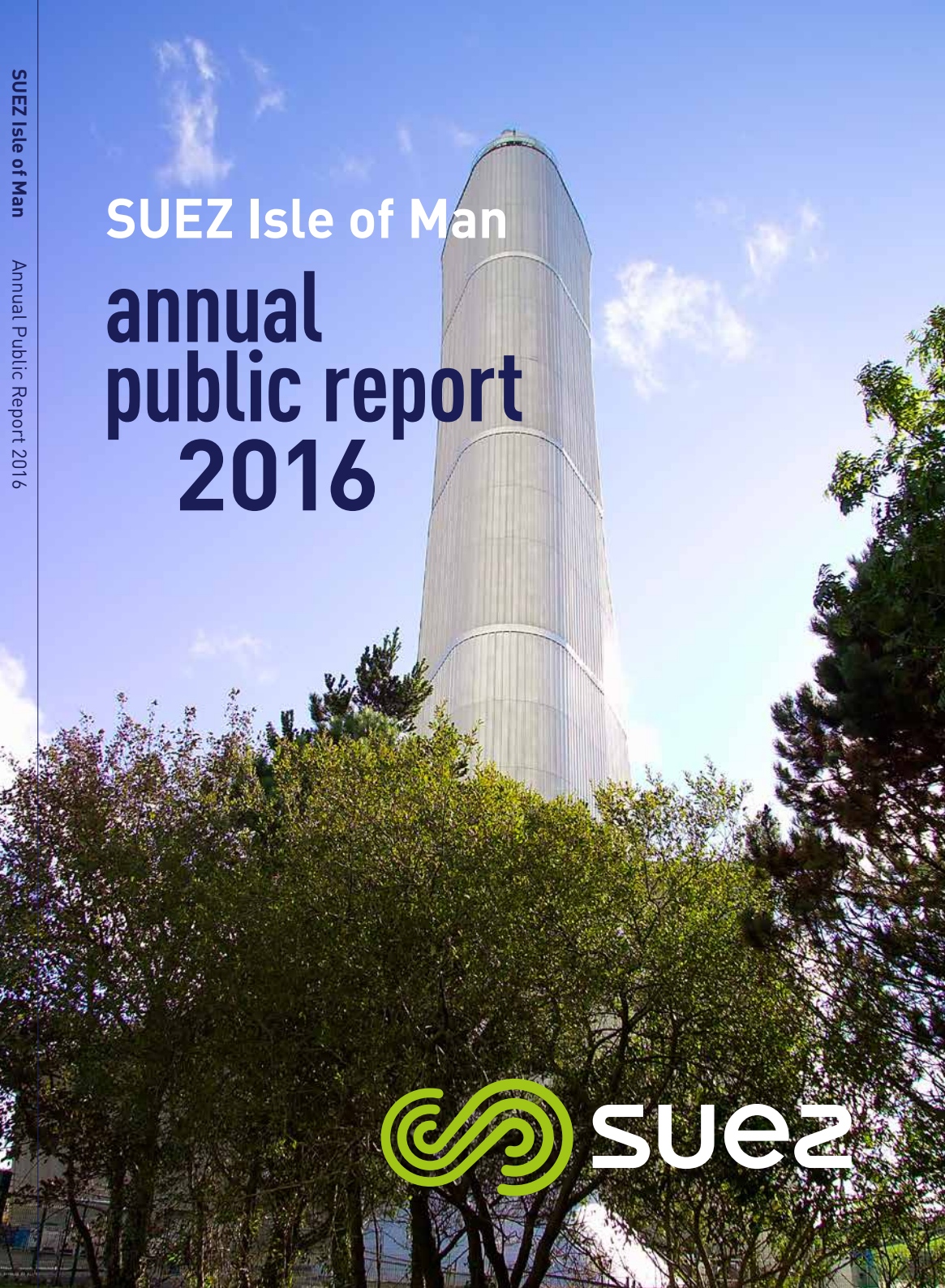
SUEZ Isle of Man

annual public report 2016



SUEZ

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foreword

We welcome your interest in the island's energy-from-waste facility and this, our annual public report for 2016.

In 2016, the Richmond Hill facility maintained its exemplary record in managing emissions, and independent auditors renewed our accreditation to the relevant international standards.

The economic value recovered from the waste processed over the year is significant. Almost 25,000 megawatt-hours of electricity was exported to the island's homes and businesses. This was generated from 50,000 tonnes of waste, ranging from municipal to flood-damaged materials, and plastic packaging from farms to tyres and bio-waste.

The efficiency of the energy-from-waste facility has always been high and as a sustainable business we strive for continuous improvement. This is reflected in our use of resources and the many improvement projects our teams completed during the year.

We have improved operational efficiency – and hit a challenging 2016 target for this – not least through smarter, more proactive maintenance. As plant and equipment age, this becomes increasingly important.

The commitment and engagement of our workforce is another critical factor in the successful performance of the facility. Their enviable track record in managing risk and working safely was sustained in 2016. Our people are highly skilled and we continue to invest heavily in their training and development.

We thank the team for their dedication to their daily duties, which are described by some of our colleagues in their own words in this year's report. We hope that you find their contributions and this annual summary of interest.

David Palmer-Jones
Chief Executive Officer
SUEZ recycling and recovery UK

Gerrit du Toit
Plant Manager
SUEZ Isle of Man

introduction

This, the latest in our series of annual reports on the island's energy-from-waste facility, covers the calendar year 2016.

Before we began processing waste in 2004, we undertook to publish a public account each year of our operations. It is also a corporate principle of SUEZ to be open and accountable to local communities where we operate.

Our annual public reports serve another important purpose too. The Richmond Hill facility is accredited to the European Union's standard for environmental management. One of the requirements of EMAS – the Eco-Management and Audit Scheme – is that we report publicly on our environmental performance and other indicators, including our consumption of resources.

Accreditation to EMAS requires independent verification. Following their 2016 audit, the verifiers' affirmation that we continue to meet the stringent requirements of EMAS is included at the end of this report.

About this report

The scope and structure of the report is unchanged from previous years. It covers all significant aspects of our operations.

In this introductory section, we describe the context in which we operate – namely, the Isle of Man's strategy for managing waste and the role of the energy-from-waste facility within that strategy.

The other four chapters describe our performance over the year in considerable detail.

Section two covers operational performance – the outputs from the incineration process, including electricity, and the inputs, from the types of waste treated to the raw materials consumed. We also explain energy-from-waste technology.

In section three, the focus is on environmental performance. We analyse the various impacts of the facility's operations on the environment, including performance against the emission limits laid down in the site's operating licence. This chapter constitutes the core of the environmental statement required under EMAS.

Our responsibilities to our own people and the wider community are the subject of section four. It examines our record on health and safety, training and development programmes, and our relationship with the public.

In the final section of this report, we describe SUEZ Isle of Man's objectives and targets. It sets out our goals for 2017 as well as outlining how we performed against the benchmarks previously set for our performance in 2016. Also in this section, there are data tables that bring together all the relevant performance data for easier reference.

SUEZ recycling and recovery UK

Our parent company is SUEZ recycling and recovery UK (formerly SITA UK). Operations here on the island sit within the energy division of the company. It gives us access to the collective expertise accumulated across six energy-from-waste facilities in the UK (with three more soon to come on stream) as well as other energy recovery technologies. This knowledge spans almost 30 years of electricity generation in various forms.

SUEZ recycling and recovery UK employs over 5,000 people. Since it was established in the UK in 1988, our company has delivered innovative and environmentally-responsible solutions for the waste generated by households and businesses.

Richmond Hill and the five (soon to be eight) other energy-from-waste facilities are part of a varied waste management infrastructure developed across the UK. It ranges from composting sites to facilities for manufacturing refuse derived fuels.

Over the course of a year, SUEZ recycling and recovery UK handles almost 10 million tonnes of waste. All the company's diverse activities are guided by a vision to engineer a society where there is no more waste.

Our company makes a significant and growing contribution by recovering value from waste materials. In 2015 alone:

- 642,000 megawatt hours of electricity were generated from energy-from-waste
- landfill gas was used to generate a further 475,000 megawatt hours of electricity
- 6.6 million tonnes of materials were recycled and recovered
- green and food waste was used to produce 146,000 tonnes of compost
- other wastes were processed to produce more than 400,000 tonnes of solid fuels

Our facilities

6 energy-from-waste facilities
9 materials recycling facilities
3 solid recovered fuel facilities
3 refuse derived fuel facilities
7 wood processing facilities
63 transfer stations
99 household waste recycling centres
11 operating landfill sites
1 mechanical biological treatment facilities
2 street sweepings recycling facilities
1 end-of-life plastics to fuel facilities
6 composting sites

The SUEZ vision

we want to live in a society where there is no more waste

Waste, we believe, should be viewed as a resource to be recycled or turned into energy rather than thrown away.

At SUEZ, we help to reduce the environmental impact of our customers' waste by recycling and extracting the value from it.

Our goal is to help create a circular economy in which nearly all waste materials are given a second life and reused, recycled or recovered for their energy content.

Our energy team strives to be the leading operator in maximising energy recovery from waste whilst always prioritising our safety vision to be the safest in the industry.

This approach gives us a leading role in the debate about the challenges ahead for the waste management industry, as we anticipate future developments and seek to influence national policy.

The global SUEZ group

SUEZ works with municipalities and industry around the world, helping them make the most of their resources.

The group has developed world-leading expertise in four areas that are seen as critical to the resource revolution:

- management of the entire water cycle
- waste recycling and recovery
- water treatment solutions
- consultancy services promoting sustainable urban and regional development

With more than 80,000 employees working across five continents, the group's innovation and the value SUEZ companies create for clients make us a leader in the world's emerging circular economy.

Manx waste management

SUEZ Isle of Man fully supports the island's strategy for a zero waste society, which matches our corporate vision.

Launched in 2012, this integrated waste management strategy aims to increase levels of recycling, build infrastructure and techniques to deal with special wastes, and apply the producer pays principle to minimise waste.

The Richmond Hill facility contributes to this strategy by treating waste that is not recycled as a resource. This helps the island maximise its self-sufficiency in several ways.

Across the European Union, the export of general waste is prohibited, while landfill – which is not sustainable in a practical or environmental sense for a small island – is being phased out. Continental European states have led the way in developing recycling alongside energy recovery for residual waste.

The island's energy-from-waste facility has the capacity to process all residual waste from local homes and businesses. It is also designed to dispose safely of clinical wastes from our hospitals and clinics. Since 2008, the job of handling animal carcasses from the farming and meat processing sectors has been taken on by the neighbouring facility, purpose-built for this role by the Government.

As well as minimising the island's reliance on landfill, energy-from-waste provides an alternative to exporting difficult-to-treat waste streams. Our facility also successfully recovers energy from waste tyres and bio-waste from sewage treatment.

The contribution to energy security is also significant. Using the island's various waste streams as a renewable energy feedstock helps reduce dependence on imported fossil fuels and vulnerability to spikes in oil prices.

managing waste

The Richmond Hill energy-from-waste facility turned **more than 50,000 tonnes of waste** into **almost 25,000 megawatt hours of electric power** for the island's homes and businesses in 2016.

In this section, we describe the technology we use to recover energy from waste and report on the different waste streams, raw materials and by-products of our operations.

The energy-from-waste process

The technology used in the facility, and our management regime, are designed to ensure it operates efficiently and, above all, safely.

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

Waste is burned at temperatures of over 850°C in the furnace of the primary incinerator, while on the secondary line, the minimum operating temperature rises to 1,000°C in its secondary chamber where volatile gases are incinerated. These thresholds are set out in the EU Industrial Emissions Directive, which is designed to ensure the destruction of waste and safe operation of incinerators.

