

odour and emission control

– a background



EXEON[®]
CLEAN AIR FOR INDUSTRY

ODOUR AND EMISSION CONTROL

– a background

Exeon are specialists in odour and emission control, having worked on a wide range of projects across many industries each with different control requirements. This document aims to explain what, why and where these control systems are used and the different types of solutions that are available including activated carbon deep-bed adsorbers, wet scrubbers and bio filters.

Our expert advice, innovative design and practical solutions ensure you can benefit from an emission control system that protects both your workforce and the local environment.

What is odour & emission control?

Legislation to protect our environment increasingly requires gas-phase emission control system to reduce harmful emissions or control nuisance odours. Odour and Emission control systems reduce the level of airborne pollution using abatement technologies specifically designed to suit the need.

Why is it needed?

Usually these air pollution streams are caused by extraction of odorous air from the facility for space ventilation, which is essential for workers health. They can also be caused by process venting or extraction.

However there are discharge limits that must be met. Neighbourhoods have the right to raise issues with unpleasant odours, and the Environment Agency of Local Authority can enforce changes in discharge levels of Odours and Emissions.

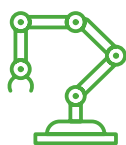
Operators of certain facilities which are known for emitting nuisance odours are required by the Environment Agency to produce an Odour Management plan and review BAT (Best Available Techniques) for control and abatement.



WHO USES ODOUR & EMISSION CONTROL SYSTEMS?

There is a wide variety of industries which can require odour or emission control, including:

Waste transfer sites



Sewage treatment sites



GRP Manufacturing sites



Chemical Production sites



Food processing companies



Pharmaceutical



Anaerobic digestion /
Waste food processing



Clinical waste



WHAT TYPE OF ODOUR & EMISSION CONTROL SYSTEMS ARE THERE?

Technologies include:

- **ACTIVATED CARBON ADSORPTION – DRY SCRUBBERS**
- **WET SCRUBBERS, INCLUDING ACID AND WATER**
- **BIOFILTERS**

ACTIVATED CARBON ADSORPTION – DRY SCRUBBERS

Activated carbon adsorption systems, otherwise known as dry scrubbers, use media banks to control odour emissions and other harmful emissions released from industrial processes. It is highly effective for treating gas phase contaminants, when used correctly.

Odour limits are often required to be $<2,500 \text{ ouE/m}^3$ (odour units) at discharge and this usually necessitates active carbon treatment, at least as a final polishing stage.



How Activated Carbon Works

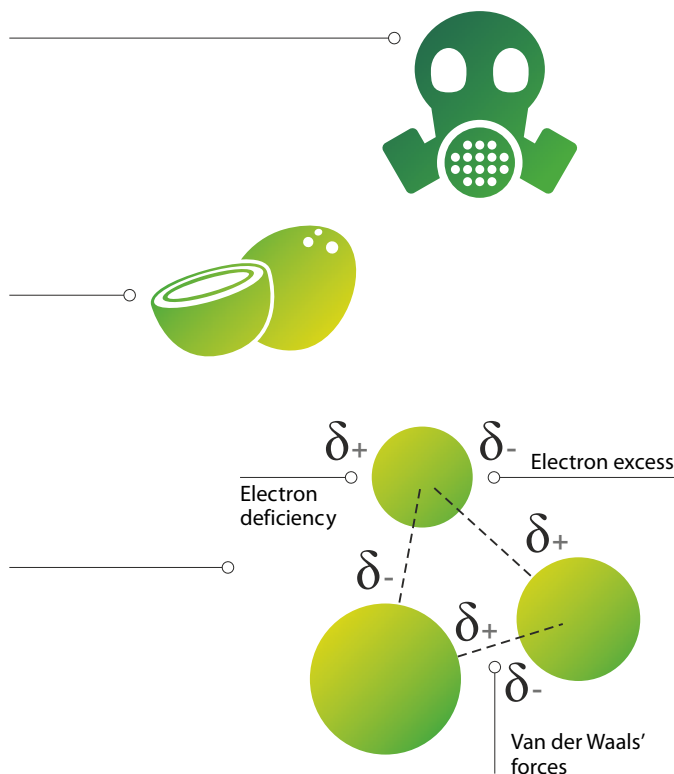
Activated carbon has been used since the First World War to protect infantry against chemical gas attack.

