal diffusion and saturation capacity, and user safety.