VERSION CONTROL RECORD			
Contract/Proposal Number:		**SOL0613CPP03_MD**	
Authors Name:		**Steve Butler**	
Signature:			
Issue	**Description of Status**	**Date**	**Reviewer Initials**
1	For Issue	12th November 2013	SB

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1 ODOUR MANAGEMENT PLAN

1.1 Introduction

This document has been prepared by Sol Environment Ltd on the behalf of Clean Power (UK) Ltd (in support of its Planning and Environmental Permit Application) for the operation of their proposed Micheldever Energy Recovery Centre.

The document provides a structured framework and approach in effectively managing potential odour releases associated with the operations at the site.

This Odour Management Plan document (referred hereafter as the 'OMP') has been produced in accordance with the following documents:

- Environment Agency's Technical Horizontal Guidance Note '*H4: How to comply with your permit*' (V4 April 2011); and
- General monitoring procedures detailed in Environment Agency guidance document Internal Guidance for the *Regulation of Odour at Waste Management Facilities*.

The purpose of this document is to outline the management control measures that have been established to prevent and control odour emissions and associated impacts from the site.

1.2 Structure of Odour Management Plan

The OMP has been structured in accordance with the EA H4 Annex 7 '*Template for an Odour Management Plan.*'

The OMP considers the following aspects of the facility:

- Activities that have the potential to produce odour and sources of release;
- Potential outcomes of each failure scenario in respect to odour impact; and
- Actions to mitigate the effect of odour release (during normal and abnormal operations); and
- Details of responsible persons at the installation.

In addition, this OMP has been developed to clearly define the measures by which odour emissions will be controlled and prevented, namely by;

- Minimising the inventory of odorous materials;
- Minimising the evaporation of odour containing vapours into the air;
- Containment and abatement;
- Dispersion;
- Monitoring.

1.3 Status of the OMP

The OMP is a "live" document and will form part of the key environmental management document for the facility. All monitoring procedures, responsibilities and compliance actions will updated as and when required.

2 SITE BACKGROUND

2.1 Site Setting

The Site is located at Micheldever Rail Sidings, Overton Road, Micheldever Station, Hampshire, SO21 3AP.

The proposed development is a bespoke renewable energy and resource recovery centre that has been designed to recover all available recyclable materials from residual mixed waste feedstocks. The proposed development integrates the above technologies to provide a single treatment facility for solid wastes which would otherwise be destined to landfill or incineration.

The installation will process approximately 195,000 tonnes of non-hazardous waste comprising the following:

- A 12 MWe Pyrolysis ACT plant which will recover and recycle approximately 128,000 tonnes per annum of commercial and municipal mixed source waste; and
- A 2MWe AD facility which will recover approximately 67,000 tonnes per annum of food and food processing waste.

The application site consists of approximately 3 hectares of previously developed land to the north of Micheldever railway station and to the south of the A303. The western and eastern boundaries of the site are formed by the South West Mail railway line and Overton Road respectively. The nearest residential properly is Western Farm at 80m to the south east.

With this in mind the site is considered to be sensitive in relation to potential odour impacts. Detailed pertaining to potential odour receptors (i.e. the closest residential properties) which have been considered in the OMP are detailed in Section 2.3.

2.2 Facility & Process Overview

A number of proactive controls have been integrated into the Site Working Plans for the management and prevention of odour emissions arising from the proposed site activities. This document builds on these procedures and introduces further measures specifically for the control and abatement of emissions.

All personnel employed on site will be suitably trained and experienced at operating all plant and equipment associated with their particular role; especially with regard to those involved in potentially odorous activities. On occasions where these competent and experienced personnel are off work or unable to perform their role, the most suitable replacement will be sourced from the available workforce and any relevant training will be administered before they perform the task.

Waste Reception

On arrival to site, all incoming waste vehicles will report to the weighbridge. The appropriate waste consignment documentation will be examined to ensure that all wastes being delivered are acceptable under the EWC codes and conditions set by the Environmental Permit.

All incoming waste vehicles will be weighed, before being directed to the main reception building for the delivery of the waste. All vehicles arriving at site will be sealed and designed for effective control of odour.

Loads will be inspected visually to check for contaminants, unsuitable or prohibited materials. All personnel on site will be suitably trained to identify wastes which are not permitted for treatment under the Site Permit. The updated list of acceptable EWC Codes will be available in the weighbridge office. Highly contaminated waste and materials non-conforming to the EWC Codes provided will be rejected (whole or part load as appropriate). No malodorous wastes will be accepted at site.

Rejected loads will returned directly to the consignee with the expectation that the originator will be required to provide a written explanation, along with any future measures they will take to minimise the chance of a repeat event. If a particular customer persistently fails to meet the load requirements determined by the Site Manager; the plant management team will 'blacklist' either the customer or the waste stream for an appropriate period of time. All events will be documented in the site diary; records will be kept within the office and all staff will be made aware.

Wastes will be transported in covered and enclosed vehicles, most wastes will be transported in sealed bags and containers or vehicles. The likelihood of delivery vehicles having to wait in the yard for prolonged periods is minimal, due to the rapid turnaround of vehicles within the waste reception area. No open top vehicles carrying any putrescible or potentially odourous wastes will be accepted at the facility.

All waste acceptance and reception activities are carried out in accordance with CPP-E01, E02, E03 of the Site Operational / Working Plan.

The reception of all mixed solid waste (MSW) will take place within the main waste reception area (Zone 1 of the main building).

Zone 1 of the building is a purpose built, sealed internal reception area which is operated under negative pressure in order to mitigate potential odour dispersion impacts. The reception hall has been designed with an internal lobby that is if fitted with extraction to ensure that an effective building seal is maintained.

Vehicles will access the internal waste reception and dispatch areas of the internal waste reception area by a number of doorways, comprising externally mounted heavy duty metal roller shutter doors (for overnight site security), with internally mounted rapid-closing heavy-duty polyethylene roller shutters to permit access in and out of the building by vehicles during normal working hours. The roller doors will be opened twice for each delivery in order to let the vehicle in and out of the building. The door will be kept closed whilst the vehicles are unloading waste within the building. Each of the inner roller shutter doors is fitted with perimeter air curtains for the purposes of maintaining air pressure controls during the periods when the doors are opened.

The reception area comprises a number of sealed isolated bays fitted with push floor transfer system.

The physical reception area will be designed in order to accommodate Rear End Loader (REL) vehicles (which will form the typical 'bin wagon' vehicles used for municipal waste collection) and walking floor (curtain sided) transporters. The reception areas comprise an initial holding bay and associated transfer systems. All solid

wastes will initially be discharged onto the reception area and undergo initial inspection, prior to being transferred directly into the loading system of the autoclave for steam sterilisation.

The waste reception area and loading system consists of the following:

- Weighbridge (capable of taking the full range of delivery vehicles);
- In-feed ferrous magnet (for the removal of oversized metals);
- In-feed shredder (capable of shredding c.30 Tonnes per hour);
- Mobile crane (capable of lifting c.4 Tonnes of waste per grab);
- In-feed conveyor system (capable of delivering full load to autoclave in approx. 15 minutes);
- In-feed weighing system (to register accurate batch weights); and
- Hydraulic moving floor.

Once unloaded, vehicles will be inspected and returned to the weighbridge.

Any wastes which do not conform to the requirements of the site, i.e. contain specific hazardous contaminants (oil, solvents, car batteries, WEEE etc), exceed the size requirements etc, will be segregated and isolated / quarantined.

All non-conforming wastes will be rejected in accordance with the site waste rejection procedures.

Competent Operator Absenteeism

All operations will be performed by competent and trained individuals who are both suitably qualified and experienced. Should an operator not be present, the most suitably experienced operator will be used as a replacement. Relevant training will be issued as necessary and overseen by the Company's 'Technically Competent' Person, this will occur for each and every instance where personnel have time off throughout the year, across the entire business.

2.3 Nearest Sensitive Receptors

All residential receptors are listed in Table 2.1 below.

Table 2.1: Location of Potentially Sensitive Odour Receptors

Receptor	Name	Receptor Type	OS Grid Co-ordinates		Distance and direction to site boundary
			X	Y	
HR1	Coxford Farm	Residential	451942	143788	c. 110m N
HR2	The Boundary	Residential	452200	143823	c. 260m NE
HR3	The Pines	Residential	452447	143834	c. 460m NE
HR4	Woodlands	Residential	452350	143823	c. 380m NE
HR5	The Beacons	Residential	452653	144096	c. 780m NE
HR6	Granary	Residential	452050	143968	c. 300m N

HR7	Works building	Commercial	451762	143598	c. 130m W
HR8	Western Farm	Residential	452104	143374	c. 80m SE
HR9	Travellers Rest	Residential	451995	142891	c. 480m S
HR10	Micheldever Station A	Commercial	451484	142965	c. 590m SW
HR11	Micheldever Station B	Commercial	451634	142975	c. 500m SW
HR12	Micheldever Station C	Commercial	451750	142981	c. 441m S
HR13	New Road A	Residential	451928	142867	c. 535m S
HR14	New Road B	Residential	451844	142867	c. 530m S
HR15	Station Garage Yard	Commercial	451648	142885	c. 565m SW
HR16	Black Wood Holiday Cottages	Residential	452924	143347	c. 930m E

Please Note; The distances noted above are to the nearest practical boundary. In reality, distances to odorous activities will be greater. Annex A2 shows a map with the locations of the nearest sensitive receptors.

Due to the proximity of the nearest residents, the site is considered to be sensitive in relation to odour impact and therefore the highest level of odour control and mitigation has been applied to site to ensure that all potential odour releases are prevented.

2.4 Off-site odour sources

The Micheldever site is not surrounded by any neighbouring industrial processes considered to have a significant potential for odour issues.

3 POTENTIAL ON SITE ODOUR SOURCES & ACTIVITIES

The site operations have been designed with a hierarchy of odour control measures, all of which are considered in the context of the installation setting, frequent waste operations and abnormal activities.

The key operations with the potential to produce and release odour at the facility are described below. This OMP has been developed to ensure that potential odour, from each part of the process, is minimised through effective management to an acceptable level.

3.1 Receipt of waste and off-loading

All wastes received by the site are delivered directly into the pressure controlled Waste reception Area (Zone 1) specific areas as described below and shown visually in Annex A2:

- Segregated food wastes – delivered directly to the internal inlet feed hopper within the enclosed Reception Building (Zone 1) where it will be macerated, blended and pumped directly into the digestion tanks.
- Mixed source waste ('MSW') – tipped within the enclosed Reception Building (Building Zone 1);

The main reception building is a sealed building and is served by a dedicated extraction and abatement system (see Section 4.2). The building will be fitted with an internal 'double' lobby which is fitted with extraction to ensure that the pressure control can be maintained at all times.

The Waste Reception and Processing Building will be operated under negative pressure system, drawing air from within the building and extracted to the pyrolyser combustion intake fans for use as combustion air and thermally oxidised.

This system will use conventional stainless steel ductwork and extractor fans to maintain a slight negative pressure (nominally maintained at approximately -50 Pa) through the building, thus minimising the potential escape of odour and bio-aerosols from the building. All wastes received are stored within enclosed containment (via mixing / storage tanks or in-pipe systems) or transferred into the autoclaves as soon as practically possible.

The building also incorporates vapour capture and extraction canopies over the doors of the steam sterilisation units.

In addition to the above the reception hall is fitted with passive, Ultraviolet / Ozone odour control equipment within the roof space of the building. This equipment will effectively neutralise any odourous air within the building and reduce the potential for escape, as well as reduce the burden and dependency of the extraction plant..

Waste will not be stored for more than a couple of hours before processing and will generally be processed within the same day. The swift processing of waste is a key aspect in avoiding the potential for the putrification of waste and creation of anaerobic conditions within the waste reception area.

The potential for odour generation during the receipt, offloading and shredding of waste materials is directly influenced by the nature of the incoming wastes and the extent of any degradation. The extent of degradation of

raw materials will effectively be determined by the age of the waste and ambient temperatures, i.e. during hot periods of extended retention, materials with higher odour potential will inevitably be delivered to site.

A dedicated internal reception bay will be provided for the anaerobic digestion plant. Pure biomass matter will be macerated, blended and immediately pumped directly to the digestion tanks, therefore ensuring all odour generating activities are enclosed within the process building and AD tanks.

The reception, discharge and processing of wastes within the sealed building is the key control measure for minimisation of odour emissions.

Table 3.1: Summary – Waste Reception

Primary Odour Sources	Key Control Measures
• Odourous incoming waste due to quality of material; influenced by moisture, age, degradation, ambient temperature, organic content etc; • Arrival of new waste on-site; • Off-loading waste on-site; • Stockpiling of potentially odorous waste on site for prolonged period before processing.	• All vehicles containing potentially odourous materials will be sealed; • Reception of waste within an enclosed pressure controlled building; • Building fitted with a extracted double lobby to prevent any risk of odour escape; • Dedicated extraction system to maintain building at negative pressure; • The reception hall is treated with a network of Ultra Violet / Ozone roof mounted treatment devices; • All extracted air is thermally oxidised through the process prior to the discharge to atmosphere; • Inspection of all incoming wastes to ensure the waste is contained sufficiently and is not too odorous or contaminated e.g. a suitable bin and safely sheeted/covered, following procedure for rejection of unacceptable loads; • Processing of potentially odorous materials within the same day of receipt on site; • Communication with customers to ensure that materials are delivered to site before developing unacceptable odour e.g. not to stockpile potentially odorous materials for long periods before delivery; • All internal extracted air thermally oxidised prior to discharge; and • Immediate storage within enclosed systems (i.e. storage tanks) or transfer into autoclave units.

The majority of waste streams that will come into the site will, unless appropriately managed cab have the potential to produce offsite odour impacts. Table 3.2 provides the details of the necessary odour management conditions to avoid offsite nuisance issues.

Table 3.2: Potentially Odorous Incoming Waste Sources			
Type/Source/Quantity	**Typical Age and Storage Conditions**	**Seasonal Variations and Odour Implications**	**Management Considerations**
Mixed Source Waste Local District Council municipal waste from transfer station and municipal waste bin collections	Stored in household or commercial wheeled bins for up to 2 weeks before collection; either delivered directly to site or bulked up at transfer station for delivery to site within 3 or 4 days.	Due to the nature of municipal waste, the composition will not vary significantly through the year. This is primarily due to pre-collection sorting facilities (for green waste and recyclables is particular) provided by the Local District Council. Odour implications: Degradation could begin rapidly during summer months with increased ambient temperatures. Excess nitrogen will form ammonia and odourous compounds.	Ensure all MSW received is stored within the dedicated internal Reception Area prior processing. In the event of "surge" overwhelming the site's capacity, material to be diverted to alternative site or sent to landfill.

3.2 Autoclaving

All mixed waste will be inspected and directed in to the autoclave units via a materials conveyor, where they are undergo a pressure sterilisation cycle in order to convert the waste to a sterile recovered biomass fibre and sterilised recovered recyclables.

Post autoclave processing involves mechanical segregation where all recyclates are recovered and the subsequent remaining biomass is directed to a storage hopper. Pressure sterilisation of the recovered biomass material (at temperatures exceeding 160ºC), reduces the overall volume of material by 80% and removes any potentially odourous content of the biomass.

