Attachment D2

Molaisín Compost Ltd
Waste Licence Application

Attachment D2 - Facility Operation

General

The process used to compost biowaste in the facility is based on the Rutgers static pile system of composting, "a high-level technology which uses forced aeration of large static piles with blowers" (Haug R.T, 1993). The incoming biosolids are mixed with dry finished compost and other dry amendments. The amendments are used are sawdust, chopped straw, woodchips, leaves and paper powder. In the Rutgers system, air is blown from the underside of the static pile of composting material towards the exterior of the mixture. This reduces volatilisation in the static mixture system and the possibility of odour emissions. The system maintains a temperature ceiling of just greater than 55°C by means of the on-demand removal of heat by ventilation through temperature feedback control. This encourages a high decomposition rate since significantly higher temperatures inhibit and slow down decomposition by reducing microbial activity. After the initial phase of high rate composting, the material is matured in a curing area before its subsequent use as a finished product. The aerobic process in conjunction with an efficient process air extraction system followed by biofiltration has proven effective in eliminating odour emissions.

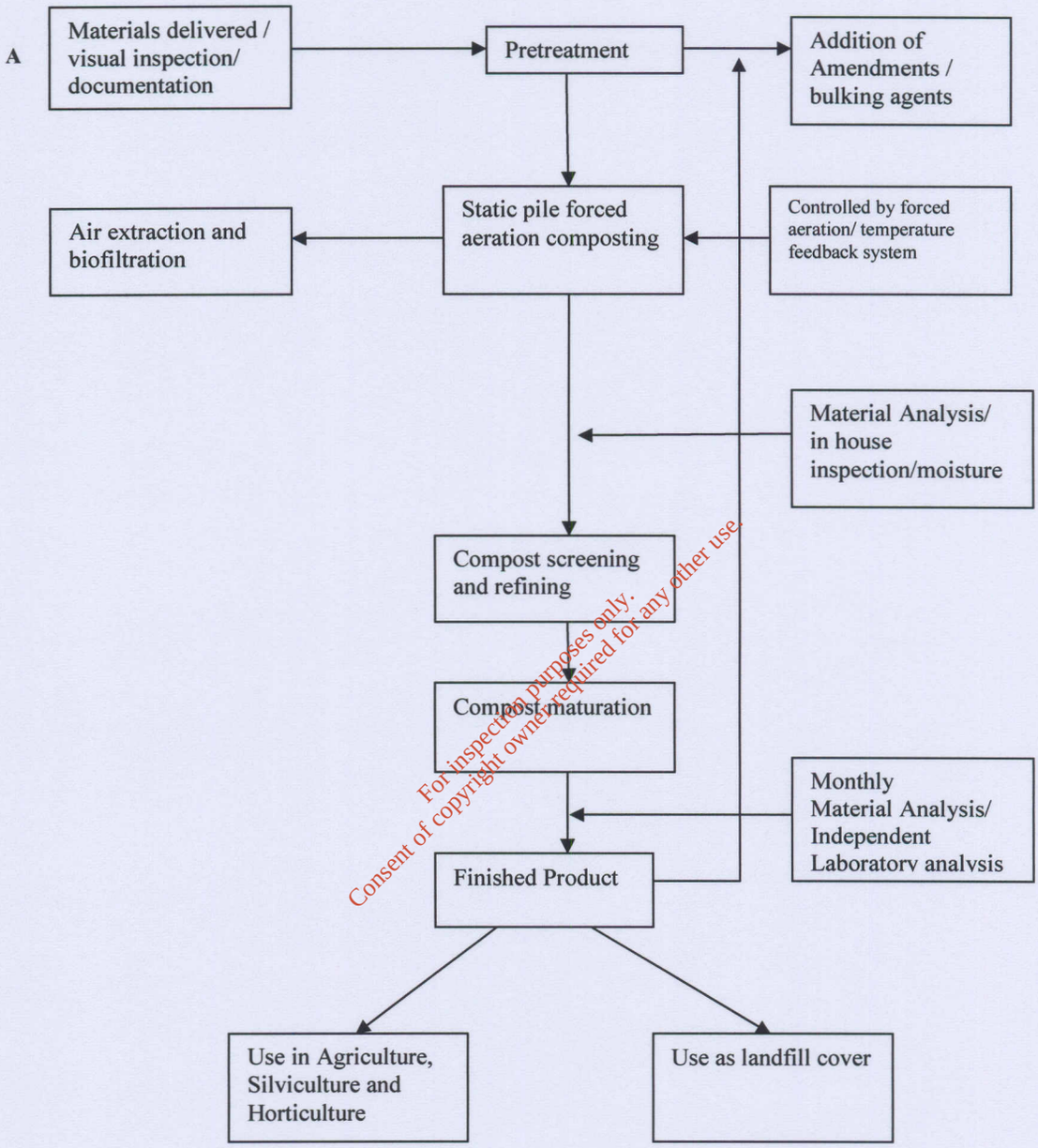
Description of process steps

The process steps are shown schematically in Figure 1.1.

The process can be divided into five steps:

1. Preparation;
2. Forced aeration static pile composting with temperature feedback control;
3. Compost screening and refining;
4. Compost maturation;
5. Finished product.

Figure 1.1 McGill Composting Unit Operations Diagram



Preparation

Biowaste is delivered to Molaisín Compost facility by collection vehicles. The delivery trucks are visually inspected and material manifests signed by personnel before driving to the delivery point inside the composting building. The delivery point is a designated tipping area consisting of mass concrete walls at three sides which contain the biowaste. Any foreign materials which may cause damage to machinery or disturb the process are removed from the biowaste prior to mixing.

Any of the bulking agents and biowastes used in the process have a small particle size of less than 5cm, and the biowaste is homogenous in nature.

Many of the waste streams accepted at the facility are of differing moisture content or consistency and require the careful addition of amendment to prepare a suitable composting mixture with appropriate moisture content of around 55% and Carbon-Nitrogen (C/N) ratio of approximately 30:1. Correct mixing is necessary to begin a fast odour free process and ensure the predictability of the finished product.

The appropriate amendments are added with the biowaste into a hopper by a front end loader. This allows the controlled addition of the materials into a mechanical mixer. The mixer is specifically designed to blend the materials uniformly so that the characteristic parameters are met.