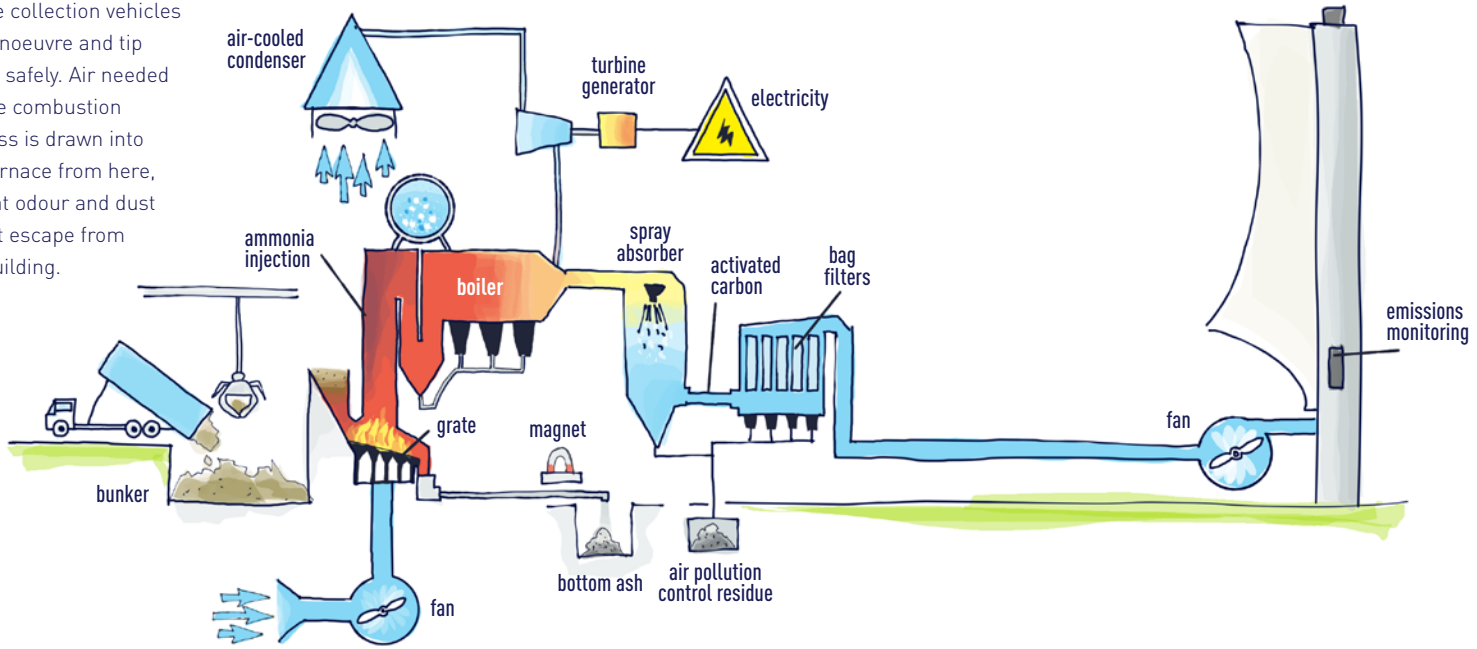
On arrival at Richmond Hill waste vehicles use an automatic weighbridge set back from the site entrance, so that lorries do not have to queue on the public highway. Waste type and amount, as well as customer details, are recorded and the driver is directed to the appropriate despatch bay.

Reception hall

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

Control room

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



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 facility is shut down for maintenance. A shredder, for bulky items such as mattresses, also discharges material directly into the bunker.

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 into super-heated steam. At high pressure, this steam drives a turbine-alternator to generate electricity.

Electricity generation

Electricity is generated at 11kV. At full capacity, around 1.5 megawatts is used to power the facility, leaving up to 5.5 megawatts for export to the Manx Electricity Authority, which distributes it around the island. The facility's switchgear 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 sampled for contaminants before being removed for disposal to landfill.

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 reused 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, 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 air pollution control residue, or fly-ash, contains particles from the incineration process, lime used in the spray absorbers, salts and carbon dust. It is analysed for contaminants and stored in a sealed silo or UN approved bags until it is collected for disposal in specialist authorised facilities.

Emissions monitoring

As they pass through the stack, the residual flue gases from the process are continuously monitored before release. This data is relayed automatically to the control room and to a secure recorder. A detailed analysis of emissions can be found in section three of this report.

Our operations

High standards of performance were sustained over the year as the throughput of waste and electricity exports increased. Our operations teams also delivered a heavy programme of maintenance.

The primary incinerator operates around the clock seven days a week, with two shutdowns for maintenance scheduled each year. On the secondary line, clinical waste and waste oils are processed in batches over several days each month.

A shutdown may also be initiated if the facility's control systems detect that performance is not within set parameters. This could be due to an exceedance of an emission limit, equipment failure or non-conforming waste.

Scheduled maintenance

As well as major maintenance, the shutdowns allow for regulatory inspections of the boiler and ancillary equipment.

Our routine maintenance schedules were revised in 2014/15 with a view to improving the reliability of the plant and pre-empting equipment failures. Under this revised schedule, a water pump feeding the boiler was replaced during each shutdown in 2016. Ongoing repair works to the refractory of the primary line's furnace were also undertaken.

The first shutdown, which took place in May 2016, also saw the replacement of the quenching vessel for cooling water. Inspections in 2015 had found extensive areas of pitting and corrosion.

A new low-voltage link was installed, which will allow the plant to be powered by a single transformer. Prior to this modification, a failure of either of the facility's two transformers would put the plant off-line.

The second shutdown was brought forward by a week – to 20 September 2016 – to deal with a failed boiler tube, which was replaced. Pressure testing revealed further erosion to the weld line in another section. A protective overlay was applied as a temporary measure, pending installation of new tubes in the first shutdown of 2017.

Major works were also required on the water-cooled grate. Damage to the grate's expansion boxes, caused by the waste, had been causing water leaks. As well as fitting new grate bars and boxes, their cooling circuits were modified, creating four rather than two zones so fewer units need to be isolated when leaks occur. Protective wear plates and refractory have been added to prevent the damage previously caused by hard material moving down the grate, wearing and scoring the exposed parts of the boxes.

An annual service check on the steam turbine and generator was also carried out in the shutdown, which was completed on 10 October 2016.

Re-shaping the silo

Fly ash – or air pollution control residue – is collected and stored in a silo, before being discharged into a tanker for disposal. The silo – a flat-bottomed steel structure – was redesigned, repaired and partially replaced during the year.

During discharge, the ash often 'bridged' above the outlet, forcing our Shift Operators to have to intervene and release the blockage. As pockets of material would become lodged at the sides of the silo, this also had the effect of promoting corrosion and eventual structural failure.

The decision was made to remove the flat base and add a new cone-shaped section in line with more recent designs in use at other SUEZ facilities. During the works, the silo was bypassed and the air pollution control residue was sealed in bags.

The new configuration of the repaired silo ensures a 'first in, first out' movement of air pollution control residue and promotes a mass flow of the material that reduces the risk of bridging and should extend the silo's life.

Operational efficiency

Over recent years we have undertaken a series of initiatives to sustain and enhance the operational efficiency of the facility.

These measures included a new operations management system to improve how we manage plant and equipment assessments, computerised tracking of all maintenance works on our Mainsaver system, and reviewing maintenance schedules so as to pre-empt equipment failures.

Our target in 2016 was that 80 per cent of all maintenance works should be preventative rather than reactive. In practice, we achieved a figure of just over 86 per cent, so less than 14 per cent of maintenance was undertaken reactively to remedy faults.

As the facility matures – it has now passed the mid-point of its 25-year operating contract – more technical faults can be expected and more maintenance will be required, so these efforts become even more critical.

We also monitor our operational efficiency and targets are set each year to spur our performance.

The overall equipment effectiveness target for 2016 was 80.33 per cent. This value is a product of three quantities (availability, performance and quality) related to the energy-from-waste system and process. Specifically, it measures production lost due to issues with equipment reliability, plant processes and our operational procedures. Over the year, we achieved the target with an overall equipment effectiveness outcome of 80.96 per cent.

Continuous improvement

Running in parallel with this ongoing operational efficiency programme, we continue to drive continuous improvement across the board – from waste handling to safety.

Staff have been trained to analyse our ways of working to identify any wasteful element in the process. Colleagues also receive awareness training and are kept informed of progress in driving continuous improvement.

In 2016, our people instigated a variety of continuous improvement projects. The operations team alone completed 26 initiatives. The following is a small cross-section:

- A new-style review meeting has become an integral part of the facility's daily routine. The daily review meeting involves the Shift Manager, Maintenance Planner, SHEQ (safety, health, environment and quality) Manager, Technical Plant Engineer and Day Operations Supervisor. They consult a series of boards with performance indicators for the last 24 hours' operation, monthly trends, critical issues affecting operations, and any corrective actions that may be required. Each meeting follows a set agenda, and its stand-up format helps keep the session brief and to the point, ensuring that all crucial information is clearly communicated in no more than 20 minutes.
- The valves that control the boiler's feed water were painted red or green to identify their normal position – i.e. whether they are open or closed during normal operation of the facility. The colour coding means operators can quickly determine if a valve is correctly set from a visual inspection and no longer need to consult a piping and instrumentation diagram. This also reduces the risk of losing demineralised water by avoiding the potential for a valve to be left in the wrong position during start-up, with the associated impact on operations.
- Working in confined spaces poses an increased risk requiring additional safety measures. The deslagger and hoppers beneath the grate of the furnace are such an area and must only be entered under a confined space permit. While all operations staff were aware of this, it was agreed there should be appropriate signage and locks fitted to prevent unauthorised entry. This is in line with the new health and safety rules implemented for unblocking the deslagger.
- Visual inspection ports were installed in the deslagger unit and pipework to remove the need for people to look directly into ash paths and therefore reduce the risk of injury.
- There are four sets of tubes through which hot combustion gases travel to superheat steam from the boiler. Temperature gauges were added to the fourth pass hoppers to help identify when and where ash in the gases causes blockages. These have the effect of reducing the temperature of the adjacent rotary valves. Operators used to assess the radiant heat to trace the blockage. The temperature gauges installed on the valves have red-amber-green overlays to indicate whether a blockage is present. As well as saving time, this improves safety by reducing the risk of burns and need for rodding.
- Operators can now quickly get a clear overview of the plant's operating conditions thanks to a new single-page screen introduced on control monitors. Before, staff had to scan a series of charts with multiple graphs and sub-pages, and respond to warning alarms when necessary. Now they can see a series of graphics showing green or yellow, the latter indicating that a parameter is straying from normal operating condition. This allows more time to take action to avoid the plant tripping, and reduces the risk of critical parameters being overlooked. Emissions are comprehensively monitored on a separate screen.

Furnace trial yields better repairs

A new method of repairing the primary line's furnace lining is proving successful. Inspections in the autumn shutdown showed that a 10m^2 trial area of refractory – repaired a year earlier – was still in good condition. Whilst sections replaced using the original technique have failed in that time.

The improved repair method involves grit-blasting the boiler wall back to bare metal and stud-welding a larger number of anchors between boiler tubes. The expansion gap is then filled with ceramic fibre paper.

Around 40m^2 has now been repaired in this way over three shutdowns. We intend to continue with this method and work with our specialist contractor to increase productivity so larger areas can be replaced during shutdowns.

