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SITA Isle of Man Annual Public Report 2004-5

Contents

Foreword

Welcome to SITA Isle of Man's first annual public report.

This is a significant publication for us. It marks the first operational year of the energy-from-waste (EfW) plant at Richmond Hill. And it also sets out the basis on which we will report on its performance to you, our stakeholders, over the life of our 25-year operating contract.

The Isle of Man's EfW plant is of immense importance. It is the most advanced EfW installation to be designed and operated in recent years. It provides a service that forms the cornerstone of the island's waste management strategy. And, at a time when the British Isles is striving to come to terms with the challenge of environmental sustainability, its contribution is of great interest beyond our shores as well.

The year to April 2005 was an eventful and exciting period. With the completion of the construction phase, we successfully commissioned the facility and began operations.

A project of this scale and complexity is bound to experience 'teething troubles'. We have had to overcome a series of technical challenges, but by far the greatest obstacle to the efficient running of the plant was the shortfall in combustible waste delivered to the gate in the first six months or so.

I am pleased to be able to report that this difficulty has been resolved and our EfW plant can now operate continuously and to the highest standards of environmental performance.

This report presents the key environmental data for the period (complementing the information posted daily on our website*). It describes how we seek to minimise the negative impacts of operations on the environment, while maximising the benefits generated for the Island. It also includes information on health and safety, training, and our involvement in the community.

As well as reporting on the highs and lows of 2004/05, we outline our objectives and targets for the coming year.

Our aim is to provide a full, rounded and accurate overview of SITA Isle of Man's operations and performance. I hope you find this report of interest, and would welcome your comments and suggestions.

Jeffrey Robinson
General Manager
SITA Isle of Man

*www.sita.co.uk

section one

Introduction

Key points

- SITA's commitment to openness
- The role of proven technology
- Making the island self-sufficient
- How to achieve sustainability

Our first report

This publication, our first annual public report, serves several purposes.

The primary one is to inform the Manx community about the operations and environmental performance of the island's EfW plant.

SITA Isle of Man is committed to honesty and openness in its dealings with the Manx Government, the public, our customers, and other stakeholders.

As part of that commitment, each year we will report publicly on all the key impacts and outputs of the plant. Our website, which provides unparalleled access to daily emissions data, is another demonstration of that commitment.

Our desire for transparency reflects the strong ethical values and corporate governance of our company. As a wholly owned subsidiary of SITA UK, and as a part of the international SUEZ company (see page 6), we subscribe to a code of ethics that demands the highest standards of behaviour and of environmental, social and corporate responsibility.

This annual public report also forms part of our commitment to achieving the internationally recognised benchmark for environmental management – EMAS (see page 18). We are working towards accreditation to this European Union standard, which sets a range of stringent requirements, including continuous improvement and public reporting of environmental performance data.

We intend that this first publication will also serve as a benchmark for our progress in coming years as we report on the performance of SITA Isle of Man.

The report covers the operational period from 17 August 2004 – the official commencement of our 25-year operating contract and the date when the Department for Local Government and the Environment officially assumed ownership of the plant – to 31 March 2005, the end of the fiscal year.

About SITA and SUEZ

SITA has over a century's experience of waste management and is, today, Europe's largest provider of waste management services.

Part of global services group SUEZ, the company delivers integrated solutions – through recycling, composting, energy recovery, and other innovative technologies – for municipalities, industry and commerce.

SITA has operated in the UK since 1988, and is now its leading provider of recycling and waste services, including refuse collection and street cleansing.

More significantly, SITA UK is pioneering a new approach. Viewing waste as a resource, our strategy aims to maximise the value that can be recovered from this resource.

All branches of the company are fully committed to materials recovery and recycling along with energy recovery, composting and the development of innovative technologies. Drawing on this expertise and experience, SITA devises the most cost-effective and environmentally friendly solutions for its customers.

SITA UK Statistics

Employees	**5,000**	Transfer stations	**45**
Turnover	**£480 million**	Composting sites	**12**
Industrial and commercial customers	**35,000**	Materials recycling facilities	**10**
Local authority contracts	**70**	Civic amenity sites	**97**
Residents served	**12 million**	Energy-from-waste plants	**3**
Landfill sites	**101** **(36 operating, 65 closed)**	Trucks	**1,493**

The SUEZ Group

SITA also has the multi-national resources and know-how of the SUEZ Group behind it.

SUEZ employs over 160,000 people worldwide and has earned a global reputation for responsible and successful operations in energy, water, waste and communications.

The activities of the environment division, which includes SITA's waste management operations, involve collection and treatment of wastewater, and the production and supply of drinking water. More than 91 million individuals are served with drinking water by SUEZ.

The SUEZ energy division develops solutions that support sustainable development in the electricity and gas sectors. Renewable sources, such as wind power, are providing a growing share of the energy generated.

The waste management challenge

Across Europe countries are developing alternatives to landfilling waste. Burying household and other rubbish has traditionally been the cheap and easy option, making landfill the main method of disposal in many states.

In recent years, however, policymakers and the general public have become increasingly concerned about the environmental implications. Leachate, odour, and flies can be controlled through engineering and careful management. Landfill gas can be exploited for power generation. But landfill sites remain a major source of methane – one of the most potent greenhouse gases driving climate change. In addition, the ready supply of void space – such as worked out quarries and gravel pits – is running out in many countries. As a result, it cannot be environmentally sustainable to carry on disposing of most of our waste in landfills.

European Union law is accelerating the shift to alternatives. Its landfill directive sets deadlines for diverting biodegradable municipal waste, which produces methane as it breaks down. This is a formidable challenge for the UK, whereas other countries in continental Europe combine high levels both of materials recycling and incineration, often with energy recovery, using landfill for residual wastes.

Why energy-from-waste?

The Isle of Man is not subject to EU law, but waste management is an even more pressing problem for a small island with limited land, a growing population and rising waste levels.

In 2000, our Government responded to this challenge with a new strategy. The Waste Plan, approved by Tynwald, set out to minimise waste going to landfill through a combination of waste-to-energy, recycling and waste reduction.

This strategy is consistent with best environmental practice in Europe, including the proximity principle, which states that waste should be dealt with as close as possible to its source and not exported to other areas.

Using proven technology and with sufficient capacity to process the island's waste, the EfW plant guaranteed self-sufficiency for the Isle of Man in the medium term. The Richmond Hill site also removed the need to truck waste north across the island to the Point of Ayre, where the Wright's Pit East landfill was fast filling up.

