National Technical University of Athens

Municipality of Papagos

"Development and demonstration of an innovative household dryer for the treatment of organic waste"

DRYWASTE (LIFE 08 ENV/GR/000566)

Minutes from the trip to the UK

Deliverable.5

6/7/2010

National Technical University of Athens

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DRYWASTE PROJECT
Minutes from the trip to the UK

Background

This deliverable reports on the site visit at Chineham ERF facilities of Veolia Environmental Services Company in June 2010. The site visit was organized under the framework of Drywaste project, **LIFE 08/ENV/GR/000566.**

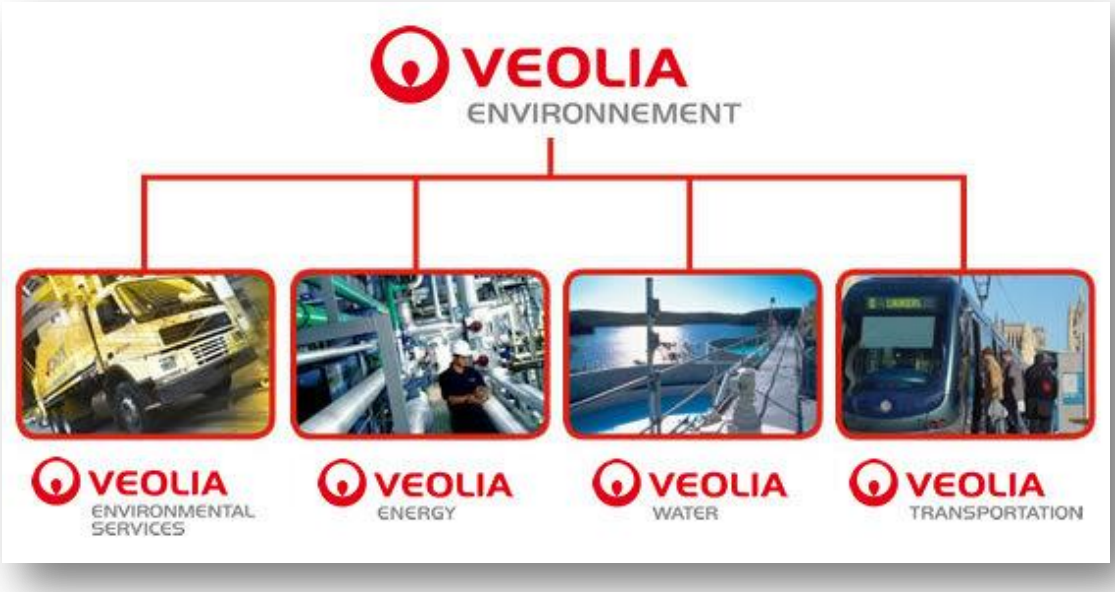
Picture.1: Mr. Andy Macqueen, Facility Manager of Chineham ERF.

1. Introduction

Veolia Environment (Table.1, figure.1) is considered to be one of the world's leaders in environmental services. With operations in every Continent, Veolia provides environmental solutions in four complementary segments: water, environmental services, energy services and passenger transportation.

Table 1.Veolia group statistics (Veolia Water Industrial outsourcing, 2010)

2008 sales	€10.1 billion
Industrial and tertiary sector customers	749,000
People served	70 million
Waste collected	41 million tonnes
Waste treated	66 million tonnes
Employees	93,000



Fiqure.1: *Veolia group* (Veolia Water Industrial outsourcing, 2010)

The Company's activities include the collection, treatment and recycling of solid, liquid and hazardous waste in the municipal, industrial, marine and commercial markets.

Veolia operates a number of technologically advanced solutions that are able to convert waste into an energy resource.

1.1. Veolia Environmental Services in the United Kingdom

Veolia Environmental Services has been present in the United Kingdom since 1990. The revenues of the company as has been recorded in 2008 (Veolia Water Industrial outsourcing, 2010) were above £1.3 billion. Veolia Environmental Services employs almost 12,500 employees across the country.

Veolia Environmental Services is renowned for its integrated waste management and environmental services to local communities and industry. The company provides a large spectrum of waste services including refuse collection, recycling, waste treatment and street cleansing to over 21 million customers from circa 100 Local Authorities in the UK.

The company also operates a network of landfill sites (13 landfills with a total void capacity of circa 48 million m^3), Materials Recovery Facilities, transfer stations (Circa 133 refuse collection, recycling, street cleansing and grounds maintenance contracts in partnership with circa 100 local authorities and waste disposal authorities), civic amenity sites, Energy Recovery facilities (6 Energy Recovery facilities with a total capacity of 1.4 million tons) and compost sites (5 composting facilities with a total tonnage of green waste processed of 200,000 tons per annum). (Veolia Water Industrial outsourcing, 2010)

Two (2) researchers from the National Technical University of Athens and Two (2) from Papagos Municipality attended this trip as reported in **Table.2.** The duration of the trip was 3 days (from 03/06/2010 until 05/06/2010).