Slower warm-up limits damage

Each start-up of the primary incineration line during the year followed an extended warm-up procedure introduced towards the end of 2015.

Its purpose is to limit damage to the refractory wall of the furnace caused by rapid release of moisture, which can cause cracks and dislodge its protective tiles. While the longer warm-up period adds to the cost of operation, this will be offset by reducing the need for refractory repairs.

Driving moisture off more slowly should extend the lifespan and reliability of the refractory, which protects the boiler tubes from excessive heating and corrosion. Failure in any area of the refractory results in accelerated wear, additional tube repairs or replacement and even unplanned shutdowns.

This warm-up curve requires 33 hours 15 minutes to reach operating temperature over several stages. The previous procedure was based on boiler pressures, and took between 12 and 14 hours.

What we processed

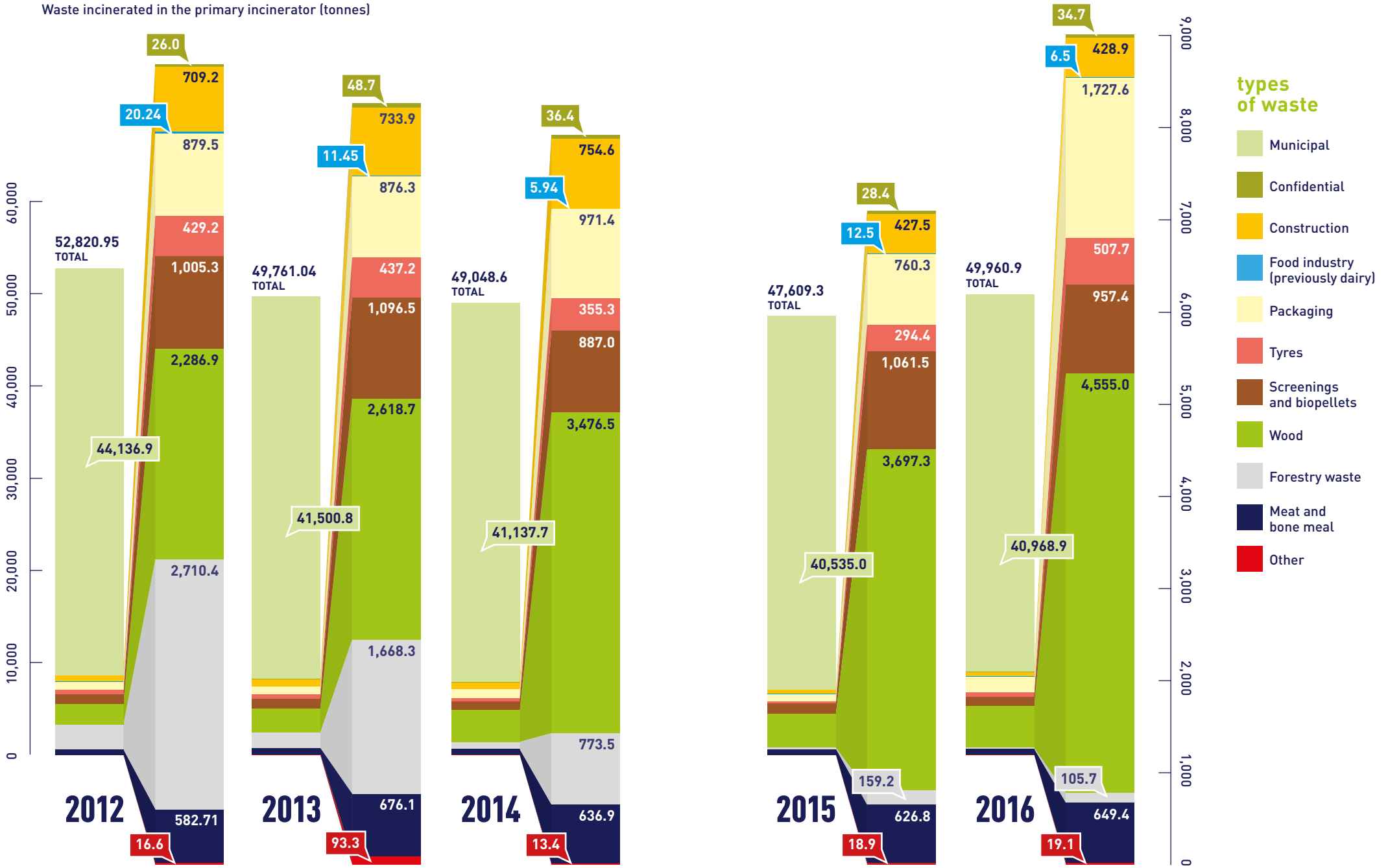
The throughput of waste increased by some 2,200 tonnes in 2016 to more than 50,670 tonnes.

December 2015's severe floods contributed to this rise and wood waste went up by almost a quarter. The volume of packaging waste also increased sharply as farmers took advantage of the Government's waste amnesty, which is designed to divert plastics from local burial or burning.

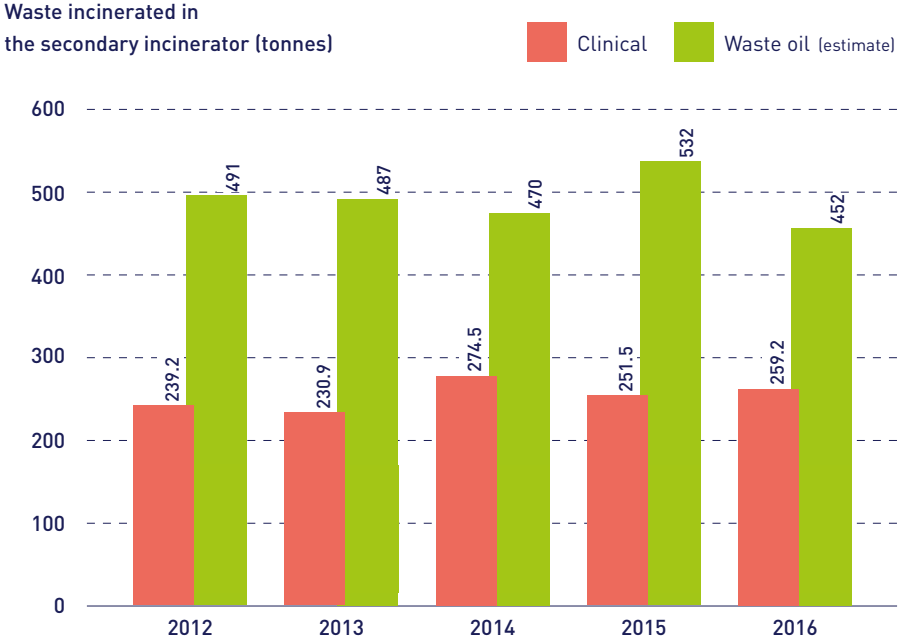
More tyres were processed in 2016 than in recent years. This followed the previous year's reduction in the gate fee (from £155 to £100 per tonne) and also the Government's prohibition on the exporting of stockpiled tyres.

On the facility's secondary incineration line, there was an increase in the amount of clinical waste processed, though this was more than offset by a reduction in the burning of waste oil.

Waste incinerated in the primary incinerator (tonnes)



Waste incinerated in the secondary incinerator (tonnes)



Energy generation

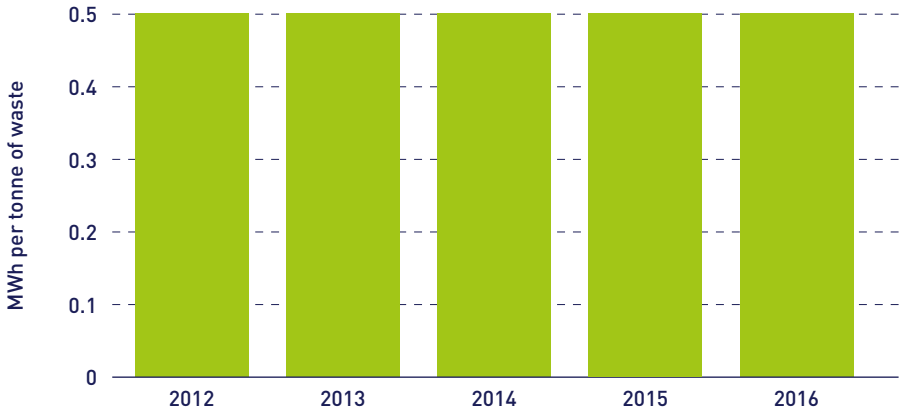
The steady growth over recent years in the energy output of the island's secondary power plant continued in 2016.

Electricity exports were just short of 25,000 megawatt hours, as on average half a megawatt hour of energy was recovered from each tonne of waste processed.

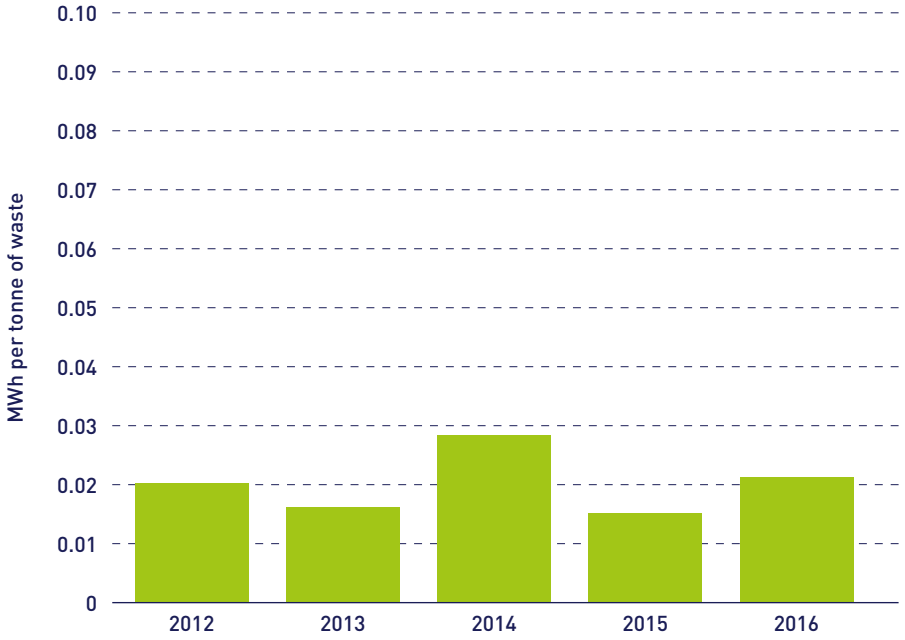
The net contribution to the island's grid would have been even higher but for an increase in the facility's own electricity consumption. This reflected the incidence of unplanned shutdowns and several other factors:

- The new warm-up procedure extends the start-up phase, so the facility must import electricity for longer, before the turbine can be engaged to start generating power.
- In October 2016, a failure of the turbine's emergency stop valve triggered an outage that alone accounted for 500 megawatt hours of lost output.
- For electricity to be exported safely, the facility's power system needs to be synchronised with the island's grid. In December 2016, we experienced a problem with the breaker that safeguards against electrical surges. This fault had never occurred before and took some time to trace.

Electricity exported



Electricity consumed



Other outputs and inputs

Bottom ash is the main by-product, apart from electricity, from the energy-from-waste process. While the facility consumes electricity too, its safe operation also relies on gas oil, various chemicals and water.

Bottom ash

When waste is incinerated, ash is deposited on the furnace grate. This is sampled for contaminants before it is taken from the facility for disposal in the Turkeyland landfill.