Designed to meet the latest EU emissions standards, the EfW plant was also equipped to dispose safely of animal and clinical waste, clearing the way for closure of the island's old and polluting hospital incinerator. It also acts as a power station – generating up to 10 per cent of the Isle of Man's electricity needs from a renewable resource.

The EfW facility can process the island's 'base' output of up to 60,000 tonnes a year of municipal and commercial waste, while operating at optimum efficiency. Waste levels are currently increasing at about two per cent each year, so in time other solutions will need to be developed as the plant's throughput reaches its limit.

Recycling and reduction

The EfW plant allows the Isle of Man a high level of self-reliance and security, and the time to develop the infrastructure needed to collect and process recyclables and to promote waste minimisation.

A range of environmental and economic factors must be weighed when devising waste strategy. The right balance for an island community may differ greatly from that for a mainland state. Issues to be considered include the financial cost and environmental impact of exporting recyclable materials for reprocessing, and importing fossil fuels, as well as subsidies per tonne, markets for recyclables, and beneficial end uses. A realistically high cost for waste treatment is also a prerequisite if recycling is to be economically viable. This was demonstrated on the island when waste charges were increased from £10 to £100 per tonne.

SITA Isle of Man will contribute, where appropriate, to the island's developing waste strategy, which is currently under review. Already, we have agreed to support the Government's efforts to recycle used paper by storing and baling the material within our facility for onward shipment to a UK paper mill.

Other initiatives, such as the recycling of incinerator bottom ash and promoting education about waste, are outlined elsewhere in this report.

Waste management

Key points

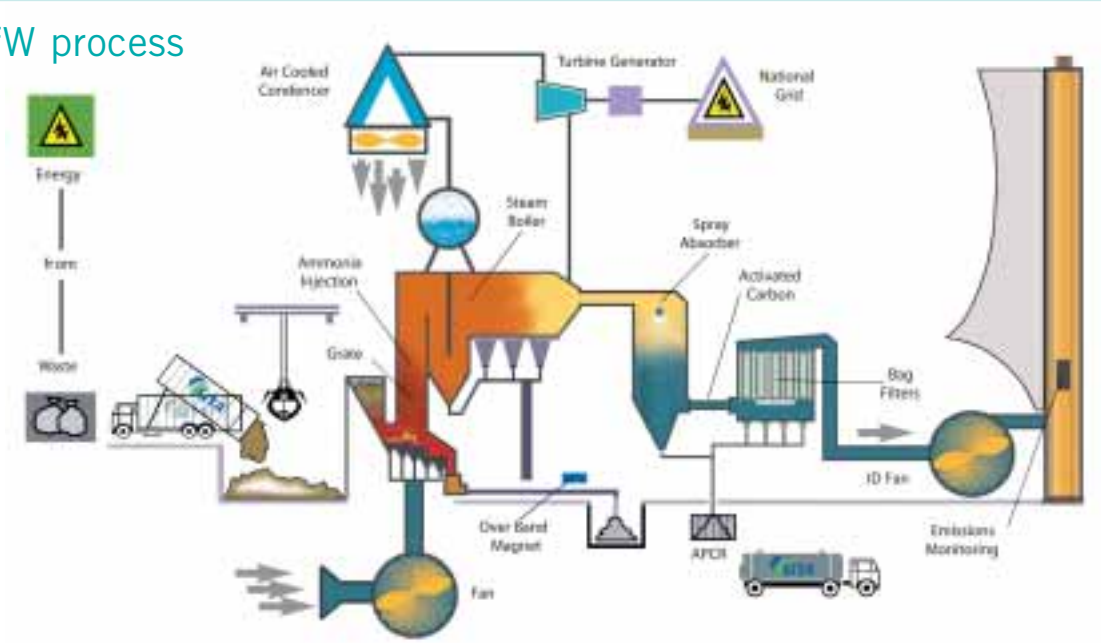
- Successful takeover of primary incinerator
- High level of availability achieved
- Low waste levels forced stoppages
- Secondary incinerator takeover delayed
- Award for Innovation in Design

The EfW process

Our facility comprises two incineration lines. The primary line can burn up to 60,000t per annum of municipal and commercial waste. Our second line, designed for animal and clinical waste, and waste oils, has an annual capacity of 5,000 tonnes.

On arrival, waste vehicles use an automatic weighbridge set back from the site entrance to avoid queuing on the public highway. Waste type, amount, and customer details are securely recorded and the driver is directed to the appropriate despatch bay.

The EfW process



The plant and the entire treatment process are designed for maximum efficiency and safety.

Reception hall – A large reception hall allows refuse collection trucks to manoeuvre and tip safely. Air needed for combustion is drawn into the furnace from here so that odour and dust do not escape from the building.

Bunker – Waste vehicles reverse to a wheel stop and tip their loads into a large concrete bunker. This is big enough to hold 16 days' waste so that tipping can continue when the plant is shut down for maintenance. A shredder, for bulky items such as mattresses, also discharges directly into the bunker.

Control room – The plant's control room centralises the operation of all equipment, including the grab crane used to mix and load waste into the hopper that feeds the furnace. All on-site functions are monitored automatically and manually. Its systems verify in real time that equipment is functioning properly, continuously monitor the combustion gas, and maximise the efficiency of the entire EfW process.

Grate and boiler – Combustion air is blown up into the bottom of the water-cooled grate through five computer-controlled zones. The thermal energy released from the burning is used to convert water to super-heated steam. At high pressure, this steam drives a turbine-alternator.

Electricity generation – Electricity is generated at 11kv. Up to 1MW is used to power the plant, leaving around 6MW for export to the Manx Electricity Authority, which distributes it around the island. The plant's switch gear is designed to protect the island's supplies from interruption.

Bottom ash – Ash left on the grate after incineration is carried by conveyor, after quenching, to a storage bunker. A magnet above the conveyor extracts ferrous material for recycling. The remaining bottom ash is trucked off-site for disposal or recycling.

Air-cooled condensers – After exiting the turbine, the air stream is cooled and condensed back into water through air condensers. This recovered water is treated and re-used in the boilers to produce more steam.

Emission control – The gases from the furnace are subject to a rigorous cleaning process involving selective non-catalytic reduction (SNCR), spray absorbers, and active carbon injection. This removes oxides of nitrogen, acidic gases, dioxins, and heavy metals from the gas stream.

Air pollution control residue – The cleaned gas is passed through fine-fabric bag filters to remove solid particles before it is emitted through the stack. The resultant APCR residue, or fly-ash, contains particles from the incineration process, lime used in the spray absorbers, salts and carbon dust. It is stored in a sealed silo until tankered away for treatment and disposal.