The base material can be coal, wood or even peat, but the best quality carbon uses coconut shells. The material is chemically or thermally treated, usually with superheated steam, to expose the internal pore structure. This increases the surface area by over 100 times. A teaspoonful of carbon can have the surface area of a football pitch.

The vast surface area and tortuous route through the pore structure encourages molecular to surface collisions. "Van der Waal" forces cause molecules to attract and remain within the carbon structure, this is known as "adsorption".

A carbon block filter is typically in pellet or granular form in beds, arranged so that air can pass through. The time the air is in contact with the carbon block is known as "dwell" or "contact" time. Typical dwell times range from 0.2 seconds to 10 seconds, depending on the application.

When the bed is "saturated" with contaminant, then "breakthrough" is experienced, with emissions rising. This means the bed is exhausted and no further adsorption can take place.



Activated Carbon System Options



There are a number of Activated Deep Bed Adsorption units in Exeon's Nodour range, the most appropriate depending on the site requirements. Exeon can also design, supply and install prefiltration or pre-treatment units to maximise the life of the carbon by removing any particulate and/or ensuring the extract air reaches the carbon in optimal condition, i.e. correct humidity and temperature.

The table below provides an overview of the most common systems. The final choice and design will always be made to meet the individual site specifics, and bespoke designs are also available.

	Nodour: Hi-flo	Nodour: Mid-flo	Nodour: Lo-flo
Description	Containerised deep-bed odour adsorption system.	Cylindrical deep-bed 'dry scrubber'.	Smaller systems, which can be mobile or permanent to suit the need.
Activated carbon bed type	Single or twin vertical deep bed of activated carbon.	Horizontal deep bed of activated carbon.	Horizontal deep bed of activated carbon.
Suitability	High Airflows, low-medium concentration applications.	Low to Medium Airflows, high concentration applications.	Low Airflows, high concentration applications.
Typical Applications	<ul style="list-style-type: none"> • Ventilation for factories with high levels of odour. • Waste Transfer Facilities and RDF plants. • Anaerobic Digestion Plant Reception Halls. 	<ul style="list-style-type: none"> • Anaerobic digestion facilities. • Food production odours including abbatoirs. • Chemical emissions. • Sewage & Waste odours • VOCs. 	<ul style="list-style-type: none"> • Blood tank / offal tanks at abbatoirs. • High concentration Chemical emissions. • Sewage & Waste venting tanks. • VOCs.
Airflow levels	5,000m ³ /hr – 100,000m ³ /hr+. Up to 80,000m ³ /hr per module, and multiple modules can be provided – so there is no upper limit on airflow.	500m ³ /hr – 5,000m ³ /hr, can be for forced or passive ventilation streams. Modular and can be installed in parallel for increased airflow on high concentration applications.	1 – 1,000m ³ /hr.
Specialised activated carbon for longevity and efficient odour/emission control?	YES	YES	YES



Nodour: Hi-flo	Nodour: Mid-flo	Nodour: Lo-flo
<ul style="list-style-type: none"> • Easy maintenance access. • Simple, safe and clean procedure for filling. • Prefiltration can often be incorporated into the Hi-flo vessel itself, minimising footprint. • Modular construction, can be added to with ease. • Relatively low life cycle cost compared to other technologies. • Heavy duty construction, construction material & protection designed to suit the application. • Easy to transport and handle. 	<ul style="list-style-type: none"> • Easy maintenance access. • Simple, safe and clean procedure for filling Activated carbon, designed to suit the size of vessel. • Very efficient – removes virtually all odours, and flexible for a wide range of applications. • PVC Construction, therefore highly corrosion-resistant and good UV resistance. • No water supply required. • Simple and relatively lightweight construction. • Easy to transport and handle. 	<ul style="list-style-type: none"> • Simple 'plug & play' operation. • Low cost to install. • Can provide a mobile filtration solution for varying applications across site. • Easy to transport and handle.