Table 2. Trip attendants

Sotiropoulos Aggelos	NTUA
Papadaskalopoulou Christine	NTUA
Fasouli Aikaterini	Papagos Municipality
Augoustakis Panagiotis	Papagos Municipality

The site visited was the Chineham energy recovery facility in Basingstoke, Hampshire (Picture.2)

Picture.2: Chineham ERF facility

1.2. Chineham (Basingstoke) Location

Basingstoke lies approximately 35 minutes west from Waterloo train station (Figure.2) in London. Chineham lies on the north-western edge of Basingstoke in Hampshire. It lies about 3 miles (5 km) northeast of central Basingstoke, just north of the A33 road between Basingstoke and Reading.

Figure.2: *Basingstoke location map* (Feel Appreciated, basingstoke_map. outsourcing 2010)

Most of the houses in the area have been built since 1980. Prior to this, Chineham was mainly green fields (Picture.3) with a small amount of ribbon development along the A33 Basingstoke to Reading road, housing about 400 people. This is now a densely populated residential community that forms one

of the major housing areas on the north-eastern edge of Basingstoke. The population of Chineham in 2001 was 7,003. (Wikipedia, outsourcing (2010))

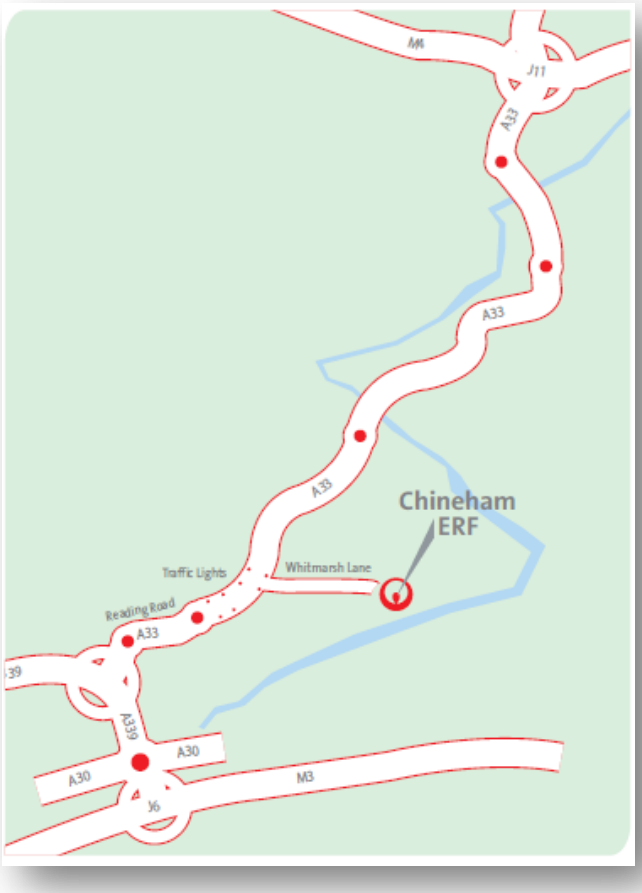
Picture.3: Chineham Lane (Panoramio, outsourcing 2010)

2. Chineham ERF facility

2.1.Overview

Chineham energy to waste facility is located (figure.3) in Whitmarsh lane approximately 500 meters from A33. The facility is covered with very tall trees all around and the only thing that can be seen from a kilometer distance is the very tall Chimney of the facility. Only a single house is located close by in a 600 meters distance from the plant. Near the facility an old waste water plant is still operational (remains of the old facilities located in the region).

The Chineham Integra North ERF was built over the remains of an old incinerator which operated at the region in the past. Because of this fact, the facility had to be built in a specific way while the size of it was limited to that of the old one. The facility covers 1,7 hectares of land.



Fiqure.3: *Chineham ERF location*

The Chineham ERF is part of the Hampshire Waste Strategy, known as 'Project Integra'. It is one of the most progressive integrated waste management systems in United Kingdom and provides sustainable waste management for all domestic waste in the county.

Project Integra is a partnership between Hampshire County Council, the two Unitary Authorities of Southampton and Portsmouth, the 11 District Councils and Veolia Environmental Services. Hampshire was hailed as an example of good practice for its partnership approach to waste management in the 2002 UK's strategy report 'Waste Not Want Not'. In addition, in 2000-2001, Project Integra was attributed 'Beacon Council Status' in the first year of the awards, in the category 'sustainable development – dealing with waste'. Since Project Integra was adopted, significant progress has been achieved.