Emissions monitoring – As it passes through the stack, the residual flue gases from the process – water vapour and oxygen – are continuously monitored before release. This data is relayed automatically to the control room and to a secure recorder.

Commissioning and takeover

The two-year construction project at Richmond Hill began early in 2002, and was followed by the commissioning phase and technical trials. Only when the primary incinerator successfully completed the minimum performance tests did takeover go ahead – on 17 August 2004.

Before the partial takeover of the plant, we identified a series of ancillary matters where improvements would be required. We have reviewed these regularly with contractor Aker Kvaerner and the Department, and they have largely been resolved.

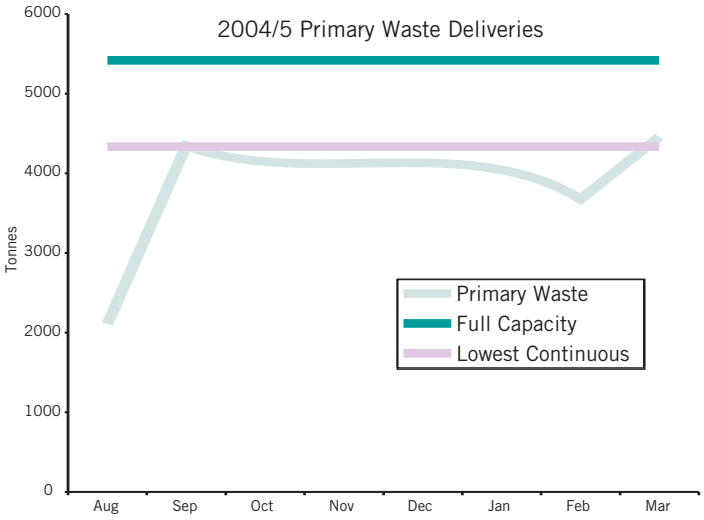
Despite such 'teething problems' – which are to be expected in the early operational phase of a major plant – the EfW facility achieved high availability levels.

Takeover of the secondary incinerator – for animal, clinical and oil wastes – was delayed by poor reliability and mechanical handling and process control difficulties. These were eventually resolved, after the year-end, allowing completion of the takeover process on 26 July 2005.

Despite this delay, we are pleased to be able to report that all the island's clinical waste arising since April 2004 – along with a large proportion of the year's animal waste – has been treated at the plant.

Operations

Waste levels were substantially below expectations throughout the operating period. The plant is designed for continuous operation around the clock, and requires an annual throughput of around 50,000 tonnes to sustain this (see diagram). At this level and above, the overall efficiency of the plant, emissions and electricity output can all be kept at their optimum.



At around 4,150 tonnes per month up to March 2005, the amount of waste processed fell some 10 per cent short of what was required. As a result the primary incinerator was shut down on three occasions to allow waste levels in the reception bunker to build up to a viable level.

The waste shortfall was due mainly to the continued landfilling of combustible waste and inappropriate burning of waste in open fires around the island. Closure of the Wright's Pit East landfill in March 2005 to waste suitable for incineration had an immediate effect on throughput at the plant. Since April, it has been able to operate continuously, save for planned maintenance periods.

Periodical stoppages are necessary to allow planned and preventative maintenance. Oil is burned before resuming incineration so as to heat the grate to the required temperature. Frequent cooling down and heating up of equipment also increases the need for repairs and maintenance.

In the early days of operation there was also some confusion among local authorities as to what types of waste could be processed at the EfW facility. We have worked with the Department of Local Government and Environment to clarify the plant's capabilities and look forward to further improving communication with our customers in the coming year.

Waste and outputs

Municipal waste accounted for 95 per cent of the total processed in the primary incinerator (see pie chart below). More than 25,000 tonnes passed through the plant in the period to the end of March 2005.

Waste from the construction sector was the next biggest stream, at over 920 tonnes, followed by packaging materials, at more than 260 tonnes.

In addition to recovering energy from plastics and most general household and commercial waste, our facility is also designed to deal with tyres. Old tyres, often illegally dumped or burnt, have become a major problem in the UK and other countries with the phasing out of landfill disposal. With no re-treading capacity and few other beneficial uses, the island's waste tyres must be shipped to the mainland.

Our primary incinerator's high-performance moving grate is equipped with water-cooling that enables it to burn tyres safely with municipal waste. Several trials were successfully completed after the first annual operating period. Work is also in hand to assess the feasibility of tyre shredding to increase our capability for dealing with this waste stream.

Energy

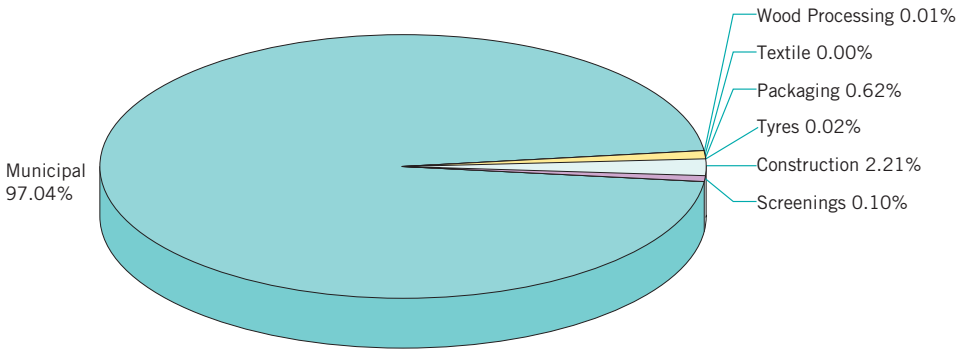
The EfW facility is a power station that produces electricity using household and other wastes as fuel instead of fossil fuels such as coal, gas and oil. We have the capacity to generate 6.8MW per annum – enough to power about 4,000 homes, or 10 per cent of the island's electricity needs.

We consume electricity as well as generate it. During the operating period we produced nearly 13,200MW and supplied more than 10,100MW to the island. This net export not only reduced the Isle of Man's dependence on imported fuels, but also our community's contribution to global warming.

During 2005 our output will rise and we also aim to achieve energy savings. Our facility's energy-efficiency is high, at 22 per cent, largely due to an ultra-efficient 16-stage turbine that uses two air pre-heaters. Before the year-end we began work on power management projects designed to minimise power imports during periods when electricity is not being generated and to deliver more energy per tonne of waste.

The EfW process reduces the volume of waste by 90 per cent, leaving a residue to be dealt with. For every 100 tonnes of waste incinerated, about 25 tonnes of bottom ash and three tonnes of air pollution control residues (or fly-ash) are produced. Other by-products of the EfW process include ferrous materials, which are recycled.

