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## IND-G-002

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**Registration activity Biomass waste incineration between 50kg and 3,000kg per hour**

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# Introduction

This document provides information and guidance for anyone undertaking incineration of biomass waste (the burning of organic matter such as waste wood or plant materials) in a plant with a capacity of more than 50kg per hour and equal to or less than 3000kg per hour which may be authorised under the Environmental Authorisation (Scotland) Regulations (EASR).  It should be read alongside the standard conditions for this activity.

# What activity does this guidance apply to?

The incineration of biomass waste in incineration or co-incineration plant with a capacity of more than 50kg per hour and equal to or less than 3000kg per hour.

Biomass waste is defined as:

* Vegetable waste from agriculture and forestry.
* Vegetable waste from the food processing industry, if the heat generated is recovered.
* Fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and the heat generated is recovered.
* Cork waste.
* Wood waste with the exception of wood waste which may contain halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coating and which includes, in particular, such wood waste originating from construction and demolition waste.

You can find the European Waste Codes identifying the specific wastes in the Waste Acceptance section of this guidance document. These codes are a list of waste types which categorise wastes based on a combination of what they are, and the process or activity that produces them. More information on the waste codes and how to use them is available on the [NetRegs website](https://www.netregs.org.uk/environmental-topics/waste/duty-of-care-your-waste-responsibilities/european-waste-catalogue-ewc-waste-codes/).

# This guidance does not apply to:

* The pre-treatment of biomass waste.
* The post-treatment of bottom ash.
* Plants with a capacity of 3000kg per hour or more.
* Plants with a capacity of 50kg per hour or less.

These activities are likely to require a waste management authorisation from SEPA.

# Description of biomass waste incineration and co-incineration activities

The authorised activities are the incineration or combustion of biomass waste and the immediate storage of bottom ash.

This activity will apply to sites where biomass waste - such as wood - is burned to provide heat. Examples of where this activity might take place include furniture manufacturers burning clean waste wood offcuts to heat their premises, or wood waste being burned in a biomass boiler at a hospital.

A typical biomass waste incineration / co-incineration process includes:

* Storage of biomass waste in weather-proof containment.
* Mixing of biomass waste to create a homogeneous feedstock.
* Automatic mechanical feeds.
* Combustion chamber.
* Automatic control systems for temperature, oxygen levels and balanced primary and secondary air.
* Storage of bottom ash.
* Waste acceptance criteria and checks.

This activity does not authorise the drying of biomass waste, which is categorised as pre-treatment of waste however, the process and/or any combustion plant used in the drying process may require authorisation separately. Please see the SEPA website for details.

## What is co-incineration?

* The use of waste as a regular or additional fuel in a co-incineration plant; and/or
* The thermal treatment of waste for the purposes of disposal in a co-incineration plant.

‘Co-incineration plant’ means any stationary or mobile plant whose main purpose is the generation of energy or production of material products and:

* Which uses wastes as a regular or additional fuel, or
* In which waste is thermally treated for the purpose of disposal.

If you top up a boiler’s clean virgin wood feedstock with particleboard offcuts from furniture manufacturing this would count as co-incineration and would fall under this Activity. That is because the particleboard offcuts are categorised as waste. Please [read the SEPA Guidance for Biomass Combustion](https://www.sepa.org.uk/media/155820/ppc_technical_guidance_tg22_biomass_combustion.pdf) for additional information.

## Waste acceptance

* Only clean wood waste is to be incinerated/combusted the process. This is wood that has not been subject to any chemical treatment and has not been accidentally contaminated (e.g. has had paint or oil spilled on it, treated with a preservative, etc.).
* The following waste types must not be incinerated/combusted:
	+ Biomass containing halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coating.
	+ Biomass that has been classified as hazardous waste.
	+ Biomass that has originated from construction and demolition works (commonly known as Grade B, C & D waste wood within the industry).
* Procedures must be in place to ensure that only acceptable biomass waste is incinerated/combusted.
* All accepted waste must be accompanied by [Duty of Care documentation](https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2012/10/duty-care-code-practice/documents/00404095-pdf/00404095-pdf/govscot%3Adocument/00404095.pdf).