Bottom ash is predominantly formed of silica, essentially sandy soil. Other naturally occurring compounds make up the other four per cent. These include arsenic, in concentrations well below the threshold considered a risk to public safety.

In 2016, almost 10,500 tonnes were recovered from the process, an increase on the previous year in line with the volume of waste treated. The amount per tonne of waste was steady at 207 kilograms.

Other SUEZ energy-from-waste facilities divert bottom ash for re-use as an aggregate replacement in highways and construction. This has not proved practicable so far on the Isle of Man.

Air pollution control residue

The ash particles that rise with the hot gases from the furnace are removed in the gas 'scrubbing' process. This fly ash is encapsulated by chemicals and forms an air pollution control residue.

Due to its lime content, this residue must be treated as a hazardous waste. Salts and carbon dust also make up the air pollution control residue. Activated carbon is sprayed into the flue during the gas cleaning process, capturing lead, chromium, arsenic and other heavy metals.

The mix of wastes incinerated, and the presence of items such as batteries in household waste, determines the concentrations of these substances. We analyse samples of the air pollution control residue quarterly.

Air pollution control residue is sealed in containers before shipping to specialist facilities in the UK, where it can be disposed of safely.

Just over 1,650 tonnes of the air pollution control residue was created in 2016. This was an increase, reflecting both the greater amount of waste treated and a new calibration method on the main grab crane used to load waste. This had the effect of reducing the recorded tonnage for each load so the air pollution control residue ratio per tonne of waste increased.

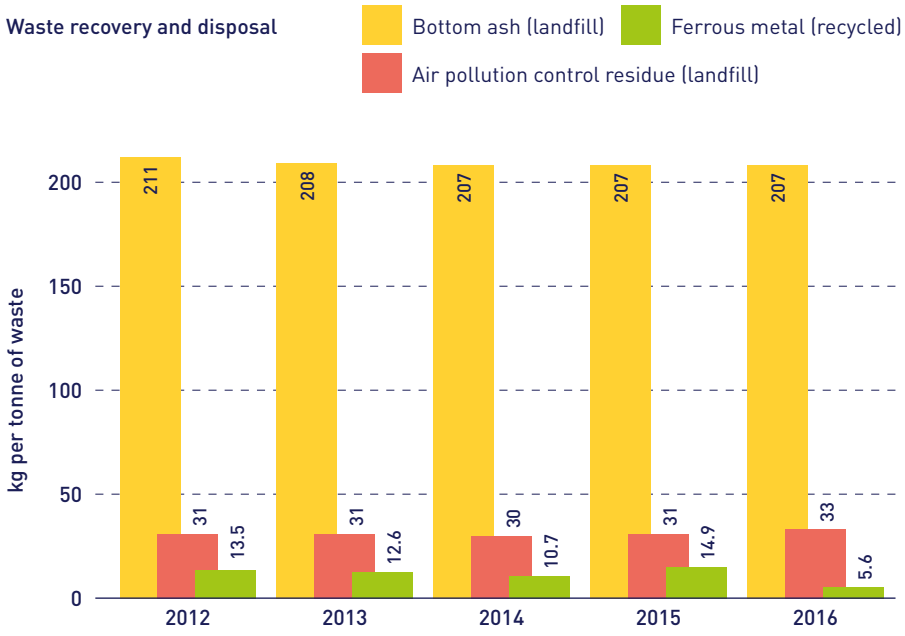
Ferrous metals

Mixed wastes delivered to the facility contain various types of ferrous metal, such as pieces of steel and iron. After incineration, the bottom ash is conveyed along a conveyor. An overhead magnet recovers these metal pieces from the ash.

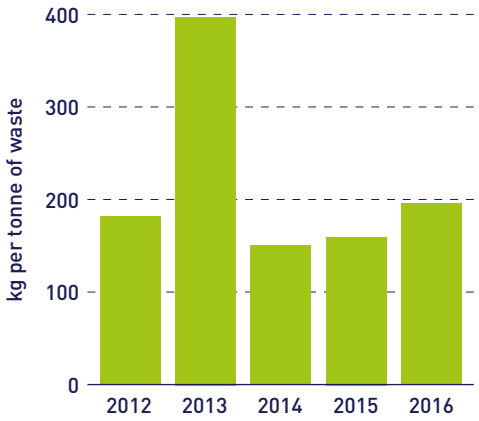
In 2016, the amount recovered halved to less than 300 tonnes due to low operational availability of the magnet. A delay in receiving parts and the need for a planned maintenance shutdown to carry out the repairs contributed to the extended period of magnet unavailability.

Ferrous metals are of less value to reprocessors when they have been through an incinerator and some items, such as cans, can interfere with the operation of the grate.

Waste recovery and disposal



Consumption of raw materials – Water



Water

Water is used to cool the furnace grate and to produce super-heated steam in the boiler, driving the turbine. Around the facility, water is consumed in general cleaning, office and toilet areas and our visitor centre.

The facility was designed to conserve water and protect this resource from contamination. Within the energy-from-waste process, water is recycled and on the site we store and reuse rainwater.

Our use of water increased in 2016, mainly due to a higher number of leaks in the pipes supplying the grate.

Gas oil

During the start-up and shutdown phases of operation, it is essential to burn gas oil to reach and maintain the minimum incineration temperatures required for the safe destruction of waste.

Gas oil burners on each of the incineration lines are also triggered when temperatures drop due to any interruption to loading of the grate or non-compliant waste.

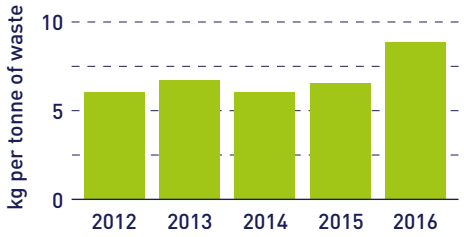
While burning the oil helps avoid potentially harmful emissions, it also creates carbon emissions, so we strive to limit its use.

In 2016, our rate of consumption rose. This reflected a higher number of unplanned shutdowns and changes in operational procedures. As reported, a longer warm-up curve was introduced when restarting processing on the primary line. This reduced the wear and tear of the new lining installed towards the end of 2015 and the procedure was followed for a full year in 2016.

Other changes – in the safety rules around deslagger blockages – increase the frequency of shutdowns, with the associated oil consumption during the warm-down phase of shutdown and warm-up phase on restart.

The year also saw a reduction in the amount of waste oils available for burning in place of virgin oil.

Consumption of raw materials – Gas oil



Chemicals

Lime, ammonia and carbon are used in the gas scrubbing process, which keeps emissions within the strict limits set in our site licence.

While compliance is our overriding priority, we manage our consumption of these chemicals in the interests of resource efficiency. Reporting on usage has also been an EMAS requirement since 2011.

In 2016, the measured consumption rate per tonne of waste fell for all three chemicals:

- Ammonia: Oxides of nitrogen form when nitrogen in waste is released into the air. They are controlled by injecting ammonia into the boiler. Despite the increase in waste processed, total use of ammonia was down to less than 24 tonnes. This saving was achieved following maintenance work by our engineers, which resulted in more efficient balancing of the nozzles that deliver the ammonia solution.
- Lime: An alkaline lime solution is sprayed to neutralise acidic gases in the flue, including sulphur dioxide and hydrogen chloride. Improvements made in the atomiser cleaning procedure and changing the inverters reduced the incidence of trips, so the dosing system operated more efficiently.
- Carbon: Dioxins and trace metals are absorbed by activated carbon. Recorded usage fell by almost four tonnes to 18.4 tonnes. This was largely due to a modification to the measurement software, which now gives a more accurate reading.

We continue to review chemical usage monthly, as we manage consumption while ensuring that the facility's exemplary track record in controlling emissions is sustained.

Our other activities

SUEZ recycling and recovery UK provides a suite of integrated services for managing a wide variety of types of waste. On the island, we operate a confidential waste service as well as handling hazardous wastes.

Confidential waste

The volume of confidential waste increased in 2016. Almost 35 tonnes were securely destroyed within the facility – an increase of more than six tonnes on the previous year.

Hazardous waste

All wastes deemed hazardous are subject to strict international regulations on shipment and disposal.

We took over the management of hazardous waste on the island in 2007. Since last year, we have operated a purpose-built facility for securely storing the wastes, pending their onward shipment.

Our staff collect hazardous wastes from industrial and other premises, analyse and classify them, before identifying the appropriate treatment or disposal facility. Wastes from different sources are consolidated into efficient loads and transfrontier shipment notices are issued in accordance with international regulations.

Members of the public can also request the removal of any potentially dangerous chemicals or other substances from their property, under an equivalent service provided for households and funded by the Government.

In 2016, we shipped four loads – two containing flammable paints and paint-related materials, one for acid waste and another comprising alkali and cyanide waste.

managing environmental performance

Managing the environmental impact of waste is a core purpose of our business.

The Richmond Hill facility and our management systems and procedures are designed to minimise environmental impacts.

In 2016, we sustained our track record of delivering the highest standards of environmental protection.

This section of the report constitutes our environmental statement for the purposes of EMAS. We set out our environmental policy, describe the systems used to manage those impacts and explain how our performance is monitored and checked.

The supporting environmental data is included towards the end of the report.

Environmental policy

SUEZ recycling and recovery UK has laid down the policy that governs all our operations on the island. This framework integrates occupational health and safety and quality of service with environmental management.

The policy requires full compliance with the specifications of the site licence and all relevant legislation and regulations. We are also challenged to exceed those standards wherever practicable.

Our parent company monitors our performance and sets objectives and targets to drive continuous improvement.

Our integrated policy statement for safety, health, environment and quality

SUEZ recycling and recovery UK recognises that how we manage our customers' and our own waste has an impact on the environment, the health and safety of our employees, persons working on our behalf, and the public. From a position of leadership in the UK's recycling and waste management industry, the company is fully committed to the effective management of all issues associated with our activities.

Management responsibility

The company's Management Board will ensure that responsibility for environmental, health and safety, and quality issues is clearly defined and understood throughout the company. All activities will be conducted in a manner designed to: protect the health and safety of our employees and persons working on our behalf; protect the environment from risk of pollution; and ensure a high quality of service for our customers.

Legislation

SUEZ recycling and recovery UK will comply with, and wherever possible exceed existing environmental, health and safety, fleet and other pertinent legislative requirements at all stages of our business activities and operations.

Stakeholder relations

SUEZ recycling and recovery UK recognises the importance of our relationship with stakeholders: employees, the public, contractors, customers and shareholders. We will communicate this policy to them, report annually on performance, and engage with stakeholders so as to understand and consider their expectations in the way we manage our business.

Continual improvement

SUEZ recycling and recovery UK will monitor and measure progress by setting improvement objectives and targets to ensure continuous improvement in performance. In order to mitigate the impact on the environment, enhance health and safety management and performance, and ensure delivery of service to all our customers, we will:

- Seek to prevent injury and ill health and promote a positive health and safety culture.
- Ensure all our facilities are managed in such a way as to prevent and minimise pollution.
- Seek to minimise the environmental impact of transport use.
- 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 to maximise reuse, recycling and energy recovery from waste.
- Use suppliers or contractors that have environmental and health and safety standards compatible with our own wherever possible, and maintain good customer and supplier relationships.
- Continually reassess all of the above in light of changing technology, legislation, the precautionary principle, business requirements and best practice.
- Ensure adequate resources are provided to meet specified customer and company requirements.
- Ensure personnel working for SUEZ recycling and recovery UK and on our behalf are aware of their responsibilities and comply with our policies and procedures.
- Regularly evaluate and review company performance and service provision.