Composition of waste types



Bottom ash
Bottom ash left over from incineration is sampled for contaminants. Analysis shows (see pie chart below) that typically, 96 per cent of the ash is comprised of harmless compounds such as silica, essentially sandy soil. The other four per cent is made up of compounds such as arsenic, chromium and other naturally occurring elements. Measurements show that their concentrations in bottom ash are well below background levels or thresholds considered to pose a risk to public health or ecology.

Currently, the material is transported to Wright's Pit East for disposal. In Britain, bottom ash produced by SITA UK's EfW plants is recycled as an aggregate replacement and used in applications such as road-building and footways. We hope that this will prove possible on the island also.

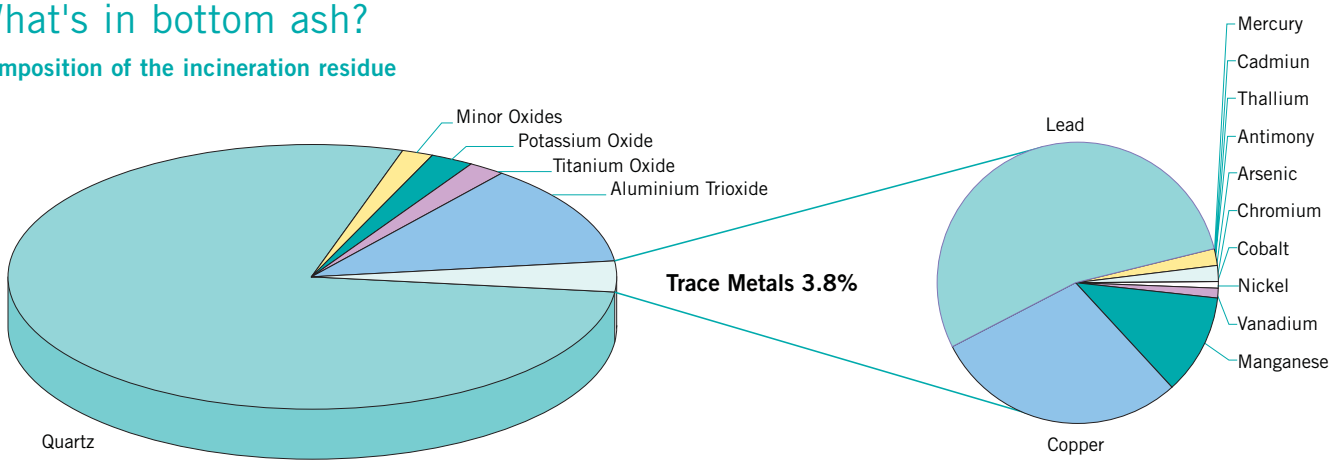
APCR (fly-ash) This residue from the gas-cleaning process is transported in sealed tankers to the UK. Mixed with waste chemicals from industry, it neutralises them so they can be disposed of, along with other non-hazardous waste, in a normal landfill.

Ferrous material Recovered from bottom ash, ferrous material is dispatched for recycling by steel mills in the UK.

Water Unlike many EfW plants, our facility does not discharge process water to watercourses. By recycling water within the EfW process and storing and re-using rainfall, we also reduce our demand for towns' water by 40 per cent. The water discharged from a storm outfall and our on-site sewage treatment plant is continually monitored for pH and conductivity.

What's in bottom ash?

Composition of the incineration residue



Other waste issues

Both the pattern of waste deliveries and anecdotal evidence point to the fact that some waste materials continue to be disposed of inappropriately on the island.

As was mentioned in Section 1, landfill is the cheapest disposal route, though it is now widely recognised that the method is not environmentally sustainable for general waste. That is true even of well-engineered, tightly regulated landfills. The consequences of burying general waste in unregulated sites, or in sites licensed solely for inert wastes such as hardcore and soil, are far more serious.

Household and a wide range of other wastes pose an environmental risk if disposed of in this way. Treated and painted timber, for example, can contaminate land or water if buried, or if chipped for use in compost, mulch or other applications.

Uncontrolled burning of waste is also a hazard as well as a public nuisance, producing particles, smoke, acid gases, greenhouse gases, and dioxins. Indeed in Western countries, tight regulation of incineration and other industrial processes has reduced dioxin releases to the point where bonfires now tend to be the dominant source.

The increased cost of disposal will be a factor in the diversion of trade and commercial waste to other routes, legitimate or otherwise. This rise reflects the environmental and economic realities of the shift to sustainable waste management.

Award for excellence

We, and the Isle of Man government, were proud to win a prestigious waste industry award for excellence in our first year of operation. The award for Innovation in the Design of a Waste Management Facility was inaugurated by the internet-based news site letsrecycle.com and endorsed by UK Minister of the Environment Elliot Morley MP.

The judges praised the landmark design of the Richmond Hill building and its many innovative processes and features, including the 16-day storage facility, use of rainwater for 40 per cent of process needs, avoidance of discharges to local rivers, water-cooled grate technology, and the first internet site in the British Isles to show actual daily emissions monitoring data.

Representing the Isle of Man Government, Pamela M Crowe MLC accepted the award with Jeffrey Robinson, General Manager of SITA Isle of Man, at a ceremony in London on 21 October 2004.

section three

Managing environmental performance

Key points

- Environmental management system on track for accreditation
- Emissions data published and explained
- First plant to monitor dioxin continuously
- Misperceptions about 'smoke'

Environmental policy

As a part of SITA UK (and SUEZ) we strive to achieve the highest standards of operational efficiency and environmental performance.

Our SITA Isle of Man environmental policy (see page 16) commits us to full compliance and, where we can, to exceeding the standards set down in legislation and regulations.

The management board of our parent company ensures that responsibility for environmental matters is clearly defined and understood throughout the company. Local managers and staff are required to carry out all activities in a manner designed to protect the environment from the risk of pollution.

We are accountable to all our stakeholders – employees, the public, contractors, and customers, as well as shareholders. We communicate our environmental policy to stakeholders, engage with them to understand and inform their expectations, and report annually on the environmental performance of SITA Isle of Man.

We measure our environmental performance and monitor our progress against objectives and targets designed to spur continuous improvement.

Our environmental policy

We recognise that how we manage our customers' and our own waste has an impact on the environment that we must strive to minimise.

MANAGEMENT RESPONSIBILITY

SITA UK and SITA Isle of Man management will ensure that responsibility for environmental issues is clearly defined and understood by all employees and that all activities are conducted in a manner designed to protect the environment from the risk of pollution.