WET SCRUBBERS

Exeon provide a range of wet scrubbers, designed to reduce concentrations of chemicals/pollutants on discharge airflows to meet required emission levels. They remove contaminants from a gas stream by passing the contaminant airstream through a packed structure with a scrubbing liquor injected to absorb the contaminant. They are essentially showers where the contaminant airstream is washed by the recirculating liquid in order to absorb the pollutants.

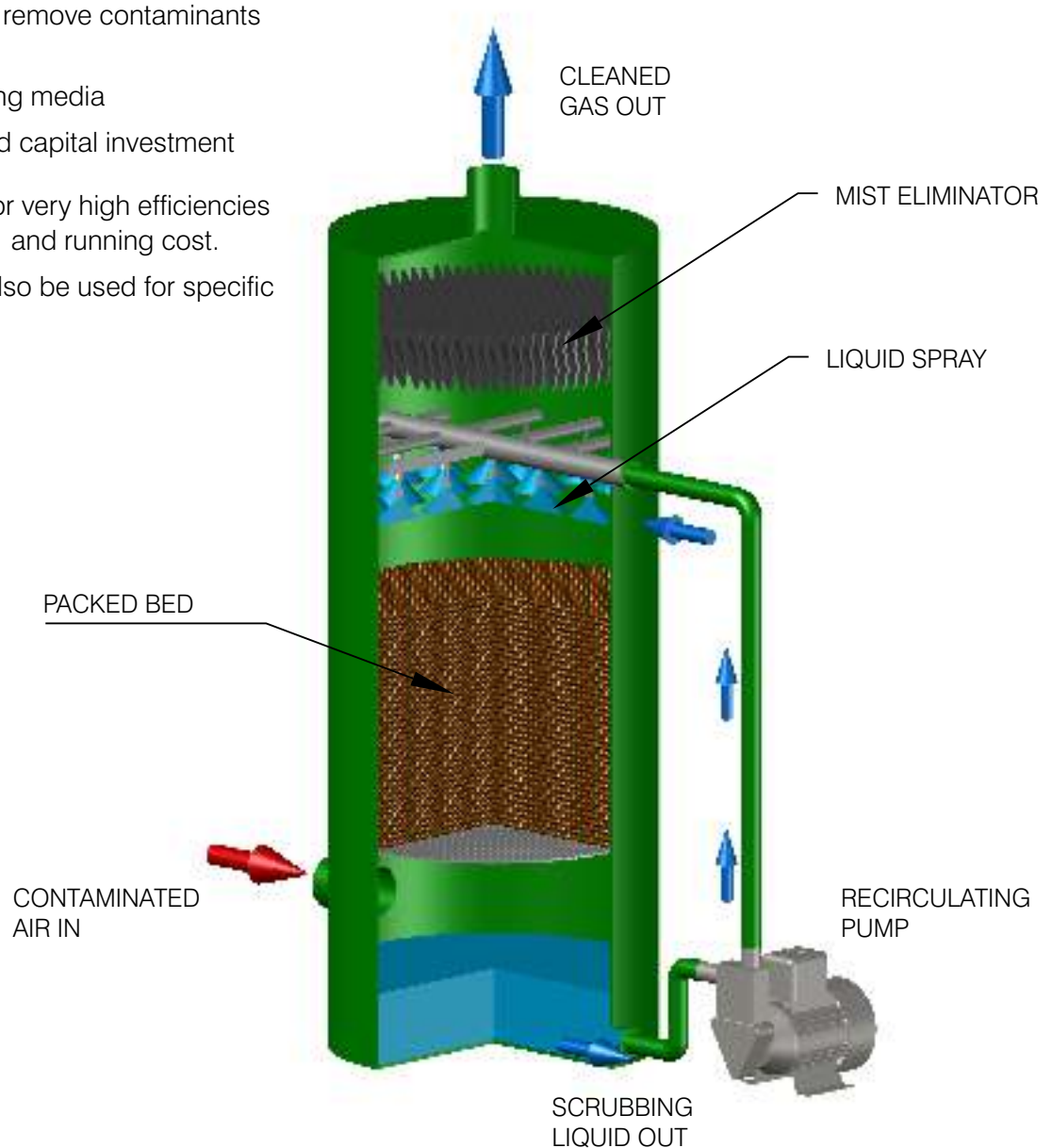
PACKED TOWER SCRUBBER

Wetted packed towers are commonly used for gas scrubbing.

- Large contact area to remove contaminants from gas flow
- Uses specialist packing media
- Low running costs and capital investment

They can be designed for very high efficiencies with relatively low capital and running cost.

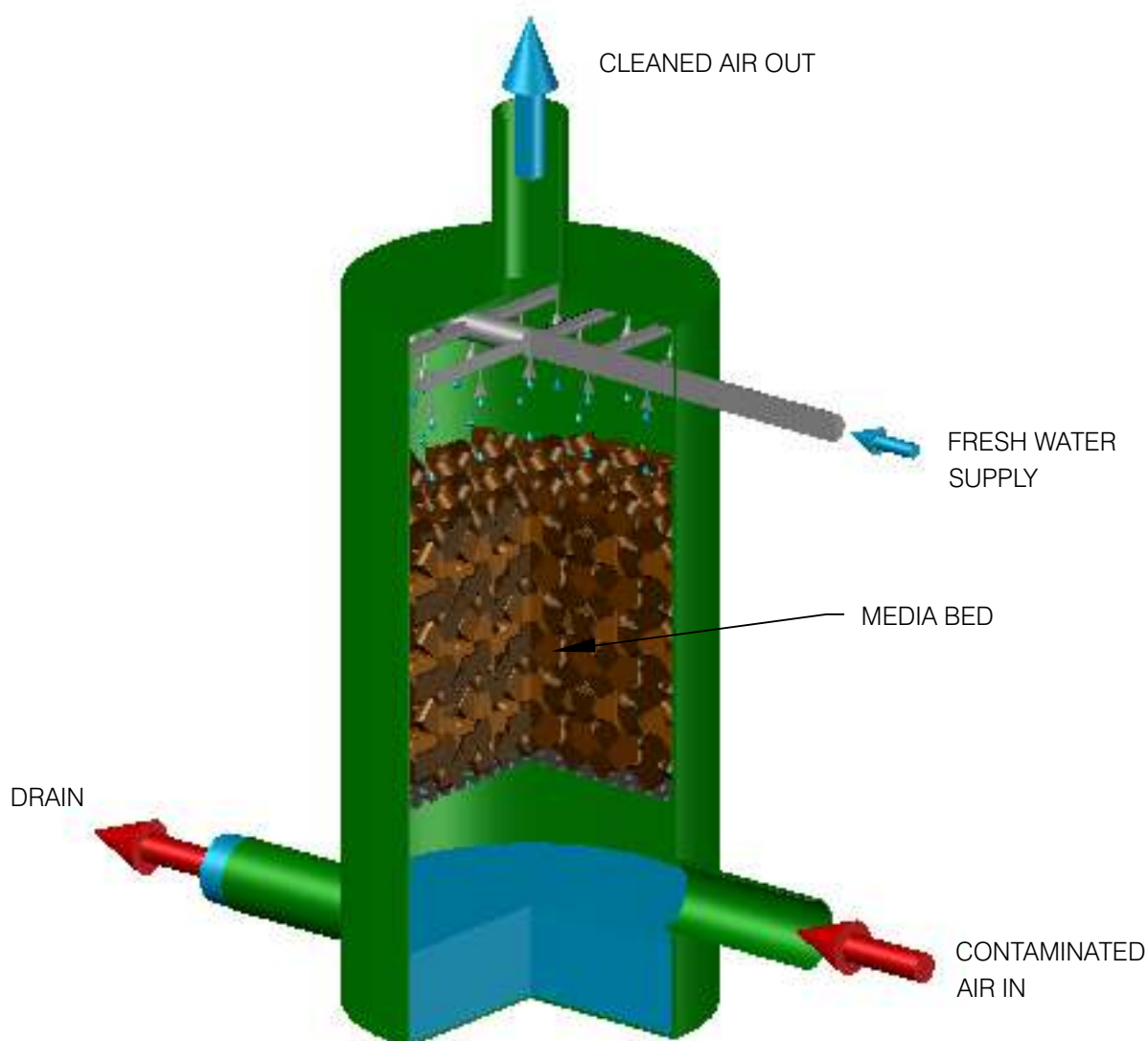
Spray only towers can also be used for specific applications.



