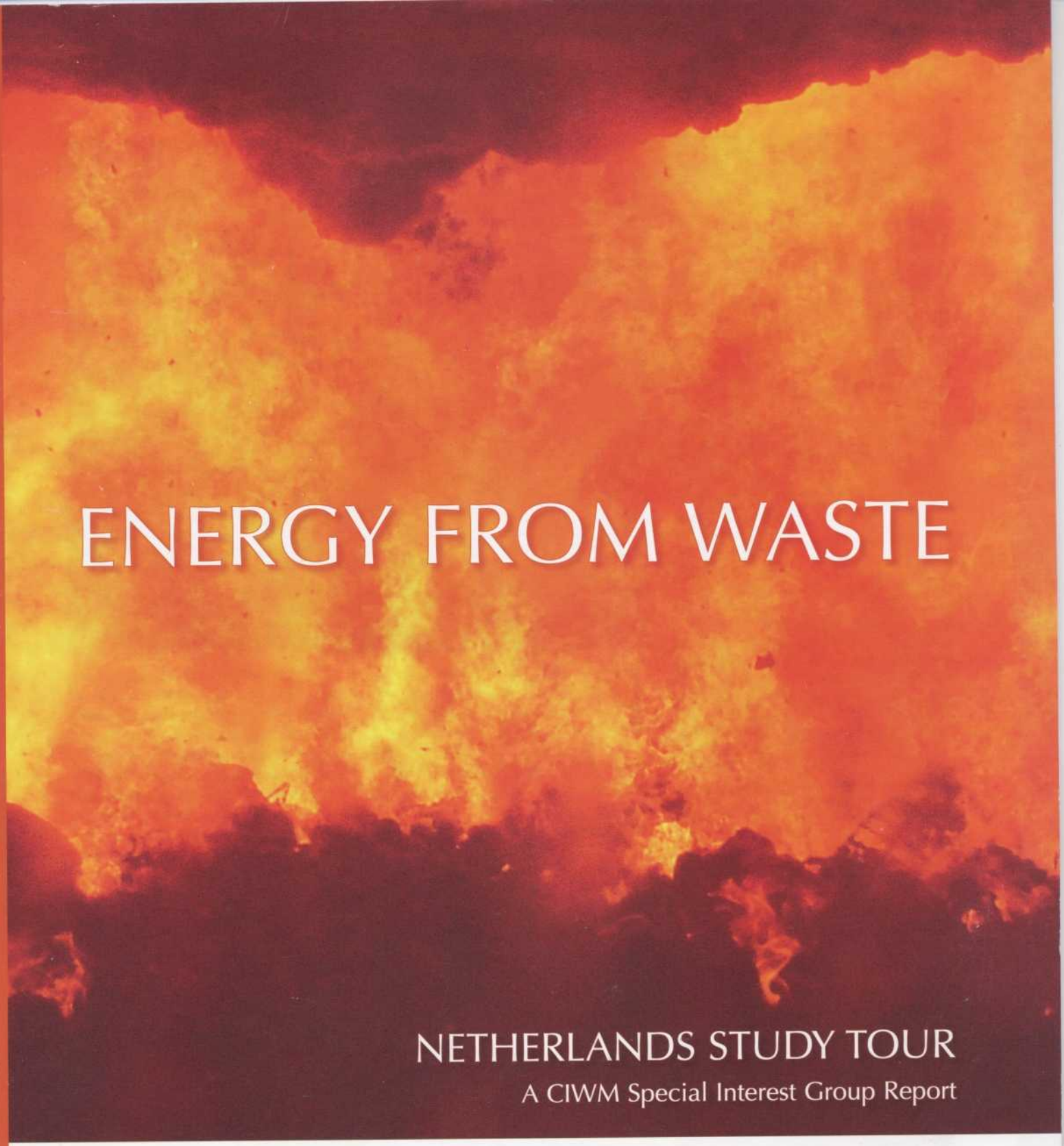

ENERGY FROM WASTE

NETHERLANDS STUDY TOUR

A CIWM Special Interest Group Report

The Chartered Institution
of Wastes Management

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THE TOUR GROUP

Tour leader

David Greenfield
East Sussex County Council

Tom Ellis
CIWM

Paul Frith
Enviros (CIWM representative)

Melanie Chilton
Milton Keynes Council
(CIWM representative)

John Downer
Jacobs (CIWM representative)

Ruth Coward
Defra

Matthieu Charlionet
SMEDAR
(Interreg III representative)

Michel Sarrut
SMEDAR
(Interreg III representative)

Marleen Jannick
(DTI representative)

Rob Mynard
(Defra representative)