The autoclaving system is fully enclosed and has dedicated extraction hoods which discharge to the air intakes of the thermal oxidisation plant.

The main potential odour source from the autoclave relates to the extracted steam and condensate. To ensure that the escape of steam is minimised from the door system, the autoclave has been designed to be taken from positive pressurisation to vacuum prior to the door being opened.

This has the effect of 'flashing off' any steam thus allowing all the steam to be extracted and condensed prior to the door being opened. Any remaining vapour emanating from the treated materials will be captured by the steam extraction systems, condensed and treated by the water treatment plant. The design of the water treatment plant ensures that there are no impact to air associated with the condensate treatment.

All autoclaved material is discharge onto a conveyor system that is fitted with extraction.

All extraction is routed back to the thermal oxidiser plant (air intakes of the charcoal combustion system).

All autoclaved fibre material is stored in sealed vessels and before introduction to the pyrolyser for thermal recovery.

Table 3.3: Summary – Autoclaving	
Primary Odour Sources	**Key Control Measures**
• Conveyance and autoclaving of municipal waste • Storage of processes autoclaved fibre	• Autoclaving process is entirely enclosed; • Processing at high temperatures removes all malodorous content; • All condensate is extracted from autoclave and treated in waste water treatment plant to remove any odourous content, prior to the doors of the autoclave being opened; • Autoclave doors have air extraction hoods that are routed to thermal oxidiser; • All treated materials are discharged onto a extracted conveyor system; • Resultant 'odourless' biomass fibre produced comprises an inert, odourless flocculent; and • Biomass fibre is transferred directly to pyrolyser and dried in situ to remove any remaining moisture content, all extracted 'moisture' is treated by the extraction system.

3.3 Pyrolysis and Syngas Combustion

The recovered biomass fibre is then fed directly by sealed auger into the pyrolysis units (comprising sealed pre-heating and main gasification chambers) and pre-heated by hot gas to an elevated uniform temperature (c. 700°C).

During pyrolysis the biomass is thermally degraded to form a clean charcoal and synthesis gas ('syngas'), which is cleaned and used for power generation. All gas is treated through a water quench and recovered via a water treatment system.

Treated synthesis gas is then stored in a gasometer and then used to operate industrial gas CHP engines to produce electricity and heat. All air emissions from the engines are discharged to atmosphere via an SCR abatement plant order to ensure that air quality impacts are minimised.

Table 3.4: Summary – Pyrolysis & Syngas Combustion	
Primary Odour Sources	**Key Control Measures**
• Transfer of biomass fibre to pyrolysis unit; • Combustion of synthetic gas; and	• Transfer of biomass fibre occurs via a sealed measuring conveyor, within an enclosed building;

• Propagation of odour through external atmosphere.	• The Pyrolysis or biomass fibre is a completely enclosed process within a sealed unit; • Resultant syngas is fed directly to the gasometer via a scrubber and waste water recovery system; • Emissions from the combustion of syngas are thermally destructed prior to discharge to atmosphere.

3.4 Digestion and storage

Food waste will be pumped into two digestion units directly from within the Zone 1 sealed and pressure controlled reception area of the main building. All waste is immediately discharged into a 40m3 pit, macerated and pumped directly into the digestion tanks.

The waste undergoes anaerobic digestion for a period of approximately 64 days during which fermentation occurs to produces a methane-rich biogas.

Odour impacts associated with the transfer of materials from the Reception Building to the digestion tanks has been completely eliminated through the use of fully enclosed pumping systems and sealed connection pipes.

The potential production of odourous gases within the anaerobic digestion process (hydrogen sulphide (H_2S, a common by-product of anaerobic digestion)) is mitigated through utilisation of two chemical dosing systems. The primary system injects a small quantity of O_2 into the gas storage region of the tank (i.e. headspace beneath the double membrane membrane roofs). If oxygen injection is not sufficient to reduce the levels of H_2S, secondary odour reduction is achieved through the addition of Ferric Sulphate. Ferric Sulphate is directly dosed into the digester.

All vents and extracts (membrane roof extraction, vent relief valves, breathers etc) from the digestion and digestate tanks are routed back into the intake of the thermal oxidiser within the main building. There are no physical releases of any odourous emissions to the environment from the AD process.

The digestate product from the primary AD process is stored in two enclosed secondary digestion tanks (30m x 6m) for up to 4 months to allow for secondary gas production.

All digestate will be pumped to a sealed pastuerisation batch tank where it is heat treated, filter pressed and transferred into a sealed tank, located within Zone 2 of the man building. All pasteurised liquid digestate will be exported off site within tankers and used for agricultural fertilisers. Any delivery and collection tankers on site will be required to couple up to a dedicated extraction system that is connected to the main thermal oxidisers / odour treatment plant.

All treatment of digestate takes places internally, i.e. within the pressure controlled building. There is no external handling, treatment or storage of digestate in any form at the site.

All solid filter cake arising from the filter press will be transferred directly in to the autoclave plant for treatment.

Table 3.5: Summary – Digestion and Storage	
Primary Odour Sources	**Key Control Measures**
• Transfer of materials from Reception Building to external tank farm; • Production of malodourous H_2S; • Venting of AD tanks; • Venting of Delivery / collectin vehicles • Handling and treatment of digestate; • Exposure to odorous content during dispatch	• Reception building a sealed pressure controlled environment • Immediate direct pumping of waste from Reception Building / Tanks in sealed pipes; • Injection of Oxygen and Ferric Sulphate to alleviate H_2S levels; • All vents and extracts from the AD tanks are routed back directly to the odour abatement / extraction plant; • All collection and delivery tanker vents coupled to the odour abatement and extraction plant; and • All digestate processed within sealed buildings with odour abatement.

3.5 Treatment of Biogas

The biogas produced in the digesters will be saturated with water and has the potential to contain residual odorous gases (Hydrogen Sulphate, Ammonia). Prior to combustion of the gas, the biogas is dewatered by condensation in an underground gas pipe. All condensate will be collected by condensation wells and pumped to the water treatment plant for treatment.

The dry gas will then be recirculated through a dry carbon filter for the purposes of removing any residual odourous gases or other volatile odorous content.

Table 3.6: Summary – Treatment of Biogas	
Primary Odour Sources	**Key Control Measures**
• Presence of volatile odorous content / residual odourous gases within biogas.	• Dewatering of biogas and re-feeding of condensate into the digesters; and • Use of a carbon filter to capture residual odorous elements of the biogas.

3.6 Pathways

Any odours produced from any aspect of the plant have the potential to be emitted to air directly and have the potential to be carried to the nearby receptors via the atmosphere.

The extent of which odour is detectable downwind and the intensity and character of such odours is dependent on the flowing factors:

- The nature and magnitude of odorous emissions released from the source.
- Wind direction and wind speed.

- Atmospheric turbulence (vertical and horizontal) and the level of dilution and dispersion odours undergo as they travel downwind.

All these factors can vary significantly over time.

4 CONTROLMEASURES

The facility has been designed with a hierarchy of odour control measures based around the operational requirements of the site been aligned with sector best practice.

The working plan and associated operating procedures have been developed in accordance with the requirements of the Environment Agency EPR Horizontal Guidance Note H4 Odour Management.

The following sections detail management techniques, procedures, and odour control measures to minimise the potential for odour generation for each aspect of the operations, supplementing the information provided in Section 3.

4.1 Hierarchy and Principles of Odour Control

The key factors regarding the control, minimisation and abatement of odour emissions are:

- Inventory Control;
- Air tight / sealed pressure controlled buildings;
- All AD tank and delivery/collection vehicle vents and breathers are connected and routed to main pyrolysis thermal oxidiser plant;
- Process Control, odour control and gas clean up technology;
- Thermal oxidisation and odour destruction and
- No external handing or storage of digestate .

Details of each of the above factors are provided within the sections below;

Inventory Control

All wastes are loaded and unloaded within the reception hall. No wastes of any variety are stored or processed externally.

All waste will be immediately loaded and processed through the autoclave and steam sterilised. The autoclaves have the capacity to process wastes at a rate equivalent to 2.5 to 3 times of the daily average delivery rate.

Having the capacity to process wastes at a far greater rate than the rate of delivery, allows the reception hall to be managed with little or no accumulated wastes. It is the basic principle of the site that the reception hall is emptied and cleared of waste at the end of each working shift and that all wastes are processed as soon as possible.

By managing the reception hall with little or no accumulated wastes, the potential for significant odour issues are minimised and prevented.

As an additional measure, before any new waste streams or customers are taken on; potential odour emissions of the new feedstock materials will be a key factor to consider before they are accepted for receipt at the site.

Air Tight / Sealed Process Controls

The building has been designed to be both airtight and operated under negative pressure. The negative pressure is maintained at all times, irrespective of the operational state of the plant.

All vehicle access doorways into the reception area are equipped with entrance lobby, operated under negative pressure and are fitted with air curtains to maintain building pressure integrity during deliveries.

Sealed Tanks, Vents and Vehicle Measures

All tanks vents, extraction and breather pipes are directly routed to the extraction ductwork within the main building.

Physical connections will be provided for each tank, via an underground duct, directly back in to the main building and into the main extraction system inlet.

All vehicles that are required to collect digestate will also be connected to the same extraction system, thus preventing ay uncontrolled releases of odour from either the tanks or tankers.

There will be no aspects of the anaerobic digestion plant or collection / delivery vehicles that will discharge tany odourous or potentially odourous emission to air.

Process Control Measures

Operational techniques to minimise odour during receipt and off-loading include;

- Site management shall work with suppliers to ensure that waste volumes are consistent during peak seasons (in the event of deliveries that exceed the site permitted capacity, waste shall be diverted to a suitably authorised site);
- All wastes transferred to site for processing will be delivered to site within enclosed vehicles and tankers.
- Non-conforming loads shall be rejected and removed from site in accordance to waste procedures (CPP-E03);
- The process is entirely enclosed;
- The most odorous stages of the process occur within the Reception Building where adequate pressure control is maintained by sealed entry / exit points (excluding periods of delivery) and negative air pressure is maintained in order to sufficiently contain any contaminated air.
- Reception hall is also fitted with roof mounted ozone / Ultraviolet treatment equipment which is recognised by the Environment Agency as being a highly effective ‘passive’ treatment measure for the treatment of waste reception halls;
- Operational areas shall be maintained in a clean condition and regularly scraped/swept in accordance with procedure (CPP-E15).

Any wastes exhibiting offensive, intense or other aggravating odour characteristics will be noted in the site diary. If incoming loads are too odorous on receipt, the following will be considered by the site management.

- Blend with less odorous waste and or carbonaceous materials in order to reduce the amount of waste with problematic odour.
- All potentially odorous MSW loads shall be tipped within Zone 1 of the enclosed reception and processing building and inspected on arrival for contaminants or excessively odorous material (in accordance with site pre-acceptance and acceptance procedures – CPP-E01 and CPP-E02 respectively).
- Non-conforming loads shall be rejected and removed from site in accordance to waste procedures (CPP-E03).
- Reject materials from being tipped, load back onto vehicle for removal from site or processing within the Energy from Waste installation.
- Divert waste to landfill.

Thermal Oxidisation and Odour Destruction

All air removed from the reception area and autoclave ventilation systems will be extracted by the induced draught fans associated with the pyrolyser combustion systems. This system is also directly connected to all Anaerobic Vent pipes and extracts. All tankers deliveries and connections will also be coupled to the system via a flexible external connection point.

The internal air conditions shall be maintained at negative pressure (c. -50 Pa) via utilisation of air intake dampers, therefore facilitating a fully-enclosed and sealed building and odour control system.

A dedicated extraction fan (installed in the roof void of the Reception Building) will maintain an air exchange rate at approximately 3 changes per hour. Air will be extracted from the Reception Building and directed to the air intake of the pyrolysis unit and used for combustion air, thus ensuring thermal oxidisation of any odorous content.

The site is fitted with 4 independently operated thermal oxidisation plants, each with sufficient capacity to provide reception hall and / or lautoclave extraction.

In the event that none of the thermal oxidisation plants are not operating, the site is fitted with a backup fluidised bed bio filtration plan which has at least 20 times more active surface area per unit volume than the most efficient static bed bio filters with a removal efficiency greater than >90% for TRS (total reduced sulphur), VOC's and sulphide compounds.

Autoclaving, Pyrolysis and Syngas Combustion

To minimise potential odour emissions from the biofuel production and energy generation process the following operational techniques shall be applied;

- The autoclaving process is a sealed process that is carried out within an entirely enclosed building that is pressure controlled and abated. All odour emissions shall be thermally oxidised through the combustion air systems and released to atmosphere via the thermal oxidiser.
- The autoclave doors are interlocked to ensure all steam and vapour is evacuated to prevent heat and steam losses. Upon opening, a small amount of flash steam vapour will be released and extracted by the

autoclave door extraction hoods. All recovered steam is then condensed and the water is subsequently reprocessed through the water treatment plant. This water is then reused as boiler make-up water. This closed loop system minimises the potential release of odours.

- Each batch of waste inserted into the autoclave shall be processed at temperatures of at least 160ºC, this processing removes all malodorous content and converts the waste material into a sterile non-reactive biomass fibre.
- Syngas produced by the pyrolysis unit will be pumped directly to the gasometer via a scrubber and waste water recovery system;
- All steam is condensed from the autoclave by vacuum;
- Condensate from the autoclave process is discharged to the water treatment plant within the process building, so any odour emissions from this source will also pass through the odour abatement system and gas engines prior to discharge from the building.
- The process is entirely automated and monitored in accordance with Site Working Plan – Procedure CPP-E14.

Digestion & Storage

To minimise potential odour emissions from the production and storage of digestate, the following operational techniques shall be applied:

- Both digester tanks can be fed directly from the waste reception area via sealed pipework.
- Any H_2S generated in the digesters will be reduced by directly injecting O_2 into the gas storage chamber (headspace beneath the membrane roofs). If levels are particularly high and O_2 addition is not sufficient, Ferric Sulphate will be injected to the digester. The quantity of H_2S generated will depend entirely in the feedstock, fluctuations will be prevented through the upstream homogenisation and mixing process;
- All gas storage tanks will be fitted with a sealed double membrane roof;
- All vets and extractions from the AD tanks are routed back to the thermal oxidisation plant;
- Sterilised digestate is stored in an enclosed storage tank prior to removal from the plant;
- All acceptance, pre-treatment and processing tanks will be equipped with level gauges and alarms.

It is key to note that no external handling, treatment or storage of digestate is taking place on site. The site does not have any storage lagoons. In all cases digestate is stored in sealed tanks, which in all cases are vented back into the main odour abatement plant.

Treatment of Biogas

To minimise potential odour emissions from the production and storage of biogas, the following operational techniques shall be applied:

- The biogas will be dewatered (by cooling) prior to combustion in the CHP plant.
- All biogas will be circulated through an inline dry carbon filter, comprising activated charcoal media. The purpose of this plant is to remove any trace hydrogen sulphide emissions and other odorous content generated by the digestion process;

- The biofilter will be itemised under the site planned preventive maintenance programme (facilitating the replacement / recharging of carbon media on a regular basis) and maintained under service contract by OEM contractor.