ENVIRONMENTAL LEGISLATION

We will comply with, and wherever possible exceed, existing environmental and other pertinent legislative requirements at all stages of our business activities and operations.

STAKEHOLDER RELATIONS

We recognise the importance of our relationships with stakeholders – employees, the public, contractors, customers and shareholders. We will communicate this policy to them, report annually on our environmental performance, and engage with stakeholders so that we can take account of their expectations in the way we manage our business.

CONTINUOUS IMPROVEMENT

We will measure and monitor progress by setting environmental objectives and targets to ensure continuous improvement in our environmental performance.

Through all aspects of our operations we will:

- Seek to reduce the amount of energy obtained through non-renewable resources, use energy efficiently and reduce greenhouse gas emissions.
- Seek to minimise the volume of waste generated and to maximise reuse, recycling and energy recovery from waste.
- Use suppliers or contractors that have environmental standards compatible with our own wherever possible.
- Implement ISO 14001 or other appropriate environmental management systems.
- Continually reassess our policy and operations in the light of changing technology, legislation, the precautionary principle, business requirements and best environmental practice.

Environmental management

Environmental management systems underpin our commitments to compliance and continuous improvement.

Using the experience and expertise of SITA UK's Environment Department, an environmental management system (EMS) was implemented within SITA Isle of Man before the plant became operational.

Our EMS procedures govern every aspect of the plant's operations – from the training given to drivers delivering waste, through the inspections made to identify non-conforming material, to how we report our activities to the regulator.

This system is monitored from the UK as well as reviewed and audited locally. In line with SITA UK policy, we are working towards obtaining accreditation to ISO 14001 – the international standard for EMS.

Independent consultants have commended the system and, subject to a third-party assessment, we hope to gain accreditation before the end of 2005.

We have also begun the process of registering our system to the Eco-Management and Audit Scheme (EMAS). This standard, backed by the European Union, sets rigorous requirements for continuous improvement, public reporting of performance, and annual external validation (see page 18).

About EMAS

The Eco-management and Audit Scheme (EMAS) is a management tool for companies and other organisations to evaluate, report and improve their environmental performance.

To receive EMAS registration an organisation must:

1. **Conduct an environmental review** covering all environmental aspects of the organisation's activities, products and services; methods to assess these; the legal and regulatory framework; and existing environmental management practices and procedures.
2. In light of the results of the review, **establish an effective environmental management system** aimed at achieving the organisation's environmental policy as defined by top management. The management system needs to set responsibilities, objectives, means, operational procedures, training needs, monitoring and communication systems.
3. **Carry out an environmental audit,** assessing in particular the management system and conformity with the organisation's policy and programme as well as compliance with relevant environmental regulatory requirements.
4. **Publish a statement of its environmental performance** that lays down the results achieved against the environmental objectives and future steps to be taken to continuously improve the organisation's environmental performance.

EMAS accreditation is subject to an independent validation by external assessors. Audits are repeated each year to check that the requirements of EMAS continue to be met.

Our aim is to achieve EMAS validation during 2006. Obtaining, and retaining, this independently verified seal of approval for our environmental management system is a key benchmark for our future progress.

In addition, we are preparing a document mapping how the entire business is managed. The Management Process integrates all procedures – for quality and health and safety as well as environmental management – in a coherent framework. This will help ensure that we manage the business in a way that drives continuous improvement.

This plan is being written in line with the requirements of the relevant international standards (respectively, ISO 19000, OHSAS 18001, and ISO 14001 and EMAS).

Environmental impacts

Every waste management activity has the potential to damage the environment and must be carefully controlled. Following a standard SITA UK procedure, all potentially significant environmental impacts of our Isle of Man activities were assessed before operations began. This process identifies whether each possible effect is under satisfactory control and what improvements are required. From this assessment process our environmental objectives and targets are established.

Activity	Potential environmental impact	Activity to control/ reduce risk
Waste control.	Pollution arising from incorrect receipt, storage or disposal of waste.	Procedures in place include education of delivery companies and drivers, and spot checks on waste loads – both random and risk-based. EMS requires investigation of incidents and monitoring of corrective action.
Residue handling.	Contamination of land, water, and air from bottom ash and APCR (fly-ash).	Procedures to minimise pollution risk during storage and handling. Bottom ash is assessed on-site to ensure suitability for disposal at Wright's Pit East and results reported to the regulator. APCR disposal point also assessed and audited.
Emissions to air.	Air pollution from waste incineration.	Procedures and systems in place include continuous monitoring of the combustion gas, and real-time feedback via Control Room to optimise EfW parameters and emissions control systems. EMS and exceedance reporting procedures require investigation and action to prevent recurrences.
Surface water/ effluent control.	Pollution of aqueous environment.	Process water is re-used within the EfW process and not normally discharged to river. Any discharge, including that from the on-site sewage treatment plant, is subject to monitoring.
Delivery and storage of fuel and chemicals.	Chemical release to land, water or air.	Procedures provide for safe handling and preventative maintenance. Spill kits available and employees trained in their use. Spillages within plant are contained and not discharged to ground or river.
Consumption of chemicals, water, fuel and electricity.	Contribution to climate change, resource depletion.	Procedures provide for monitoring and management of consumption.
Noise.	Nuisance detracting from local amenity.	Preventative maintenance plans identify potential problems. Routine external monitoring undertaken.
Litter, dust, odour, pests.	Nuisance detracting from local amenity.	Procedures in place, for waste reception and handling, to minimise risk.

Environmental objectives and targets

2004	2005
An initial assessment to ISO 14001 was carried out by the external crediting body SGS.	Ensure continuous improvement in our environmental performance. Attain accreditation to ISO 14001 in 2005.
There were 29 notifications submitted to the Department of Local Government and the Environment.	Ensure all activities are undertaken in a compliant manner. Reduce emission limit exceedances by 10%.
Approximately 5000 tons of bottom ash were sent to landfill.	Minimise the negative impact of our activities and use of landfill. Reduce the quantity of waste to local landfill by investigating the suitability of bottom ash for recycling as an aggregate.
Monitoring of chemical, fuel, water and electricity implemented.	Minimise our use of natural resources. Reduce the consumption of chemicals, fuel, water and electricity.

ENVIRONMENTAL PERFORMANCE

Regulation

Waste incineration is among the most tightly regulated industrial processes in the western world. In 2000 the European Union introduced a Waste Incineration Directive (2000/76/EC) significantly lowering the limits on allowable emissions. An environmental assessment of the permitted releases found that they had no significant adverse effects on human health or ecology, a conclusion confirmed by the World Health Organisation.