Authorised biomass waste types:

* Waste codes **02 01 03** and **02 01 07:** Plant tissue waste from agriculture, horticulture and forestry.
* Waste code **03 01 01:** Waste bark and cork from wood processing and the production of panels and furniture (waste must not have been chemically treated).
* Waste code **03 01 05:** Sawdust, shavings, cuttings, wood, particle board and veneer that is fixed to the board, other than those mentioned in 03 01 04 (waste must not have been chemically treated).
* Waste code **03 03 01:** Waste bark and wood from pulp, paper and cardboard production and processing (waste must not have been chemically treated).
* Waste code **15 01 03:** Wooden packaging. Only visibly clean wooden packaging, including pallets, where no chemical treatments have been applied.
* Waste code **19 12 07:** Wood other than wood containing hazardous substances (19 12 06) from waste management facilities. Only source-segregated, visibly clean, single waste wood streams such as pallets, where no chemical treatments have been applied.

Please read the SEPA Authorisation Guidance for Biomass Combustion for further information on acceptable woods.

# Environmental controls

It is expected that the methods described in this section are utilised to control emissions from the biomass incineration activity. Where other methods are used, they should offer at least an equivalent level of environmental protection.

## Controls to achieve good combustion:

* The aim is to prevent any visible air borne emissions from any part of the process.
* Emissions from combustion processes should be free from smoke during normal operations.
* Emissions of carbon monoxide and other hydrocarbon emissions should be limited through good combustion of fuel and taking steps to avoid incomplete combustion.
* Sulphur oxides must be limited by using suitable low sulphur fuels compliant with the sulphur content of liquid fuels regulations.
* Biomass waste should be stored under cover to keep fuel dry.
* Biomass waste types (for example offcuts, briquettes, wood chips and dust) should be stored and fed separately to improve control of the combustion conditions.
* Automatic fuel feed systems should be used to prevent the emission of smoke and other pollutants.
* Flue gases should be recirculated to assist optimum combustion and reduce emissions of nitrogen oxides (NOx).
* The following should be managed and controlled:
* Fuel content and its feed rate.
* Primary and secondary air.
* Temperature in the combustion chamber.
* Oxygen levels.

## Combustion start-up and shutdown emissions

* The number of start-up and shutdowns of combustion plant should be kept to a minimum.
* All reasonable steps must be taken to minimise emissions during start-up and shutdown.
* An ancillary burner fuelled by natural gas, gas oil or virgin wood should be used to raise the temperature of the combustion zone on start-up from cold and prior to inserting biomass waste.

## Emissions controls and dispersion

The emissions from the (co-)incineration of biomass waste and associated activities which require control include:

* Dust.
* Carbon monoxide.
* Odour.
* Oxides of nitrogen.
* Total volatile organic compounds.

For melamine-faced biomass waste hydrogen cyanide must also be controlled. Melamine resin is a hard plastic material often applied to particleboard, medium density fibre (MDF) or plywood to improve durability, look and texture.

For plywood, chipboard, fibreboard and similar fuels formaldehyde must also be controlled.

Where wet arrestment (i.e. wet scrubber) is used as abatement in the process, unacceptable emissions of droplets may occur if the linear velocity exceeds 9 metre/second. This should be avoided by fitting mist arrestors, or, in existing plant without mist arrestors, reducing this velocity as far as practicable.

* All reasonable steps must be taken to ensure there are no visible dust emissions from any plant, conveyor, transfer point or stockpile to ensure there are no visible emissions beyond the boundary of the authorised place.
* Dust emissions should be prevented by either containment or enclosure of dusty processes.
* Emissions from a stack need sufficient dispersion and dilution in the atmosphere so that they do not ground at concentrations harmful to human health or the environment.
* Flues and ductwork should be cleaned regularly so that a build-up of material does not affect emissions and their dispersion.