Controls of Vehicle Deliveries

In order to prevent odour issues resulting from vehicle deliveries the Energy Recovery Centre will be supported by an agreed Delivery and Servicing Plan (DSP). The DSP will include a route management plan, restrictions on delivery hours and controls on types of vehicles.

The DSP will detail the vehicle types and their means of enclosure which will be agreed prior to the facility being brought into use. Most organic material received on site will be non-odorous, however any vehicle that will be delivering loads which may have an odour that is likely to have a detrimental impact on residential amenity will be transported in an enclosed trailer.

All vehicles (tankers) either delivering materials or collecting digestate from site, will be required to connect up to the odour extraction system (thermal oxidiser).

4.2 Liaison with Neighbours

If an action is being considered that may cause temporary odour impacts outside of the normal operational procedures, then the Local Environment Agency area team will be informed in advance. Neighbours who may be affected (see Table 2.1) will be contacted to advise them of the operation being undertaken, and that any increase in odour will be of a temporary nature.

In addition, the site will engage with the local community as often as possible in order to alleviate against negative site perception. The site management shall operate a publically accessible website, whereby pertinent and contact information is published such that the public remain informed and are provided with a means of contacting the site if necessary.

In the event of a complaint received from the public, Clean Power Properties operate in accordance with the dedicated odour complaints procedure (See Section 6.5).

5 FAILURE / ABNORMAL EVENT SCENARIOS

In accordance with the requirements of Environment Agency's draft Technical Guidance Note H4, consideration has been given to the types of failure or abnormal events that have the potential to result in an odour impact.

Abnormal events include the following:

- Meteorological conditions and
- Failure of process control measures.

Failure and abnormal event scenarios are presented in Annex B and summarised below.

5.1 Abnormal Meteorological Conditions

A number of meteorological conditions can exist that promote the generation of odour and may inhibit its effective dispersion (i.e. high temperatures and still conditions) may result in increased risk of impact at receptor locations.

The company management shall monitor meteorological forecasts to understand the prevailing conditions and to ensure that any activities which may give rise to increase odour potential cause are carried out in favourable meteorological conditions to reduce the potential for impact.

5.2 Failure in Process Control Measures

Failures in the process control measures have the potential to result in a release of odours which could impact nearby receptor locations.

Potential failures on site are summarised in Table 5.1:

Table 5.1 – Potential Failures in Process Control Measures
• Failure of E-Claves / Pyrolysis Units / Syngas Engines/Anaerobic Digestion plant, which may result in a delay in processing the material received. Magnitude of impacts will depend on the length of the breakdown, the type and volume of waste received and the prevailing meteorological conditions by could potentially result in elevated odour concentrations at receptor locations. • Failure of Thermal Oxidiser Plant, which may result in failure to comply with IED emission limits and the potential release of odorous emissions. In such cases all plant will enter in to a controlled shutdown and the standby odour abatement plant utilised. Note that there 4 thermal oxidiser plants in operation at any one time.

5.3 Accident Management Plan

The site maintains and accident management plan, detailed within Annex G.

6 MONITORING

The company will employ the following monitoring techniques to ensure that the Key Control Measures (Section 4) are maintained and effective, operational procedures are followed and that good practices are being followed.

- Site inspections by the Site Manager or delegated personnel;
- Site audits and inspections by the Environmental Agency;
- Site Inspections by the Planning Authority; and
- Third party audits.

All plant monitoring equipment requires to be calibrated annually unless the manufacturer's recommendations recommend more frequent. Each piece of monitoring equipment will have a unique serial number and calibration records will be kept in the site office. When a piece of equipment is sent off site for calibration a replacement will be hired or purchased in advance.

6.1 Responsible Persons

Responsible persons are detailed within Annex E. All site personnel are responsible for immediately reporting odour problems to the Site Manager or managing director.

6.2 Meteorological Conditions

Meteorological forecasts and conditions shall be monitored to enable potential odour problems to be predicted and, if necessary, remedial actions, such as modifications to the method of working or the use of abatement techniques to be implemented. Meteorological data will be recorded as per Table 5.1.

Table 6.1: Meteorological Monitoring

Monitoring Requirements	Frequency
Observed and recorded description of conditions: precipitation, drizzle, rain, sleet, snow, temperature, winds etc.	Recorded daily
Wind speed and direction	Recorded continuously

6.3 Olfactory ('Sniff Test') Monitoring

Odour shall be monitored daily at points around the site boundary and observations shall be noted in the site diary and/or on a daily monitoring document. Surveys shall be carried out in accordance with the monitoring protocol contained within the Environment Agency's Technical Guidance Note H4.

The odour assessor may not be subject to significant odour in the 30 minutes prior to the assessment and shall be compliant with the requirements laid down in the Olfactory Survey procedure (detailed in Annex C). This is to ensure that monitors are not suffering from odour fatigue and will be sensitive to site odours.

If odour is detected and is judged to be moderate (Odour Intensity Rank 3) then the Managing Director (or Site Manager) will be notified immediately and the olfactory survey will continue to attempt to determine the scope and extent of the odour plume, as follows:

- A suitable location downwind of the site and potentially sensitive receptor at which the odour plume is unlikely to extend will be selected for assessment;
- Survey will continue toward the facility until a site-related odour is perceived; and
- Assessment points perpendicular to the plume axis and equidistant from the site will then be monitored, subject to access requirements.

Monitoring frequencies shall be as detailed in Table 6.2.

Table 6.2: Monitoring Frequencies

Parameter	Monitoring Technique	Frequency
Meteorology	See Table 6.1	
Odour	Olfactory monitoring	Daily site and perimeter checks. Increased frequency in response to complaints.
	Complaint monitoring	Continuous
Complaints	Corrective action monitoring	Post-implementation of a corrective action

6.4 Odour Monitoring

Odour monitoring is conducted at frequencies detailed in Table 6.2 by a competent person.

Distances and locations of off-site monitoring points will vary in accordance with the meteorological conditions (i.e. depending on the specific wind speed and direction at the time of monitoring).

The main aim of monitoring will be to test if any odours emitted from the site will be causing the nearest receptors nuisance. In scenarios where nuisance is being caused then operations can be suspended until the conditions improve, also the site manager may deem it necessary to find the precise source of the odour and attempt to eliminate it or neutralise it immediately.

6.5 Complaint & Corrective Action Monitoring

Complaints[1] shall be recorded and include: date and time, nature of complaint, name of complainant (if given), a summary of investigation and actions taken and their results.

[1] Operators may receive complaints (immediate or delayed) directly from community members, or indirectly from the Environment Agency or a Local Authority.

In the event of a complaint, further olfactory monitoring will be undertaken. The monitoring protocol below is adapted for the site from the Environment Agency guidance document for the regulation of odour at waste management facilities.

The odour assessor shall undertake odour observations at the location of the complaint and at potentially sensitive receptor locations downwind from the site. At each location observations shall be made concerning odour intensity, persistence and character. Details will be logged following the instruction provided in the reporting form (see Annex D) which addresses the following issues:

- Control of Pyrolysis and AD process (i.e. are anaerobic conditions being maintained)?
- Adequacy of containment / treatment measures?
- Adequate dispersion (i.e. are meteorological conditions suitable for dispersion? What mitigatory measures were applied?).

The above process shall be repeated upon completion of a corrective action (implemented as a result of an odour issue being identified).

Monitoring shall additionally endeavour to identify the scope and extent of the odour plume as described in Section 6.3.

6.6 Records

Daily records shall be maintained and include the following details:

- Results of inspections and olfactory monitoring carried out by site personnel;
- Weather conditions including wind speed and wind direction;
- Operational problems including date, time, duration, prevailing weather conditions and cause of problem;
- Complaints received including address of complainant (if available);
- Details of corrective action taken, and any subsequent changes to operational procedures; and
- An evaluation of the effectiveness of control and abatement techniques used.

7 Compliance Action Plans

7.1 Control & Trigger Levels

Control trigger levels are presented below in Table 7.1.

Table 7.1: Control & Trigger Levels

Parameter	Monitoring Technique	Control Levels
Odour	Routine olfactory monitoring	Odour Intensity 3 recorded at sensitive receptor (persistent / transient nature noted and considered)
	Complaint monitoring	Receipt of complaint

7.2 Compliance Actions

Exceedance of the control levels in Table 7.1 will necessitate further investigation into the causes and indicate whether further monitoring is required. Actions to be taken in the event of an exceedance will be dictated by the nature and extent of the exceedance(s) (e.g. by considering the magnitude of exceedance and whether it was event driven or on-going).

7.3 Response to Complaints

Receipt of an odour complaint during normal operations is treated as an exceedance of control levels. The primary response will be as detailed in accordance with the site's complaints procedure. An investigation shall be initiated into the cause of the complaint, this will involve as necessary:

- An olfactory survey following the procedure detailed in Section 6.3;
- An examination of the site activities at the time of the complaint;
- An examination of the meteorological conditions at the time of the complaint; and
- A review of the effectiveness of operational and odour control procedures.

If the complaint is validated it will be treated as an exceedance of the control level. The outcome of the investigation will determine the corrective actions to be implemented (see Section 5.5 below).

7.4 Detection of Moderate Odour During Olfactory Survey

Detection of a moderate odour, (i.e. 'odour easily detected while walking and breathing normally, possibly malodorous), will initiate a more extensive olfactory survey to determine the extent of the odour plume (as described in Section 5.3). An investigation will be initiated into the cause of the odour. This shall involve as necessary:

- A review of the site activities at the time of the olfactory survey;
- A review of the meteorological conditions at the time of the olfactory survey; and

- A review of the effectiveness of process operations and odour control procedures.

7.5 Corrective Actions

The outcome of an investigation will determine the corrective actions to be implemented, they will consider, but not be limited to:

- Alteration to waste reception procedures and odour control measures employed;
- Time / temperature parameters under which AD should be carried out;;
- Review of biogas treatment and chemical injection systems; and
- Update of OMP if new procedures are created.

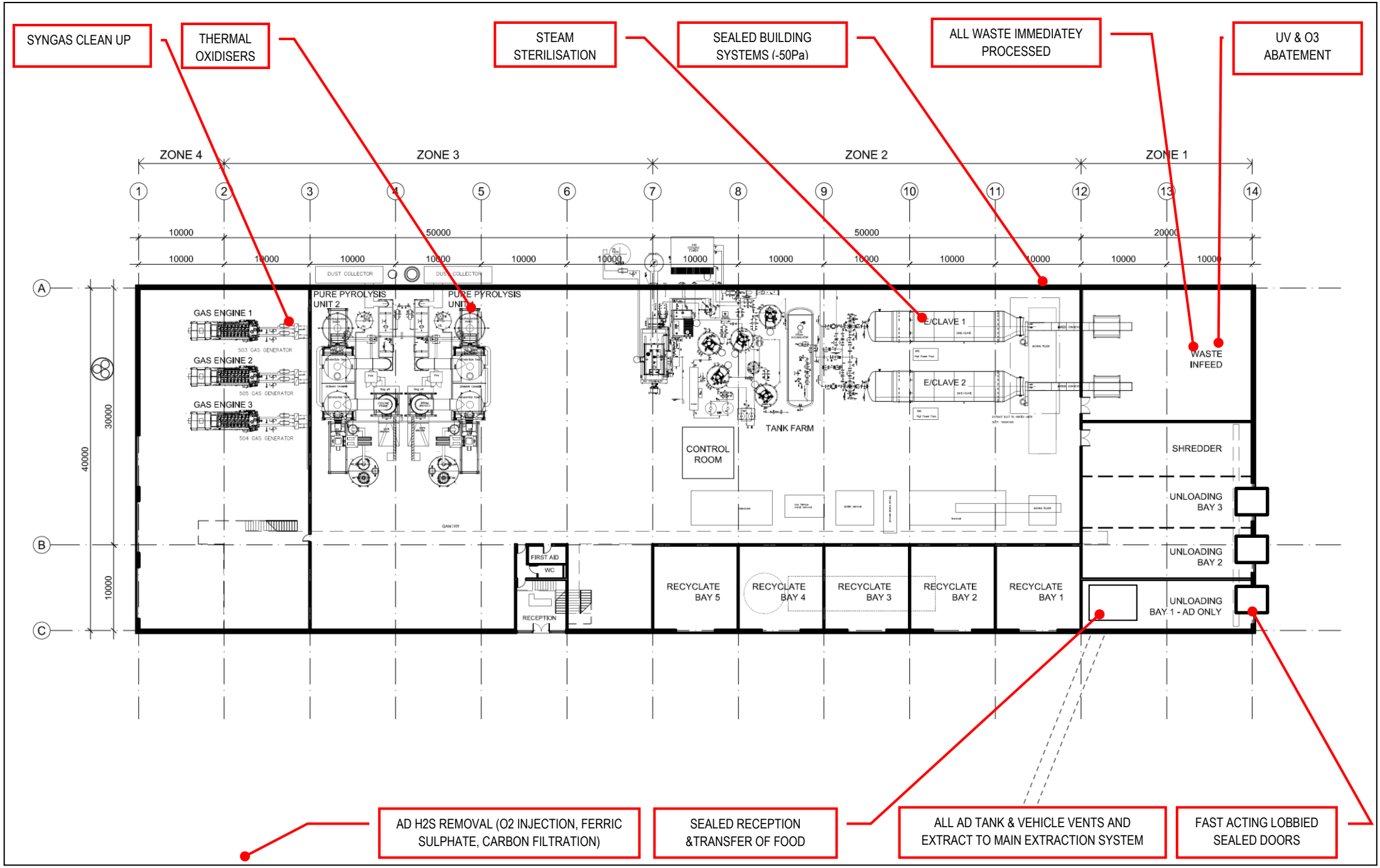
7.6 Reporting

Exceedance of a control level will be investigated (as described above) and recorded. This includes recording the following:

- Nature of the incident;
- Date of occurrence(s);
- Results of the investigation;
- Details of responses/ action plans implemented; and
- The event will be marked within the site's incident log.

The report of any exceedance will be made available to the Environment Agency on a quarterly basis.

Annex A1: BUILDING ODOUR CONTROL MEASURES ILLUSTRATED AND TECHNICAL DETAILS



1. Do not scale off this drawing
2. All dimensions to be confirmed on site
3. This drawing is copyright of Sol Environment Ltd
4. This drawing is to be read in conjunction with relevant consultant drawings and specifications

Rev:	Date:	Desc:
0	JUN 13	Original

Client: CLEAN POWER PROPERTIES LTD
Job No: SOL0613CPP_01
Drawing No: OMP01
Revision: 0
Project: ODOUR MANAGEMENT PLAN
Drawing Title: ODOUR MANAGEMENT MEASURES
Drawn By: STEVE BUTLER
Scale: NTS
Date: JUNE 13

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The Solid Fuel Burner

The **Onix** Corporation is on the cutting edge of technology with its research on solid fuel. This research resulted in the development of The **ONIX** Series Solid Fuel Burners.

These burners operate primarily on reclaimed wood, bringing the fuel cost to a minimum. Depending on the availability of in-house waste such as poly tailings, sawdust, etc., consumers may experience a negative fuel cost.