Project Integra was formed on the basis of the following seven point action plan:

1. Action on waste minimisation
2. Action on composting

3. Action on recycling
4. Support for anaerobic digestion
5. Use of recovery technologies, including incineration
6. Three to five waste processing facilities (not exceeding 200,000 tonnes per annum)
7. Residual waste to landfill

Picture.4: Integra facilities

It was the first of three facilities in Hampshire and recovers waste which cannot be traditionally recycled. The three facilities together form an intrinsic part of the strategy to manage Hampshire's waste. Marchwood in Southampton and the ERF in Portsmouth, followed in the footsteps of Chineham (Picture.5).

Picture.5: Chineham ERF maquette

The Chineham ERF (Table 3.) processes approximately 100,000 tones/year of non-recyclable waste - saving significant amounts of rapidly diminishing landfill space – and generating around 8 MW of electricity for the National Grid, enough to power more than 8,000 local homes.

Table 3. Technical details of the plant

Refuse throughput	90,000 tones per annum approximately 12 tones per hour.
Storage capacity	four days full plant capacity
Number of tipping bays	5
Steam output	37.5 tones of steam per hour at 400°C and 45 bar
Flue gas treatment	CNIM semi-dry lime scrubber followed by high performance bag filters, discharging into a 65 meter high chimney
Energy produced	maximum generating capacity 8MW

2.2. Process description

Mixed household waste (including significant quantities of organic waste) is collected into 2 separate bins, at source and sent to the Energy Recovery Facility once per every week (figures 4,5, Table 4.). There are different companies in the area that collect the mixed waste from households. The waste

Picture.6: Chineham ERF crane (right), feed)hopper (left)

is collected from different towns around the facility. When waste is transferred the facility, it is tipped into a bunker. A crane grabs the waste and places it into the feed hopper. It then drops down a feed chute onto the grate.

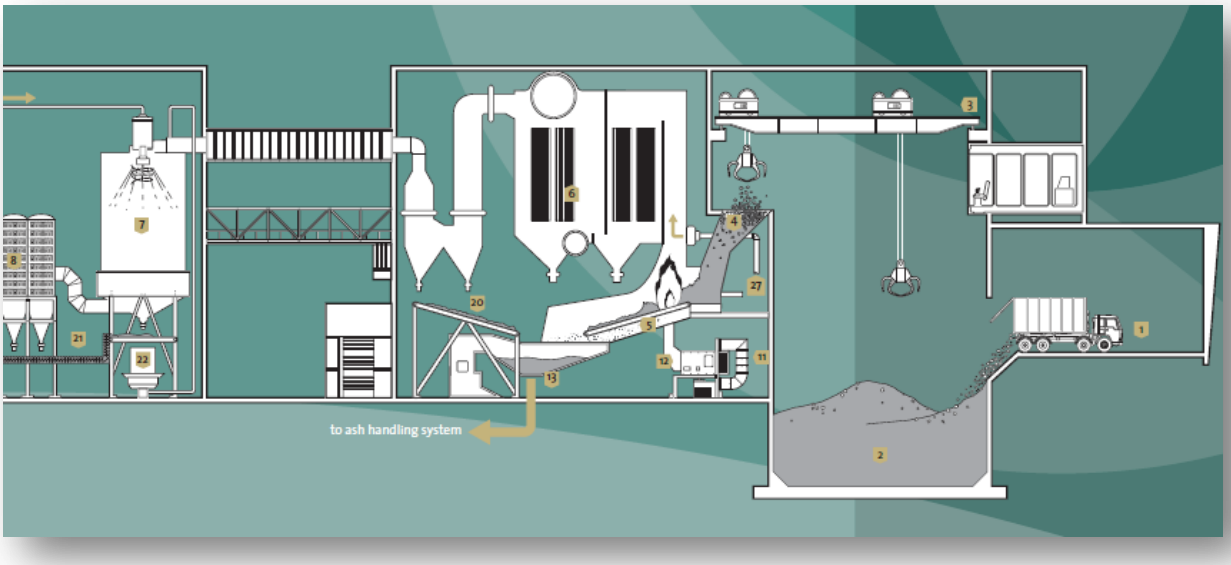


Figure.4: *Chineham process description (*Veolia Environmental Services, outsourcing, 2006).

