

CASE STUDY

Guernsey Waste Transfer Station Odour Control System

August 2019



- Project Summary:** ERG was contracted by Wood Group to provide the Odour Control System for the new Waste Transfer Station to serve the island of Guernsey
- Main Contractor:** Wood Group
- Client:** States of Guernsey
- Key Project Data:** The Odour Control System was designed, supplied and installed by ERG to match Wood's and States of Guernsey's specification including:
- Capture and treatment of odorous air from Waste Transfer Facility including compactors and balers plus AD soup tank, rated for 25,000 tonnes/year of domestic, commercial and industrial waste
 - Maintaining building under negative pressure to limit fugitive emissions
 - Dedicated extraction from key process equipment
 - Dust removal from extracted air to limit maintenance to Odour Control Equipment
 - Package availability >98.5% in operation
 - Odour Control System to achieve stack odour conc <1,000 ou_E/m³
 - Rigorous testing regime to demonstrate compliance
- ERG Project value:** approx. £1M
- Project Timescale:** Contract award: February 2018
Preliminary and detailed engineering: 3 months
Equipment manufacture: 3 months
Installation (2 phases): 3 months
Commissioning and testing: < 1month
Completion: December 2018



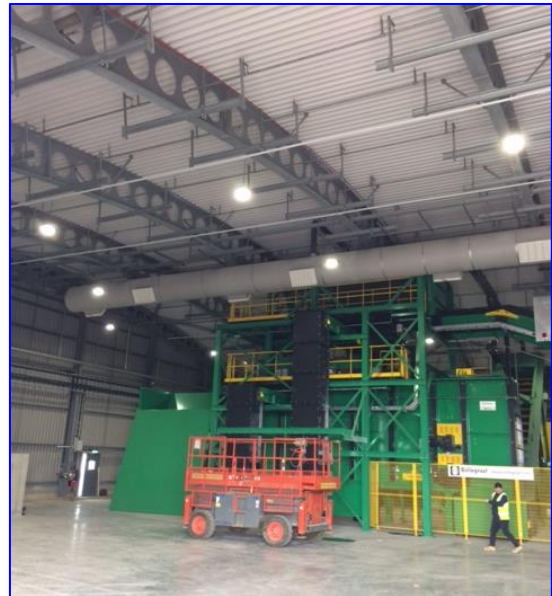
1. Introduction

This case study briefly describes the design and implementation challenges, and ERG's successful solution to these challenges, for the Odour Control Package installed by ERG at the new Guernsey Waste Transfer Station. The site was installed and came into operation in 2018.

2. Project Overview

Guernsey's new WTS/RDF Plant acts as a Waste Transfer station (WTS) to receive the island's domestic and commercial waste and export baled Refuse Derived Fuel (RDF). The Plant is designed to handle 25,000 tonnes/year, comprised of 10,000 t/yr household waste and 15,000 t/yr commercial and industrial waste, with a up to 50% of the waste being paper, cardboard, wood; 25% kitchen organics; 20% plastics; 5% metals; 2.5% glass and up to 2.5% potentially hazardous materials.

The Plant includes shredding and baling equipment for baled RDF production, food waste processing to separate packaging and produce an organics soup for export to an AD facility off the island, and glass and metals separation and storage.



All of the WTS/RDF Plant waste reception and processing equipment is housed within a 3,200m² building, separated into three halls.

Wood Group (Amec Foster Wheeler) were the Principal Designer and Principal Contractor. Wood awarded the contract to ERG to design, supply, install and commission the Ventilation and Odour Control System (OCS) for the Plant.

3. Technology selection and key engineering decisions

ERG's technology selection

ERG's Odour Control System offered the Best Available Technology (BAT) solution for the application, and was engineered to provide high quality equipment, robust operation, optimised power and utility consumption, and to achieve the process performance guarantee.

The OCS package design basis summary is:

- Maintain the building at negative pressure to prevent fugitive emissions by extracting 3 air changes/hour (ac/hr) – giving a design air flowrate of approx 100,000m³/hr. During periods when the building is unmanned – such as night-time and weekends – turndown of the air flowrate to 1 ac/hr to minimise power consumption.
- Treatment of dust at 30mg/m³ average.
- Removal of odour to achieve <1,000 ou_E/m³ at the stack – odour caused by a complex mixture of compounds typical of the waste specified, including volatile fatty acids, aldehydes, other VOCs, organic sulphides, H₂S and ammonia.

The system performance was successfully demonstrated by ERG using a combination of CFD (computational fluid dynamics) modelling of the air flow within the building, occupational exposure monitoring inside the building, and dynamic olfactometry at the discharge stack.

Odour Control Package scope

The ventilation system includes:

- Air inlet louvres positioned in the building fabric to maximise low level fresh air ventilation to the working spaces and optimise the flow of air within each of the three halls for capture of odorous air.
- Corrosion-resistant PVC/GRP ductwork in each hall to provide general room extraction and dedicated LEV (local exhaust ventilation) of key processing units (shredder, baler, food processing) – all with adjustable flow control dampers set at commissioning. Also included are fire dampers to provide segregation of the halls in the event of a fire. The bespoke ductwork was designed to extract the air from the building and direct it to odour treatment.

And the Odour Control System comprises:

- Dust filter with automated cleaning and discharge of the collected dust into a flexible IBC – the dust filter removes entrained dust from the halls to prevent it blinding the downstream odour treatment equipment.
- Duty and standby fans to provide 100,000m³/hr air at the system pressure drop – variable speed to adjust to the dust filter pressure drop and provide daytime normal, and night-time and weekend reduced flowrates. Acoustically lagged to limit nuisance noise.
- High efficiency carbon filters which remove the full range of odorous compounds and achieve the specified 1,000ou_E/m³ maximum odour concentration at the stack – designed to maximise carbon bed life and minimise pressure drop (and therefore the power consumption by the fan).
- 25m high discharge stack to disperse the treated air so ground level concentrations do not lead to complaints of nuisance odour from the site's neighbours.
- Local control panel for the Odour Control System, housed in a kiosk adjacent to the system.



4. Designing with constructability and operability in mind



Implementing Guernsey's Odour Control System included several challenges. These included:

Carbon filter dimensions selection

The system includes two carbon filters operating in parallel. Although the airflow could be treated comfortably using a single carbon filter, the sea freight to the island permits nothing larger than a standard shipping container, and so the carbon filter could not exceed 2.3m diameter, too small for a single practical filter vessel – and so to maximise the carbon media bed life and minimise the pressure drop, ERG selected two filters in parallel. These polypropylene/GRP vessels were shipped to site ready for installation, using ERG's innovative annular filter design.

Achieving energy savings and limiting fugitive emissions

The night-time and weekend turndown of the fan flowrate saves over 10,000 kWh/week, an annual power saving of more than £50k. So there's a clear advantage to this – achieved using a variable speed drive on the fan control and an easy to use operator interface. But at the lower flowrate, the negative pressure in the building is minimal, and sealing of the air admittance louvres becomes a challenge. To overcome this, ERG used carefully selected weighted dampers on the building louvres, sealing in the odorous air even at night.

Power supply to the fan

At 132kW installed power, the OCS fans have the largest 400V motors on the island. ERG worked with Wood and our control panel manufacturer to match the Low Harmonic VSDs to Guernsey's power network, ensuring the Plant did not adversely affect the stability of the island's electricity.

Handling the dust

Dust is a universal problem at WTS facilities. With this in mind, ERG's package ensures all of the ductwork is designed to make cleaning as easy as possible. And the dust filter in the OCS package is automated to clean the filter cassettes, with the collected dust discharged to a single big bag using a screw conveyor and rotary discharge valve to make recycling this dust back into the facility simple for the operators.



5. Performance testing to demonstrate specification compliance

During the first 9 months of operation, monitoring shows the OCS to be performing well. Although the inlet odour challenge is lower than design, odour removal performance by the carbon filters is >75% to give a stack discharge of <math><100 \text{ ou}_E/\text{m}^3</math>, significantly below the guaranteed $1,000 \text{ ou}_E/\text{m}^3</math> limit.$

And with on-going support through a maintenance contract with ERG, States of Guernsey are assured this performance will continue – meeting the project requirement for years to come.

6. Summary

ERG's Ventilation and Odour Control System provided Wood and States of Guernsey with industry-leading, cost-effective technology – successfully implemented to an exacting timeframe by our team of experienced and professional engineers.

More information from



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