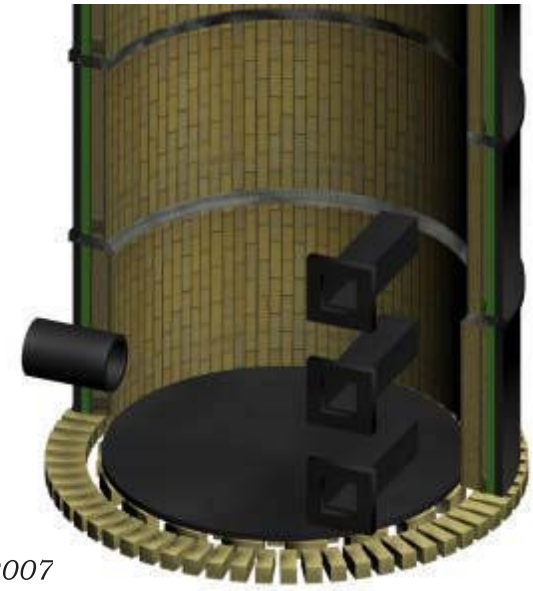
These burners are capable of delivering between 0.5 MM and 150 MM Btu's per hour and can achieve temperatures of 2,000 degrees Fahrenheit while saving money on every Btu used.

The **Onix** Corporation's **ONIX** Series solid fuel burners have many industrial applications including replacing outmoded burners, dryer heat source, heat for kilns, heat source for boilers, as well as winter space heating.

The **Onix** Corporation prides itself on meeting or exceeding local, state, and federal air quality standards. Our emissions contain virtually no sulfur, NOx, or CO.

20 MM Btu/hr solid fuel burner for a drying system. Drying system retains capability of using natural gas as a fuel.

There are over 100 **ONIX** Series solid fuel burners presently in operation world wide providing millions of Btu's for a fraction of previous fuel costs. These burners can be operated on a number of recovered co-products of manufacturing, which represent an additional expenses to a company currently discarding the co-products.



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Cyclonic Combustion

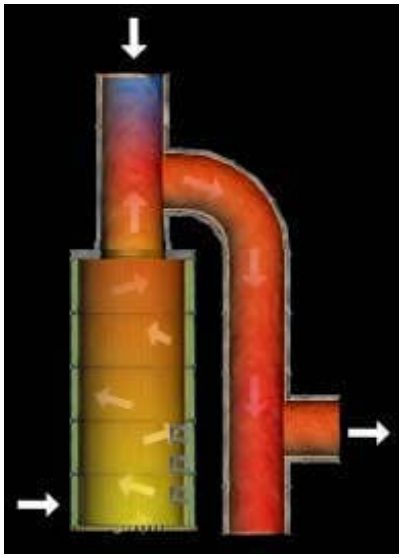
How it works

Cyclonic furnaces have become a major alternative to conventional burners. Applications include both large-scale utility boilers and certain industrial processes where waste heat can be recovered profitably.

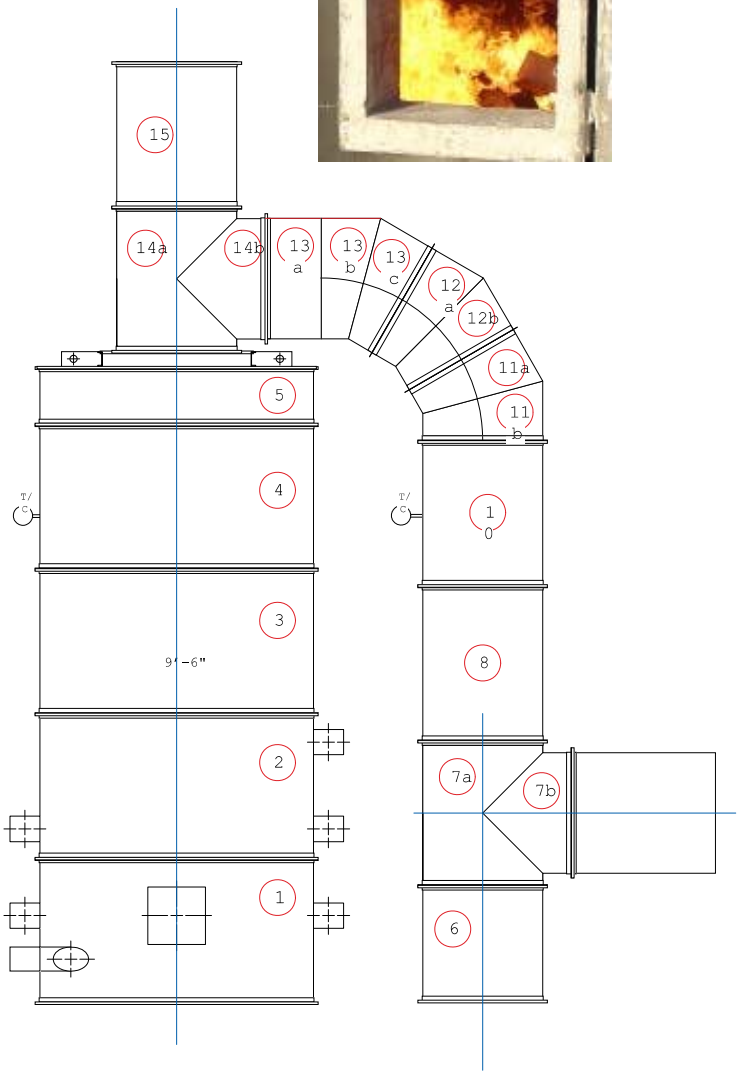
The **ONIX** Series solid fuel burner is operated by cyclonic combustion. In cyclonic combustion, the burning occurs at a positive pressure, rather than the slight negative pressure associated with most suspension fired wood systems.

The combustion occurs in a specially designed cylindrical reactor which discharges hot gaseous combustion products directly into the boiler or other vessels. Pulverized wood is blown into the cyclonic burner where it oxidizes immediately. Centrifugal action forces the particles toward the cylindrical wall of the burner where char oxidation occurs. Very high turbulence is generated in the cyclonic burner and char oxidation occurs within milliseconds.

Combustion intensity in cyclonic burners is considerably higher than combustion intensity in conventional wood suspension fired furnaces.



The vigor of the cyclonic action forces the wood particles to the burner wall, facilitating not only rapid combustion but also solid product removal. Cyclonic burners typically remove 99% of the solid products of combustion. These solid products of combustion exit the burner then enter the boiler or other vessels and are removed as fly ash by a particulate control system.



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The Onix Corporation
ROTARY DRUM DRYERS • ALTERNATIVE FUEL SYSTEMS

SYSTEM FUNCTION

Cyclonic Solid Fuel Burner

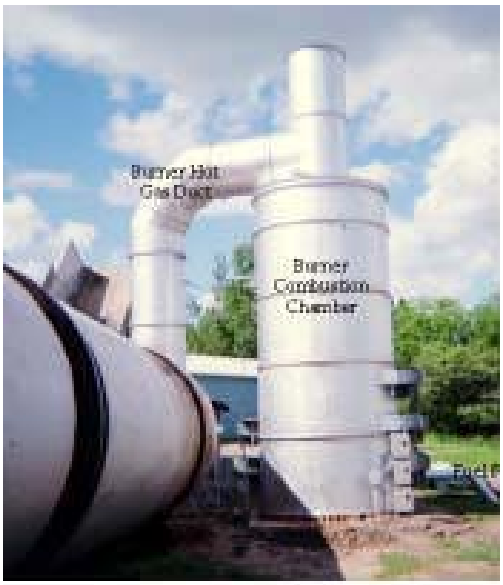
—-A Type "K" thermocouple at the dryer discharge senses an energy demand. Three things happen simultaneously :

1. Fuel feed rate increases.
2. The additional fuel creates an energy increase in the burner; this energy is drawn into the drum by the dryer i.d. fan.
3. The dryer outlet temperature is increased.

—-Wood fuel fires very clean in the burner. If burner emissions from the propane combustion or dried sawdust are exhausted directly from the combustion chamber to atmosphere, only heat waves are visible. There is no smoke, no malodor, and virtually no CO and VOC's. The combustion process is extremely hot and exceptionally clean.

—-Dried fuel is delivered to The **Onix** Corporation feeding equipment. This variable speed feeding equipment is capable of delivering material to the burner at continuous rates from 1 to 100 ft.^{3}/hr.

—-The entire system is automatic and basically labor free, with 100% automatic fuel feed to exact dryer needs.



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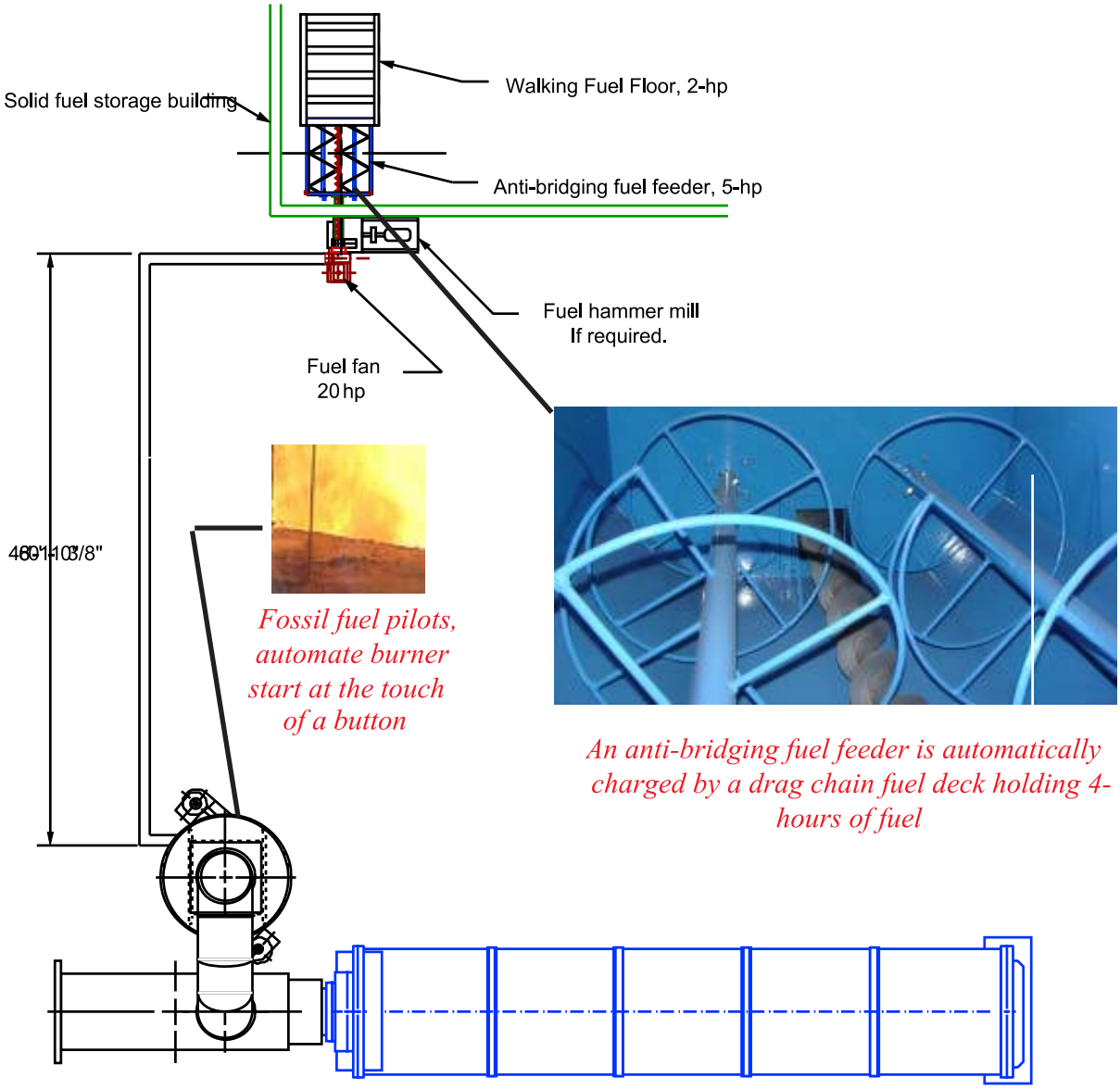
Onix – Fuel Delivery

All units are priced to include 4-hours of fuel storage through incorpora - tion of a top loading fuel deck. Tank feed systems can be substituted.

The Onix Corporation

26 MM Btu/hr Solid Fuel Burner

Typical Feeding Arrangement



Fossil fuel pilots, automate burner start at the touch of a button

An anti-bridging fuel feeder is automatically charged by a drag chain fuel deck holding 4-hours of fuel

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Onix Installation

All units are priced to include installation within the continental US
(excluding fuel piping and motor wiring).
All pieces are pre-lined with refractory to speed up mechanical installation time to 1-day.

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Onix Controls

Control packages integrated with the Onix-OS©.

Real-time data displayed on a secure web page allows you to view your company's dryer data from your LAN or internet connection. Integrated security cameras will allow you to watch the dryer operation from afar.