To ensure sufficient dispersion is not impaired by low velocity or deflection:

* + The stack(s) exit must be vertical.
	+ A cap or restriction at the end of the stack should not be used.
	+ A cone may be used to aid air dispersion.
	+ Emission stacks for any biomass waste (co-)incineration and connected activities must have a height as follows:
* For a stack located on a building, the stack height must be greater than or equal to 3 metres above the building’s roof ridge height.
* For a stack located separately to any building, the stack height must be greater than or equal to 3 metres above the ground.
* All stacks must be at least the same height of any building which is located within a distance of 5 times the uncorrected stack height.

Emission stack height examples:

* + A stack exits through the roof of a building with a roof ridge height of 6 metres. The stack will need to be tall enough to extend to at least 9 metres from the ground line of the building so that it is 3 metres above the roof ridge. As it exits through the roof, the stack won’t need to be 9 metres long itself, just long enough to reach a 9m height from the building ground-level.
	+ A stack stands beside the building which it serves. The building roof ridge height is 6 metres. In this case the stack will need to be at least 9 metres tall.
	+ In both the above cases, there is another building located within 5 times the uncorrected stack height i.e. 5 x 9 metres = 45 metres. This building has a roof ridge height of 12 metres. Both stacks will need to be extended a further 3 metres in order to have a corresponding height of this additional building.

Diagram 1 on the next page shows examples of stack heights and distances from other buildings as described above.

### Diagram 1: Examples of stack heights and distances



## Abatement

Any dust collection system should be chosen to comply with the emission limit values (ELVs) and operating conditions stipulated in the Registration. Dust is removed from the exhaust gases, typically by multi-cyclones, or by electrostatic precipitation, bag-filters or ceramic filters.

### Cyclones and multi-cyclones

Cyclones and multi-cyclones remove particles such as dust from a gas stream to an extraction system through centrifugal force. Cyclone separators can be installed as single units, or in multiples, known as multi-cyclones. It is also possible to install cyclones in series, or, in parallel.

Emissions from cyclones and multicyclones will be dependent on the flow rate of the exhaust gas and the characteristics of the dust – more suited to larger dust particles.

Cyclones are often used as a first stage gas cleaning device, but cyclones alone are not expected to be able to meet the emission limit values with regard to dust.

### Electrostatic precipitators (ESP)

Precipitators function by electrostatically charging the dust particles in the gas stream. The charged particles are then attracted to and deposited on plates or other collection devices. When enough dust has accumulated, the collectors are shaken to dislodge the dust, causing it to fall with the force of gravity to hoppers below. The dust is then removed by a conveyor system for disposal or recycling.

### Fabric filters (bag houses)

Baghouses are fabric filter bags or pleated filters arranged in rows and mounted vertically in a sheet metal housing. They are designed to receive dusty gas blown in from fugitive or process sources, capture dust, and exhaust clean air. Fabric filters would need the gases to be cooled before filtration.

Operators should be provided with a guarantee from the filter manufacturer that a set of filters will meet this emission concentration limit, and the guarantee should be supported by emission test data for the filter type that the guarantee relates to.

### Ceramic filters

The operation of ceramic filter plants is similar to fabric bag houses. The gas to be cleaned is typically drawn into the plant by an induced-draft fan such that the dust being collected builds up on the outside of the ceramic elements in the form of a cake. Ceramic filters can filter gases at raised temperatures.

Operators should be provided with a guarantee from the filter manufacturer that a set of filters will meet this emission concentration limit, and the guarantee should be supported by emission test data for the filter type that the guarantee relates to.

## Bottom ash storage and disposal

The storage of bottom ash must be controlled to avoid ash escaping off-site.

* Automatic de-ashing systems should be used where practical.
* Bottom ash should be stored in covered containers, silos or undercover.