The Management Board will periodically review this policy to ensure that it continues to meet the needs and aims of the business.

Management systems

All aspects of operating the energy-from-waste facility, and our related activities, are covered by an integrated quality and environmental system.

This system specifies the procedures to be followed at every stage – from accepting delivery of wastes to disposing of the residue from gas scrubbing. It is designed to make the compliant course of action clear to our staff in any given situation. The management system also directs how we report on our performance to the island's regulator.

We have registered our management systems to the relevant international standards and are committed to maintaining certification. This requires regular and independent re-assessment of our procedures and how we follow them.

Our environmental management system meets the requirements of ISO 14001: 2004, to which it was initially certified in the first year of operations. For quality management, our system is certified to ISO 9001:2008.

We first achieved certification to EMAS, the EU standard for environmental management, in 2006. This has been renewed each year, including 2016.

This external verification is in addition to periodic inspections by the Government's Environmental Protection Unit, audits by our parent company and our own internal auditing.

Environmental compliance

Our company is committed to surpassing the standards enshrined in relevant UK and European legislation as well as local laws and regulations.

Registration to the EMAS and ISO 14001 environmental standards reflects this commitment.

All relevant legislation and regulations are listed in our company's register. The Manx legislation with which we must comply is as follows:

- Public Health Act 1990
- Collection and Disposal of Waste regulation 2000
- The Import and Export of Waste regulation 2001
- Town and Country Planning Act 1934-1991 (as amended 1999)

We are regulated by the Government's Environmental Protection Unit, which reports to the Department of Environment, Food and Agriculture.

Compliance audits

An independent audit of our compliance with EMAS took place in March 2016.

SGS, an international verification and testing organisation, assessed how our facility measured up to the requirements of the EU's standard for environmental management. The inspection team subsequently confirmed that the Richmond Hill facility is fully compliant.

Our certification to the ISO 9001 and ISO 14001 standards was also renewed. These audits were completed in June 2016.

SUEZ recycling and recovery UK also conducted two audits. The first, in May 2016, was by its business control safety, health, environment and quality audit team. This is a comprehensive assessment of how the business as a whole is operated.

Its remit covers the site licence and record-keeping, emissions, incoming and outgoing materials, training, risk assessments, health and safety, emergency control, communications, work equipment, occupational health and first aid.

The second audit, in November 2016, has been developed to focus specifically on the processing systems of the group's energy-from-waste facilities. This covers fixed assets, procurement, fuel management, spares stock management, weighbridge calibration, human resources and other areas of administration.

Both audits returned high scores against the company's performance benchmarks. The audit team found "a very high level of technical expertise, and a correspondingly high level of safety awareness". Similarly, our processing auditors reported that "the site is operating very well".

Our facility is also assessed against targets for environmental compliance set by our parent company. These are based on the UK Environment Agency's Compliance Classification Scheme for waste management facilities.

The scheme scores any breach of a site's licence permit conditions according to the potential environmental impact. Where the root cause of a breach is a lack of training, this can result in a double score.

SUEZ recycling and recovery UK sets a target score of less than 10 for all its sites. The two incineration lines at Richmond Hill were each rated significantly below that threshold: with a figure of just 0.1 for the primary line and 4.0 for the secondary.

Environmental impacts

As with every industrial process, energy-from-waste has the capacity to cause environmental harm. Our systems are designed and our staff trained to manage and minimise the impacts of our customers' waste and its processing on the environment.

All potentially significant impacts, both negative and positive, are assessed, recorded and reviewed. The site's Significant Environmental Impacts Register helps us ensure that our activities are managed in ways that control these risks. Maintaining the register also helps identify possible improvements.

Biodiversity

Many of the procedures in our integrated management system are designed – like the facility itself – to enhance the protection afforded to local wildlife habitats and biodiversity.

For example, we take special measures in areas where chemicals and liquids are stored, and control discharges to watercourses. We also review and test our emergency planning.

Two emergency drills were carried out during the year:

- An acid spillage was simulated in the first drill. In the scenario, a forklift truck knocked over a drum of 'acid', causing it to burst and leak. The spill was contained by the bund, but the liquid was able to enter a drain leading to the site's recycled rainwater tank.

  Following radio contact with the control room, an Operator was dispatched to assess the situation and liaise with the Shift Manager. As most of the spillage had entered the tank, they agreed to monitor the pH level of its contents and adjust this as necessary before the water was reused in the energy-from-waste process.

  Mats and granules were used to absorb the remainder of the spillage, and all potentially contaminated materials were placed in the quarantine area and labelled for disposal.

  The timely response, liaison and pragmatic solution were judged to be appropriate and in line with good practice.

- The ammonia alarm was activated in the other drill. Staff evacuated promptly to the correct location, on the second floor, while a Shift Engineer wearing breathing apparatus took a gas monitor to investigate the source of the leak.

  A roll call confirmed that everyone was accounted for, but one contractor had failed to sign in. During the drill, the site's entrance gates had failed to close fully. In the event of an ammonia leak, drivers would be instructed to stop at the weighbridge and remain in their vehicles with windows closed or leave the site.

  The gates' magnetic lock has been replaced to ensure they can be closed remotely from the control room. The drill also highlighted the need to emphasise the importance of signing in to avoid the risk of a casualty being missed during roll call.

The EMAS standard, which encourages biodiversity, also requires that we report on the footprint of the facility. Our site covers approximately 23,000 m^2:

- 8,000 m^2 – the facility and associated buildings
- 10,000 m^2 – roads and other hard surfacing
- 5,000 m^2 – landscaped areas
- 1,600 m^2 – hazardous waste transfer station, comprising 1,600 m^2 of hard standing, 331 m^2 covered by a light industrial building with reception area and bunded storage lanes

Significant Environmental Aspects Register

Aspect	Potential environmental impact	Activities to control / reduce risk
Waste control and hazardous waste	**Positive impact** Reduction in waste to landfill. **Potential negative impact** Pollution of land, air and water arising from incorrect receipt, storage or disposal of waste.	Procedures in place including education of delivery companies and drivers, with spot checks on waste loads. Procedures in place for assessing, classifying, handling, storing and disposing of hazardous waste. Integrated management system requires investigation of incidents and monitoring of corrective action.
Residue handling	**Positive impact** Potential recycling of bottom ash resulting in a reduction of natural resource consumption and reduction of waste to landfill. **Potential negative impact** Minor contamination of land, water and air from bottom ash and air pollution control residue.	Procedures to minimise pollution risk during storage and handling. Bottom ash is assessed on site to ensure suitability for disposal to landfill and results are reported to the regulator. Air pollution control residue disposal point also assessed and audited.
Emissions to air	**Potential negative impact** Air pollution from waste incineration.	Procedures and gas cleaning systems in place, including continuous monitoring of combustion gases and real-time feedback via the control room to optimise emissions control.
Surface water / effluent control	**Positive impact** Recycled water and rainwater used on site to reduce the use of mains water. **Potential negative impact** Pollution of aqueous environment.	Process water is reused within the energy-from-waste processes and not discharged into the river. Any discharge, including that from the on-site sewage treatment plant, is subject to monitoring and quality control.
Delivery and storage of fuel and chemicals	**Potential negative impact** Chemical release to land, water or air.	Procedures provide for safe handling and preventative maintenance. Spill kits are available and employees trained in their use. Spillages are contained and not discharged to ground or river.
Consumption of chemicals, water, fuel and electricity	**Positive impact** Generation of electricity. Recycling of water and use of rainwater. **Potential negative impact** Contribution to climate change, resource depletion.	Procedures provide for monitoring and management of consumption. Targets set to continuously reduce usage.
Noise	**Potential negative impact** Nuisance detracting from local amenity.	Facility design. Preventive maintenance plans identify potential problems. Routine external monitoring undertaken.
Litter, dust, odour and pests	**Potential negative impact** Nuisance detracting from local amenity.	Procedures in place for waste reception and handling to minimise risk.
Biodiversity	**Positive impact** Use of landscaping for natural flora and fauna. **Potential negative impact** Possible contamination of land during lifetime of the facility.	Procedures to record any incident that could potentially contaminate the land. Procedures provide for safe handling of chemicals and preventive maintenance chemical storage. Spill kits are available and employees trained in their use. Spillages are contained.

Our environmental performance

All emissions to air, water and land from the Richmond Hill facility are closely monitored under the terms of our site licence.

All results – including airborne emissions, but also solid residues and discharges to water – are reported to the Environmental Protection Unit.

This monitoring takes places within the regulatory framework set by the EU Industrial Emissions Directive. Its stringent standards make energy-from-waste one of the most tightly regulated industrial processes.

Emissions

Air emission limits are set in the site's operating licence for a range of parameters.

As gases pass through the flue – after the scrubbing process – they are analysed by a system that continuously monitors emissions.

The continuous emissions monitoring system measures the following:

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

The primary facility also continuously samples for dioxins and furans. Other compounds are subject to emission limits, but cannot be continuously measured. We biannually monitor flue gases for metals. Quarterly monitoring of particulates is carried out on both lines. Dioxin testing is also performed each quarter on the secondary line.

Our waste disposal licence sets half-hourly limits for certain compounds and 10-minute limits for carbon monoxide. When an emission exceeds such a limit, the facility may still operate in full compliance with its licence conditions, but we must bring it back under control within a specified time or shut the facility down.

All exceedances must also be reported to the Environmental Protection Unit. Our compliance staff investigate the root cause and take corrective action, where appropriate. Before the event is closed, the Environmental Protection Unit is also informed of the outcome of each investigation.

Up-to-date information on the facility's emissions is openly available. As well as publishing this information annually, we post daily emissions data for the continuously monitored parameters on our website (www.suez.co.im). This shows the emissions profile for the previous 90 days for both incinerators, with daily readings displayed graphically for each parameter and emission limit. We also report the quantity of electricity exported.

Licence 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	
Hydrogen fluoride			2 mg/m^3
Carbon monoxide		50 mg/m^3	150 mg/m^3 95 per cent of all 10-minute averages in any 24-hour period
Sulphur dioxide	200 mg/m^3	50 mg/m^3	
Oxides of nitrogen	400 mg/m^3	200 mg/m^3	
Cadmium and thallium (and their compounds)			0.05 mg/m^3
Mercury (and its compounds)			0.05 mg/m^3
Sb, As, Cr, Co, Cu, Pb, Mn, Ni and V (and their compounds)			0.5 mg/m^3
Dioxins and furans			0.1 ng/m^3
Ammonia			*
Polyaromatic hydrocarbons			*
Dioxin-like PCBs			*

* Parameter does not have a limit stated in the waste disposal licence, but is required to be measured and reported to the Environmental Protection Unit.

Emissions to water

Surface water	Limit
pH minimum	6
pH maximum	10
Conductivity	*
Temperature	30°C
Flow duration	*
Suspended solids	*
Chemical oxygen demand	*
Sulphides	*
Sb, As, Cd, Cr, Co, Cu, Pb, Mn, Hg, Ni, Ti and V	*
Visible oil	Nil
Ammonia (N)	0.6 mg/l

* Parameter does not have a limit stated in the waste disposal licence, but is required to be measured and reported to the Environmental Protection Unit.

Sewage treatment facility	Limit
pH minimum	6
pH maximum	10
Visible oil	Nil
Suspended solids	60 mg/l
Biochemical oxygen demand	50 mg/l

Licence variations

Our site licence has evolved over the years, mainly to cover additional waste streams. We ensure that the substance in question can be safely and efficiently processed without compromising the facility's performance.
All proposed changes – whether permanent or temporary – must then be approved by the Department of Environment, Food and Agriculture.