A front end loader collects and fills the composting process bays which measure 6 metres wide and 15 metres long. The composting bay consists of a concrete floor with 10 evenly spaced embedded channels. Permanent perforated polyvinyl chloride (PVC) pipes are fitted into the channels. The perforated pipes are used to blow air through the material in the aerated static piles. The pipes are removable for cleaning and maintenance. The processing floor area consists of a central processing area and 10 composting bays.

No leachate emanates from the static composting piles. Specific mixing ratios are used to form a composting mixture of suitable moisture content. The moisture levels result in the compost having a large moisture holding capacity. If the polymers contained in many of the biosolids break down, water is released which has been bound up in the polymers structure. Instead of the water running out of the piles like what can happen in

unmanaged piles, the bulking agents in the mix have sufficient absorbency to hold the moisture in. Moisture levels of all incoming materials are obtained through analysis and used to produce a uniform predictable mix.

Forced aeration static pile composting with temperature feedback control.

The aerated static pile process differs from other processes in that composting material is not turned. Aerobic conditions are maintained by forced aeration through the pile. The size and quantity of bulking agent must be controlled to maintain porosity throughout the pile and assure adequate airflow without excessive blower head loss.

A layer of bulking agent such as wood chips is placed over the permanent aeration piping. The compost mixture is placed in a deep pile on the prepared bed. The outer surface of the pile is covered in a layer of compost.

At this point the pile is ready to begin operation. The blower is operated to push air into the pile. Blower operation is controlled to maintain aerobic conditions throughout the pile. Temperature feedback control, with the aid of thermocouples inserted into the piles, is used to throttle the blower to maintain a setpoint temperature. A central control panel located within the building is used to control the process.

Detention time in the aerated pile is usually between 14 and 21 days, after which the pile is dismantled. The compost must then be screened to remove lumps or bulking agent such as wood chip. Separation of the compost is required for reuse of bulking agent and for improved product quality by removing the large bulking particles.

Temperatures are recorded during the composting period. At McGill, Castletownroche, good temperature elevations are observed with the aerated static pile process, especially because of the consistent ambient temperature inside the facility. There is little ambient temperature variation during day and night, and little change even between winter and summer conditions. Temperature within the piles increase rapidly during the first 1 to 5 days, hold relatively constant and then begin to decrease after two weeks. The compost in the bays is moved once a week to other bays in a rotational manner. Subsequent curing is required to produce more mature compost.