The Onix-OS©

Solid Fuel Burner Overview Screen

Solid Fuel Burner Data

Burner System Faulted

Control -- Burner Loop

Burner Temperature	1,540
Burner Set point	1,540
Burner Fuel Valve Output %	24

Auto Manual

Auto/Man

Burner Ignition Failure

Burner Temperature	1,540
Combustion Air Ratio	10:0
Combustion Air Output %	16

M-1 CAF#1	M-2 CAF#2	M-3 CAF#3	M-4 CAF#4	M-5 CAF#5	M-6 Fuel Fan	M-7 Fuel Hammer mill	M-8 Fuel Auger VFD

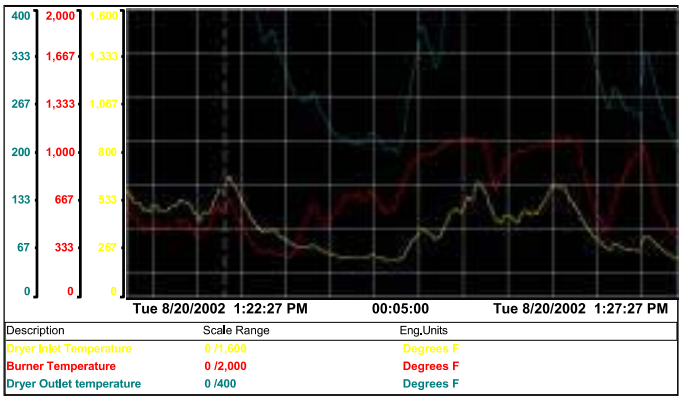
Burner 30 Second Stop

System E-Stop Pressed

Burner Immediate Stop

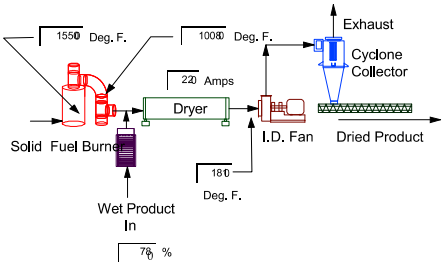
Burner Auto Start

Dryer System Overview



Description	Scale Range	Eng.Units
Dryer Inlet Temperature	0 /1,600	Degrees F
Burner Temperature	0 /2,000	Degrees F
Dryer Outlet temperature	0 /400	Degrees F

Drying Process Screen



Rotary Dryer Data

Dryer Amps	22
Dryer Inlet Temperature	1000
Dryer Outlet Temperature	181
Dryer Outlet Set point	180
Fuel Valve Output %	62

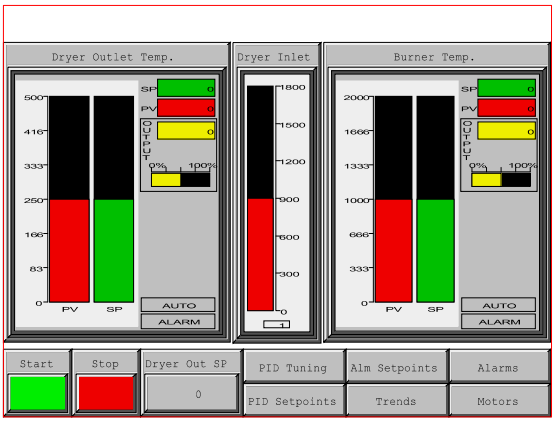
Auto

Auto Man

Wet Product Feeder VFD Output %	70

Wet Product Feeder VFD Start/Stop

Dryer Feed Directed to Dryer Stockpile



Dryer 30 Second Stop

Dryer Cleanout and Shutdown

Dryer Immediate Stop

Dryer Auto Start

Dryer Trends

Motors

System Overview

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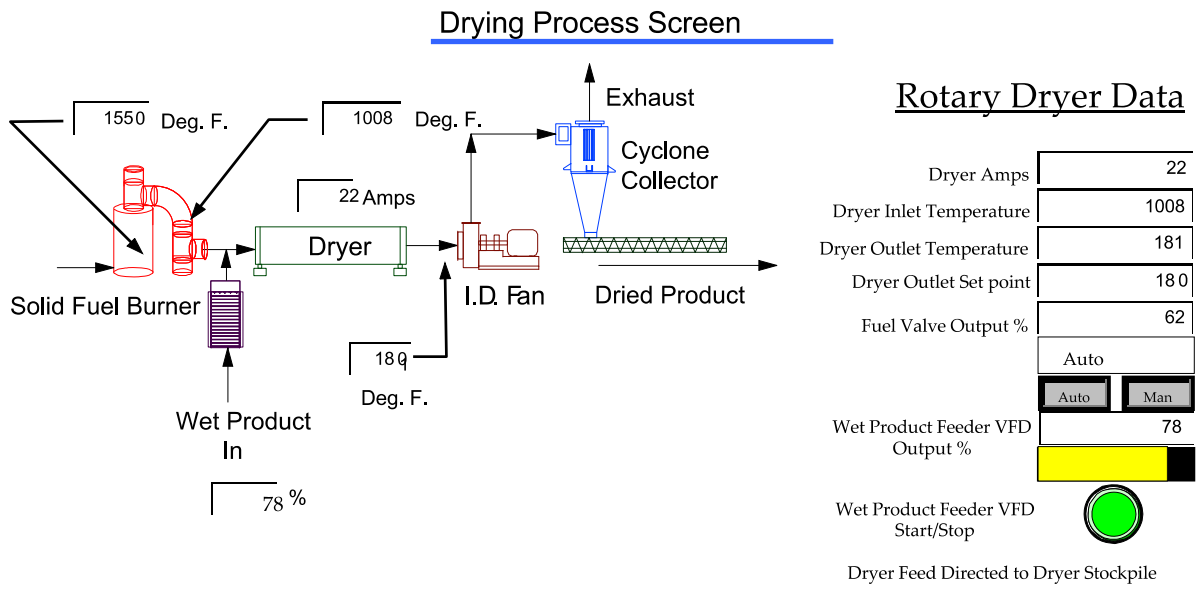
Onix OS©

The system features Allen Bradley/Entivity/Automation Direct Touch Screen controls. This degree of control allows for automatic and manual control. Controls will display fuel consumption in pounds per hour. The controls monitor dryer inlet and outlet temperatures and cause system safety shut-down in case of extremes. This level of automation offers burner trial for ignition at the touch of a button and a comprehensive operator 10" touch screen display for all dryer functions controlled. A networked PC will historically track burner and dryer temperatures and all operator settings. An alarm screen on the touch screen will track alarm history. A modem connected to the PLC/PC allows for remote adjustment and troubleshooting of the PLC/PC program via phone or internet. Technical support is only a few mouse clicks away. Future expansion of this program is possible to include all dryer functions.

The graphic below presents an example of what the operator might see during system operation. The Onix-OS© also historically tracks dryer inlet, outlet and burner temperatures indefinitely. The Onix OS© can be upgraded to control all plant functions at anytime in the future or to display integrated existing values present, within the plant. The Onix-OS© can be remotely monitored or accessed via telephone or internet, which then permits interaction with control and trend screens.

Plant operators have a rugged 10" NEMA-4 touch screen interface to access all burner functions. Burner faults and alarms are tracked and recorded with a time and date stamp. This system integrates stopping of the wet product feeder and dryer i.d. fan in an ultimate high alarm condition.



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Onix OS ©

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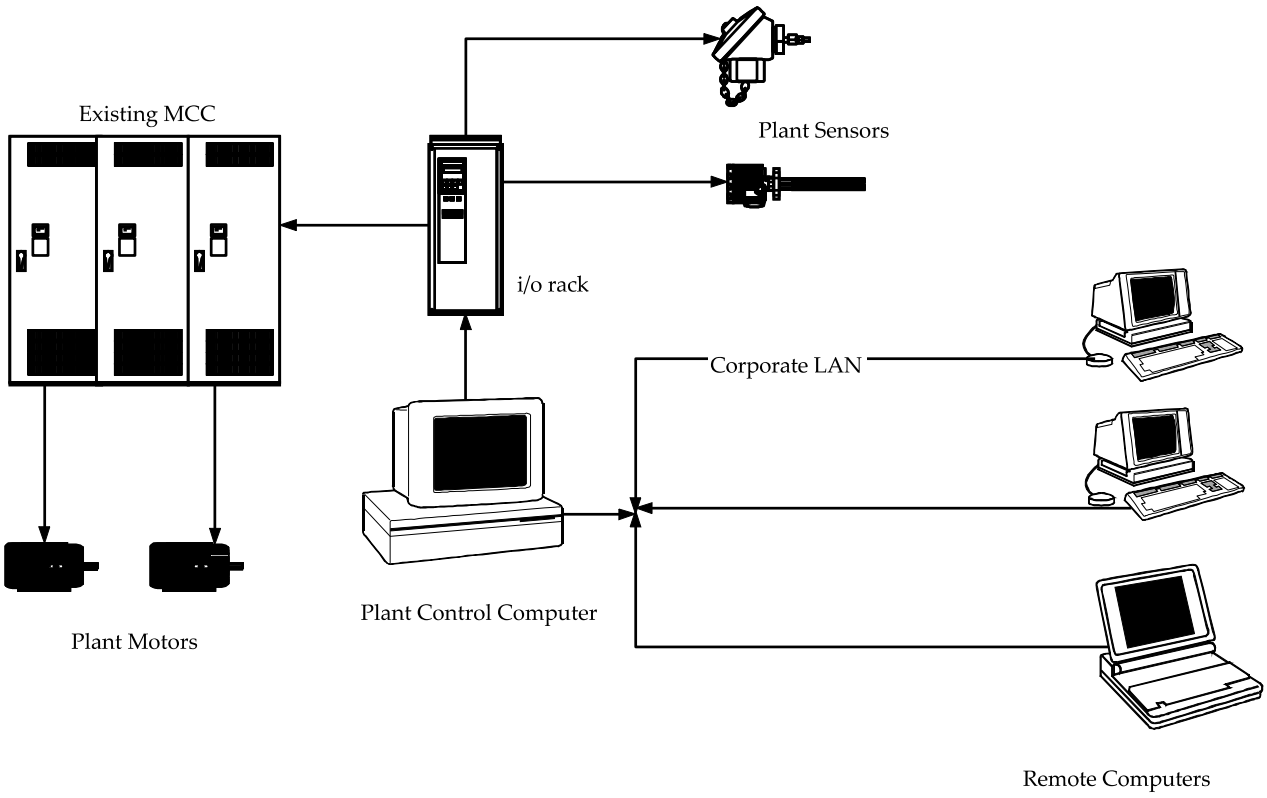
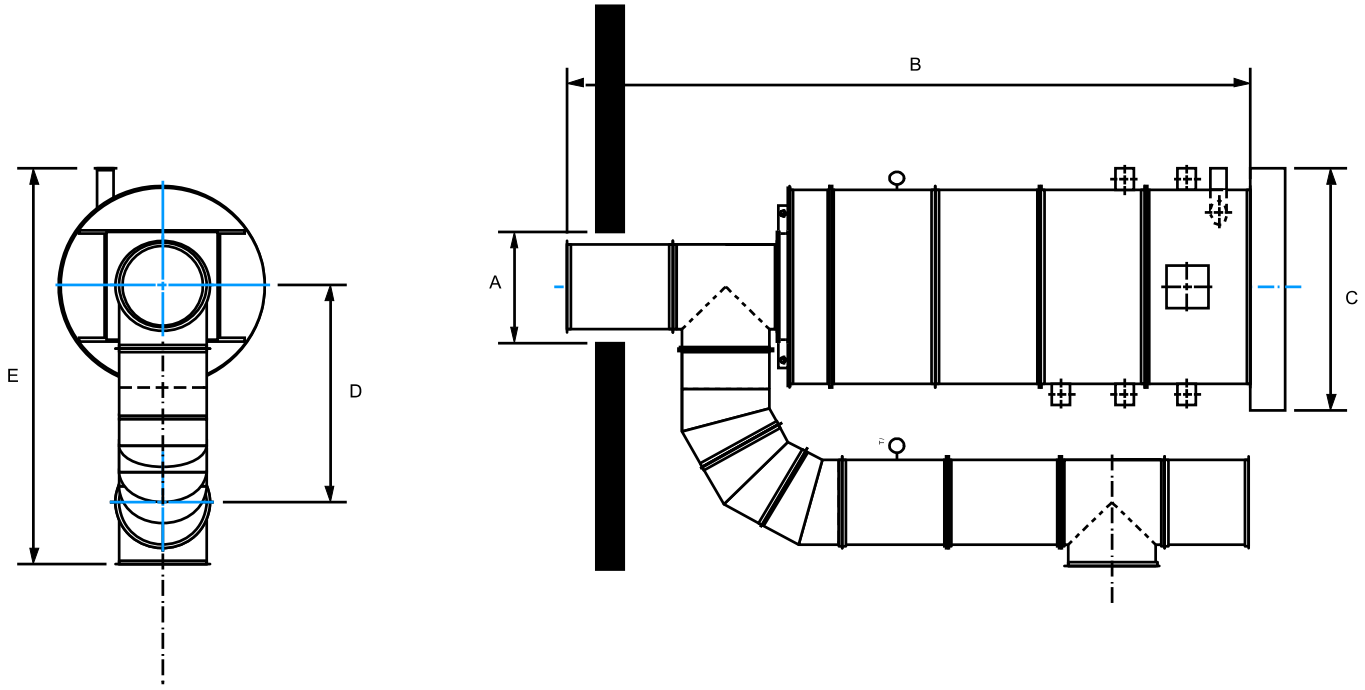
The Onix-OS© boasts up to 64 PID loops having, for all practical purposes, no limit to the number of burners or system components which it can control. This system has touch-screen control and is capable of automatically tracking historical trends and data archiving. The Onix-OS© can start and control all the motors at your plant, not just the dryer motors. The Onix-OS© allows authorized plant personnel to dial into the system to retrieve data on plant operation during the night, the past week or years back. It can track any parameter and inform when and why the system shuts down due to any alarm extreme. Reports can be generated to outline plant wide production during any selected time interval. The Onix-OS© can be modified to add motors or data items from a remote computer. This system will require the presence of an operator at start-up and



The Onix Corporation

ROTARY DRUM DRYERS • ALTERNATIVE FUEL SYSTEMS

Solid Fuel System Dimensions



Model Number	A	B	C	D	E	HP
ON-02	24	125	64	68	109	20 hp
ON-04	24	152	75	68	120	40 hp
ON-05	26	162	79	71	127	40 hp
ON-10	33	198	93	81	152	45 hp
ON-12	45	213	98	100	175	50 hp
ON-20	59	248	112	122	210	55 hp
ON-26	59	268	122	123	220	55 hp
ON-30	59	280	127	123	224	55 hp
ON-45	82	330	142	158	274	75 hp
ON-52	82	344	148	158	280	80 hp
ON-60	82	359	154	158	286	85 hp
ON-75	91	384	166	173	310	100 hp

All dimensions are in inches and are approximations contingent on approval drawing release
The number after the ON- indicates the burner maximum output in Millions of Btu/hr

P.O. Box 270_71Main Street--Caribou, ME 04736 * 800-844-0076 Phone * 207-496-3253 Intl. Phone -- 207-496-3743 FAX
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ROTARY DRUM DRYERS • ALTERNATIVE FUEL SYSTEMS

Model Number	App. Horsepower	Maximum Energy Output
ON 02	20hp	**2 MM Btu/hr**
ON-04	40hp	**4 MM Btu/hr**
ON-05	40hp	**5 MM Btu/hr**
ON-10	45hp	**10 MM Btu/hr**
ON-12	50hp	**12 MM Btu/hr**
ON-20	55hp	**20 MM Btu/hr**
ON-26	55hp	**26 MM Btu/hr**
ON-30	55hp	**30 MM Btu/hr**
ON-45	75hp	**45 MM Btu/hr**
ON-52	85hp	**52 MM Btu/hr**
ON-60	90hp	**60 MM Btu/hr**
ON-75	100hp	**75 MM Btu/hr**

- Complete solid fuel burner packages included anti-bridging fuel feeder with 4 hours of fuel storage for top loading, tank feed system may be substituted.

- All solid fuel burners have customer choice of gas, propane or #2 fuel oil fossil fuel pilot

- All programs must undergo a thermodynamic analysis by The **Onix** Corporation to assure program viability and price.

- All system components have a three-year warranty full replacement.

- Horsepower requirements are approximations. Price includes a fuel hammer mill for on line size reduction for 1" maximum lump size.

- All systems include PLC/ PC for system control interface, data tracking and network wide control. Internet viewing of system is available with applicable internet connection.