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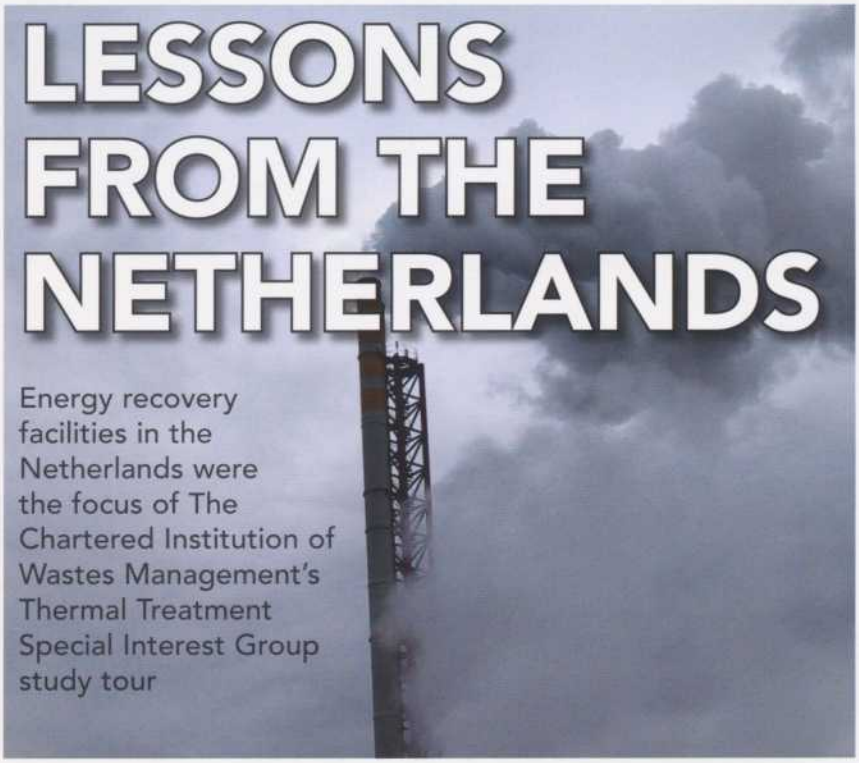


Energy recovery facilities in the Netherlands were the focus of The Chartered Institution of Wastes Management's Thermal Treatment Special Interest Group study tour

In May 2005 the Chartered Institution of Wastes Management's Thermal Treatment Special Interest Group visited five waste facilities in the Netherlands to understand some of the constraints and pressures that affect decision-making and operation of such plants.

The tour party was biased in favour of younger members of the Institution who had specific involvement with thermal treatment and also included representatives from Defra, the Department of Trade and Industry and a French delegation that was part of a joint Interreg III bid with East Sussex County Council.

The tour visited DRSH, a sludge treatment plant in Dordrecht; three energy-from-waste plants at AVR-AVIRA in Arnhem, Twence in Enschede and HVC in Alkmaar; and a mechanical biological plant at Omrin in Leeuwarden.

The Netherlands is divided for administrative purposes into 12 provinces, which are further divided into 467 municipalities called Gemeenten. The country is also divided into water districts, each governed by a water board. These 37 water boards predate the nation itself and were set up in 1196.

In 1990 a waste management council was set up by the national government to implement waste policy at a national, provincial and municipal level. It developed a Ten Year Waste Management Programme (1995-2005) for processing and disposal capacity requirements for waste management.

The programme assumed the Netherlands could meet a 60 percent recycling target in 2000 by waste prevention and recycling. Several of the initiatives for achieving the target were made statutory by the Environmental Management Act (1994), which made municipalities responsible for collecting organic and other household waste from the kerbside once a week. This act also decreed that municipalities have separate collections of dry materials such as glass, paper, textiles and hazardous waste, a wider remit than the UK's Waste Minimisation Act.

Municipalities have responsibility for recycling, treatment and disposal facilities, including providing finance, but the size of most municipalities makes it difficult to undertake these tasks individually. Many work together to procure and finance facilities for larger areas, even the whole of the province. This statutory responsibility

leads to joint working but is necessary in order to meet very stringent legislation, such as the Waste Decree 1995, where combustible waste was banned from landfill unless there was a shortage of incineration capacity. The decree lists 32 waste types to which an almost total ban on landfill applies.

The 1993 Waste Incinerators (Air Emissions) Decree regulates incinerators for domestic waste and commercial waste of similar composition. It contains standards and regulations relating to atmospheric emissions, the combustion process, monitoring and record keeping. Requirements for quality of secondary raw materials produced from waste are laid down in the Building Materials Decree, the Other Organic Fertilisers (Quality and Use) Decree and the Fuels (Organic Halogen Content) Decree. Requirements for landfill establishments are laid down in the Landfill Decree (Soil Protection Act).

The national policy is to treat collected organic components of household waste separately and, where this is impossible, utilise these components for direct conversion to energy. Composting and anaerobic digestion are the recommended technologies for treatment of bio waste, according to the waste management hierarchy enshrined in both European and national legislation (ECN Country Report Netherlands).

The municipalities have similar responsibilities but are helped in their recycling by producer responsibility. Around 80 percent of household waste is covered by some form of producer responsibility, which means funding is quite different from the UK.

The Netherlands differentiates vegetable, garden and fruit waste from other green waste. Vegetable, garden and fruit waste is called GFT, Dutch initials for groente, fruit en tuinavfal. This distinction is similar to the German bio waste definition. The latter contains the organic waste from separate collection of the municipal solid waste. Green waste is defined as the organic residues collected from gardens and parks. Since 1999 the commercial and industrial organic residues from undertakings are specifically mentioned and included in the official regulations.

The Netherlands, showing locations of facilities visited

The Dutch National Waste Management Plan sets minimum standards for treatment of specific waste streams and ensures adequate disposal capacity is available. The minimum standard for GFT is composting.

In 2000 approximately 92 percent of households in the Netherlands (16m people in approximately 6m households) had separate collection for organic waste resulting in 1.57m tonnes of bio waste being processed into 600 000 tonnes of compost.

In 2001 there were 26 operational composting plants for domestic bio waste with a capacity of 1.577m tonnes. Two composting plants are processing nearly a third of the capacity of all the plants in the Netherlands. As well as the bio waste composting plants there are approximately 100 green waste-only composting plants, which also treat 1.5m tonnes of bio waste. Only two anaerobic digestion plants for source separated bio waste are in operation, with annual capacity of 88 000 tonnes.