Emissions

Our state-of-the-art EfW facility exceeds the requirements of the directive, and anticipates its latest enhancements. From the end of 2005, these set new emission limits and standards for reporting, necessitating retro-fitting of additional systems to existing incinerators in the UK and other EU states. These tightened standards are already contained in the operating licence issued by the Department of Local Government and Environment (see below).

EMISSION LIMITS

Emissions to air	**Half hour average**	**Daily average**	**Other limit**
Particulate matter	30 mg/m^3	10 mg/m^3	
VOCs (as Total Organic Carbon)	20 mg/m^3	10 mg/m^3	
Hydrogen chloride	60 mg/m^3	10 mg/m^3	
Carbon monoxide	100 mg/m^3	50 mg/m^3	
Sulphur dioxide	200 mg/m^3	50 mg/m^3	
Oxides of nitrogen	400 mg/m^3	200 mg/m^3	
Hydrogen fluoride			2 mg/m^3
Cadmium & Thallium (& their compounds)			0.05 mg/m^3
Mercury (& its compounds)			0.05 mg/m^3
Sb, As, Cr, Co, Cu, Pb, Mn, Ni, & V (& their compounds)			0.5 mg/m^3
Dioxins & furans			0.1 ng/m^3
Ammonia			
Polyaromatic hydrocarbon (PAH)			
Dioxin like PCBs			
Emissions to Water Surface water		**Limit**	
pH minimum		6	
pH maximum		9	
Visible oil		Nil	
Conductivity			
Suspended solids			
Chemical Oxygen Demand			
Sulphides			
Sb, As, Cd, Cr, Co, Cu, Pb, Mn, Hg, Ni, Tl, & V			
Emissions to Water Sewage Treatment Plant		**Limit**	
pH minimum		6	
pH maximum		10	
Visible oil		Nil	
Suspended solids		30 mg/l	
Biochemical Oxygen Demand		20 mg/l	

Emissions (cont'd)

The licence sets average daily and half-hourly emission limits for six parameters. Cleaned flue gases are monitored by the plant's Continuous Emissions Monitoring System (CEMS) for:

- Particles
- Carbon monoxide
- Sulphur dioxide
- Hydrogen chloride
- Oxides of nitrogen
- Volatile organic compounds

The SITA Isle of Man facility is the first in the British Isles to have continuous sampling for dioxins and furans. We also regularly monitor flue gases for a range of other compounds – such as cadmium and mercury – that cannot be continuously measured, but are subject to emission limits.

The results of all monitoring – including discharges to water, bottom ash and other solid residues – are reported to the Department of Local Government and Environment and are independently available to the regulator at all times.

When any limit is breached, the exceedance is reported to the department's Environmental Protection Unit (EPU) within 24 hours under a three-stage procedure. Our compliance staff investigate the reasons for the exceedance and, where appropriate, implement corrective action. The outcome of these investigations must be reported to the EPU before the event is closed.

We also post daily emissions data for the continuously monitored parameters on the SITA Isle of Man website. Visitors can view the emissions profile for the previous 90 days for both the primary and secondary incinerators. A graph shows the daily readings for the chosen parameter and the emissions limit. Details of exceedances are also listed along with the outcome or status of the resultant investigation.

SITA Isle of Man's website has been well received. The number of 'hits' had topped 40,000 per month by the end of the year. On average more than 4,000 individuals visited the site each month – a high level of traffic, indicating the emissions data service is valued.

Dioxin

Dioxin is a generic term used to describe over 100 compounds. Almost all are harmless to humans though a few are highly toxic. Dioxins are a by-product of combustion when carbon particles are in the temperature range 300 – 450ºC, as in garden bonfires.

At temperatures over 750ºC no dioxins can be formed. Our EfW facility is designed to burn waste at temperatures of up to 1200ºC and to keep the gas stream above a 850ºC threshold for a minimum of two seconds.

The innovative continuous monitoring system uses a sampling meter to extract dioxins from the flue into a specially prepared cartridge sent each month to a UKAS-accredited laboratory for analysis.

Continuous monitoring of dioxins is set to become a requirement for waste incinerators in the EU. We are providing data collected by SITA Isle of Man to the UK's Environment Agency to support its work to frame emission limits for dioxins.

Environmental data

The following table summarises the key environmental data for the EfW plant's first operating year.
Where appropriate, data is expressed per tonne of waste incinerated to allow a year-on-year comparison in future reports.

Wastes incinerated in the primary incinerator	2004
Wastes from wood/ paper processing	0.1 tonnes
Packaging	262 tonnes
Construction waste	926 tonnes
Waste screenings	33 tonnes
Municipal waste	25013 tonnes
TOTAL	**26234.1 tonnes**

Wastes incinerated in the secondary incinerator	2004
Animal waste	691 tonnes
Waste oil	66 tonnes
Clinical waste	157 tonnes
TOTAL	**914 tonnes**

Consumption of Raw materials	2004 Kg/tonne of waste
Propane gas	0.02
Gas Oil	30.7
Water	649

Energy Consumption & Energy Production	2004 MWh/tonne of waste
Electricity consumption	0.00985
Electricity production	0.5

Waste Disposal and Recovery	2004 Kg/tonne of waste
Bottom ash (landfill)	0.19
Air Pollution Control Residue (APCR) (landfill)	0.048
Scrap ferrous metal (recycled)	0.0086

Air Emissions	2004 Kg/tonne of waste
Particulate matter	0.004
VOC s	0.001
Hydrogen chloride	0.014
Hydrogen fluoride	0.00008
Carbon monoxide	0.028
Sulphur dioxide	0.073
Oxides of nitrogen	0.348
Ammonia	0.005
Cadmium & Thallium	0.000025
Mercury	0.0000006
Sb, As, Cr, Co, Cu, Pb, Mn, Ni, & V	0.0003
Dioxins & furans	9.9 x 10-18
Dioxin like PCBs	1.6 x 10-18

Water emissions Kg/tonne of waste	2004
Suspended solids	0.013
Biochemical oxygen demand	0.0012
Chemical oxygen demand	0.018

Environmental incidents

We have documented and reviewed all environmental incidents that occurred during the operating period covered by this report, and taken action to prevent a recurrence.

A summary of the environmental incidents, their causes, and the corrective taken is set out below.

