



Environmental Control Specialists

Controlling Emissions from Restaurant and Commercial Cooking Processes
Grease Smoke and Odour Control

DESIGN SPECIFICATION REPORT

Project: 6 Guildhall St
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Interpretation of Requirements

Following conversations and a site visit to the proposed site, I have at your request put together a design for an odour control system for your proposed project.

As with any project we get involved in we always where possible recommend to our clients that they should closely follow the DEFRA guide for guidance on odour control equipment selection.

This ensures that what we propose will be in line with local authority's requirements and if the system is maintained correctly they will not exhaust nuisance smoke or odours, leading to complaints from nearby residents.

With this in mind I carried out a risk assessment as detailed in Annex C of the DEFRA Guide.

Taking into consideration the level of discharge, proximity of receptors, size of kitchen and cooking type your project requires a **very high level** of odour control to comply.

After discussions it was decided to recommend a **very high level** to please your client and to suggest the correct specification so as to be sure of not upsetting any receptors in the vicinity.

The System

The system specified has been designed on Turkish Charcoal cooking and Fish & Chip Range.

The first stage of control will be Grease Baffles in the Canopy followed by our Electrostatic Precipitator's (ESP's) in a Double Pass configuration, (ESP followed by ESP).

These units are the only ESP's on the market that are specifically designed for commercial kitchen application which is why we have built in sumps for oil and grease capture.

ESP's are also the most effective method for Smoke removal.

Our ESP's work up to 98% efficiency through a single pass.

Registered England and Wales 1827831 at Lyon House, Lyon Road, Romford, Essex RM1 2BG



Once Oil, Grease and Smoke have been removed the odorous air will mingle with our UV-C Ozone system, which in total will achieve a minimum 0.4 second residence time.

If Char-Grilling, we would always recommend a double pass ESP system.

In conclusion you can see that the system I have designed is over and above what the DEFRA guide recommends (Double Pass ESP) and the end product of installing a system like this will be a result that should see a reduction of all kitchen extract smells and smoke of up to 95%.

A nuisance odour will not be factor at discharge.

Further equipment can always be added, if needed.

A service contract can also be set in place, frequency depends on business.

How the Equipment Works

Electrostatic Precipitation and its use for the separation of sub-micron particles has been around since the late nineteenth century. The principle of operation is to impart a negative or positive electrical charge (Ionisation) to a particle. The particle is then passed between finely spaced parallel metal plates (average spacing 5-10mm) which are held at opposite electrical potentials. One plate will be charged to the same polarity as the ionised particle whilst the other will be earthed (opposite with respect to the positive/negative).

As the charged particle travels between the two metal plates it is forced away from the plate held at the identical polarity and drawn towards the earthed plate. During the path of travel the Parallel Effect takes place resulting in the charged particle becoming attached to the earthed plate due to the electrostatic difference, once attached the particle will either run off and be held in the sump or in the case of dry particulate remain suspended on the plate until cleaned off during maintenance.

The Electrostatic Precipitator is ideal for use in kitchen exhaust systems to separate the small grease and smoke particles that penetrate the main grease filters in the canopy.



Efficiency

The Electrostatic Precipitator is a very efficient means for separating the particulate phase; operating efficiency when clean can be as high as 98% at particle sizes down to 0.01 micron. However, as the plates and ioniser become laden with particles during the use the efficiency will reduce due to the insulating effect of the dirt.

Pressure Loss

The Electrostatic Precipitator does not present a high-pressure loss (10mm—15mm Water Gauge). This gives a specific advantage in that most standard Kitchen extractor fans will have the capability of overcoming this small differential.

This is particularly advantageous when it is considered that if the pressure loss were high larger noisier fans would probably be necessary resulting in potential noise pollution.

UV Technology (Gaseous Phase)

The system is based on the synergy that occurs when ozone and ultraviolet are combined. The system comprises a quantity of lamps a percentage of which are designed to produce UV light at 185nm, converting ozone from the oxygen present in the air. The remaining lamps combine to produce UV light at 254nm which destroys the ozone and any mercaptans remaining in the proximity of the lamps. A photo catalytic liner is used to enhance the production of hydroxyl radicals, which are both very short-lived and extremely oxidising. A UV system cannot destroy smoke or other particulate although it has some affect in altering the make-up of cooking grease to a better managed compound.

How does Ultraviolet Work?

Strong sunlight permanently de-activates bacteria, spores, moulds and viruses. Over a century ago, scientists identified the part of the electromagnetic spectrum responsible for this well-known effect; wavelengths between 200nm and 300nm, called UV-C.

The mechanism of kill is well documented and unlike chemical disinfectants the organism is unable to develop any immune mechanisms. The mechanism of kill involves the absorption of photons of UV energy by the DNA, which fuses the DNA and prevents replication.

DNA (Deoxyribonucleic acid) consists of a linear chain of nitrogen bases known as purines (adenine and guanine) and pyrimidine's (thymine and cytosine).

These components are linked along the chain by sugar-phosphate components.



The DNA of most forms of life is double stranded and complementary; the adenine in one strand is always opposite thymine in the other, and linked by a hydrogen bond, and guanine is always paired with cytosine by a hydrogen bond. The purine and pyrimidine combinations are called base pairs.

When UV light of a germicidal wavelength is absorbed by the pyrimidine bases (usually thymine) the hydrogen bond is ruptured. The dimer that is formed links the two bases together, and this disruption in the DNA chain means that when the cell undergoes mitosis (cell division) the DNA is not able to replicate.

How is UV Light Generated?

Ultraviolet light is most typically generated from a low pressure lamp as described below; Low Pressure lamps are the most common lamp type and are the oldest source of ultraviolet light.. They consist of a quartz envelope that separates two tungsten filaments. The lamp is evacuated and a level of mercury is introduced into the quartz envelope. The spectral output of this lamp type is monochromatic, a single line output at 253.7nm or 185nm. A fluorescent lamp is a low-pressure lamp that has the inner surface of the lamp coated with phosphors to absorb all of the 253.7nm light and only emit the longer wave.

Technical & Safety Considerations

The units must always be installed on the negative side of the fan and the system should be switched via an interlock both connected to the fan and an airflow switch connected to the unit itself which will ensure that in the event the unit is disconnected from the duct or if the extract system is switched off the system will be isolated. The unit can only discharge into duct which is going to atmosphere the unit must not discharge into an enclosed space.

Then Purified Air recommends that the UV-C system be used in conjunction with a filtration system such as their Electrostatic Precipitator (ESP).