An order of preference for managing waste, known as the Lansink's Ladder after the MP who proposed it, is laid down in the Environmental Management Act. Prevention is the top rung and landfill the bottom rung.

LANSINK'S LADDER

1 Prevention
2 Design for prevention and design for beneficial use
3 Product recycling (re-use)
4 Material recycling
5 Recovery for use as fuel
6 Disposal by incineration
7 Disposal to landfill

The principle underlying this waste management hierarchy is that the amount of waste going to landfill should be minimised due to the space requirements involved, the need for aftercare in perpetuity, the loss of material resources and emissions from landfills.

DRSH – DORDRECHT

The tour's first stop was a sewage sludge treatment plant in Dordrecht, south of Rotterdam

Centrally placed facilities (waste water treatment plants) collect and biologically clean all waste water in the Netherlands. Completion of this process leaves clean water and a concentrated waste product – sewage sludge – of about 70kg per inhabitant per annum. This sewage sludge still contains a high percentage of water – with only about 25 percent solid.

Since the 1980s sewage sludge has been deemed unsuitable for use as a fertiliser. As a large part of the Netherlands is below sea level, ground water is much closer to the surface and the effects of contamination are noticed more rapidly. With a rising population and suitable possibilities for disposal dwindling – and with all burnable wastes banned from landfill sites – incineration is considered the most sustainable solution.

In the Netherlands the Industrial Waste Ordinance limits the transport of sludge across provincial boundaries. Co-operation between four of the regional water authorities concerned (with a fifth joining at a later stage), the department of public works and the Regional Environmental Inspectorate was viewed to be the only long-term solution to the disposal of sewage sludge.

In 1990 the four water authorities of Zuid-Holland entrusted the responsibility for sludge treatment to a separate organisation. They established a public limited company named after the initials of the four Water Authorities – DRSH Zuiveringsslib – and built the sewage sludge plant in Dordrecht.

The DRSH plant was built to meet the German 1993 emission standards, more stringent than that of the EU, and required two permits for air and water standards. The permit application went smoothly because of compliance with German standards and choice of location in an already heavily industrialised area near petrochemical and refinery plants.

The DRSH plant has a capacity of 376 000 tonnes and incinerates 330 000 tonnes of sewage sludge a year. This is further reduced to 23 500 tonnes after incineration – about 7 percent of the total. This ash is used in tarmac, for sealing landfill sites and in specialised mortar.

In 2003 the annual incineration costs for 330 000 tonnes of sewage sludge produced by 5m inhabitants came to €30.7m, inclusive of transport costs and tax making the annual cost in 2003 €6.15 per person.

OPERATION

- Sewage sludge is delivered to a bunker in sealed trucks and the air is extracted and blown into the incinerator to feed the furnace
- The sewage sludge is pumped into the dryer where steam, produced further on in the process, dries the sludge
- Water vapour from the drying process is condensed and purified at a nearby waste water treatment plant
- The dried sludge is incinerated in a furnace, which contains a red-hot sand bed, kept at 850°C
- The air extracted from the bunkers is blown into the bottom of the furnace, causing the sand bed to swirl and the sludge to burn
- Ash is carried in the flue gasses from the incinerator to a steam boiler. The hot flue gasses are cooled to create steam transported to the dryer to dry the sludge
- After the flue gasses have cooled in the steam boiler, an electrostatic filter removes more than 99.9 percent of dust particles
- Fly ash is stored in silos
- The remaining flue gasses are sprayed with water to remove dust and other pollutants, ie the scrubbing process. This involves an acid stage for eliminating heavy metals and hydrochloric acid, and an alkaline stage for eliminating sulphur dioxide
- The flue gasses pass through a further filter capable of removing residual mercury and dioxins. Finally, it passes through a bag filter to catch any last dust particles. Flue gasses are heated to 120°C to aid dispersion after it leaves the 80 metre high stack and – because of its temperature – creates no visible vapour plume
- The scrub water used to clean the flue gasses is treated in a two-step chemical process to remove the heavy metals before being sent to the nearby waste water treatment facility for purification. The leftover filter cake contains many heavy metals, particularly mercury. This is sent to a special treatment facility for hazardous substances and treated until rendered inert.

An emissions stack at the Dordrecht site

OPERATIONAL STATISTICS FOR DRSH DORDRECHT

Built in 2 phases	**Built in 1993 with a fourth line added in 1998**
4 Lines	**3 lines, each processing 2.2 tonnes dried solids an hour 4th line processes 4.5 tonnes dried solids an hour**
Incineration of sludge Capacity	**80 000 - 85 000 tonnes dried solids a year 360 000 - 380 000 tonnes sewage sludge a year**
Operating hours	**7 500 hours a year**
Ash produced	**30 000 tonnes a year**
Gas usage	**10 - 15m³/tonne dried solids**
Electricity usage	**300 kWh/year per tonne of dried solids**

EMISSIONS FROM THE STACK (PER ANNUM)

Emission	2001	2002	2003
	Emissions in kg/annum		
NH_3	129	260	170
NO_x	33.6	32.5	2.3
SO_2	1.5	2	2.3
	Emissions in kg/annum		
Dust	282	300	160
Ash Silos	9.9	1.1	18
CO	3.19	3.6	7.2
C_xH_y	704	860	1.7
HCl	438	180	200
HF	29	30	54
Mercury	0.7	2.0	2.1
Cadmium	0.6	0.8	1.9
Heavy Metals	2.4	2.4	2.4
Zinc	2.5	4.1	3.6
	Emissions in mg/annum		
Dioxins	<0.2	<1.3	<1.4
	Emissions in kg/annum		
N_20	5.03	8.4	15.1
CO_2	103.2	99.1	93.7