- All prices are in U.S. Dollars

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A Breath of Fresh Air

Efficient

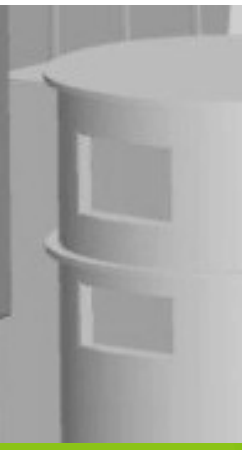
Economical

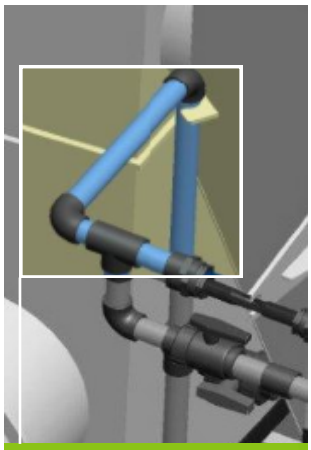
Compact

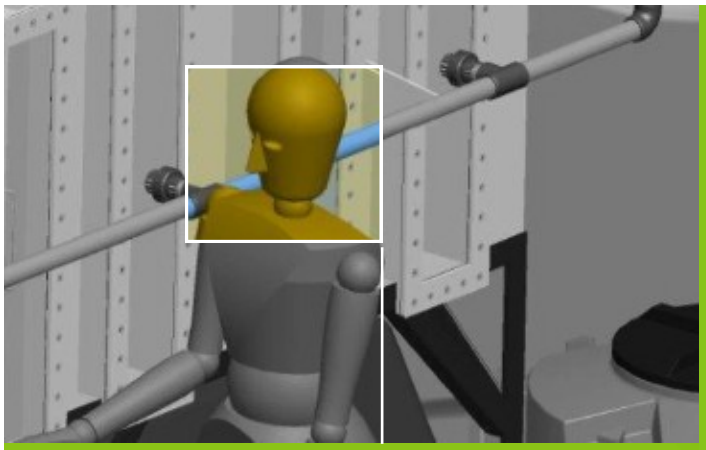
VTfiltration

Fluidized Bed Bio Filtration

Ultimate **Odour** and **VOC** Control







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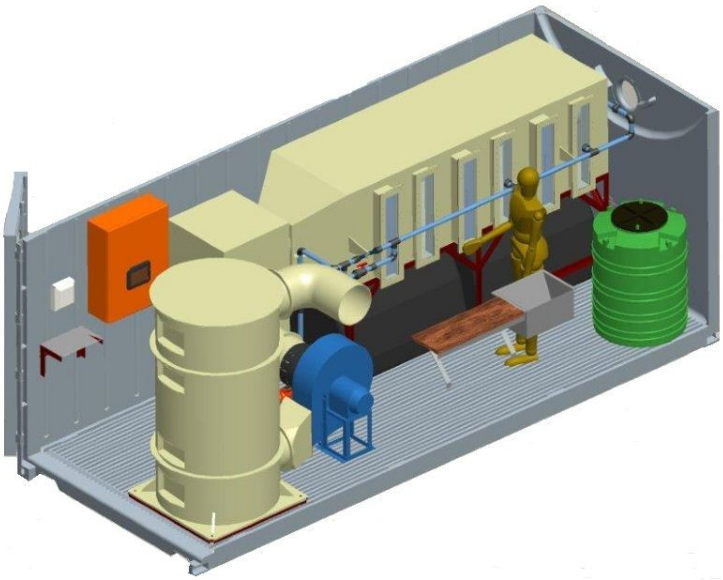


- 1/10 the size of Static Bio Filter
- Very Low Maintenance Cost
- Controlled Humidity - No Effluent
- Removes 99.60% of H2S
- Complies to Most Stringent Standards
- Self Regenerating Media
- Modular and Mobile
- Small Footprint With High Capacity

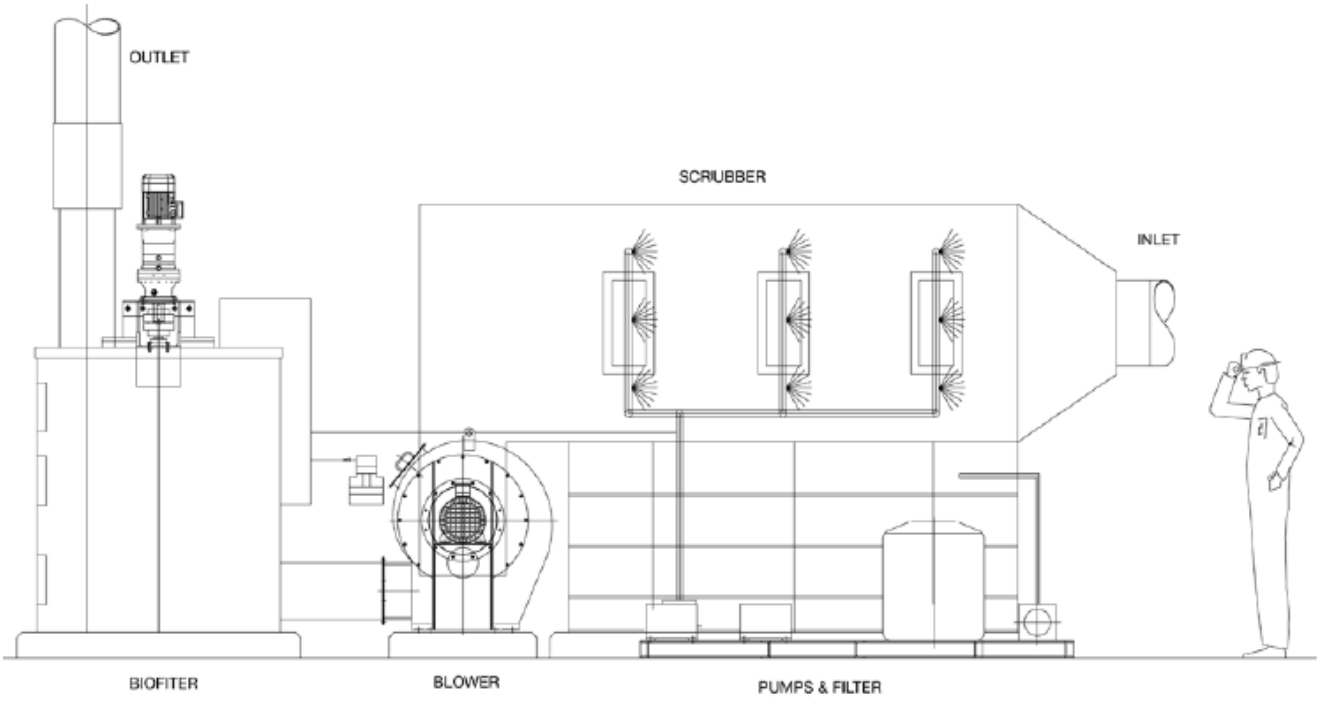
We say with confidence that this is the best Bio Filtration technology available on the Global Market today!

W Series

VTfiltration

A Breath of Fresh Air

Waste and Waste Water treatment - inconsistent air stream.



VT Filtration Systems' W-Series was developed for treating odours in typical wastewater applications where the main pollutant is hydrogen sulphide. Other pollutants, occurring in lower concentrations, which are also removed by the system include:

- Other Total Reduced Sulphur (TRS) compounds including mercaptans, dimethyl sulphide, dimethyl disulphide
- A variety of Volatile Organic Compounds (VOC's)
- Ammonia

The W- Series uses a two phase approach for the removal of pollutants:

Phase 1 – Ozone Scrubbing

- Soluble hydrogen sulphide (H2S) is absorbed into the scrubber brine.
- Ozone is used as the oxidant. It is generated from oxygen with no hazardous by products.
- Ozone is introduced into the solution where it oxidises the pollutants (H2S, SO2) to sulphates.

Phase 2 – Fluidised-bed Bio filter

- TRS compounds are removed (mercaptans >90%, sulphides >85% and any remaining hydrogen sulphide >99% or 0.1ppmv.
- VOC's are removed >90%
- Pollutants are oxidised by bacteria to form a harmless bio-sludge. The bio-sludge waste falls to the bottom of the filter and is drained away from the plant on a continuous basis.
- The media humidity is controlled to optimise phase transition of pollutants.

The W-series is the smallest and most cost effective system available for its application. This is mainly due to three factors:

1. We combine two processes into one system, thereby targeting specific pollutants more effectively.
2. Ozone scrubbing is a very efficient way of removing hydrogen sulphide from an air stream.
3. Our patented fluidised-bed bio filter has at least 20 times more active surface area per unit volume than the most efficient static bed bio filters.

W Series

Other advantages over using only bio filtration include:

Reduced start-up delays and downtime

- The scrubber is a purely chemical process, so there is no start-up period for removal of the main pollutant, hydrogen sulphide (>99%).

Replacement of the Bio filter media is not necessary.

- The media consists of inert PVC pellets, which provide a growing surface for the bacteria. It does not compact or decompose.
- There is no deterioration of the active biomass over time, because waste bio-sludge is removed from the media on a continuous basis.

Handles peaks and variations better

- The scrubber buffer solution absorbs the peaks and variations in the inlet hydrogen sulphide concentrations (up to 500ppmv).

Other sources of hydrogen sulphide where the W-series is effective include: petroleum refineries; unrefined petroleum product depots; natural gas plants; petrochemical plants; oil sands plants; pulp and paper plants that use the Kraft pulping process and stock feedlots.

Our 700m3/hr Evaluation Unit is available for trial installations. This is a fully functional 2 phase unit.

System Requirements:

Power Supply: 380V AC

Water Supply: 3/4" connection to potable or clear effluent supply (minimum 3 bar).

PH Stabilizer such as Lime/Caustic consumption: Varies between 0.3 to 1.5 litre/100,000m3 of air treated and is dependant on the hydrogen sulphide concentration.

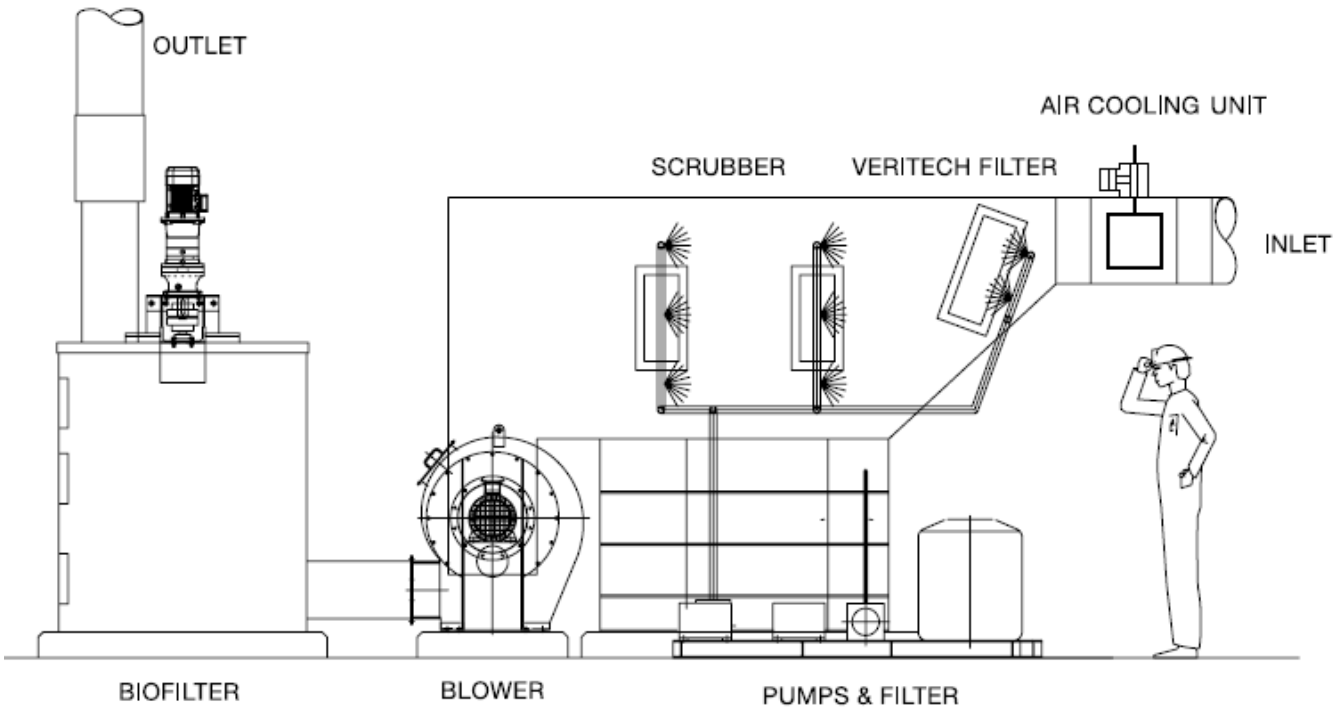
Wastewater drain: 110mm sewer connection or similar

Spatial:

Model	Capacity	Footprint	Height
VT3000W	3,000 m3/hr	6 x 2.5 m	2.5 m
VT6000W	6,000 m3/hr	6 x 2.5 m	2.5 m
VT15000W	15,000 m3/hr	12 x 2.5m	2.5 m

R Series

Constant & Identified Air Stream - such as Rendering Plants



VT Filtration System's R-series was developed for treating odours from food waste rendering plant applications, typically comprising:

- Total Reduced Sulphur compounds (sulphides and mercaptans)
- VOC's including aldehydes, ethylamine, organic acids and PAH's
- High ammonia concentrations

Typically, these emissions must first be cleaned of fats and particulates before the cocktail of odorous compounds can be removed by a combination of wet scrubbing and bio filtration.

The R- series uses a three phase approach for the removal of these pollutants:

Phase 1 – Veritech Filter

• Fats and particulates are removed through mechanical filtration.

Phase 2 – Wet Scrubbing

• Soluble pollutants (mostly ammonia) are absorbed into the scrubber brine and oxidised to harmless by products.

Phase 3 - Biofiltration

- VOC's and TRS's are oxidised by bacteria to form a harmless bio-sludge. The bio-sludge waste falls to the bottom of the filter and is drained away from the plant on a continuous basis.
- The media's humidity is controlled to optimise phase transition of pollutants.

The R-series is the smallest and most cost effective system available for its application. This is mainly because we combine three processes into one system, thereby targeting specific pollutants more effectively:

1. Wet scrubbing is a very efficient

2. Our patented fluidised-bed bio filter has many times more active surface area per unit volume than the most efficient static bed bio filters.

3. Our patented Veritech filter is proven to be the most efficient fat filter available, thereby ensuring that the downstream processes are not clogged by fat.

A Breath of Fresh Air

R Series

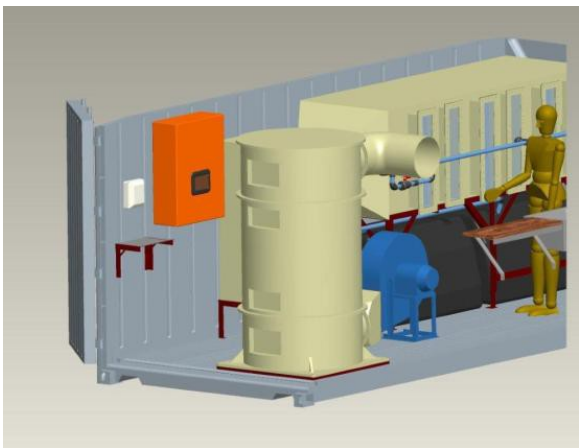
Other advantages include:

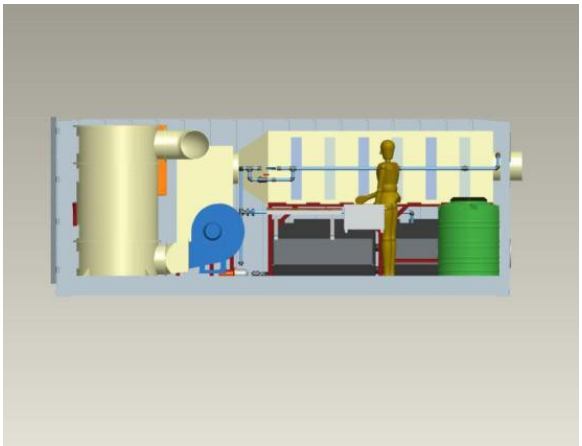
Replacement of the Bio filter media is not necessary.