Incident	Cause	Action taken
AIR EMISSIONS		
Carbon monoxide (gas produced by incomplete combustion).	A 7-staged air supply optimises combustion. The ratio of primary, secondary and tertiary combustion air was found to be incorrect.	Adjustments made to the combustion control system by the system designer.
Hydrogen chloride (acidic gas produced by burning certain wastes, including plastic).	Cooling water blocked by sediment.	A filter cleaning schedule introduced.
Hydrogen chloride	Atomiser earth fault.	Earth fault repaired and new working practices introduced.
Hydrogen chloride	Control panel over-heated.	Cabinet door modified to ensure air cooler unit functions correctly.
Hydrogen chloride	A false high-level alarm prevented quicklime production.	Routine cleaning introduced to prevent limescale build-up on probe.
Hydrogen chloride	A sample-line heating system fault led to a build-up of condensed hydrogen chloride. This vaporised when the heater was repaired, giving erroneous emission readings.	The CEMS integrator reviewed the relay used on the heating line and replaced it with a new design.
Particles (formed during combustion and in gas cleaning process, and removed by filters).	False analyser reading due to incorrect installation and commissioning.	Analyser installed and commissioned correctly.
Particles	Analyser fault led to erroneously high readings.	Analyser replaced and an improving cleaning regime instigated.
Sulphur dioxide (acidic gas produced from burning).	Analyser inappropriately calibrated.	Routine calibration schedule implemented and stock of calibration gases stored on site.
VOCs (volatile organic compounds are chemicals that contain carbon and evaporate easily at room temperature form from a wide range of household substances), **carbon monoxide, hydrogen chloride and sulphur dioxide.**	Compressed air system lost pressure over time.	Procedure introduced to switch compressor system back to automatic following maintenance. Alarm system amended to detect loss of air pressure.
WATER EMISSIONS		
Biochemical oxygen demand (a measure of how much dissolved oxygen is consumed as microbes break down organic matter).	A sewage treatment settlement tank overflowed to the continuous proportion sampler system, giving a high reading.	Procedure implemented for routine inspections of tank and cleaning of sampler chamber.

Plume suppression

Smoke is the result of incomplete combustion. The EfW plant's chimney stack does not emit smoke. Our proven EfW technology ensures all waste matter is completely incinerated and our filtering system traps particles in the gas stream as part of the cleaning process.

The plant does, however, emit water vapour and carbon dioxide. In certain weather – typically, cold and damp conditions – this vapour condenses in the air close to the top of the 67m-high stack, forming a plume.

During the planning process for the plant, it was agreed that the facility should have the capability to dispel a plume in certain circumstances. Oil burners were installed within the stack, and these heat up the gas as it passes through so the vapour condenses at a much higher level where it is not visible.

The relevant planning condition states that no smoke plume should be emitted from the stack, except during the first 15 minutes after starting the incinerator from cold, or when its visibility is due to atmospheric conditions causing water vapour to condense.

We adhere strictly to this condition. Our policy, therefore, is not to burn off vapour plumes unnecessarily – on legal and environmental grounds as well as financial. Utilising the plume suppression system each time in these conditions would, we estimate, involve burning 200,000 litres of fossil fuel annually.

section 4
Social responsibilty

Key points

- 27-strong workforce recruited and trained
- Health and safety procedures operating
- Active liaison and community programme

SITA Isle of Man owes a responsibility and a duty of care to the people of the island as well as to our environment. This extends to our employees, neighbours, stakeholders and the community at large.

Our employees

Twenty-seven people were recruited and trained to run the EfW facility. We have systems in place to manage their health and safety and to provide for their ongoing training and development.

We also recognise that we can continue to improve how we manage our people. As a way of moving toward best practice in this area, we have adopted the European Foundation for Quality Management's model approach, 'Towards Culture Transformation'.

Health and safety

Our approach to managing health and safety is founded on 10 standards set by our ultimate parent group, SUEZ. These require a safety action plan for every SITA company and site as part of a framework of risk assessment, training, incident reporting and investigation, and auditing.

We implemented a Health and Safety Plan in 2004. The objectives and targets it set, and the management systems established, have been monitored regularly and updated where appropriate.

All site areas were assessed for risk. The appropriate systems, equipment and procedures were put in place and we trained our staff to deal with emergencies.

SITA IoM/UK site managers have ultimate responsibility for the safety of their staff. But each employee is also expected to be personally responsible for his/her own safe behaviour. We communicated our safety requirements to all personnel, and maintenance contractors, and provided appropriate training and support.

Our health and safety system requires that all incidents, including near misses, are documented and reviewed, so that action can be taken to prevent future injuries.

There were four incidents in the operating period.

- September 04: Contract cleaners used the wrong power socket while cleaning, blowing a fuse on a power ring. This caused telephones and a non-critical PC in the control room to switch off. Powers sockets have been labelled to ensure they are used appropriately in future.
- October 04: During commissioning, a small fire occurred in the lagging to the stack burners. The lagging was removed and the sensitivity of the smoke detectors in the area has been increased.
- October 04: An operative fractured a finger when removing some bolts using the wrong tool. All shifts have been issued with their own set of tools appropriate to the task.
- November 04: An incident reportable to the Health and Safety Inspectorate (under the RIDDOR regulations) occurred when a 'man-basket', used as a lifting platform for maintenance, failed. An internal investigation revealed a design fault. The equipment was replaced with a new basket of a different design.

Training and development

Training is central to our policy of fostering the skills, personal development and career opportunities of our people, as well as being essential for a safe and compliant working environment.

SITA UK has a comprehensive training and development programme for employees at all levels. Progress is documented in individual training records and training needs are reviewed annually.

Our new employees receive health and safety induction training. Competency training is delivered through on-the-job supervision and workshops. In 2004 our operating team also received advanced operator training provided by colleagues from SUEZ's EfW facilities in France.

Personal development at work

Our company philosophy is to encourage staff to assume responsibility for projects that challenge and build on their personal knowledge and experience. The work done by shift engineer Conrad Philander on energy management and tyre incineration is a product of this approach.

An electrical engineer, and graduate of the University of Guyana, Conrad joined SITA Isle of Man in November 2003. He is one of five shift engineers working round the clock at the facility. Assisted by two shift operators, each engineer is responsible for supervising operations and control of the incineration and energy generation plant.

In his first assignment, Conrad was tasked with identifying and assessing opportunities across the plant for increasing energy efficiency. His review produced a series of proposals for minimising energy losses and consumption that are being implemented.

These range from more intensive maintenance of heat exchangers, steam traps, pipework, and insulation to reduce steam losses from the boiler – to fitting timers to limit the electricity consumed by security lighting in summertime, and in the waste reception hall after 5pm when deliveries have finished for the day.