The plume from Dordrecht already meets the requirements of the Waste Incineration Directive

Control facilities at the Dordrecht plant

AVR-AVIRA – ARNHEM

The AVR-AVIRA facility in Arnhem is a good example of Dutch integrated waste management, comprising an energy from waste plant providing district heating with a modern vegetable, garden and fruit waste composting plant

The Netherlands already complies with the requirement to reduce the amount of biodegradable waste going to landfills to 35 percent of the amount produced in 1995. This is achieved, in part, by encouraging direct recovery of organic waste of plant origin, eg by composting vegetable, garden and fruit (VGF) waste or by using green waste as a soil improver in the area where it is generated.

The composting plant in Arnhem does exactly this, treating approximately 40 000 tonnes per year of VGF waste collected from 4 000 inhabitants. A proximal company then handles the bagging of compost product that is used in local agriculture and horticulture applications. The compost has to meet specific composting standards before being applied for use in agriculture.

The energy from waste (EfW) facility handles approximately 340 000 tonnes per year through three lines (1 000 tonnes a day). A reverse roller grate system is used, operating at a temperature of 1 000°C. Bottom ash is recovered as a cement product for road aggregate and fly ash solidified with additives is used in the filler industry. Scrap metal is re-used by the steel industry.

Flue gas treatment is in the form of activated carbon injection and ensures the facility's emission levels fall well below the requirements of the impending Waste Incineration Directive.

A thermal conversion installation burns paper-sludge rejects from four local paper manufacturers creating 'green energy', which is paid for by the Government. Heat is distributed through an integral heating system to over 12 000 houses. Electricity is used in adjacent industrial estates and in over 11 000 local houses.

The UK Government may want to consider following the Dutch model and offer similar support for waste derived 'green energy'. Recent findings show that residual, commercial and industrial waste could provide 17 percent of UK electricity needs in 2020, demonstrating the potential for EfW to play an important role in meeting the UK's 2010 Renewables Directive target. EfW is a proven method to deal with residual waste and can, at the same time, provide local sources of energy.

TWENCE – ENSCHEDE

A 114-hectare landfill site with composting, recycling, and hazardous waste disposal facilities

Twence, a government owned company with 20 municipalities as shareholders (15 of which are served by the facility), operates the 144 hectare integrated waste management site at Enschede in the east of the Netherlands.

The site comprises landfill, composting, commercial recycling, hazardous waste handling and disposal, aggregates recovery and energy from waste (EfW).

Fichtner Consulting Engineers produced plans for the EfW plant in 1992, construction started in 1994 and the plant was commissioned in 1997. Twence wanted a Rolls-Royce facility, which it certainly achieved. The capital cost was €230m, of which €130m was spent on flue gas cleaning, a capital expenditure equivalent of €750 per tonne. The gate fee is €120 per tonne. The equivalent landfill gate fee is in the order of €40 per tonne, with a landfill tax of €83 per tonne for burnable wastes.

The two reverse moving grate lines (Martin Engineering) processed 307 000 tonnes of household and commercial waste in 2004 (304 000 tonnes in 2003). At 960°C, the residence time of the mixed waste is 45 minutes on the grate, a process rate of 18.5 tonnes per hour.

25MW is generated through the Stork/NEM boiler; 20MW is exported to the electricity grid; and the plant uses 5MW.

Unlike most other EfW facilities in the Netherlands it operates a six-shift pattern (usually five), with eight operators per shift also carrying out routine maintenance. It has 85 workers in total, including a dedicated team of five full-time cleaners who keep the plant tidy.

Maintenance represents over 5 percent of the operational budget, equivalent to less than 2.5 percent of annual capital expenditure,

ie €5750000 per annum (similar sized plants are usually 3-4 percent per year).

The tipping hall has a separate inspection line, where 5-10 percent of the input material is scrutinised for contaminants by an overhead control and viewing room. The mixing bunker is controlled from up high by two 8-10 tonne grabs, which blend new and old waste to a usable consistency. Painted red, the heart of the plant, the control room, is futuristic in design and equipment and can, in theory, be operated by a single person.

Twence has plans to construct a third line, reverse acting grate, capable of processing 27-28 tonnes per hour, an additional 220000 tonnes per year, to export an additional 22MW. It expects this to be commissioned by 2008 and is tendering for contractors. The flue gas cleaning would be an all-dry system, incorporating electrostatic precipitators, spray absorber and fabric filters.

There was public opposition to Twence's plan for the third line, which was co-ordinated by local professionals and academics. The plans were pushed through and approved on the basis of the strict emission standards adopted by the Dutch to be implemented in the flue gas cleaning technology.

Twence has a separately constructed building for public education with an auditorium with state-of-the-art audio-visual equipment and a scale model of the entire site. This underlines the strong commitment among waste management operators in Holland to encourage community engagement.