- The media consists of inert PVC pellets, which provide a growing surface for the bacteria. It does not compact or decompose.
- There is no deterioration of the active biomass over time, because waste bio-sludge is removed from the media on a continuous basis.

Operational feedback and maintenance contracts are available.

- All operational parameters can be monitored via our website.
- We offer an operation and maintenance service on all of our systems.





Spatial:

Model	Capacity	Footprint	Height
VT3000R	3,000 m3/hr	6 x 2.5 m	2.5 m
VT6000R	6,000 m3/hr	6 x 2.5 m	2.5 m
VT15000R	15,000 m3/hr	12 x 2.5m	2.5 m

System Requirements:

Power Supply: 380V AC

Water Supply: 3/4" connection to potable or clear effluent supply (minimum 3 bar).

Sulphuric acid (H2SO4) consumption: Varies between 0.3 to 1.5 litre/100,000m3 of air treated and is dependant on the ammonia concentration.

Wastewater drain: 110mm sewer connection or similar

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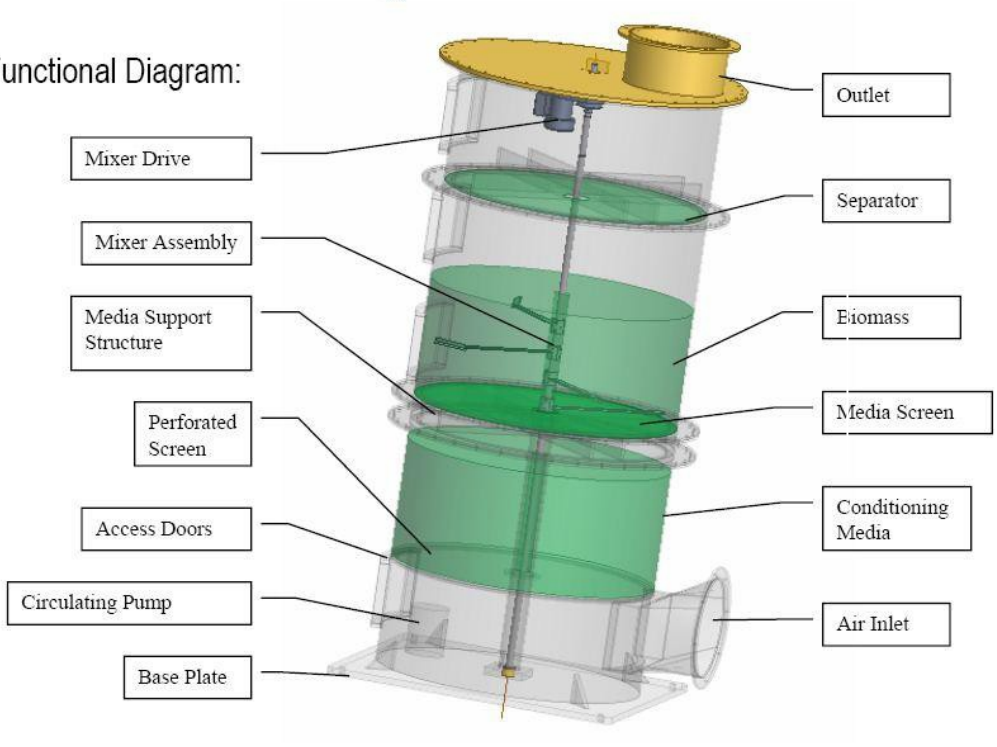
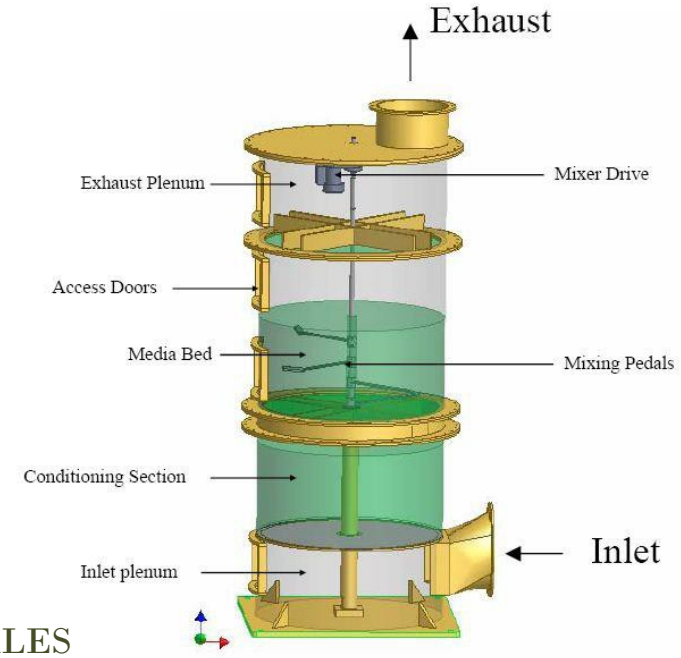
Process Diagram

- Functional Diagram:



How it Works

The contaminated air passes through the pre treatment section before entering the patented continuously agitated fluidised biomass where the rapid bio oxidation takes place. The cleaned gas stream then passes through a post filtration air polishing phase if required.



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HEAD OFFICE

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Bernstasse 1, CH 3066,
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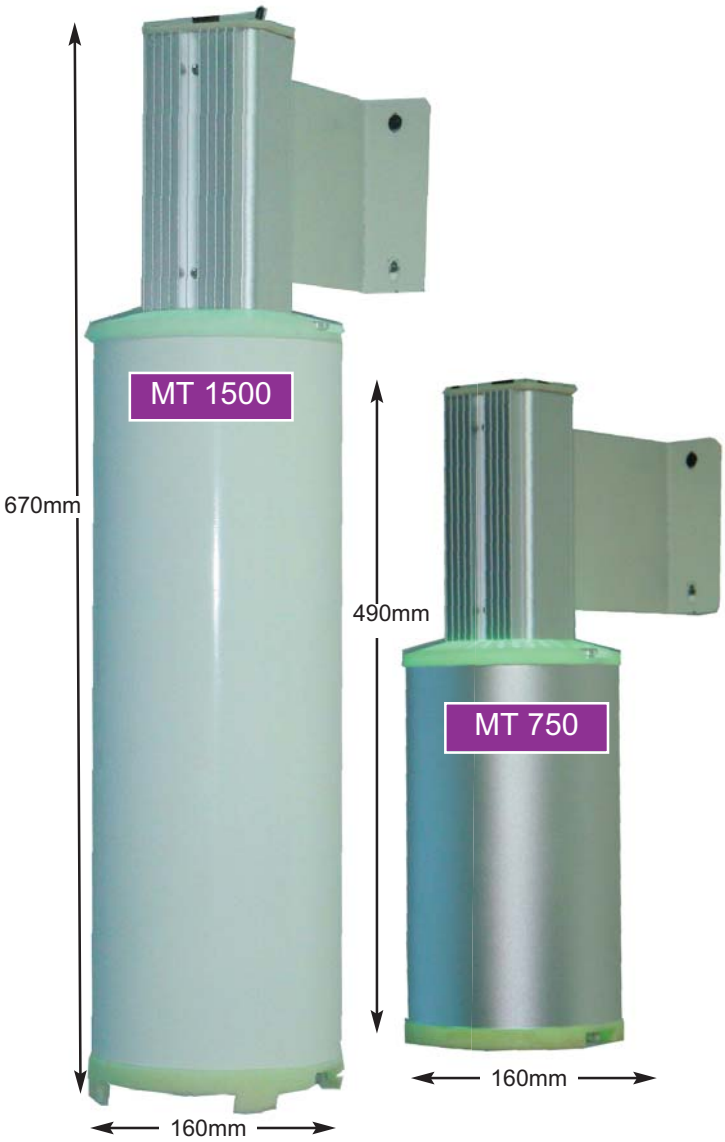
Maxi Environmental Limited

Maxi Thermal MT 750, 1500

If you could control odours while reducing costs why would you not do it?



Odours and infections are created by Bacteria, Viruses, Mould, Fungi and Volatile Organic Compounds (VOCs) found in the air and on surfaces.

Environmental Protection legislation makes it an offence to manage waste in a manner likely to cause harm to human health or the environment, including offence to the senses. Waste processing, sewerage, poultry plants, food manufacture, composting and many more industrial processes are all subject to odour control regulations

Cleaning, filtration and chemical dosing cannot control the source of the odours while masking odours with strong fragrances can only have a limiting effect. In just eight hours one bacteria can multiply to 8 million suggesting that continuous processes are required.

The Maxi Thermal 750 and 1500 offer 24/7 control of odour and infections in large enclosed spaces. The unique process uses the latest in thermal convection and U/V technology to kill up to 98% of pathogens in the air and on surfaces. Each unit offers coverage from 40m^2 to 70m^2 and a choice of lamp strengths to manage varying levels of contamination.

Hidden effects of Industrial Processing Bacteria and Viruses:

Unpleasant Odours

- Perceived poor hygiene and poor management
- Higher cleaning costs and premature refurbishment
- Non-compliance with legislation

Health Risks

- Kidney Infections, Common Cold, Influenza, Food Poisoning, Hepatitis
- Poor personal hygiene moves risk elsewhere
- Increased absenteeism and staff turnover

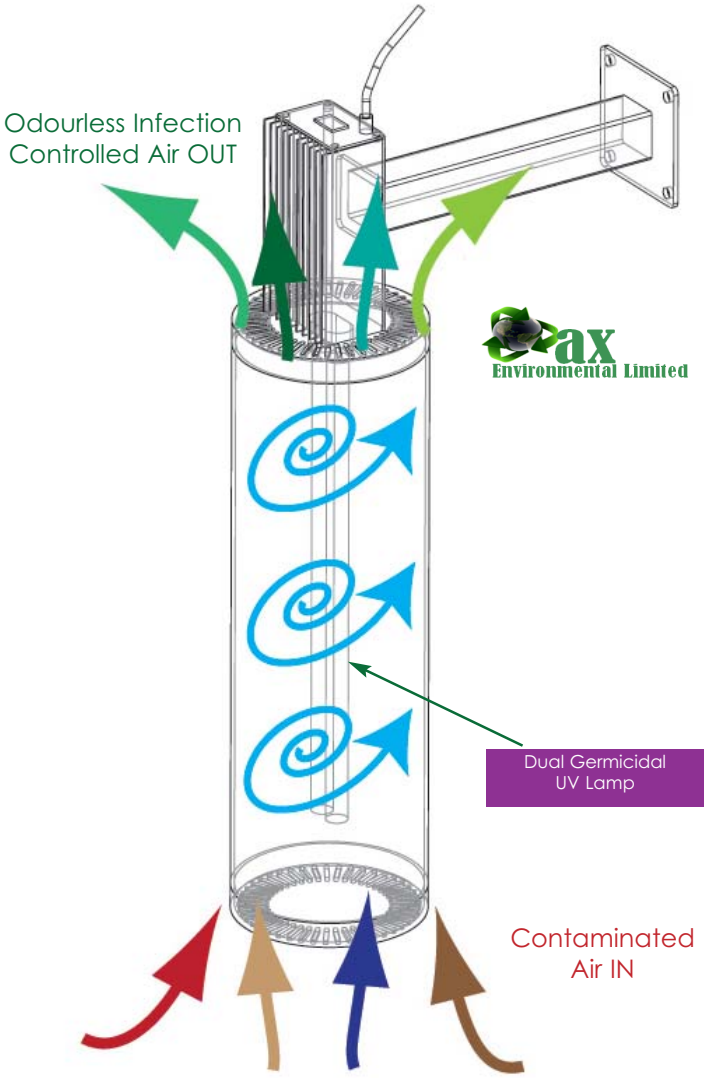
Health Protection Agency

HPA Porton Down labs proved that in one hour of continuous operation a standard Air Steril MP20 unit killed 98.11% of airborne contamination. The HPA concluded that these results demonstrated the effectiveness of the Air Steril technology.

The Complete Air Purification Solution

Maxi Environmental Limited

Control Odours Eliminate Harmful Bacteria



How Does Air Steril Thermal Convection Work

The line drawing above shows the inner workings of an Air Steril Maxi Thermal unit

By unassisted thermal convection, the unit takes in contaminated air and purifies it using our unique dual lamp system. The dual ultraviolet light operates at the peak UVC wavelengths. One lamp makes ozone (O^3)and the other lamp coverts the ozone to hydroxyl radicals (OH) short-lived but powerful destroyers of the DNA of airborne pathogens

Specialist thermal convection smoothly moves air through the unit, and distribution of air over the dual lamp is controlled to increase exposure to the UV light providing maximum pathogen destruction both internally and around the internal space environment.

With a MT decontamination air purification unit from Air Steril you will

- Control odours 24/7
- Improve working environments
- Help staff healthcare
- Reduce chemical usage
- Reduce deodorants and perfumes
- Improve the image of your organisation
- Comply with legislation

Improving air quality in industrial processing plants will clear odours and improve the healthcare of your staff and visitors. The Air Steril Maxi Thermal 750 and 1500 eliminate unpleasant odours and controls harmful Bacteria and Viruses both in the air and on all exposed surfaces 24 hours a day, 365 days a year. Suitable for all enclosed spaces but not for use in areas of sedentary continuous occupation. With minimal maintenance and low consumption, they provide a green solution which improves the air quality and local environment for all users.

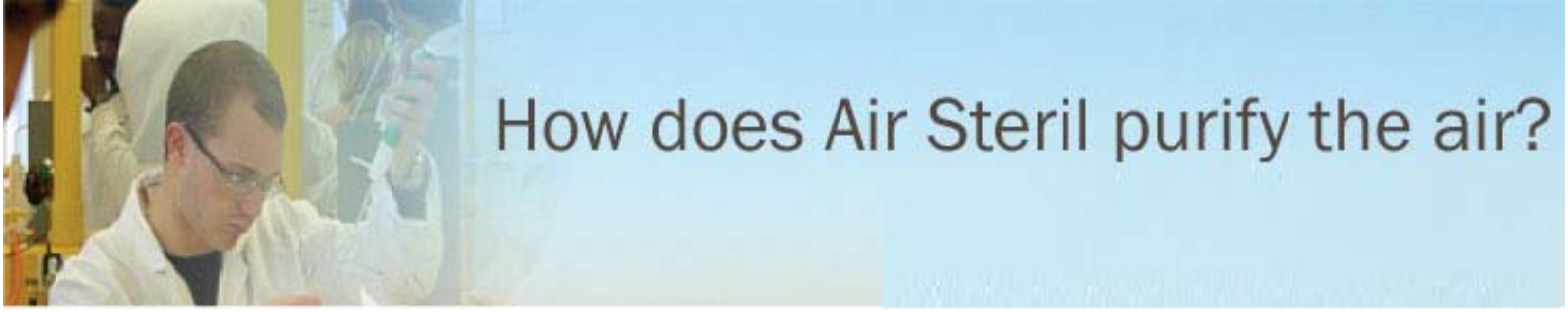
The advanced technology of the Maxi Thermal unit allows the control of Bacteria, Viruses and Moulds both in the air and on surfaces more efficiently than ever before. All of this is achieved without fans and with very low energy consumption The custom designed Thermal convection system ensures that contaminated air processed through the unit achieves optimum *dwell time* in the purifying chamber. As the processed air leaves the unit then in itself it becomes an efficient cleaning agent targeting pathogens both in the air and on surfaces.