There were no major changes in 2016 apart from some temporary exemptions to dispose of specific wastes arising on the island. These involved pesticides and weed killer, rodenticide and waste from grit blasting a bridge.

Permission was also granted to store crematorium air pollution control residue, and to accept 75 tonnes of contaminated soil and stones over the following 12 months.

Measuring our performance

Since we began operations, the energy-from-waste facility's record on emissions has been exemplary. Each year, cumulative emissions have always fallen well below annual limits.

Our operations team sustained and improved on that record in 2016 when airborne emission limits were exceeded just twice and there were no breaches of water-related limits.

The incidents involved:

Carbon monoxide

High readings for carbon monoxide were recorded during an emergency shutdown of the primary incinerator in July 2016. This was prompted by a spike in steam flow and boiler pressure. An atomiser used in the gas scrubbing system also tripped during the shutdown.

As a result, carbon monoxide levels exceeded the 10-minute daily average limit on six occasions during the four-hour period of abnormal operation. The problems, including the cause of the initial electrical circuit trip, were resolved and normal operation resumed when the plant came back on line.

Particulates

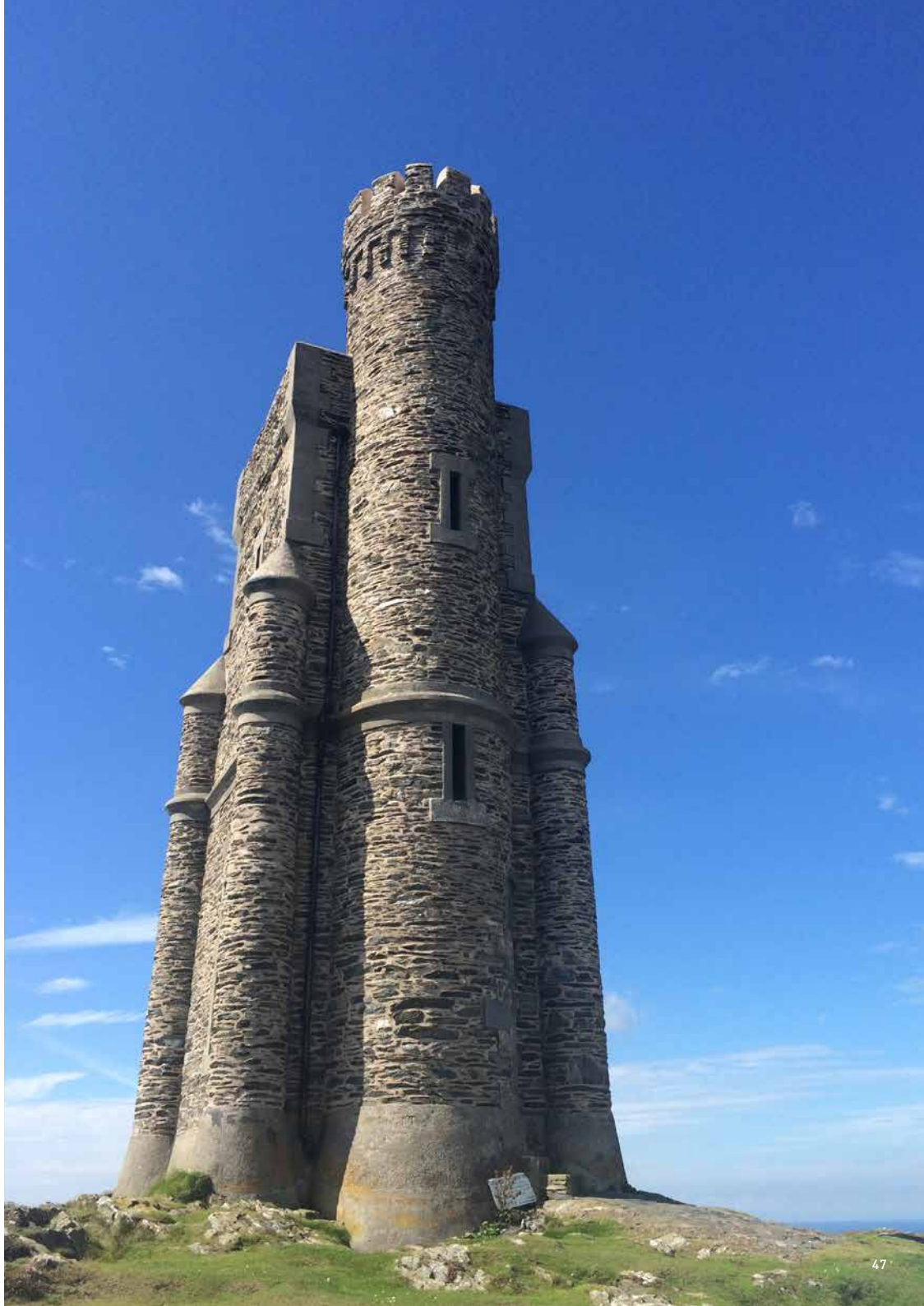
The secondary line exceeded a single half-hourly limit for particulate matter. All emissions were within limits following start-up as the incinerator reached operating temperature, but particulates spiked after the first bin was tipped.

Investigation after the run, which occurred in November 2016, confirmed that a section of brick refractory wall had collapsed into the secondary chamber, releasing a cloud of dust that was drawn past the analyser. Particulate levels were normal on the next run, after the dust build-up in the ductwork had been cleared.

The refractory wall was repaired in the following maintenance shutdown and the ductwork will be inspected to check for dead zones allowing dust to accumulate.

While most parameters saw an increase in cumulative emission rates per tonne of waste over the year, the amounts released to the atmosphere remained significantly beneath the licensed thresholds.

The data table showing the year's airborne emissions is presented along with the other performance tables in section five. These figures complement the daily emissions data published on our website. Together they provide a comprehensive picture of the facility's emissions.



corporate social responsibility

Our responsibilities include a duty of care to our employees and the wider community, as well as to the environment.

We are part of a company that values its people, and their safety, skills and development. As well as being accountable and open in our dealings with the local community, we want to contribute to the society we serve in other ways that complement our business services.

This section of the report outlines those responsibilities and commitments, including health and safety, training and development, and community engagement.

Our values

SUEZ recycling and recovery UK's corporate values are clear and simply stated. They are meant to express how we collectively, and as individual employees, approach our jobs, teamwork and customer service.

enthusiasm
We have a 'can do' attitude

excellence
We strive to be right first time, every time

creativity
We think and act smarter

responsibility
We do what we say we will do

communication
We take the time to talk and listen

collaboration
We help each other to create value

Our people

No matter how advanced our technology, or how well-designed our procedures, ultimately we rely on our people to operate the facility safely and efficiently, every day.

Their expertise and commitment is borne out in the Richmond Hill facility's track record of compliance and reliability.

For its part, the company strives to provide a safe and healthy working environment, and to invest in training and development so that employees enjoy secure and fulfilling careers.

As an in Investors in People organisation, we check and review how we are performing as an employer. We seek to involve employees in decision-making and consult them regularly on their views. This includes a biennial employee survey, in which people are encouraged to raise concerns and make suggestions.

People are also given the opportunity to contribute in routine team meetings and toolbox talks.

Triple awards success

As well as challenging and monitoring performance across the group, SUEZ recycling and recovery UK recognises outstanding achievement through an annual awards scheme.

In April 2016, SUEZ Isle of Man was presented with three awards at a conference event, held in Wigan.

These awards related to employee engagement, customer service and safety.

- Our award for best performance in employee engagement was based on the findings of an anonymous employee opinion survey. Conducted by employee research specialist Best Companies, the survey asked questions about people's working experience, relationship with their line manager and other items.
- The Isle of Man facility won a second award for the highest performance based on customer satisfaction scores.
- The third award was for best practice in safety, health, environment and quality. Our team was chosen in recognition of how it had adopted and championed the company-wide Safety in Mind initiative and for undertaking two dynamic risk assessments, along with the site's enviable safety record.

Health and safety

Our integrated management system (described in section three) is designed to embed safe ways of working in all procedures and activities.

As safe working also depends on each individual's thinking and behaviour, we strive to foster a culture of safety awareness and safe behaviour at work.

The Safety in Mind programme and charter were developed by employees across SUEZ recycling and recovery UK. This initiative has won national awards for best practice in health and safety.

Managers, supervisors and safety representatives benefit from Safety in Mind training and use what they have learnt to raise safety awareness among the workforce.

Our safety representatives consult their colleagues on their concerns and feed back their views and suggestions for improvements to working methods and equipment.

This approach is underpinned by the use of risk assessments, safety training and auditing, and investigation of all incidents – as well as all reported near misses.

Incidents in 2016

As with our track record on emissions, our health and safety performance has been exemplary since operations began at Richmond Hill. Again, this continued into 2016 and the year saw further improvement.

There were three minor incidents during the year, none of which resulted in lost time or were sufficiently serious to require a report to the authorities under Manx health and safety regulations.

This compares with a total of 10 incidents in the previous year, and 11 in 2014, when two incidents resulted in more than three days' absence from work – the threshold for statutory reporting.

The three incidents in 2016 involved a fall into an unsecured manhole, a thumb hit with a hammer and a panic attack.

Given the ever-present risk of injury, including serious harm, when working in an industrial environment, we recognise the danger of complacency. Near miss reporting is a valuable way of maintaining safety awareness and pre-empting future incidents.

After a dip in 2015, the number of near miss reports recovered to 62, around the previous year's level. The majority were recorded during the two planned shutdowns, when maintenance activity peaks along with the number of contractor personnel on site. All near miss reports are reviewed by our Safety Manager and changes to procedures are implemented where appropriate.

Training and development

We invest in training that promotes safety, enhances competence and also advances the professional development of our people.

This investment also supports our policy of promoting, where possible, from within, and providing access to career opportunities across SUEZ recycling and recovery UK and the wider, multinational group.

We support our employees to gain relevant qualifications. Shift Operators, for example, train to register under the industry's Boiler Operator Accreditation Scheme (BOAS).

Our company also invests in apprenticeships. Our current Apprentice Technician, Michael Valerga gained his Level 2 NVQ Diploma in Performing Engineering during the year, as well as Level 3 qualifications for mechanical engineering, engineering principles and machining materials by turning.

Our policy dictates that we assess each employee's competence, identify their training needs and track their progress. All operations and maintenance staff go through our in-house competence training and are formally assessed.

We manage this process using a competence and training matrix. The matrix specifies all essential training, as well as the toolbox talks delivered throughout the working year and non-essential training.

In 2016, it shows we delivered more than 1,270 person-hours of training. This total included the BOAS training for boiler operators, courses on mobile plant, fire awareness and fire wardens, first aid, initial response team, working at height and safety courses accredited by IOSH (the Institution of Occupational Safety and Health) and NEBOSH (the National Examination Board in Occupational Safety and Health). Paul Millichip, Senior Operations Technician, attained his NEBOSH General Certificate, gaining a distinction.

Our team

Our Plant Manager Gerrit du Toit leads a team of 34 people. The team was unchanged over the year, with one exception. Dena Stephens joined in July 2016 on a fixed-term contract to cover the maternity leave of our Office Manager, Amanda Garfield.

Born in Wales and educated in Reading, Dena has more than 15 years' experience in administration at a senior level in London, Cardiff and Reading, as well as the Isle of Man. Dena is a qualified Manager and an Associate Member of the Chartered Management Institute, and a member of Mensa.

New safety rules for blockages

Procedures are in place to protect our personnel from harm and manage risk in every aspect of our operations. But there is one area that poses a hazard that is unpredictable and dynamic.