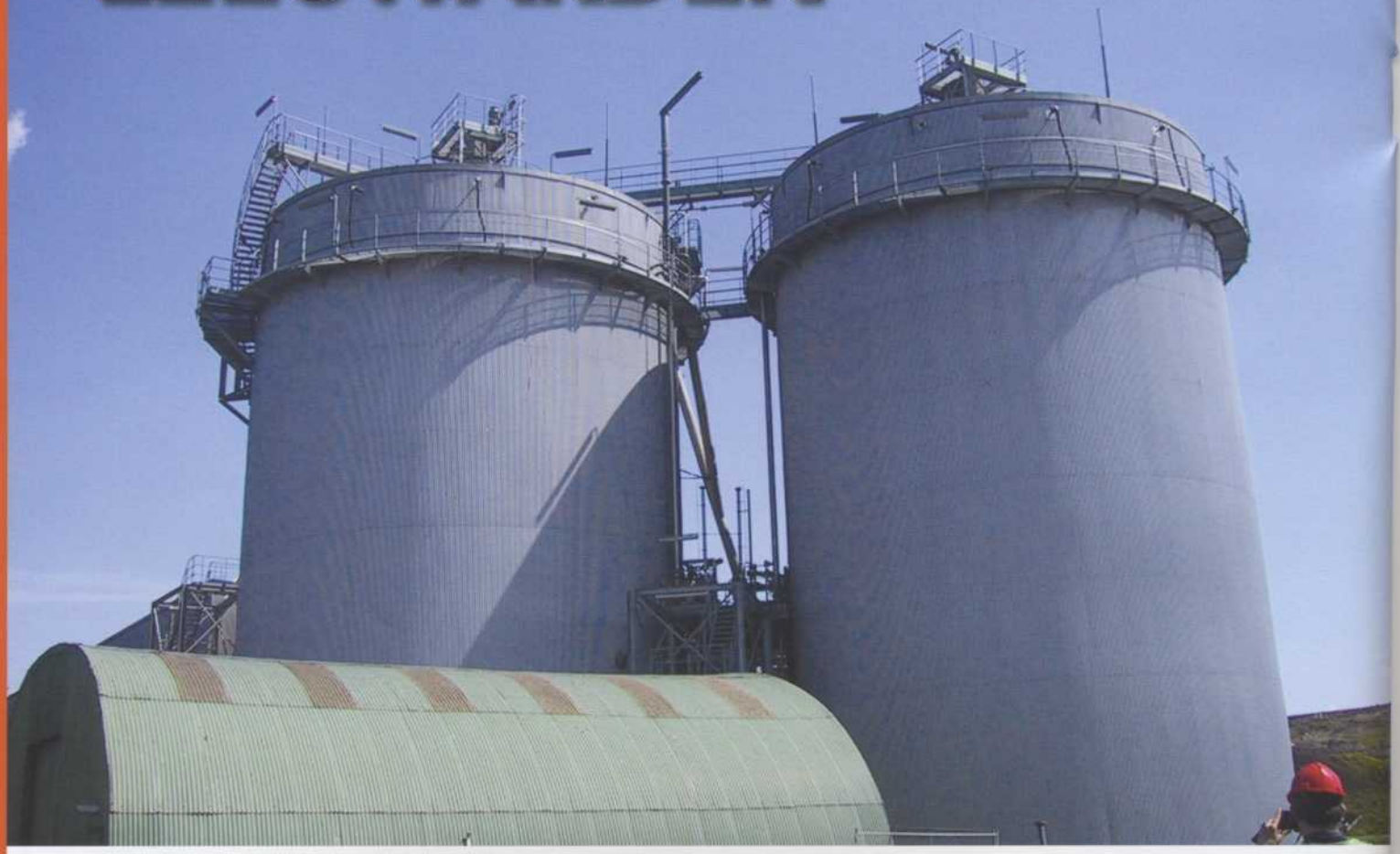
Twence is also constructing a biomass combustion plant, which because it is a renewable energy source, attracts higher energy prices for the 13.5-19MW it hopes to produce. It will burn 100000-140000 tonnes of wood and compost residues a year collected from within a 50-80km radius of the plant. It does not have a permit for its operation as yet, but is in the second round of tendering for the turnkey facility. It will incorporate dry and semi-dry flue gas cleaning using a cyclone to reduce fly ash by 90-95 percent, plus activated carbon and bag filters.

The Twence facility, which is ISO 14001 and ISO 9001 compliant, shows high standards of design and build quality.

Landscaped gardens outside the Twence plant

Metal recovery at the Twence facility

OMRIN ECOPARK – LEEUWARDEN



The Ecopark at Leeuwarden offered something different on the Dutch study tour

The only non-thermal waste management facility visited was the site operated by Omrin. Its Ecopark is centred on a mechanical biological treatment (MBT) plant in Leeuwarden, Friesland. This visit was different in a number of other contexts as Friesland is a province in the north of the Netherlands, which has a different dialect to the rest of the country and had also opted for a different philosophy for treating the residual municipal solid waste (MSW) generated in the province. An Omrin representative said the Netherlands has a 60 percent target for recycling and recovery (presumably of materials, not including energy recovery, as the Netherlands currently recycles, composts and gets energy from 86 percent of MSW according to the Eurostat database), while Friesland as a province has a target of 80 percent. This raises the issue of comparable definitions. The study group was unable to obtain a definition of what constitutes recycling in the Netherlands during its visit, however in the Eurostat database the following statement is an indication of the EU Commission's view of the current municipal waste statistics: "It should be considered that the definitions of municipal waste and household waste vary over countries. Harmonised data collection will be achieved with the implementation of the Waste Statistics Regulation."

It will be interesting to see the relative performance of different countries when compared on an even footing.