Working with a colleague, Conrad also completed a feasibility study into burning tyres as part of the plant's waste stream.

This involved a market survey to establish waste tyre quantities, and testing the plant shredder's capacity to process a range of sample tyres. The study established that increasing the amount of lime slurry used in the spray absorbers ensures sulphur dioxide levels in the gas stream are negligible. Tyres' high calorific value, the work also showed, increases energy output per tonne of waste, when they are shredded and mixed with household waste.

Conrad says: "It was satisfying to be involved in these interesting and productive studies. I benefited from the guidance of my senior colleagues, and I was able to combine previous experience and theory with practical work. This has been of great value to me as an engineer."

Our neighbours

We are committed to minimising the impact of our operations on the environment – global and local. Everyone on the island is our neighbour.

Our EfW facility and operating procedures have been carefully designed so that we impinge as little as possible on our neighbours' lives. But we recognise that problems may occasionally occur, and so we take complaints seriously and liaise with the community.

Complaints

All complaints from the public, as well as local or other authorities, are recorded and investigated. We report back the outcome to the complainant and take corrective action as soon as practicable.

In 2004 we received three complaints from members of the public.

- March 04: During the construction phase, large volumes of steam were required to clean the plant's boiler. A neighbour complained of a strong odour during this process. No odour could be detected on site, however. As this was a one-off commissioning activity no further action was taken.
- August 04: A complainant informed our staff that smoke was coming from the stack. Our control room staff promptly checked emission monitoring data for particulates and VOCs (volatile organic compounds), confirming that no smoke was being emitted. A visible plume of water vapour was observed, however. No further action was required (see Plume suppression, on page 25).
- October 04: A concern was raised about the disposal of bottom ash at an un-licensed site. An analysis of the delivery records for Wright's Pit East and for ash leaving the facility showed that all the material was accounted for. No further action was needed.

Liaison

Local liaison arrangements are in place for most major SITA sites around the UK and Europe. These usually take the form of a consultative group, hosted by SITA and including representatives of local residents and special interest groups, councils and regulators.

Unlike these voluntary groups, the Richmond Hill Consultative Committee is a statutory body, created by Tynwald to guarantee openness and transparency in the regulation of the EfW plant.

The Committee, which met five times in the course of the operating period, works in partnership with the Department to ensure that the plant operates within the terms of its licence and planning consent. Members have access to all relevant information, may raise any issue of concern, and make recommendations to the Department.

There are five local government representatives – nominated by: Bradden Parish Commissioners (2), Douglas Corporation, Onchan District Commissioners, and the Isle of Man Municipal Association. The Department is represented by the chairman of its Environment, Safety and Health Division, who chairs the committee, and its environmental health and technical specialists also attend meetings as required.

Our stakeholders

We take a wide view of our stakeholder responsibilities. Thus it is SITA Isle of Man policy to work to inform people not just about the role and workings of our plant, but also about waste and the environment generally.

During our first operating year some 500 visitors toured the facility. These included members of the Manx legislature, local authority members, and government officers, as well as delegations from the Republic of Ireland and UK interested in the latest EfW technology.

We also hosted tours for members of local interest groups and children from local schools. Following extensive research and consultation with teachers, SITA has produced an education pack that presents issues around reducing, reusing and recycling waste to primary school children in a practical and innovative way. We aim to make use of this resource in 2005.

Working in partnership with the Department, we also intend to develop our visitors facility as an Education Centre, and to continue and extend our community activities, raising awareness and understanding of waste and environmental issues.

Glossary

APCR – Air Pollution Control Residue: particles from combustion gases, carbon dust, salts and lime used in the gas-cleaning process, also known as fly-ash.

Biodegradable – Capable of being decomposed by bacteria or other biological means.

Bottom ash – The residue left on the furnace grate when waste materials are incinerated.

Climate change – The process in which man-made gases are building up in the atmosphere, trapping the sun's heat, causing changes in weather patterns on a global scale.

Dioxins and furans – A large family of compounds, including some of high toxicity, that are byproducts of uncontrolled burning, incineration, and certain industrial processes, as well as volcanoes and forest fires.

EA – The Environment Agency: the UK's waste industry regulator. A non-departmental government public body, set up under the Environment Act 1995 to take an integrated approach to environmental protection and enhancement in England and Wales.

EfW – Energy from Waste: The incineration (burning) of waste at high temperatures to reduce its weight, volume and toxicity. The energy from the incineration process is converted into electricity.

EMAS – The Eco-Management and Audit Scheme: a EU-backed scheme designed to recognise and reward organisations that go beyond minimum legal compliance and continuously improve their environmental performance.

EU Waste Incineration Directive – Reflects the ability of incineration plants to more cost-effectively achieve high standards of emission control in comparison to the 1980s. It covers virtually all waste incineration and co-incineration plants.

Fly-ash – See APCR.

Furans – See dioxins.

Greenhouse gas – Natural and man-made gases that contribute to the 'greenhouse effect' and climate change, including carbon-dioxide, methane, ozone and chlorofluorocarbons (CFCs).

Hazardous waste – Defined by EU legislation as the most harmful wastes to people and the environment.

ISO 14001 – The international quality standard for Environmental Management Systems.

Landfill Directive – The Landfill Directive (Council Directive 1999/31/EC), aims to prevent, or to reduce as far as possible, the negative environmental effects of landfilling.

Landfill site – The deposit of waste into or onto land in such a way that pollution or harm to the environment is minimised or prevented and, through restoration, reclaims land which may be used for another purpose.

Leachate – Water that has come into contact with waste within a landfill site.

Methane – An odourless gas and principal component of natural gas and landfill gas, produced as biodegradeable waste breaks down. Over 20 times more potent as a greenhouse gas than carbon dioxide.

Municipal waste – Household waste, as well as other industrial and commercial waste similar in nature or composition, such as wastes collected by a waste collection authority or its agents (ie, wastes from municipal parks and gardens, beach cleansing, and fly-tipped materials).

MWh – Mega Watt hours, equivalent to 1 million Watt hours, and a unit of energy. (1 Watt is equivalent to 1 Joule of energy per second).

Recycling – The direct re-introduction of a waste type into the production cycle from which it originates as a total or partial replacement for new material.

RIDDOR – The UK's Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995, which require the reporting of work-related accidents, diseases and dangerous occurrences.

VOCs – Volatile organic compounds: carbon-based compounds that easily evaporate into the atmosphere; commonly used in industry for de-greasing, thinning and dissolving; and found in paint, inks and adhesives.

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