Aeration system

Air supply is essential to the proper operation of the aerobic system. Air ventilation provides the oxygen necessary for aerobic metabolism, removes moisture from the composting material to provide drying, and removes heat generated by the biological activity to control process temperatures. Air is supplied uniformly by means of a 4.5 kW blower attached to a manifold system which evenly distributes the supplied air in a single composting bay. The air from the top of the bays is drawn by a series of strategically located fans throughout the facility and forced through the biofilters.

Compost screening and refining

At this stage the compost is prepared for a maturation phase. The compost is screened in order to break up and remove lumps or foreign material, to provide a greater food surface area for microorganisms to feed in the final maturation phase and to improve the product quality. The screening system is a mobile mechanical unit, which consists of specialised rubber separators on a series of high speed rotating shafts. The material is screened and the coarse overflow fraction is mixed with incoming materials. The fines are transported into the maturation bays at the ends of the facility.

Maturation

The finer composted material is placed on a layer of bulking agents in a composting bay and aerated intermittently. The material heats up quickly followed by a slow decrease. The compost is monitored for moisture content and temperature throughout the mass in order to assess its maturity. The material is subsequently taken out by front end loader and moved further back in the facility. The bays furthest from the processing area will contain the most stabilised product. The compost produced by Molaisín is a class 1 compost according to the European Commission Working Document Biological Treatment of Biowaste 2nd Draft. See Attached Results.

Finished Product

Depending on the origin and nature of the biosolids, the destination of the finished product will be landfill as an organic cover material or for agricultural and landscaping. Compost is transported from the facility by covered truck or trailers, and material manifests are signed by relevant personnel in order to document the life cycle of the original waste to the finished product use.

Compost quality and monitoring

The onsite composting process is carried out in such a way that a thermophilic temperature range, a high level of biological activity under favourable conditions with regard to humidity and nutrients as well as an optimum structure and optimum air conduction are guaranteed over a period of several weeks. This is in accordance with the European Commission Working Document, Biological Treatment of Biowaste 2nd Draft. The compost produced at McGill regardless of disposal route is an organic soil conditioner that has been stabilised to a humus like product, that is free of viable human and plant pathogens and plant seeds, that does not attract insects or vectors, that can be handled and stored without nuisance, and that is beneficial to the growth of plants. McGill achieves this by controlling the process:

- Temperature feedback control is applied to every batch of compost produced. This helps to regulate temperatures automatically by controlling the aeration rate throughout the pile. Temperatures of 55-65°C are reached during the first phase of high rate composting. A temperature decline back to near ambient temperatures is a good indication that the process is near completion. This is based on the fact that the rate of heat production is proportional to the rate of organic oxidation, which decreases after the more degradable material is decomposed. Temperature feedback control coupled with hand held temperature readings ensure proper control.

- The homogenous nature of the mixture ensures adequate porosity, allowing equal aeration throughout and preventing short circuiting of the pile.
- The indoor facility provides a reactor type environment which does not vary in temperature or humidity. It facilitates the processing by ensuring equal conditions throughout the year, and aids in producing a uniform predictable compost product.

Samples of composts produced during a month are taken after maturation. These are sent to an accredited Laboratory for analysis on the following parameters:

- % Dry Matter and %Volatile Solids
- pH, BOD
- Nutrient content including N, P, K, Ca, Na.
- Heavy metals (Cd, Cr, Cu, Ni, Pb, Zn, Hg, As)
- Microorganism content (Salmonella spp. Lysteria)
- Germination index

Odour Control

McGill has implemented an odour elimination programme in its facilities, because odour is a normal result from poorly managed waste handling/composting operation, odour control procedures and odour treatment equipment are included in the operation of McGill facilities. The fact that the facilities are sealed, enclosed and operate with a slightly negative pressure significantly guarantees no fugitive emissions.

Odour Abatement Technology: Biofiltration

Biofiltration is an air pollution control technology utilised by Molaisín Compost. It is installed as a "fail safe" system in case of any mismanagement within the factory. It uses a biologically active, solid media bed to absorb/adsorb compounds from the air stream

and retain them for their subsequent biological oxidation. A schematic of a biofiltration system currently used at the composting facility in Cappoquin is shown in Figure 1.2. Organic compounds are removed from the airstream by absorption and diffusion into a moist film on the filter media known as the biofilm. Any particulates and compounds either accumulate in the biofilm, or are digested by the resident microorganisms. Biooxidation, occurs when microorganisms digest the gases, particulate matter and volatile organic compounds in the presence of oxygen. Water, Carbon dioxide and other non odorous gases, biomass and mineral salts are the end products of these reactions. The result of the biofiltration process is an elimination of odour emissions.