BIOFILTERS

Biofilter technology is used for high concentrations of malodorous compounds and water soluble volatile organic compounds (VOC's), including sulphur compounds such as hydrogen sulphide. The contaminated air passes through a moist media bed, which acts as a host for a layer of biofilm. Microorganisms, fungi and bacteria inhabit the biofilm and degrade the odorous compounds, significantly reducing their level in the exhausted airstream.

Biofilters can be stand-alone, or often combined with dry media such as activated carbon for polishing.





CASE STUDIES

Exeon announces major new project at North London EcoPark

Exeon have been chosen as the emissions control partner in the development of the North London Heat and Power Project. This is a new facility which will create low carbon energy from non-recyclable household waste for seven North London boroughs.

The North London Heat and Power EcoPark Project accommodates a large resource recovery facility which is designed to sort waste ahead of the combustion process to allow optimal combustion. The RRF (resource recovery facility) includes an integrated ventilation and odour control system for ventilation and removal of odours from the extracted air.

Issue

- Requirement for investigation and report into Best Available Technologies (BAT) for odour control.
- Proof of internal ventilation distribution via Computational Fluid Dynamics (CFD)
- Shortage of plant space requiring specialist bespoke design
- Availability of resource for a substantial project, installed within a very tight timeframe

Solution

Exeon were able to demonstrate a range of key skills and experience that led to them being selected for the project:

- Extensive technical knowledge – Exeon provided technical support right throughout the project, including investigating different odour control technologies and their suitability, and research into the typical and predominant waste streams caused by transfer of municipal waste.

- Experience – Exeon used the team's wealth of experience in Waste Transfer stations, and their methodologies.
- Airflow distribution investigation – carefully distributing the extract points to ensure they will not clash with moving machinery, but at the same time carrying out CFD modelling to ensure internal airflow distribution to meet the high standards of the Client.
- Flexibility and availability – Exeon worked on the design for many months alongside the architects & consultants, in order to achieve the best available technique and a satisfactory outcome. This included extensive concept tested design on the plant area to ensure that no site shutdown will be required to maintain the plant.
- Speed – Exeon provided the installation package within very tight time constraints.
- Cost – Working with the site team to value engineer the proposal.

