



KITCHEN EXHAUST SYSTEMS

Design and Regulatory Considerations

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Real Issues - Odour, Noise and Fire Safety

Designers and specifiers face several challenges with dealing with clients for restaurants and new site proposals. Odour, noise and fire safety issues are all real concerns. With higher density of urban encroachment and general expectations of air and noise quality by local residents steadily increasing, designers face a broad range of challenges.

Thankfully, there are extensive resources to call on in terms of regulation guidance's, design criteria and performance specifications that are available to architects and designers.

Understanding the needs of each site

The first step in the process is to understand what sort of foods are being prepared and by what cooking method. While every commercial kitchen is different, depending on the type of cuisine produced, varying amounts of moisture, grease, smoke and odour are emitted.

Food products rapidly oxidise at cooking temperatures and form organic compounds, which are emitted in particulate and gaseous form. This is most always accentuated by the food water content vaporising. The result is a combination of solid particles, liquid droplets, vapour and gaseous phase (molecules) contaminants.

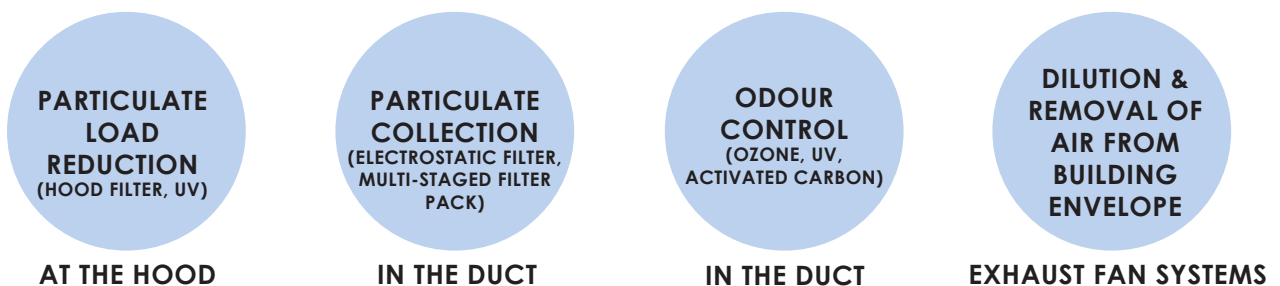
If you compare a sandwich shop with a char-grill steak house – there is a great deal of difference in the kitchen exhaust needs and potential emissions. Similarly, the approaches to removal of smoke, or gaseous odours or grease particles all require different technologies.

Types of available Kitchen Exhaust Abatement Systems

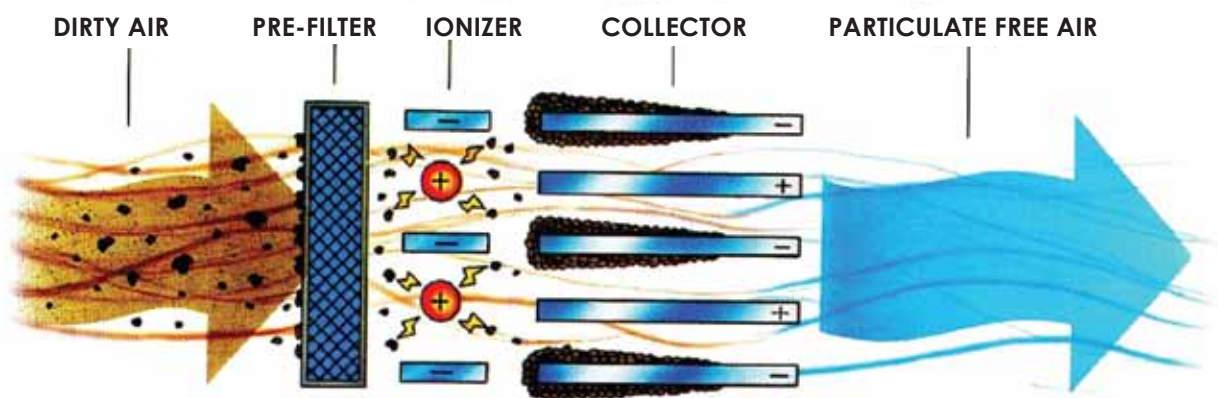
When considering regulations for a kitchen exhaust abatement system it is important to not only know the type of cooking being undertaken but to also establish as part of this abatement the necessary end result that you are trying to achieve. The restaurant owner will need to install the equipment in the right order and maintain it appropriately.