Because biofiltration is a biological process, environmental conditions within the biofilter must be maintained at specific levels to enable survival of and efficient bio oxidation by, the microorganisms. Bacteria and fungi are the two dominant groups of microorganisms found in biofilters, but bacteria will likely dominate under favourable conditions.

Mesophilic bacteria are of most importance for biofilters used in composting operations because they prefer temperatures between 10°C and 50°C. Moisture content must be kept between 40 and 70% to maintain stable microbial growth in a biofilter. When the moisture content is too high, biofilter performance can reduce.

In addition to requirements for water, oxygen and a suitable temperature, microorganisms also require a source of nutrients. Compost is an ideal biofilter medium because it provides a well developed community of microorganisms and is a source of the required nutrients. For practical reasons McGill mixes compost with another substrate woodchips to increase the porosity of the biofilter medium and the surface area for microorganisms.

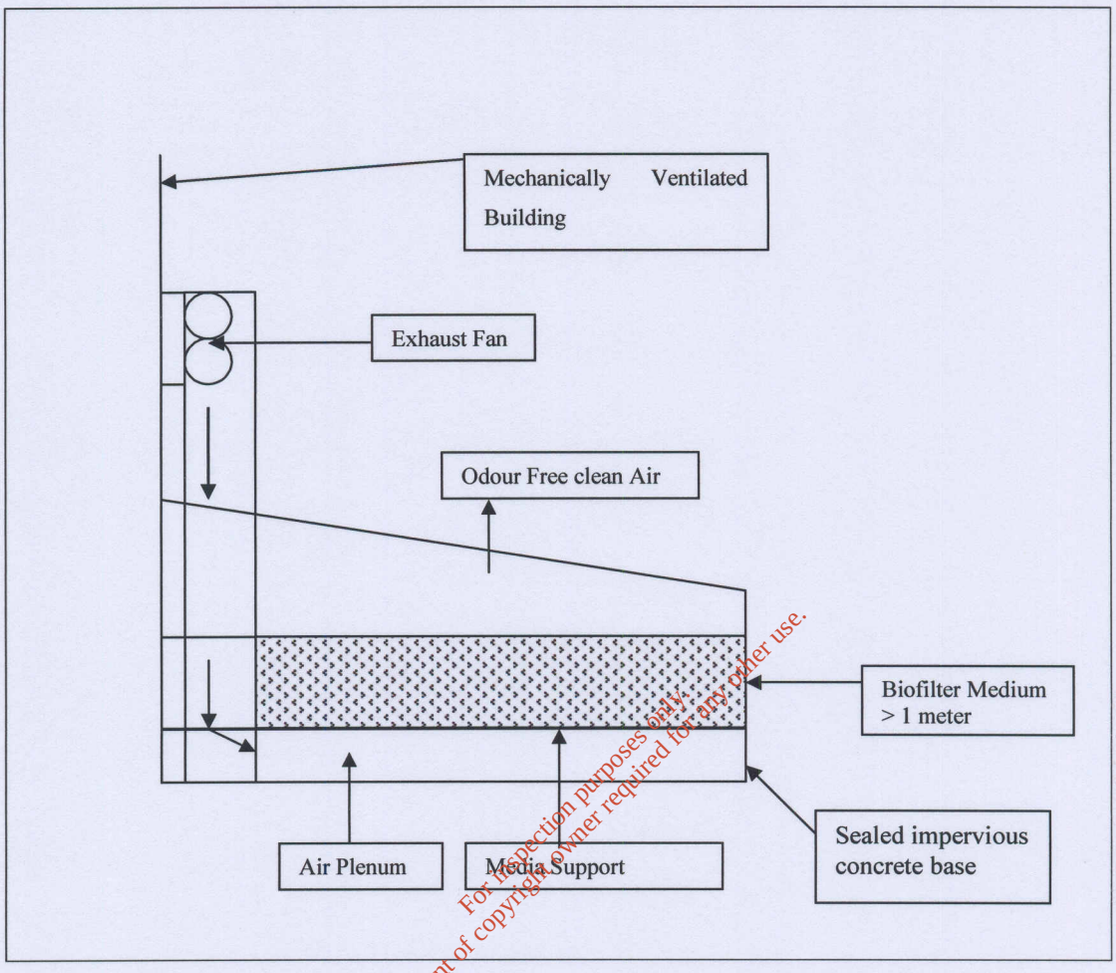


Figure 1.2 Schematic of Biofiltration system

Plant

The Plant in the facility consists of :