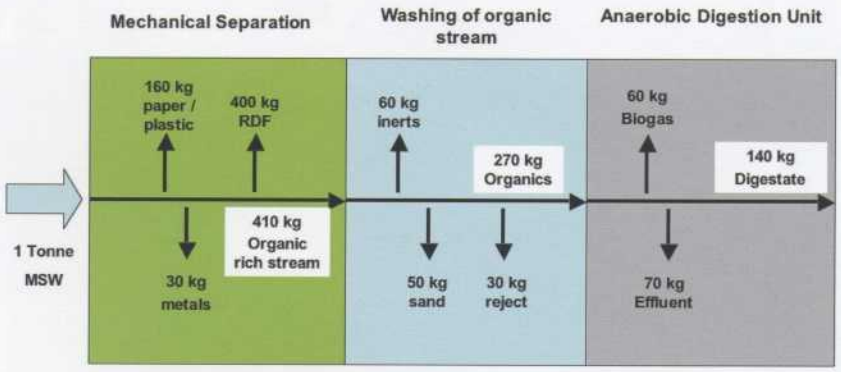
The collection methodology in Friesland involves split vehicles for receiving waste and organics from the household and a separate collection for dry recyclables. Sita, Shanks and Van Gansewinkel carry out the collection service. Omrin, owned by

the 31 municipalities of Friesland, is the treatment and disposal operator. The collected residual waste is processed at the Ecopark De Wierde. The Ecopark is on the same site as a landfill site that is part restored and is partly still active.

The Ecopark receives 450 000 tonnes per year of waste from construction, demolition and municipal sources. The MBT plant processes 220 000 tonnes per year of waste, which represents all household and most commercial waste. The MBT process involves the deposit of wastes into the plant by a grab, which goes through a series of drum screens to sort the materials by size and air blows off the lighter fractions (eg plastic film, tissue paper), while metals are extracted by magnets and eddy current separators. The larger fractions, typically paper and plastic, are separated for use as fuel and added to the light fraction that is blown off and baled as a refuse derived fuel. This is sent to Germany and burnt at a cement kiln. There appeared to be some commercial or regulatory uncertainty over this process and the operator of the cement kiln was only able to offer one-year duration contracts for receipt of the material, and at a significant cost (€70/tonne).

After removal of the large and light fraction and metals, the predominantly finer, organic rich residue is washed by steam to remove inorganic material like glass, sand and stone, and then processed in an anaerobic digestion facility.

The anaerobic digestion plant uses a thermophilic process (with added heat) operating at 55°C, which degrades the organic fraction under controlled conditions and captures the biogas generated. This type of digestion process is preferred because of faster processing time and higher gas yield rates. The process produces enough biogas to generate electricity to power the plant and export into the grid. The digester tanks are flushed from the top and bottom as part of the process and the wastes are mixed and digested in the process to produce a solid digestate and a liquid effluent, in addition to the biogas. The liquid effluent together with the landfill leachate is treated on site. The solid digestate is applied as a base and top layer for landfill.



Mass balance of MBT process

Baled refuse derived fuel

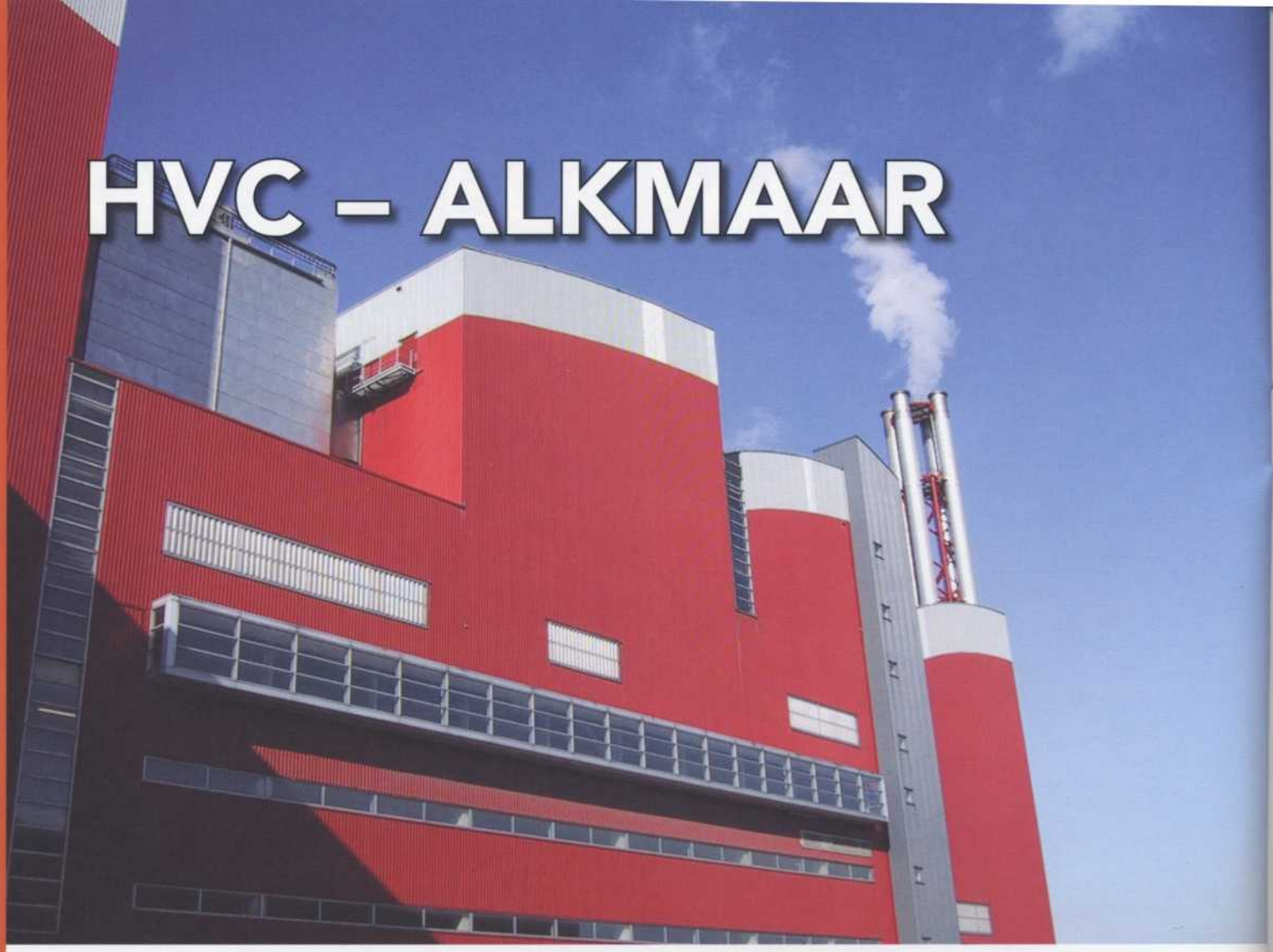
The construction and demolition waste is processed at a dedicated sorting facility where materials are sorted by hand on picking belts or by wheeled loaders. The concrete and rubble is crushed and graded for use as secondary aggregate and the wood is separated into three grades:

- unpainted, solid wood is used for manufacture of chipboard
- painted wood, hardboard and softwood are exported to Italy for use in the manufacture of MDF
- treated woods are sent for disposal as hazardous waste.

In the Netherlands 95 percent of construction and demolition waste is reported to be recycled.

The Ecopark also accepts waste electrical and electronic equipment, which is sent for recovery by specialist operators.

HVC – ALKMAAR



The fifth and final stop on the tour was the NV Huisvuilcentrale N-H incineration plant in Alkmaar, an integrated waste management company that processes waste from the provinces of north Holland and Flevoland, serving a population of 1.5m people

Opened in 1996, the Huisvuilcentrale was built on the basis of a regional Materials Plan of 1989 that contained a stipulation that two new incineration facilities were required in north Holland. 17 shareholders, including the municipalities and the regional electricity company, own the company. In total there are over 40 local authorities involved in the organisation and which supply their residual waste to the plant.

The bright red, modern incinerator plant treats residual household and commercial waste following high levels of recycling of source-separated wastes. It is estimated that residents generate about 250kg of residual waste each per year. Two composting plants, including a co-owned facility in neighbouring Purmerend, treat vegetable, food and green waste.

The bold colours of the incinerator building were chosen for their symbolism. The dark grey on the base of the building symbolises the transition from earth to fire, the red of the main walls symbolises fire and the silver grey colour of the tops of the walls symbolises the air. The result of the bright colours and the slanting design is striking and seems to fit comfortably with the surrounding landscape, although there are no obvious sensitive land uses in the immediate vicinity.

In 2004, the Huisvuilcentrale added an additional furnace to its original three lines to increase its capacity in the wake of the government's decision to ban landfilling of combustible waste. Projections indicate that in 2012 the national surplus of combustible waste will be at least 4m tonnes.

There was also a commercial incentive for the new line, providing greater economies of scale in a rapidly changing marketplace. German waste regulations are in a state of flux, which may increase (or reduce) the potential to attract new business from across the border.

Permitting for the additional furnace took around five years and included submitting the case for expansion, an environmental assessment and the technical case. There was significant opposition to the additional line from environmentalists and local communities, but through dialogue

and negotiation an agreement was reached that required the company to commit to emissions standards well in excess of the requirements of the Waste Incineration Directive. This included setting absolute annual emission limits for certain pollutants.

After collection, most waste is transferred to the Alkmaar incinerator via eight transfer stations. Most of the waste is transported by lorry – about 150-200 trucks visit the site each day – but waste from Flevoland (Lelystad) and Zaanstad is transported by boat directly to the site. This is made possible by the location of the plant on the North Holland Canal. Each year approximately 140 000 tonnes of waste is transferred from road to water; the company has calculated that this is equivalent to 22 shipments per day being taken off the roads. The incinerator charges a gate fee of around €83-85 per tonne of waste.

A staff of 160 in five teams working in morning, afternoon and night shifts operate the facility. The four lines each process around 18.5 tonnes of waste per hour. The furnace grates are installed at an angle and consist of moving grate bars that transport waste down through the furnace in about one hour, at a temperature of around 1000°C.

Steam is generated at 40bar to drive turbines, generating 70MW of electricity every year, providing 61MW to the public grid and 9MW consumed on site.

After this energy recovery the used steam has potential for use in community heating schemes, but like the SELCHP energy from waste plant in London, Huisvuilcentrale has yet to find a partner to make use of this heat energy. It is exploring the possibility of supplying a new local football stadium.

On leaving the furnace, the gases enter a six-stage flue gas cleaning system – by far the largest part of the plant. The first component, an electrostatic precipitator, removes 99 percent of the fly ash – the particles of dust and ash carried along with the flue gases. A spray dryer evaporates wastewater and a second electrostatic precipitator collects the salts formed. Flue gas scrubbers remove the acidic pollutants and heavy metals. A fabric filter collects any remaining pollutants, assisted by the presence of activated carbon. Lastly, the $DeNO_x$ plant breaks down the nitrogen oxides. Before the clean flue gases leave the stack, emissions are measured and registered in the monitoring chamber.