The appropriate place to remove various contaminants has an optimum sequence to it – like a set of sieves that are correctly sized and ordered – to take out large bits first – then sequentially removing ever smaller components. This means that grease and smoke must be removed before odours, which ensures an effective system and prevents fouling at any given stage.

In general the various stages of removing contaminants from kitchen exhaust may include:



The selection and sizing of these technologies is best done by qualified engineers experienced in this area of work. Professionally engineered systems should deliver safe exhaust emissions - with low levels of exhaust returning to the building ventilation systems or nearby residents.



GENERAL ELECTROSTATIC PRECIPITATOR STAGES

Key Parameters for Compliant Functional System

There are a number of requirements from AS/NZS1668.1 and AS1668.2 with regards to kitchen exhaust including angles of duct runs, gauge of duct and fire compartment engineering etc. This brochure will focus on the parts of the standards relevant to a compliant kitchen exhaust treatment system.

Treatment Requirements for Horizontal Exhaust

AS1668.2 requires a percentage removal of odours from horizontal kitchen exhaust. The percentage of treatment required is dependent on the flow rate of air exhausted and the distance from the exhaust louvre to sensitive receptors, i.e. the street, air intakes and natural ventilation devices.

However before you can remove odour you must first remove particulates as particulates severely reduce the effectiveness of odour control devices. In addition to this smoke (a particle) is also an odour and therefore must be removed.

Particulate Removal

Typically to achieve a sufficient amount of particulate removal a minimum efficiency of 95% at 0.3µm is desired. The reason 0.3µm is chosen as a measurement point is the fact that it is the hardest particle size to catch, every other particle size will have a greater efficiency for the same system. The wise buyer and specifier will always judge system performance with ratings at 0.3µm, in addition to this smoke is of particle size 0.3µm-1µm so it is important to have a high efficiency at this particle size.

System parameters to achieve this are:

- Single pass ESP maximum velocity of 1.8m/s
- Double pass ESP maximum velocity of 2.4m/s
- Multi-stage filter pack final filter must be rated minimum H11 as per EN1822-5:2009

Odour Removal

The efficiency of activated carbon is highly dependent on residence time; the higher the mass of carbon in the filter and/or the slower the air passes through the filter the greater the residence time. A residence time of 0.08 seconds results in an initial contact efficiency on odours of 99.5%. This is normally achieved with 450mm deep modules with four 25mm thick v-banks per 610x610mm filter filled with granulated media run at 1.8m/s. Ozone should be used with care, as it is harmful to human health. To meet AS 1668.2 requirements that no residual ozone remains in the final exhaust air, one must provide control systems that detect and alter ozone generation as the amount required varies with cooking load.

Alternatively, activated carbon can be placed downstream to adsorb residual ozone. Ozone is a viable solution for odour control if one of these control mechanisms are in place and there is at least 2 - 5 seconds of residence time in the duct work before exhaustion/carbon filtration to allow sufficient oxidation to occur.

Flame Arrestance

According to AS/NZS1668.1 clause 6.2.9 if you have kitchen exhaust ductwork that is longer than 10 metres and you have a flame under the hood, either from solid fuel or gas, you must have a UL1046 rated filter in your system. This is most commonly achieved with an UL1046 rated hood filter.

Maintenance

Often systems are poorly maintained causing them to fail, regular maintenance is a requirement of AS1668.2, ensure that there is a maintenance program arranged that is suitable for the kitchen exhaust treatment system used.

Trained Airepure staff are familiar with the interpretation of these standards and guidelines, so can be a valuable resource to you during the consulting and design stages of a commercial kitchen project.

Airepure Australia together with their partners offer a range of specialty products that provide quality air filtration, odour control and airborne containment solutions.

Contact Airepure now on 1300 886 353



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