•A Front-end loader to bucket blend the incoming biosolids with the dry ammendment.

•A Mechanical blender to complete the composting mix before putting it into a composting bay.

•A compost screen to screen out larger compost particles which are recycled back with new material for further composting.

•10 x 5 hp aeration fans to aerate the mix in the bays, and control the temperatures of the compost pile.

•1 x 75 hp air extraction fans to remove the air from the building through the biofilters.

•Electrical power washer to clean the wheels and bodies of the trucks prior to leaving the facility.

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A copy of this certificate is available on www.euroenv.ie

Customer	Fiona Doyle Mc Gill Environmental Ballinvoher Castletownroche Co Cork Ireland	*Lab Report Ref. No.*	0360/063/01
		Date of Receipt	03/03/2008
		Date Testing Commenced	03/03/2008
		Received or Collected	Courier: Interlink
		Condition on Receipt	Acceptable
Customer PO	2047	*Date of Report*	19/03/2008
Customer Ref	MCL Jan 08	*Sample Type*	Other

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
% Dry Matter	302	Drying @ 104 C	47.5	%	
% Organic Matter	127	Calculation	93.7	%	
% Volatile Solids	310	Ashing @ 550 C	55.8	%	
Ash	311	Ashing @ 550 C	5.7	%	
Cadmium Solid (OES)	0	ICP-OES	1758.00	ug/Kg	
Carbon Nitrogen Ratio	124	Calculation	12.4	Ratio	
Chromium Solid (OES)	0	ICP-OES	2653	ug/Kg	
Copper Solid (OES)	0	ICP-OES	28716	ug/Kg	
Lead Solid (OES)	224	ICP-OES	45386	ug/Kg	
Mercury Solid (OES)	0	ICP-OES	126	ug/Kg	
Nickel Solid (OES)	177	ICP-OES	3720	ug/Kg	
Nitrogen (Total Kjeldahl) Solid	104	Digestion/ Distillation/	11730.88	mg/Kg as N	
pH (Soil)	300	Electrometry	7.4	pH Units	
Phosphate (Total) Solid	166	Digestion/ Colorimetry	1804.271	mg/Kg as P	
Potassium Solid (OES)	225	ICP-OES	1703	mg/Kg	
Zinc Solid (OES)	224	ICP-OES	61011	ug/Kg	

Signed : Donna Heslin ***Date :*** 19/03/08

Donna Heslin - Laboratory Manager

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of EURO environmental services
Results contained in this report relate only to the samples tested

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A copy of this certificate is available on www.euroenv.ie

Customer	Fiona Doyle Mc Gill Environmental Ballinvoher Castletownroche Co Cork Ireland	*Lab Report Ref. No.*	0360/063/02
		Date of Receipt	03/03/2008
		Date Testing Commenced	03/03/2008
		Received or Collected	Courier: Interlink
		Condition on Receipt	Acceptable
Customer PO	2047	*Date of Report*	19/03/2008
Customer Ref	MCL Feb 08	*Sample Type*	Other

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
% Dry Matter	302	Drying @ 104 C	44.8	%	
% Organic Matter	127	Calculation	93.7	%	
% Volatile Solids	310	Ashing @ 550 C	53.9	%	
Ash	311	Ashing @ 550 C	6.3	%	
Cadmium Solid (OES)	0	ICP-OES	1960.00	ug/Kg	
Carbon Nitrogen Ratio	124	Calculation	10.7	Ratio	
Chromium Solid (OES)	0	ICP-OES	3196	ug/Kg	
Copper Solid (OES)	0	ICP-OES	26954	ug/Kg	
Lead Solid (OES)	224	ICP-OES	23702	ug/Kg	
Mercury Solid (OES)	0	ICP-OES	106	ug/Kg	
Nickel Solid (OES)	177	ICP-OES	3974	ug/Kg	
Nitrogen (Total Kjeldahl) Solid	104	Digestion/ Distillation/	14950.88	mg/Kg as N	
pH (Soil)	300	Electrometry	7.6	pH Units	
Phosphate (Total) Solid	166	Digestion/ Colorimetry	1691.693	mg/Kg as P	
Potassium Solid (OES)	225	ICP-OES	1799	mg/Kg	
Zinc Solid (OES)	224	ICP-OES	64348	ug/Kg	