Blockages in the deslagger are primarily caused by non-conforming wastes. As the nature and impact of the offending items are unclear, they create a dynamic and hazardous situation for our operators who need to respond.

Various approaches to clearing blockages have been taken and evaluated, but plant managers across SUEZ recycling and recovery UK concluded that it was not possible to guarantee the safety of intrusive blockage clearances. They decided to impose a moratorium on such interventions while waste is still being burnt.

Under the new procedure, operations staff must first evaluate the blockage and determine if continued waste feeding and/or incineration has the potential to clear the problem. If not, the operator takes the facility off-line in accordance with the specified warm-down procedure.

No entry into the ash drop-off area is permitted until the grate temperature falls below 50°C. All blockage clearance activities require a Permit to Work procedure and risk assessment.

When blockages have been cleared, the plant is returned to safe operation following the warm-up curve and start-up procedure.

Work to design a safe way of working on blockage clearances continued through 2016. While this has produced some positive changes to procedures, the risk remains high and the moratorium remains in place.

Meanwhile, we continue educating contractors and undertaking random checks on incoming loads to manage the risk posed by non-conforming wastes.

Our community

While providing an essential service to the island, we recognise that SUEZ Isle of Man also owes a duty of care to the community.

That demands integrity and transparency in all our dealings with the public, their representatives and local organisations, as well as running the facility safely and efficiently.

We respect the concerns and interests of our neighbours, promote open communications with all stakeholders, and try to contribute positively to the life of the island.

Our neighbours

One of the ways in which SUEZ companies consult and listen to local concerns is by hosting site liaison committees at major sites.

For the Isle of Man, the Richmond Consultative Committee meets that need. A statutory body set up Tynwald, the committee works with the Department of Environment, Food and Agriculture to ensure we are regulated in a transparent manner.

All relevant information on the operations of the energy-from-waste facility is available to committee members so they can ensure it operates within the terms of its licence and planning consent. Members can raise issues in meetings and directly with the Department, and table recommendations.

Procedures are also in place to handle all complaints received either directly from the public or local authorities. Each complaint is logged, investigated and the outcome reported back to the complainant. For the second year running, no complaints were received in 2016.

Climate change

SUEZ recycling and recovery UK is committed to reducing the carbon footprint of its operations. It monitors carbon emissions and reports annually on this impact both to the SUEZ group and to the Carbon Trust.

This body independently verifies our parent company's accreditation to the Carbon Trust Standard.

We estimated that in 2016 for every tonne of waste processed, 6.18 kg of carbon dioxide was emitted. This calculation is based on the amount of gas oil and electricity consumed by the facility.

Our communications

In addition to reporting publicly on our annual performance, we keep the community informed by updating the information available on our website.

We publish daily emissions data on the site (www.suez.co.im). As well as general information about the energy-from-waste facility, we provide three-month trends on emissions and publish the amount of electricity generated.

Further information about the circular economy and the role of energy-from-waste and other technologies can be found on the SUEZ recycling and recovery UK website (www.suez.co.uk).

Our visitors

Richmond Hill's visitor and education centre is another resource for education and for the community.

The centre continues to be well used, with over 400 visitors during the year. It is of particular interest to students, with ten groups from primary and high schools, and Isle of Man College visiting in 2016.

At the end of November 2016, we hosted a Government delegation led by the Lieutenant Governor, Sir Richard Gozney, who was accompanied by Ray Harmer MHK, the new Minister for the Department of Infrastructure, and the Department of Infrastructure's Chief Executive, Nick Black.

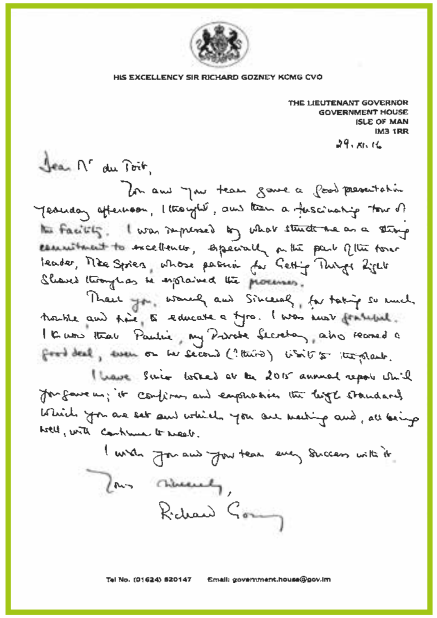
Sir Richard wrote a letter of thanks to our Plant Manger, Gerrit du Toit.

Letters of thanks

In his letter, Sir Richard wrote:

"You and your team gave a good presentation ... and then a fascinating tour of the facility. I was impressed by what struck me as a strong commitment to excellence, especially on the part of the tour leader, Mike Spiers, whose passion for Getting Things Right showed through as he explained the processes."

Sir Richard Gozney
Lieutenant Governor



HIS EXCELLENCY SIR RICHARD GOZNEY KCMG CVO

THE LIEUTENANT GOVERNOR
GOVERNMENT HOUSE
ISLE OF MAN
IM3 1RR

29.XI.16

Dear Mr du Toit,

You and your team gave a good presentation yesterday afternoon, I thought, and then a fascinating tour of the facility. I was impressed by what struck me as a strong commitment to excellence, especially on the part of the tour leader, Mike Spiers, whose passion for Getting Things Right showed through as he explained the processes.

Thank you, warmly and sincerely, for taking so much trouble and time, to educate a tyro. I was most grateful. I know that Pauline, my Private Secretary, also learned a good deal, even on her second (? third) visit to the plant.

I have since looked at the 2015 annual report which you gave us; it confirms and emphasises the high standards which you are set and which you are meeting and, all being well, will continue to meet.

I wish you and your team every success with it.

Yours sincerely,

Richard Gozney

Tel No. (01624) 820147 Email: government.house@gov.im

Another visitor, former Merchant Navy Engineer Officer Neil Hay, also expressed his appreciation:

"I was especially pleased to see the educational facilities and learn of the tours provided for young people. It is vitally important for the future of the island that people, and young people in particular, understand that this plant is in fact a well run, clean and effective way to deal with the island's waste.

I was left with an impression of a plant run safely, efficiently and cleanly, disposing of the waste products in a way that also produces a significant amount of electrical power. The steam plant was also observed to be running to very impressive parameters; you will understand my interest in this as an ex-MN engineer!"

Neil Hay
former Merchant Navy Engineer Officer

A working day in the life of our facility

From receiving waste deliveries to exporting electricity and shipping out bottom ash, each day our staff carry out a wide range of duties. Here they explain the roles they play in keeping the facility running smoothly.

"My responsibilities include ensuring that the weighbridge is functioning correctly and that consumables are all stocked for usage. I'm also responsible for the two Day Operatives in my team.

We carry out spot checks daily on incoming waste deliveries and ensure that all clinical bins for the secondary line are placed in cold storage. Waste oil is sampled and transferred to waste oil tanks. Bottom ash wagons are filled on arrival daily. We also supervise the loading and unloading of goods in/out.

A road sweeper is used to keep the weighbridge and site free of debris. The team is also responsible for housekeeping inside and outside of the facility, and for collection of hazardous waste, and waste from vets and dental practices."

John O'Toole
Day Team Supervisor

"One of our tasks is to ensure no non-conforming waste is delivered into the pit. To control this we need to inspect the waste when it arrives on site.

We pick a random vehicle, preferably a different customer each day, ask the driver to proceed to the spot check area and tip the waste on the floor. We watch to see if any oversize items or non-conforming waste is evident.

After the vehicle moves out of the way, we use the site loadall to lift and separate the waste to ensure there's no unacceptable materials hidden in the middle of the load.

We photograph the waste and if the load contains unacceptable waste, we insist it is taken away and sorted correctly. A non-conformance notice is issued against the company and we check its next delivery. If any non-conforming waste is found again, we will stop the contractor's access card for the weighbridge, so they must inform us of each delivery and we check each load until we're confident that they conform.

As wood and tyres attract a cheaper fee, these materials need to be authorised separately and checked to ensure they are not mixed with other waste."

Chris Savage
Day Operator

"The first thing I do in the morning is check the shift log for any new problems and Mainsaver for any new work requests, just to get a feel for what has happened overnight or at the weekend. Then I usually follow up on any emails received – these may be quotes for equipment services and parts or information from suppliers.

The majority of my time is taken up with carrying out planned maintenance, but also repairs, projects and improvements to the plant. Planned maintenance is an important part of the role, as this helps drive the operational efficiency and availability of the plant.

One important planned task is the maintenance of our turbine and generator. This involves checking the monitoring of generator outputs as they are used to determine import/export figures as part of the plant reporting.

Parts of the work also involve liaison with specialist contractors who carry out certain tasks."

Dave Pratt
Senior Maintenance Technician

"The shift starts at 7am, when the status of the plant and any ongoing issues are communicated during the handover.

As Shift Manager, I must prepare any permits to work to allow maintenance work by our own staff or contractors to go ahead safely during the shift.

We have a daily meeting at 9am, where key people meet to discuss any issues that may affect the day or any other longer-term issues.

Throughout the day, I will be monitoring the operation of the plant along with my shift operators, and making sure any issues that may arise are dealt with so there is minimum disruption to the normal running of the site."

Jonson Brennan
Shift Manager

"At the start of the shift, one of us does a plant walk-around, checking each level, looking, listening and even smelling for anything out of the ordinary. This could be ammonia, steam or water leaks, oil leaking and any other faults.

During this tour, we record the logs – that is the output from specific instruments on the turbine package, such as axial measurements, speed, temperature and so forth. The same also applies for the atomisers. We record the output data from their relative instruments also.

After a night shift, we have the reports for that day/night emailed to us, which reports our consumables and other relevant information that needs to be passed on to the shift coming in the next day. This information is then filled in on the daily review meeting boards, so it can be referenced in the daily meeting and passed on to the relevant managers and other staff members."

James Smith
Shift Operations Technician

"When I arrive at work, I check the Mainsaver maintenance work order table view. This shows my daily work, which is planned and scheduled for the week.

We also liaise with our planner, who attends the daily review meeting each morning. He instructs the maintenance department of any new work orders that have been raised during the night shift.

We assess the work involved, the level of priority and if contractors or spares are required. The length of time required and whether it has to be scheduled in a shutdown plan are also considered.

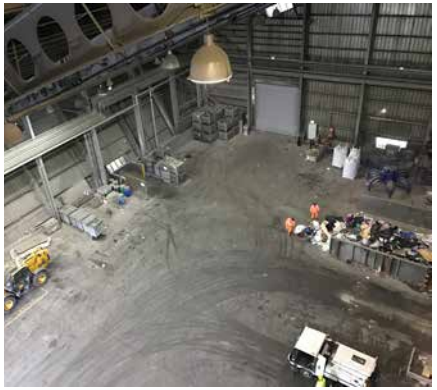
We liaise with contractors and suppliers to order spares and materials required for our maintenance tasks and also monitor the stores."

Neil Gibson
Maintenance Technician - Mechanical

"The operations team work 12-hour shifts (two days, two nights, four off). On arrival, we get a handover from the previous shift on the state of the plant and any outstanding issues.

We aim to do two-hour stints driving the crane to break up the day evenly. There are four bays that the wagons can tip into. This area needs to be constantly dug down and mixed into the waste pile to make room for more deliveries. It is important that the waste is mixed together, so that the fuel fed to the incinerator burns as consistently as possible. A grab of waste is sent up to the hopper to feed the plant roughly once every 20 minutes.