## Emissions monitoring

* Dust emissions from the biomass waste (co-)incineration plant must not exceed 60mg/m3.
* Oxides of nitrogen (NOx) emissions from the biomass waste (co-)incineration plant must not exceed 400mg/m3.
* Total volatile organic compounds emissions from the biomass waste (co-)incineration plant must not exceed 20mg/m3.
* Monitoring must be carried out:
	+ At the biomass waste (co-)incineration stack using monitoring standards BS EN 13284-1, BS EN 15058, BS EN 14792 and BS EN 12619.
	+ Within the first 4 months of starting operations and then annually after that.
	+ Without adding air to dilute emissions.
	+ During normal operations and under stable conditions.
* The sample point should be:
	+ Designed according to BS EN 15259.
	+ Installed, maintained and clearly marked to ensure safe and

representative collection.

# Management techniques

Good management techniques, training and well-maintained infrastructure are key to prevent and limit the consequences of accidents which could have an impact on the environment. For example, bunding should be used around liquid storage to contain any spillages, but good management and maintenance would take this a step further by ensuring that the integrity of the bunding is checked regularly to prevent leaks, and deliveries and movements around the site are well controlled. This will enable you to comply with environmental regulations, avoid incidents, and avoid any costs incurred through loss of resources.

* Effective control of emissions starts with proper management, supervision and training for process operators.
* Implement an environmental management system to help identify and provide a systematic approach to manage, monitor and control your environmental issues and maintain efficiency. These can be certified through ISO 140001, BS8555 or EMAS but can also be in-house.
* Develop and maintain an emergency response plans e.g. specific actions for preventing and mitigating spills or runoff that may affect water bodies. For best practice and guidance [read the CIRIA Guide to Containment Systems for the prevention of pollution (C736F)](https://www.ciria.org/ItemDetail?iProductCode=C736F&Category=FREEPUBS).

## Maintenance

Maintenance can be categorised as ‘preventative’ or ‘corrective’ (also known as ‘reactive’). Preventative maintenance includes regular planned checks, servicing and maintenance of equipment to prevent or reduce failures and breakdowns which can lead to pollution incidents, safety concerns and costly downtime. Corrective maintenance includes identifying and repairing a fault once it has occurred with the aim of restoring equipment or systems to their optimum operational condition(s).

* All aspects of the activity plant, buildings and equipment should be properly maintained and there should be a written maintenance programme with a record that the maintenance has been carried out.
* Equipment should be used properly and preventative maintenance carried out.
* Spares and consumables should be held on site so that rapid repairs can be carried out and there is no temptation to continue operating with ineffective emission controls in place.
* Where odour arrestment equipment is installed, it should be inspected at least once a day to ensure correct operation and identify any malfunctions. Depending on the type of arrestment plant this should include:
	+ Any leaks in air handling equipment and ductwork in the case of scrubbing equipment, thermal oxidisers and other combustion equipment should be identified. Inspections should include verification of the operation of any continuous monitoring equipment, the presence of any blockages and also identification of any leaks of either odorous air or liquid.

## Operator training

* Staff at all levels need to have training and instructions as to their duties to control emissions from the activity. This should include awareness of the SEPA registration requirements and actions to take in the event of incidents that may result in emissions from the activity.
* A training record should be kept for each member of staff.

## Resource use and efficiency

Best practice for resource use and efficiency is to review and implement any potential opportunities to reduce emissions and wastes. In addition to reducing the impact on the environment, you will also benefit because resource efficiency is also about:

* Reducing costs (raw material and waste disposal).
* Maximising output of product or service from a given level of materials and energy (competitive advantage).
* Finding an outlet for surplus materials therefore removing them from the waste chain.
* Helping Scotland achieve its goal of becoming a zero-waste society.
* Reducing pollution risks and avoiding reputational impacts.

Resources include water, raw materials, energy, fuel and wastes used and produced throughout a regulated process. These can be manged in the following ways:

### Raw materials

Raw material use should be managed by tracking stores and ensuring that all resources are stored appropriately to avoid contamination, spoilage or leaks. Automatic dosing equipment should be considered to ensure that optimum measured quantities are used throughout the process. LEAN methodologies that focus on reducing waste could be beneficial.

