



Castle Environmental

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LP3439HM/V005/NTS001: Non-Technical Summary – Use of Carbon Dioxide as treatment process reagent. Castle Waste Services Ltd LP3439HM

Introduction

Castle Waste Services Ltd operate a waste treatment facility at a site in Cardiff Docks in accordance with Environmental Permit LP3439HM. The permit allows the site to operate a range of physico-chemical treatment processes including treatment of Air Pollution Control residues (APCr). APCr are currently treated by two main processes, a physico-chemical treatment using waste acids to generate a filtercake that is currently disposed of to landfill, and a physico-chemical treatment process that washes the APCr with water to generate a mineral filtercake that is suitable for use in bound applications within the construction/construction products industries.

These processes are permitted by the below listed activities:

Table 1: Relevant Listed Activities from Environmental Permit LP3439HM

Activity Reference	Activity listed in Schedule 1 of the EP Regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity and waste types
A1 - Aqueous Hazardous waste	Section 5.3 Part A(1)(a) Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving one or more of the following activities: (ii) physico-chemical treatment; (iii) blending or mixing prior to submission to any of the other activities listed in this section or in section 5.1; (iv) repackaging prior to submission to any of	Treatment of hazardous aqueous waste for disposal or recovery. D9 Physico-chemical treatment not specified elsewhere which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12. D13 Blending or mixing prior to submission to any of the operations numbered D1 to D13.	All waste must be stored and treated in sealed containers and serviced with secondary containment measures comprising of suitably bunded impermeable surfaces with sealed drainage system. Treatment consists of neutralisation, pH adjustment, dewatering, precipitation using filter press and associated

	the other activities listed in this section or in section 5.1; (vi) recycling or reclamation of inorganic materials other than metals or metal compounds	D14 Repackaging prior to submission to any of the operations numbered D1 to D13. D15 Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection on the site where the waste is produced). R5 Recycling/reclamation of other inorganic materials. R13 Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where the waste is produced).	container handling operations. Waste types as per Table S2.2.
A2 - Aqueous non-hazardous waste	Section 5.4 Part A(1) (a) Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving one or more of the following activities, and excluding activities covered by Council Directive 91/271/EEC concerning urban waste- water treatment (ii) physico-chemical treatment	Treatment of non-hazardous aqueous waste for disposal D9 Physico-chemical treatment not specified elsewhere which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12. D13 Blending or mixing prior to submission to any of the operations numbered D1 to D13. D14 Repackaging prior to submission to any of the operations numbered D1 to D13.	All waste must be stored and treated in sealed containers and serviced with secondary containment measures comprising of suitably bunded impermeable surfaces with sealed drainage system. Treatment consists of neutralisation, pH adjustment, dewatering, precipitation using filter press and associated container handling operations. Waste types as detailed in Table S2.3
A3 - Hazardous Waste Recycling process	Section 5.3 Part A(1)(a)(ii) Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving one or more of the following activities: (ii) physico-chemical treatment; (iii) blending or mixing prior to submission to any of the other activities listed in this section or in section 5.1; (iv) repackaging prior to	Treatment of APCr for recovery or disposal. D9 Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12 (e.g. evaporation, drying, calcination, etc.) D13 Blending or mixing prior to submission to any of the operations numbered D1 to D12.	All waste must be stored and treated in sealed containers and serviced with secondary containment measures comprising of suitably bunded impermeable surfaces with sealed drainage system. Treatment by material washing process comprising neutralisation, centrifuge and dewatering by filter press.

	submission to any of the other activities listed in this section or section 5.1; (vi) recycling or reclamation of other inorganic materials other than metals or metal compounds; (viii) recovery of components used for pollution abatement.	D14 Repackaging prior to submission to any of the operations numbered D1 to D13. R 5 Recycling/reclamation of other inorganic materials. R 7 Recovery of components used for pollution abatement.	Waste types as detailed in Table S2.4.
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Proposal

Overview

Castle intend to make changes to the operating techniques applied to these listed activities in order to introduce the use of carbon dioxide to neutralise the alkalinity of the APCr. The CO₂ would be a partial or full replacement for waste acids it is intended that the CO₂ will be sourced from biogenic sources.

The use of CO₂ to neutralise waste is well understood. Both BOC and Air Liquide market solutions to treat waste water using CO₂. The technology is well understood and widely deployed in industry. The process is not used in the waste management industry due to the wide availability of waste acids that generate a gate fee.