Signed : Donna Heslin ***Date :*** 19/03/08

Donna Heslin - Laboratory Manager

Acc. : Accredited Parameters by ISO 17025:2005

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Customer	Fiona Doyle Mc Gill Environmental Ballinvoher Castletownroche Co Cork Ireland	*Lab Report Ref. No.*	0360/064/06
		Date of Receipt	08/04/2008
		Date Testing Commenced	08/04/2008
		Received or Collected	Courier: Interlink
		Condition on Receipt	Acceptable
Customer PO	2078	*Date of Report*	18/04/2008
Customer Ref	MCL March 08	*Sample Type*	Other

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
% Dry Matter	302	Drying @ 104 C	73.6	%	
% Organic Matter	127	Calculation	89.9	%	
% Volatile Solids	310	Ashing @ 550 C	63.4	%	
Ash	311	Ashing @ 550 C	10.1	%	
Cadmium Solid (OES)	224	ICP-OES	661.00	ug/Kg	
Carbon Nitrogen Ratio	124	Calculation	19	Ratio	
Chromium Solid (OES)	224	ICP-OES	7132	ug/Kg	
Copper Solid (OES)	224	ICP-OES	54150	ug/Kg	
Lead Solid (OES)	224	ICP-OES	28513	ug/Kg	
Mercury (Solid)	178	ICPMS	114	ug/Kg	
Nickel Solid (OES)	177	ICP-OES	5619	ug/Kg	
Nitrogen (Total Kjeldahl) Solid	104	Digestion/ Distillation/	13663.44	mg/Kg as N	
pH (Solid)	110	Electrometry	7.7	pH Units	
Phosphate (Total) Solid	166	Digestion/ Colorimetry	3483.112	mg/Kg as P	
Potassium Solid (OES)	225	ICP-OES	2808	mg/Kg	
Zinc Solid (OES)	224	ICP-OES	134122	ug/Kg	

Signed : Donna Heslin ***Date :*** 18/04/08

Donna Heslin - Laboratory Manager

Acc. : Accredited Parameters by ISO 17025:2005

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Attachments E1-E4

Molaisín Compost Ltd
Waste Licence Application

Attachment E.1 – E.4 Emmissions

McGill incorporates biofiltration in its structure as a 'backup' system to eliminate the possibility of odorous emissions from its enclosed facility.

The biofiltration process involves bacteria and fungi that are dispersed throughout the media. As exhaust air passes through the media, the bacteria degrade odorous gases. Therefore, a biofilter is a living ecosystem of micro-organisms that continually destroy odorous gases. To support this living ecosystem, a biofilter is managed with respect to the correct moisture content, oxygen level, temperature and substrate composition.

There are no emissions to Surface Waters, Sewers or Groundwater

Attachment E5

Attachment E.5 – Noise Emissions – Report from White Young Green

White Young Green, Environmental Consultants, were commissioned to undertake a noise survey for this Waste Licence Application. Day and night-time monitoring was undertaken at four boundary locations and two sensitive receptors using a CIRRUS CR:831A data logging Integrating Sound level Meter. The measurements were made using the A-weighted frequency filter and results expressed in dB(A). All details are in the report attached.

Attachment E6

Molaisín Compost Ltd
Waste Licence Application

Attachment E.6 – Environmental Nuisances

Dust Control

All activities take place indoors at the facility. There is no loading or unloading of materials outdoors. Total dust deposition monitoring is carried out bi-annually in accordance with Standard Method VDI 2119 – Determination of Dust Fall using the Bergeroff Instrument. Samples are analysed for organic and inorganic dust. Results are expressed as total dust. Sampling is exposed for a period of 30 days +/- 2 days. The results for the last two sampling periods are included in attachment F2.