### Water

Water should be stored in adequate containers and any pipework and taps maintained to avoid leaks and evaporation. Where possible use rainwater harvesting and recycled water.

### Waste

Ensure waste is managed in line with the waste hierarchy (prevention > prepare for reuse > recycle > recover value > disposal). Segregate any waste and store appropriately to ensure that it can be managed as high up the hierarchy as possible.

### Heat

Where heat is used or generated, ensure that optimum temperatures are maintained during the process; buildings, pipes and tanks should be insulated to minimise heat loss, and where possible any heat captured and used elsewhere.

### Energy

Ensure energy is used efficiently across the site by monitoring energy use, ensuring any lighting, motors, compressors or other equipment is well maintained and working at optimum, rather than maximum, levels. Consider replacing with more energy efficient equipment during upgrades. Servicing to manufacturer’s recommendations and preventative maintenance, instead of only reactive maintenance after plant faults, are also important in ensuring equipment works optimally.

# Interpretation of terms

|  |  |
| --- | --- |
| **Term** | **Definition** |
| Biomass waste | 1. Vegetable waste from agriculture and forestry.
2. Vegetable waste from the food processing industry, if the heat generated is recovered.
3. Fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and the heat generated is recovered.
4. Cork waste.
5. Wood waste with the exception of wood waste which may contain halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coating and which includes, in particular, such wood waste originating from construction and demolition waste.
 |
| Chemically treated | In respect of waste, means waste which may contain halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coating and which includes, in particular, such waste originating from construction and demolition waste. |
| Complete combustion | Combustion of a hydrocarbon fuel with a sufficient supply of oxygen to ensure only carbon dioxide and water are produced. Incomplete combustion would result in carbon monoxide also being produced.  |
| Co-incineration  | 1. The use of waste as a regular or additional fuel in a co-incineration plant.
2. The thermal treatment of waste for the purposes of disposal in a co-incineration plant.
 |
| Dust | Suspended solid particles and liquid droplets suspended in air which may be deposited on surfaces and may cause air pollution and/or nuisance.  |
| Environmental harm | 1. Harm to the health of human beings or living organisms,
2. Harm to the quality of the environment, including:
3. Harm to the quality of the environment taken as a whole.
4. Harm to the quality of air, water or land.
5. Other impairment of, or interference with, ecosystems.
6. Offence to the senses of human beings.
7. Damage to property.
8. Impairment of, or any interference with, amenities or other legitimate uses of the environment.
 |
| Event | 1. Any accident which has caused or could cause environmental harm.
2. Any malfunction, breakdown or failure of plant, infrastructure or techniques which has caused or could cause environmental harm.
3. Force majeure or action taken to save human life or limb.
 |
| Incineration | The thermal treatment of waste with or without recovery of the combustion heat generated.  |
| List of waste | The list of waste established by Commission Decision 2000/532/EC replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste, as amended from time to time. |
| Normal operation  | Operation of the authorised activities excluding start-up and shut-down periods and periods operational malfunction and breakdown. |
| Oxides of nitrogen | Nitric oxide and nitrogen dioxide, expressed as nitrogen dioxide (NO2). |
| Shut-down | The process of shutting down of all or part of a process within an authorised activity so that stable operating conditions are no longer reached.  |
| SEPA officer | An officer authorised under section 108 of the Environment Act 1995. |
| Start-up  | The starting or restarting of all or part of a process following shutdown within an authorised activity before reaching minimum stable operating conditions. |
| Uncorrected stack height | The stack height before any required increases in height are made to account for any nearby buildings.  |
| Waste code | The six-digit code referable to a type of waste in accordance with the List of Waste and in relation to hazardous waste, includes the asterisk. |

## Disclaimer

This guidance is based on the law as it stood when the guidance was published.

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