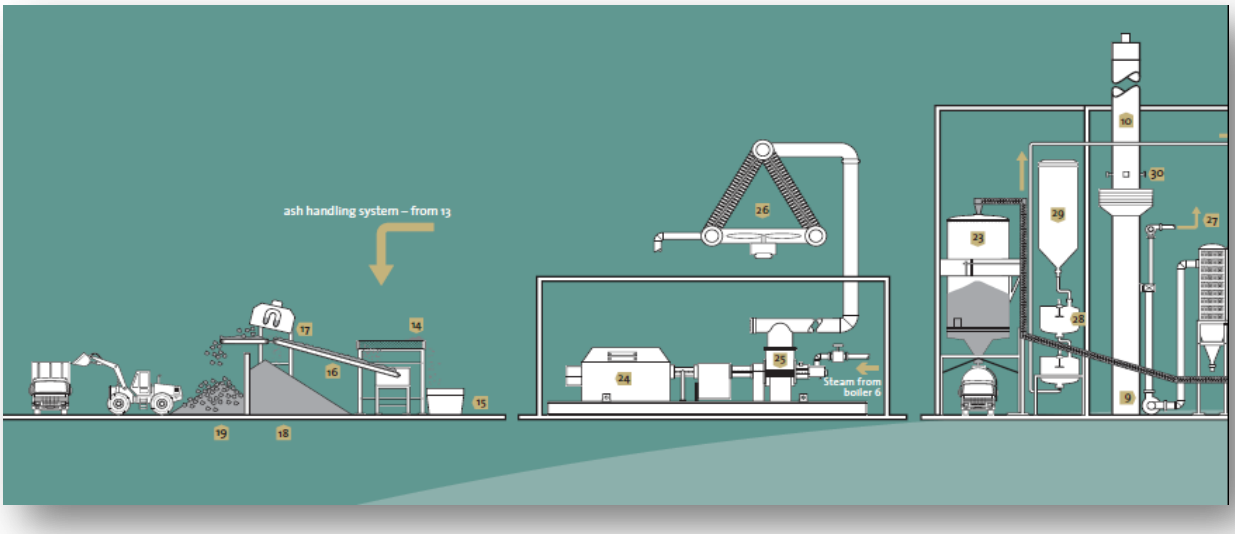


Figure.5: *Chineham process description (*Veolia Environmental Services, outsourcing, 2006).

During this route, the drying of the mixed waste takes place with the help of an air heater. The action of the grate turns the waste to allow it to fully burn. The burnt-out ash passes through the ash discharger onto an ash handling system, which extracts metal for recycling.

Table 4. Chineham process description *(Source:* Veolia Environmental Services, outsourcing (2010).

1. tipping hall	**2. refuse bunker**	**3. refuse travelling crane**
4. feed hopper	5. Grate	6. boiler
7. gas scrubber	8. bag house filter	9.induced draught fan
10. chimney	11. combustion air fan	12. air heater
13. ash discharger	14. oversize items grid	15. oversize items container
16. bottom ash	17. magnetic separator Conveyor	18. bottom ash storage
19. ferrous scrap storage	20. boiler ash conveyor	21. APC residue conveyor
22. activated carbon injection	23. APC residue silo	24. generator
25. single stage steam turbine	26. condenser	27. flue gas recirculation fan
28. lime slurry preparation tank	29. lime silo	30. emission monitoring equipment

The remaining ash is sent for recycling or disposal. Almost 99% of the waste material sent to the facility is burnt during the whole process. Hot gases produced in the combustion process pass through a water tubed boiler where they heat the water to become steam. A turbo-generator uses the steam to produce electricity for export to the National Grid. The gases from the boiler go through an extensive flue gas cleaning process which starts with the gas scrubber where lime milk is injected to neutralize acid gases.

Activated carbon is added to remove dioxins, urea is added to treat oxides of nitrogen and finally a bag filter takes away remaining particulates. The resulting material known as Air Pollution Control Residue is used to neutralize other wastes at a licensed site. The cleaned gases are finally released into the atmosphere through the chimney.

The whole processes from the beginning until the energy production takes approximately 45 minutes.

2.3. Power generation (final product)

The output steam from the heat recovery boiler is fed into the steam turbine. It enters the turbine at high pressure (45 bar and 400°C) and leaves the turbine at partial vacuum. After the turbine, the vacuum steam condenser turns the steam back into water (condensate), which is recycled back into the boiler. The output shaft of the turbine is connected to the generator via a reduction gearbox. The generator is water cooled and specifically designed for minimal maintenance. The electricity flows through an underground cable at 11,000 volts to Basingstoke substation. Integra North provides 8MW of electricity, enough to power 8,000 local homes.

2.4. Facility maintenance

Almost 2/3 of the facility costs result from waste treatment while the remaining 1/3 comes from the energy production of the facility. The permanent staff comprises of 25 people including the financial managers working in 6 shifts. The facility is designed to have a lifetime of approximately 25 years but due to the replacement of various components it is expected that the lifetime of the plant will be longer. The facility maintenance takes 1-2 weeks every year (usually at the end of May or at the beginning of June). At this time waste is handled in other Integra facilities so that there won't be any problem with the waste collection from households during this period. Potential problems arising during the operation of the facility are confronted in the same way.

Picture.7: Chineham ERF entrance

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