Fire Control

There are three concrete water tanks on site which are kept filled for use in case of a fire. The building is fitted with sensors that will be activated by fire. There are a number of fire extinguishers situated in and around the facility. There is an Emergency response plan in place. The site is covered by the attached Fire Certificate Reference Number 03/43.

Litter Control

The site boundary is inspected daily for litter. A skip from Waste Recovery Services, Fermoy is on site at all times for the disposal of litter.

Traffic Control

The facility operation has resulted in an average of an extra 8 vehicles travelling on the road daily. This is not expected to increase by more than 2 vehicles per day, even with the proposed extension. An increase of 100 tonnes per week is only an extra 5 delivery vehicles.

Vermin Control

Canon Environmental, an ISO 14001 and ISO 9001 registered company are contracted by McGill to control vermin on the site and around the facility. They visit the site on a monthly basis and monitor and upkeep the vermin control programme.

Road Cleansing

All activities take place within the enclosed facility. All materials delivered to or removed from the site are in covered containers.

COMHAIRLE CHONTAE PHORTLÁIRGE ❐ WATERFORD COUNTY COUNCIL

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FIRE SERVICE HEADQUARTERS,
KILRUSH,
DUNGARVAN,
CO. WATERFORD

Our Reference: Your Reference: Date:

FIRE SAFETY CERTIFICATE

BUILDING CONTROL ACT 1990

Reference No. in Register: 03/43

TO: MOLAISIN COMPOST LTD.,
per MATT FITZPATRICK,
ADDRESS: 8, CARMICHAEL LANE,
MALLOW,
CO. CORK

Application for a Fire Safety Certificate (**Ref.No.: 03/43**)

FOR: Compost Production Facility

AT: WOODSTOCK KILMOLASH

Waterford County Council hereby certify that the building or works to which the application relates, will, if constructed in accordance with the plans, calculations, specifications and particulars submitted, comply with the requirements of Part B of the Second Schedule to the Building Regulations, 1997. In considering the application, no assessment has been made as to whether the building or works will comply with the other requirements of the Second Schedule to the Building Regulations, 1997.

Dated this 14th day of August, 2003

Signed: _____
for County Secretary

Attachment F1

Molaisín Compost Ltd
Waste Licence Application

Attachment F.1: Treatment, Abatement and Control Systems

The Composting System

McGill operates an industrial composting business using a controlled, aerated static pile system with temperature feedback control. All processing takes place completely indoors in an insulated environment, maintaining an atmosphere with a continuous negative pressure. The incoming sludges are mixed with dry finished compost and other dry amendments. The amendments used are sawdust, chopped straw, ginkgo leaves and woodchips. These supply a carbon energy source to the microorganisms. The waste materials, namely biosolids, are a nitrogen source. The carbon to nitrogen ratio is an important factor in determining the correct composting conditions suitable for high rate aerobic composting.

In the automated forced aeration system, air is blown from the underside of the static pile of composting material towards the exterior of the mixture. The system maintains a temperature ceiling of greater than 55°C by means of the on-demand removal of heat by ventilation through temperature feedback control. This encourages a high decomposition rate since significantly higher temperatures inhibit and slow down decomposition by reducing microbial activity. After the initial phase of high rate composting, the material cools to ambient temperatures before its subsequent use as a stabilised finished product. Experience in McGill biowaste composting facilities in the USA has led to the successful implementation of the system in Ireland. The aerobic process in conjunction with an efficient process air extraction system followed by biofiltration has proven effective in eliminating odour emissions.

Temperature probes inserted into the composting mixture generate a control signal used to adjust the air/oxygen supply and maintain a setpoint temperature. Temperature is the controlled variable and aeration rate the manipulated variable. Aeration fans linked to a

pre-programmed control panel operate according to the temperature of the individual bays.

Throughout all stages of the composting process, parameters such as oxygen can be monitored by use of a handheld temperature and oxygen probe. This helps to ensure that the bays are being adequately aerated. Moisture can be checked by means of a "squeeze" test or using a drying oven.

All incoming biosolids are non-hazardous. No hazardous materials are handled by MES. This is ensured through the application of standard MES pre-acceptance procedures.

The factory is continually under a negative air pressure. The aerobic nature of the process prevents anaerobic conditions from forming. A biofiltration system exists at the Cappoquin composting facility as a backup odour control system. The air within the building will be extracted and biofiltered. The system has operated effectively since 2004 without problems.