Advanced flue gas treatment at the Alkmaar facility

The plant runs a bio-monitoring programme as part of continual flue gas monitoring. Agricultural products from the surrounding area, such as spinach, cabbage and milk are analysed by an independent research company to highlight any effect that the emissions may be having on agricultural and horticultural produce. There is an agreement with local farmers and growers to pay damages if any contamination occurs.

Huisvuilcentrale processes 670 000 tonnes of waste each year, of which 6.5 percent by volume remains as residual waste following incineration. Of this, 6.1 percent (bottom ash and fly ash) is recycled or re-used and 0.4 percent (salt) is unusable, but is stored in case it's feasible to recycle it as road salt.

Scrap metal, aluminium, copper, tin and zinc are recovered from the bottom ash and the bottom ash residue is used in road construction. Fly ash is used as filler in the production of asphalt. NV Huisvuilcentrale N-H markets these residual products in partnership with a recycling company.

LESSONS LEARNED

The UK must look to the continent and adopt the best of its resource management practices

The Netherlands has a similar number of energy recovery facilities as the UK but serves less than a fifth of the population. Achieving planning permission for incineration plants is not all plain sailing in the Netherlands. Like the UK there is strong resistance to incineration plants and acceptance only comes with conditions as demonstrated by the extension of the Alkmaar facility, where permission was conditional on installation of one of the best air pollution control systems in Europe.

In costs terms the alternative to incineration in the Netherlands is either just as expensive or more so, and landfill is not permitted for combustible waste. The Alkmaar management in its application for the extension cited a need for the facility pointing out that the cost, while high, was not extreme when compared to a landfill tax of €120 (£80) per tonne. This makes delivering large-scale disposal facilities a reality in the Netherlands.

The UK needs to have a strategy for achieving the 2019/20 Landfill Directive target and also needs to start looking forward to 2020 and beyond. This is an opportunity to deliver a workable solution that will meet UK obligations. As Steve Lee, chief executive of CIWM predicted in the Institution's waste strategy conference in March 2005: "We needed to start building yesterday." If the UK does not start soon, it will fail the Landfill Directive. The forthcoming Waste Strategy 2006 has the potential to help, as long as the UK looks at other European countries and learns from their success.

Why is the Netherlands so far ahead of the game in comparison to the UK? The answer lies in the differences in the historical pattern of waste management in the two countries. The UK has copious old mines and quarries backed up by a very competent waste industry. In this context landfill is an environmentally sound restoration process. Supporting this infrastructure is a legislative framework that enables very economic landfill and no comparable alternative at the same price for other disposal methods. The Netherlands, in contrast, had landfills or landraise in the past and in the early 1990s introduced legislation that moved decision-making from a local to a national perspective and increased the cost of landfill with a view to a ban on untreated waste going there. Compare that approach to the UK where individual authorities are still

trying to get planning permission for facilities of a similar nature operating in neighbouring authorities.

There is doubt whether UK local authorities have the necessary strategic planning to deliver the 2020 targets – few have planned for post 2010 and few have contracts in place to deliver these strategies.

By contrast the UK's high-achieving neighbour, the Netherlands, has put a national 10--year plan in place for authorities to follow, structured so that decision-making moves from local to sub-regional level and then introduced producer responsibility for 80 percent of the materials collected by municipalities. Targets are set for local authorities, without penal alternatives, and an 80 percent diversion from landfill has been achieved.

The UK needs to move towards the same position in terms of waste management as its neighbours, like the Netherlands, with an integrated, publicly consulted, resource management system in place.

Infrastructure: "Britain needs to start building yesterday"

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FURTHER INFORMATION

Chartered Institution of Wastes Management
Thermal Treatment Special Interest Group
9 Saxon Court
St Peter's Gardens
Northampton
NN1 1SX
Tel: +44 (0)1604 620426
E-mail: tom.ellis@ciwm.co.uk
www.ciwm.co.uk

NVRD
Gijs van Bezooijen
Kroonpark 2
Arnhem
Tel: +31 (0)263771333
E-mail: vanbezooijen@nvrd.nl

Environmental Services Association
154 Buckingham Palace Road
London
SW1 W9TR
Tel: +44 (0)20 78248743
E-mail: info@esauk.org
www.esauk.org/waste/incineration

European Commission
Environment DG
Information Centre
Office: BU-9 01/11
B-1049 Brussels
Belgium
Tel: +32 (0)080067891011
www.europa.eu.int/comm/environment/wasteinc/index.htm

Defra
7/11 Ashdown House
123 Victoria Street
London
SW1E 6DE
Supporter Programme Helpline Tel: +44 (0)870 2409894
E-mail: wastetech@enviros.com
www.defra.gov.uk/environment/waste/wip/newtech/index.htm
www.defra.gov.uk/environment/ppc/wasteincin/index.htm

Environment Agency
Rio House
Aztec West
Bristol
Avon
BS12 4UD
Tel: +44 (0)845 9333111
E-mail: enquries@environment-agency.gov.uk
www.environment-agency.gov.uk

Sepa
Erskine Court
Castle Business Park
Stirling
FK9 4TR
Tel: +44 (0)1786 457700
www.sepa.org.uk

Department of the Environment
(Northern Ireland)
Commonwealth House
35 Castle Street
Belfast
County Antrim
Northern Ireland
BT1 1GU
Tel: +44 (0)28 90546422
www.ehsni.gov.uk

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9 Saxon Court, St Peter's Gardens, Marefair, Northampton NN1 1SX, UK
t: +44 (0)1604 620426 f: +44 (0)1604 604467 e: journal@ciwm.co.uk w: www.ciwm.co.uk