The Maxi Thermal offers a unique design without the need of a fan motor or moving parts. All parts which could be affected by onerous off-gassing of caustic materials are encased an a hermetically sealed insulated chamber.

For more information call

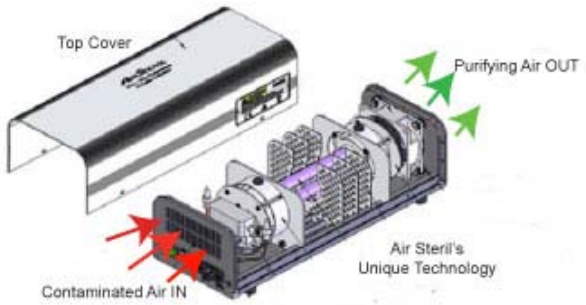
01206 4 6000 4

Dax Environmental Ltd
1 weyland Drive, Stanway, Colchester, Essex, CO3 0RG
Tel 01206 4 6000 4 Fax 01206 548136 airsteril@dax-environmental.co.uk



There are five independent mechanisms that Air Steril units use. Each mechanism can be individually controlled to create tailor-made solutions that meet specific purification applications and requirements.

The five technologies are:

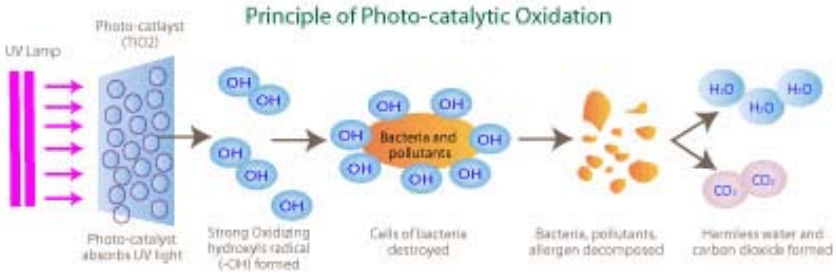


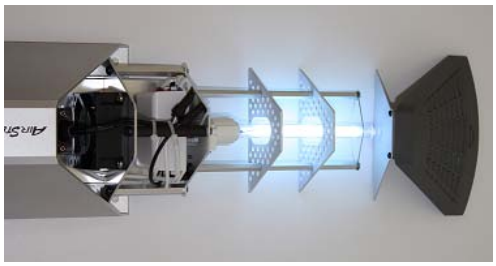
Internal
- Germicidal Irradiation (UV light)
- Heterogeneous Catalysis

External
- Triatomic Oxygen Sterilization (Ozone)
- Plasma Quatro
- Super Oxide Ion Generation

Germicidal Irradiation (UV light) will kill micro-organisms as the air passes through the unit by disrupting the DNA of micro-organisms and preventing reproduction.

The Titanium Dioxide Plates inside the unit act as a Hetrogeneous Catalysis with the UV light to transform oxygen into a reactive state so it accepts a single electron, the molecule that gave up the electron is oxidised. The result is the production of Superoxide Ions. Part of this process also produces Hydroxyl Radicals which are one of the strongest oxidizers known, stronger than ozone.





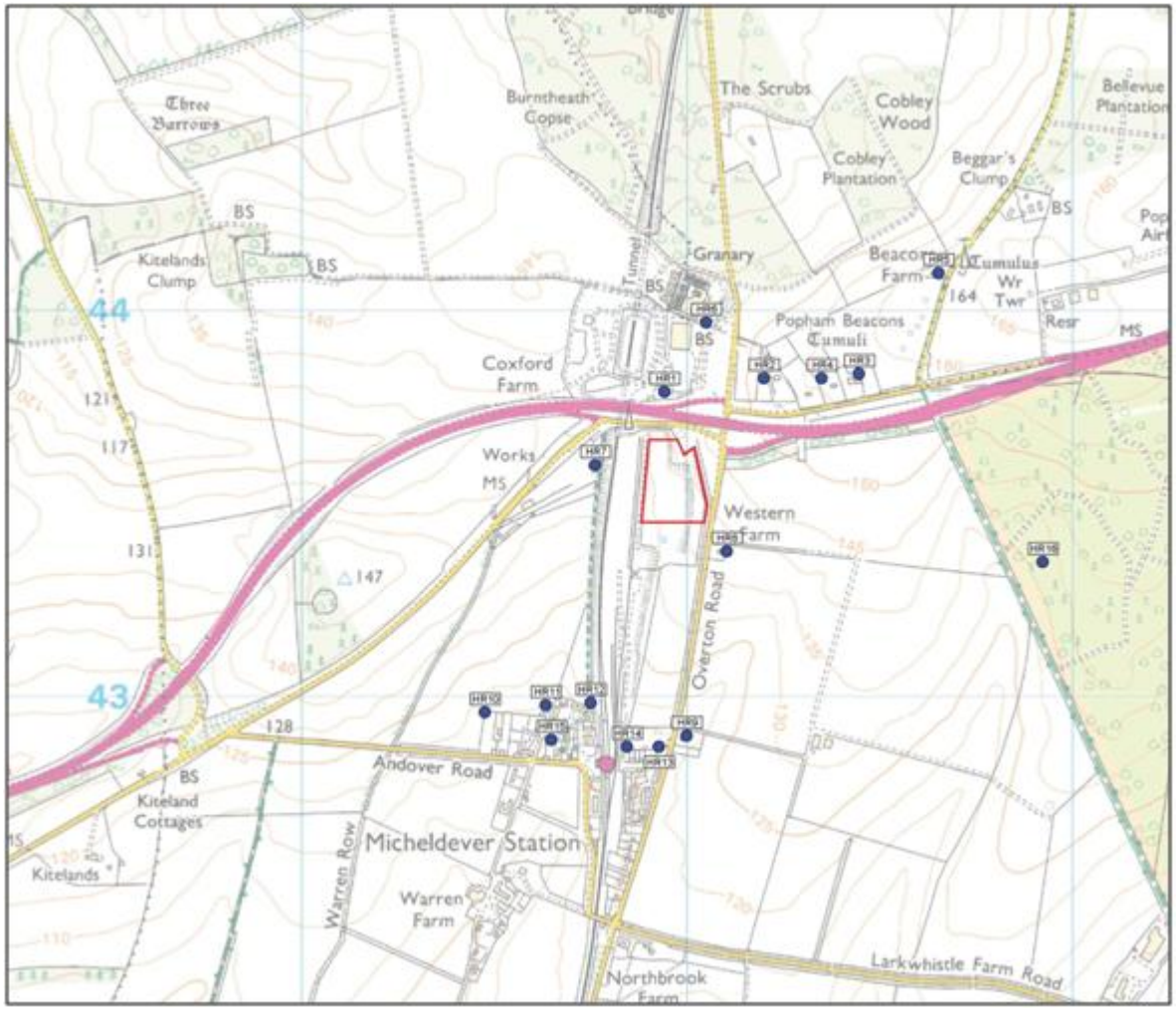
The negatively charged Superoxide Ions work by electrically charging air contaminates as small as 0.01 microns and causing them to form clusters, thus assisting removal from the air and aiding the other processes.

Triatomic Oxygen (Ozone) is excited oxygen atoms produced via a catalyst in the lamp (Quartz). Triatomic Oxygen, will eliminate bacteria, viruses, fungi and VOC s in the air and on exposed surfaces as it leaves the unit with the air flow.

Plasma Quatro is the gas energized by the high intensity UV light, it leaves the unit with the airflow and consists of a mixture of activated oxygen, triatomic oxygen and superoxide ions. These interact with each other giving a very efficient purification of the air and all exposed surfaces. Many times more efficient than ozone or UV light working alone.

AIRsteril
infection & odour free environment

Annex A2: POTENTIAL ODOUR RECEPTORS


Three Barrows
Burntheath Copse
The Scrubs
Cobley Wood
Cobley Plantation
Beggar's Clump
Bellevue Plantation
BS
Kitelands Clump
Granary
Tunnel
Beacon Farm
Cumulus
164
Popham Beacons Tumuli
Resr
MS
44
Coxford Farm
121
117
Works
Western Farm
131
147
Overton Road
43
128
Andover Road
Kiteland Cottages
Kitelands
Micheldever Station
Warren Row
Warren Farm
Northbrook Farm
Larkwhistle Farm Road

Annex B: FAILURE & ABNORMAL EVENT SUMMARY TABLE

Table B: Failure and Abnormal Event Summary					
Odour Generating Process	**Release Points**	**Abnormal Situation / Failure**	**Potential Outcome**	**Control Measure**	**Action (Resp)**
Reception, Screening etc	Reception area	Extended duration of stable meteorological conditions	Elevated odour concentrations at receptors	Weather forecast, manage reception in response to wind/weather conditions. Olfactory survey and complaint monitoring	Progressive initiation of control measures as necessary and compliant investigation in accordance with Section 6.3 (Site Manager).
Air Emissions from Waste-to-Energy Process	Stack A1	Failure of thermal oxidiser and extraction system	WID Non-compliance. Elevated odour concentrations at receptors.	Monitor odour level. Shut down WTE plant until thermal oxidiser is repaired and fully operational.	Access reason for failure and amend procedures as necessary (Site Manager).
Damage to building	Building Fabric	Damage to sealing systems preventing negative pressure operation	Odour release	Immediate temporary repair of building fabric	Replacement of panelling section
Build up of wastes within reception areas causing odour	Doors (potentially)	Failure of conveyor systems and autoclave plant	Odour release	Immediate repair of conveyor – critical spares are stored on site	Replacement of key conveyor components.
Failure of AD Odour Control Devices	Engine Stacks	Hydrogen sulphide builld up in tanks.	Odour release from stacks	Oxygen and pH levels continuously monitored in AD tanks. All plant continuously monitored	Plant Engineering Team.

Annex C: EXAMPLE OLFACTORY ASSESSMENT FORM

OLFACTORY SURVEY ASSESSMENT REPORT		
Name of Assessor:		
Reference Table 1* - Confirmation (signature) *confirmation that conditions of Reference Table 1 are met		
Survey Timings	Date	
	Start Time	
	Finish	
Location of complaint (if relevant)		
Wind Direction		
Wind Velocity (m/s)		
Cloud Cover (%)		
Temperature (°C)		
Precipitation		

Location [1]	Odour Intensity [2]	Odour Extent [3]	Odour Description [4]	Receptor Sensitivity [5]

Sketch

Provide a sketch of test and source locations

[1]Include compliant location first (if relevant)
[2]Refer to Reference Table 2
[3]Refer to Reference Table 3
[4]Describe the character of the odour (e.g. rotten eggs, musty, earthy, drains etc)
[5]Refer to Reference Table 5

Notes;

If odour intensity is judged as 3 or above at a sensitive receptor location the Site Manager must be immediately notified

The extent of the plume should be investigated as follows:

Choose a suitable location downwind of the compositing facility and sensitive receptor at which the odour plume is unlikely to extent. Continue toward the site until a faint odour is detectable.

Select further assessment points at right angles to the plume axis and equidistant from the composting facility to determine extent of plume.

REFERENCE TABLE 1
Requirements for Assessor
Assessor has not been exposed to composting odours for previous 30 minutes
Assessor has not smoked or consumed strongly flavoured food or drink in previous 30 minutes
Scented toiletries should not be applied immediately before or during assessment.
Vehicle used for assessment should not contain deodoriser and care should be taken concerning odour in windscreen wash.

REFERENCE TABLE 2	
Odour Intensity	Description
1	No detectable odour
2	Faint odour (barely detectable, need to stand still and inhale facing into wind.
3	Moderate odour (odour easily detectable while walking and breathing normally, possibly offensive)
4	Strong odour (bearable, but offensive odour – will my clothes hair/smell?)
5	Very strong odour (malodorous)

REFERENCE TABLE 3	
Odour Extent	Description
1	Local and transient (only detected during brief periods when wind drops or blows)
2	Transient as above, but detected away from site boundary
3	Persistent but fairly localised
4	Persistent and pervasive up to 50m from site boundary
5	Persistent and widespread (odour detected > 50m from site boundary

REFERENCE TABLE 4	
Receptor Sensitivity	Description
1	Low (e.g. footpath, road)
2	Medium (e.g. industrial or commercial workplaces)
3	High (e.g. housing, pub/hotel etc)

Annex D: ODOUR COMPLAINT REPORT FORMS

ODOUR COMPLAINT REPORT FORM	
Time and date of complaint:	
Name and address of complainant:	
Telephone number of complainant:	

Date of odour:	
Time of odour:	
Location of odour, if not at above address:	
Weather conditions (i.e., dry, rain, fog, snow):	
Temperature (very warm, warm, mild, cold or degrees if known):	
Wind strength (none, light, steady, strong, gusting):	
Wind direction (e.g. from NE):	
Complainant's description of odour: ○ What does it smell like?	
○ Intensity (see Reference Table 1):	
○ Duration (time):	
○ Constant or intermittent in this period:	
○ Does the complainant have any other comments about the odour?	
Are there any other complaints relating to the installation, or to that location? (either previously or relating to the same exposure):	
Any other relevant information:	
Do you accept that odour likely to be from your activities?	
What was happening on site at the time the odour occurred?	
Operating conditions at time the odour occurred (e.g. flow rate, pressure at inlet and pressure at outlet):	
Actions taken:	

Form completed by:	Date:	Signed;

Odour Intensity	Description
1	No detectable odour
2	Faint odour (barely detectable, need to stand still and inhale facing into wind.
3	Moderate odour (odour easily detectable while walking and breathing normally, possibly offensive)
4	Strong odour (bearable, but offensive odour – will my clothes hair/smell?)
5	Very strong odour (malodorous)

Annex E: RESPONSIBLE PERSONS

Table C1: Responsible Persons		
Control Measure	Responsible Persons	
	Implementation on-site	Overall Manager
Receipt of waste and off-loading In accordance with Section 3.1.		
Autoclaving, Pyrolysis & Syngas combustion In accordance with Section 3.2/3.3		
Digestion & Storage In accordance with Section 3.4		
Treatment of Biogas In accordance with Section 3.5		
Meteorological monitoring In accordance with Section 6.2		
Olfactory Surveys In accordance with Section 6.3		
Complaint monitoring In accordance with Section 6.5		

Overall Responsibility and Authority: