

CASE STUDY

Flixborough Composting Plant Soil Stabilisation

Introduction

Driven by increasing changes in European legislation regarding waste disposal, North Lincolnshire County Council identified a need for a composting facility to be located at Flixborough. The site selected posed difficult technical challenges as the underlying geological conditions included alluvium overlying a peat layer, incompatible with the weight bearing requirements of the composting facility.

A traditional solution would require the transfer of the loads from the proposed slab to a suitable horizon below the peat layer. This would normally use a system of piles capped by a reinforced concrete slab designed to carry the traffic loads and the mass of the compost. After taking into consideration aspects such as cost and time, this methodology was considered not viable for this project.

An alternative design was therefore proposed which utilised a road pavement type construction. However one of the requirements of the design was that no fluids were to be permitted to seep, or percolate into the groundwater regime. A rigid concrete pavement was presumed to be inappropriate as the differential settlement movement would almost certainly crack the slab and/or displace any construction joints. Consolidation settlement analysis was reported to predict vertical displacement of the slab to the order of 250 mm.



Pushing out of PFA



Incorporation of PFA into soil

Clugston Construction was appointed as the main contractor for the works and it appointed the specialist ground engineering contractor, CON-FORM Contracting, who proposed a flexible pavement design as an equivalent to the rigid concrete pavement design proposed by others.

During the design of the solution CON-FORM had to take into consideration the fact that large site vehicles would need to traffic the works throughout the construction phase. The normal stabilisation approach of applying Portland Cement (CEM1) in to the top layer of the soil would not support this key requirement as the rapid strength development of CEM 1 would lead to shear failure problems in the surface of the compacted soil, when trafficked.

The solution developed therefore utilised the pozzolanic reaction between lime and Pulverised Fuel Ash (PFA), similar to the ideas used in constructing road sub-base Fly Ash Bound Mixtures (FABM) - see Technical Datasheets 6 series.

Trial mixes and tests were carried out using lime and PFA as the blender and it was found that the slower rate of strength gain and the ability to autogenously heal, overcame the problems of rapid setting. The following ground engineering strategy was therefore applied:

- A 350mm depth of soil was treated insitu with 2% lime to condition the soil.
- The soil was then compacted using rolling dynamic compaction (RDC).
- 80kg of conditioned PFA per m² was then added to the treated soil and rotovated.
- The stabilised soil was then overlaid with 250mm of 40mm down to fines, slag aggregate.
- A further 400kg of conditioned PFA and 60kg of CEM 1 per m³ was added, with water, and the material rotovated insitu to produce a CBM 1. The moisture content was then checked and adjusted by either the addition of cement or water to achieve the optimal moisture content.
- Compaction of the CBM 1 was then carried out with a vibrating roller.



RDC to induce initial settlement

helping CON-FORM provide Clugston with a cost effective solution to the technical problems encountered on this site.

A comprehensive testing regime including CBR's NDM's and plate bearing tests were carried out to provide a continuing assessment of the works.

The CBM 1 will be finally surfaced with MACRO-PAVE[®], CON-FORM's own semi-flexible, joint free, pavement solution, forming the final wearing surface.



Final trimming of CBM

The conditioned PFA was supplied from Drax power station with ~1650 tonnes being required for the soil stabilisation and 2,200 tonnes for the production of the CBM 1. The ground engineering project was completed in August and the composting plant is due for completion in November 2004.

Acknowledgements

The UKQAA would like to thank Coenraad Fourie, Site Manager and Dave Truscott, Contracts Director, both of CON-FORM and Clugston Construction for their help and co-operation in producing this case study.

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