Details

The existing waste treatment infrastructure will be utilised for the process. The production line that will be used will be the APCr washing infrastructure. Briefly this consists of:

Powder storage silo

Slurrying tank

Press Feed Tank

Membrane Filterpress

Filtrate collection vessel

Skip for filtercake collection

The only additional infrastructure that will be required is a CO₂ storage vessel and vaporiser.

The existing process is used to generate a slurry of APCr to remove soluble components such as chloride and alkali metals. The slurry is then dewatered, washed and dried within the filterpress. The slurry and the resulting filtercake retains an amount of residual alkalinity due to the remaining hydrated lime (calcium hydroxide). calcium hydroxide is readily converted to calcium carbonate in the presence of carbon dioxide. This process occurs naturally with CO₂

sequestered from the atmosphere and is the chemical reaction that occurs in the weathering of other thermal residues such as Incinerator Bottom Ash (IBA).

Once the target pH is achieved, the slurry will be transferred to the filterpress for dewatering, washing and drying as per the current arrangements.

The filtercake will be non-hazardous by alkalinity, will have a low concentration of soluble components due to the washing process and will have further reduced solubility of heavy metals due to the formation of insoluble metal carbonates. It is anticipated that the solid residues will be suitable for disposal to non-hazardous landfill. However, the main intention is that these residues can undergo trials to be utilised as a replacement for aggregates within the construction / concrete products industry in the same manner the existing washed residue is.

The effluent generated from the current arrangements for the washing process requires additional treatment prior to discharge to foul sewer. Additional treatment includes pH adjustment and precipitation due to the elevated pH and soluble metal ions within the effluent. In contrast, the effluent generated following treatment with CO₂ has a pH within specification of the sewer discharge and significantly reduced metal ion concentrations negating the requirement for additional treatment.

On this basis, it is anticipated that the use of CO₂ will benefit the site in supporting the consistent and sustainable compliance with the BAT-AELs applied to the indirect discharge to foul sewer.

To date, laboratory trials have been undertaken which confirm the process proceeds as we would expect and that the residues generated are suitable for onward disposal or use.

Proposed variation to the Environmental Permit LP3439HM

There is no requirement to add treatment activities to the permit in order for this change to be implemented. The proposal also does not require a change to the existing permitted throughput at the site or the individual process. The proposal does not require any additional waste types (EWCs) to be added to the permit or process. Waste inputs will remain the same as existing.

Due to the limited scope of the proposed changes, and the fact there are no changes to waste types, there will be no changes to the emissions profile for the site or requirements to alter monitoring requirements.

The only element of the existing permit that will be required to be reviewed is Table S1.2 Operating Techniques which requires reference to the updated document '*Method Statement 2.3.2.17 - APCr Treatment Process version 3.0*'.

Due to the limited nature of the variation, it is considered to be a minor technical variation.

Application Pack

The following documents are contained within this application pack:

Permit Variation Forms

Application for an Environmental Permit Part A – *LP3439HM/V005/Form A*

Application for an Environmental Permit Part C3 – *LP3439HM/V005/Form C3*

Application for an Environmental Permit Part F – *LP3439HM/V005/Form F*

Associated Documents

Activity table – Form C3 – *LP3439HM/V005/Table 1a*

Method Statement for the treatment process - *2.3.2.17 - APCr Treatment Process version 3.0*

Updated Accident Prevention Plan – *2.3.1.10*

Environmental Risk Assessment – *LP3439HM/V005/ERA*

Summary of changes of power consumption – *LP3439HM/V005/PWR*

Site Plan – *LP3439HM/V005/Site Map*

Confidentiality claim – LP3439HM/V005/CCclaim

Summary

Castle are proposing a change to the operating techniques of the washing process operated at the site to allow the utilization of CO₂ as a reagent. Minor modifications to existing process infrastructure are required to allow the introduction.

The benefits of using CO₂ include;

Permanent sequestering of CO₂ into a chemically stable form.

Reduced carbon footprint of the site operations



Generation of a carbon negative solid output that will be suitable for landfill disposal and investigation to assess suitability for re-use.

The change does not propose introduction of any new waste stream or an increase to process capacity.

Introduction of CO₂ to the process is consistent with the current listed activity of physico-chemical treatment and therefore does not require a variation to the permitted activities for the site.