TECHNICAL

The plant design includes the following:

- Dual systems each with 4 fans including 1 offline
- Total system volume 581,200 m³/hr (290,600 m³/hr per system) giving 4 air changes per hour in the serviced space
- Each system has an offline 2-stage dust filter housing so change can be carried out without plant shutdown or reduced speed
- Automatic dampers throughout the plant to rotate fans
- Setback speeds with inverter-controlled fans
- Annular bed adsorbers with activated carbon for odour removal
- Stainless steel used throughout for maximum design life
- 40M high twin 3.0m diameter stacks



CASE STUDIES

North London Temporary Bulk Waste Facility

Issue

Exeon were asked to provide a technical proposal for Ventilation & Odour control for the Temporary Bulky waste facility at London Energy, part of the Ecopark upgrade project. The facility was designed to handle Municipal waste for 12-18 months whilst the Ecopark project was in progress.

The installation was required to be completed within 6 months to allow the waste flow to continue uninterrupted.

The installation was initially required to achieve a low level of odour units (1,500 ou/m³) at discharge. There was concern this stringent level would result in short bed life.

Solution

Exeon ran odour models to ensure optimal stack height, discharge velocities and odour control bed depth, to ensure the optimal bed life was achieved.

Exeon also recommended and installed dust filters to preserve the life of the carbon media.

Exeon worked with the design and install team and successfully completed the installation ahead of schedule in a very tight installation window.



CASE STUDIES

Food waste odour control at AD plant

Issue

The facility processes food waste to create renewable biogas and electricity. The Depack facility has a high odour level from the processing of this waste and was causing local complaints, as well as odours spreading within the offices. An existing ionisation system was not providing any benefit.

Solution

Following detailed analysis of the existing plant and operations, odour modelling and surveying, a twin dual-bed activated carbon unit was designed and installed complete with 90KW fan and 18M stack and access gantry. A high-efficiency particulate prefilter section ensured protection and maximum life of the 2-stage carbon bed.

The resulting odour tests were very successful, having reduced odours from around 6,000 ouE/m³ at inlet to around 200 ouE/m³ at the outlet. Tests taken again after 6 months showed this being maintained.



CASE STUDIES

Odour Control System at Food Production Facility

Issue

Exeon were asked to look at an odour control issue at a large food processing facility in South West England.

The brief was to provide a solution to reduce cooking extraction odour levels to an acceptable level, particularly garlic odours which are highly penetrative.

The current extraction systems, which include fan and ductwork systems were discharging the cooking extract straight out through the roof, which was leading to ongoing complaints from neighbours in the neighbourhood.

Although ozone odour treatment units were already installed, these had not been effective in reducing measured odour levels in the extracts.

Solution

Exeon recommended that an Activated Carbon Deep Bed Adsorber (Nodour Hi-flo) unit was installed on each of the two extract systems. These had a 2-stage prefilter to protect the carbon from cooking greases and smoke particulate, and carbon beds providing a high contact time.

This provided an optimum combination of odour removal and life of carbon, and also a system which is easy and practical to maintain.

It also needed to be located in the roof void for aesthetic reasons, which was a challenge, although not an impossibility for our installation department.

Exeon demonstrated a practical example of how the carbon system worked, to the neighbourhood, who had concerns and this helped them understand the measures the facility needed to take (and were taking) to remove the odours.

This was done with an on-site demonstration of the activated carbon principle using our demonstrator rig and garlic spray. The demonstration was very effective and created a good deal of interest from those attending, including members of the local community, the local Environmental Officer, and even the local MP!

The system met the design criteria, and the system was very effective and helped restore good relations with the local community, and in the words of the site chief engineer "we can't smell a thing now!" removed the complaints from the local neighbourhood.

WORKING WITH EXEON

Exeon have a consultative approach to our dealings with the customer. We have a vast pool of knowledge and resource that can be made available, this includes:

- Technical and advisory to discuss project implications
- Experience across a very wide range of sectors, including successful installations in waste, food and chemical
- Problem solving installations on similar applications
- Discussing options for different technologies
- Capex and Opex implications of different technologies and installation types

We can quickly create outline drawings of bespoke solutions in CAD and Solid-works and budget costs to assist with design. We also have Revit capability for integration with multi-service models.





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