As there are special discounted waste codes for wood and tyres, these loads need to be manually authorised on the weighbridge computer when the vehicle arrives. The load is visually checked for conformity from the crane chair, then authorised as acceptable on the weighbridge computer as the vehicle leaves.



There is roughly 50 tonness of water in the boiler. We generate about 21 tonnes of steam per hour at 39 bar and 400°C. Burning six tonnes of waste per hour, we generate roughly four megawatts and use about one megawatt to run the plant.

The plant is controlled by a computer program called ICP – incineration control program. We monitor the entire process – from putting the waste into the hopper, through combustion on the grates, steam generation, flue gas treatment and electricity generation. We view trends of pressures, temperatures, flows and volumes, etc. By spotting parameters drifting out of specification and reacting before they reach alarm limits, we aim to keep the plant operating as efficiently as possible."

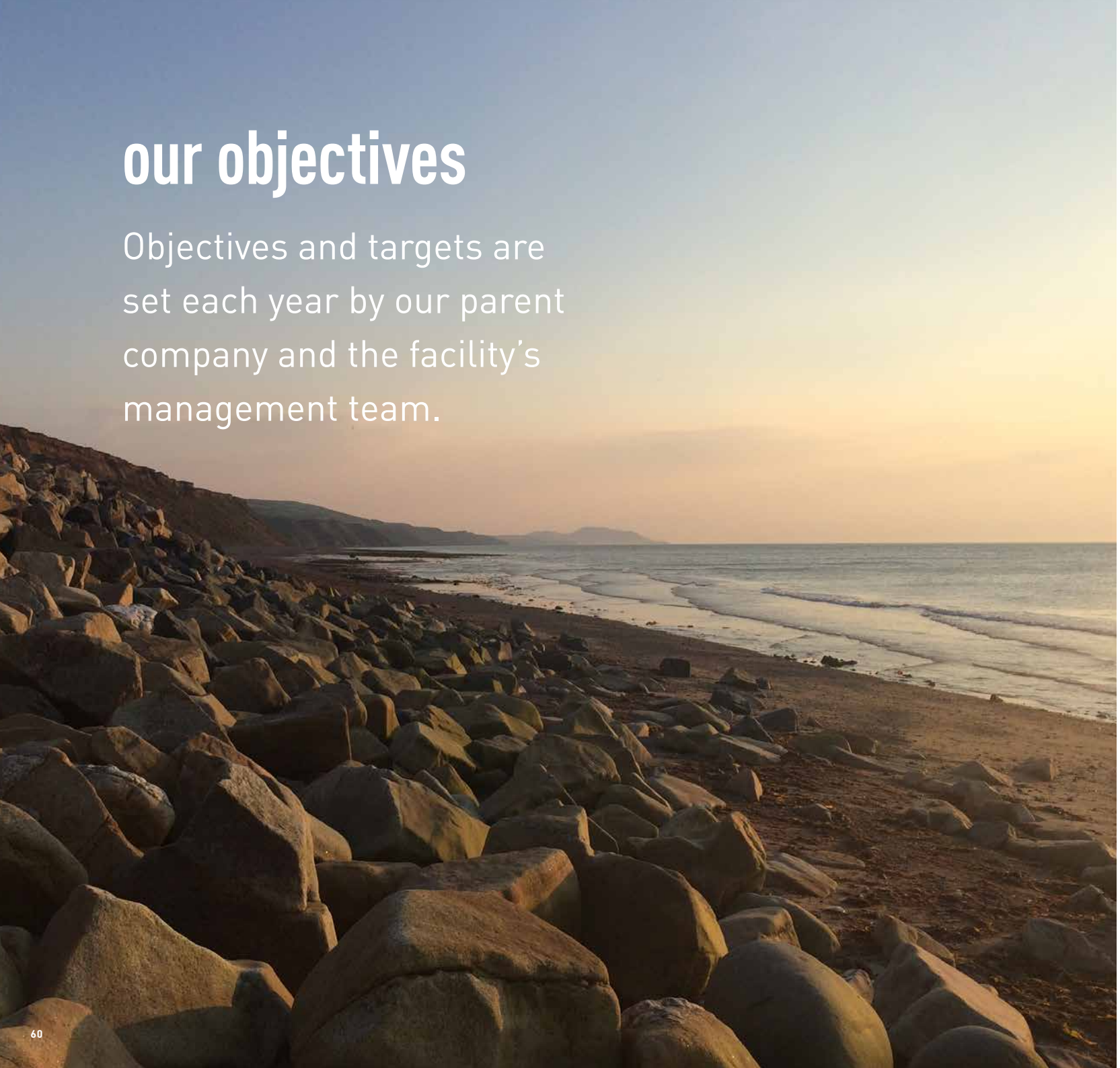
Paul Millichip
Senior Operations Technician

"One of our main jobs throughout each day is to fill incoming wagons with the bottom ash that is taken away from site. This is done in the ash pit loading area via the gantry above the ash pit and wagon. The crane is operated via handheld remote control. The amount of ash loaded into the wagons varies depending on the size of the vehicle. Smaller vehicles can take four grabs of bottom ash and the largest vehicles can take up to 10 grabs. Once the vehicles are filled, the driver sheets up the wagon and hoses off any ash that might be on the vehicle before leaving the site."

Dean Wade
Day Operative

our objectives

Objectives and targets are set each year by our parent company and the facility's management team.



In this section, we report on our performance against those benchmarks in 2016 and present all the supporting data for this report.

How we did in 2016

Our strategic objectives	Targets set for end of 2015	Achieved?	How we performed
Compliance	Each line to achieve CCS score of < 10.	✔	A score of 0.1 for the primary line and 4.0 for the secondary line.
Emergency preparedness	Carry out four emergency preparedness procedures.	✔	Two procedures carried out – a spill drill and an ammonia alarm drill, in addition to numerous fire alarm evacuations.
Biodiversity	Implement actions in biodiversity plan, as required.	✔	Biodiversity action plan in place.
Hazardous waste storage	Complete hazardous waste shipments, as required.	✔	Four shipments made.
Compliance and communication	Conduct environmental meetings as part of the health and safety meeting, incorporating both into a safety, health, environment and quality meeting.	✔	Environmental issues raised during monthly safety, health, environment and quality meetings.
Environmental protection and compliance	Complete site-specific accident management plan. No daily emission breaches during normal operating conditions.	✔	Emergency response procedure and related training deemed sufficient (no flood procedure required given low risk). No daily emissions breaches occurred during normal operating conditions.
Reduce oil usage	Maintain current oil usage levels.	✖	Oil usage increased from 6.5kg/tonne of waste to 8.8kg/tonne due to unplanned stoppages, new procedure for deslagger blockages, and new, longer warm-up curve.
Enhance staff competency	All shift managers and senior operations technicians to have achieved training and competence matrix level one.	✔	All qualified to or above this standard.
Management systems	Maintain accreditation to ISO 14001, ISO 9001 and EMAS.	✔	EMAS verification completed in March 2016. Audits for ISO 14001 and ISO 9001 completed in June 2016.
Reporting	Meet SUEZ internal reporting and carbon monitoring requirements.	✔	All reports submitted.
Operational efficiency	Meet operational equipment efficiency and preventative maintenance targets.	✔	All targets met. Operational equipment efficiency target of 80.33% achieved with 80.96% outcome. Maintenance target of 80:20 ratio of preventative to reactive maintenance achieved with 86.41%:13.59%.
Continuous improvement	Conduct five continuous improvement projects.	✔	More than 25 projects completed.

Objectives and targets for 2017

Our strategic objectives	Targets set for end of 2017
Compliance	Each line to achieve CCS score of < 10.
Emergency preparedness	Carry out four emergency preparedness procedures.
Biodiversity	Implement biodiversity action plan, as required.
Hazardous waste storage	Complete hazardous waste shipments, as required.
Compliance and communication	Conduct safety, health, environment and quality meetings.
Environmental protection and compliance	Complete site-specific accident management plan. No daily emission breaches during normal operating conditions.
Oil usage	Maintain oil usage in line with 2016 levels.
Staff competency	Maintain competency matrix.
Management systems	Maintain accreditation to ISO 14001, ISO 9001 and EMAS.
Reporting	Meet SUEZ internal reporting and carbon monitoring requirements.
Operational efficiency	Meet operational equipment efficiency and preventative maintenance targets.
Continuous improvement	Conduct five continuous improvement projects.

performance data

Waste processed

Wastes incinerated in the primary incinerator (tonnes)	2012	2013	2014	2015	2016
Confidential	26.0	48.7	36.4	28.4	34.7
Construction	709.2	733.9	754.6	427.5	428.9
Food industry (previously dairy)	20.24	11.45	5.94	12.5	6.5
Municipal	44,136.9	41,500.8	41,137.7	40,535.0	40,968.9
Packaging	897.5	876.3	971.4	760.3	1,727.6
Tyres	429.2	437.2	355.3	294.4	507.7
Waste screenings and biopellets	1,005.3	1,096.5	887.0	1,061.5	957.4
Wood	2,286.9	2,618.7	3,476.5	3,697.3	4,555.0
Forestry	2,710.4	1,668.3	773.5	159.2	105.7
Meat and bone meal*	582.71	676.1	636.9	626.8	649.4
Other	16.6	93.3	13.4	18.9	19.1

* previously included in food industry category.

Wastes incinerated in the secondary incinerator (tonnes)	2012	2013	2014	2015	2016
Clinical	239.2	230.9	274.5	251.5	259.2
Waste oil*	491.0	487.0	470.0	532.0	452.0

* estimated.

Exceedances

	2012	2013	2014	2015	2016
Number of exceedances of licence emission limits	4	6	2	5	2

Consumption of raw materials

	2012		2013		2014		2015		2016	
	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage
Gas oil*	6.0	322.9	6.7	350.1	6.0	296.6	6.5	313.8	8.8	446.2
Water	181	9,676	395	19,933	150	7,472	159	7,687	195	9,888
Lime	9.79	512.9	8.86	447.0	8.47	421.6	8.7	422.7	8.49	430.2
Activated carbon	0.43	22.6	0.42	21.2	0.39	19.5	0.46	22.3	0.36	18.4
Ammonia	0.66	35.2	0.64	32.3	0.66	33.0	0.58	28.2	0.47	24.0

* Gas oil and ammonia usage are recorded in litres and converted to tonnes using the conversion factor at **www.thecalculatorsite.com/conversions/weighttovolume.php.**

Energy consumption and generation

	2012		2013		2014		2015		2016	
	MWh per tonne of waste	Total MWh	MWh per tonne of waste	Total MWh	MWh per tonne of waste	Total MWh	MWh per tonne of waste	Total MWh	MWh per tonne of waste	Total MWh
Electricity consumed	0.02	1,050.0	0.016	814.4	0.028	1,391.5	0.015	717.5	0.021	1,044.2
Electricity exported	0.5	26,797.8	0.5	24,940.9	0.5	22,928.1	0.5	24,675.8	0.5	24,958.5

Waste recovery and disposal

	2012		2013		2014		2015		2016	
	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage
Bottom ash (landfill)	211	11,286.0	208	10,493.0	207	10,330.3	207	10,030.0	207	10,475.0
Air pollution control residue (landfill)	31	1,664.7	31	1,551.3	30	1,501.9	31	1,498.3	33	1,650.8
Ferrous metal (recycled)	13.5	723.1	12.6	634.9	10.7	533.0	14.9	723.2	5.6	283.5

Air emissions

	2012		2013		2014		2015		2016		Tonnes allowed under waste licence*
	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	
Particulate matter	0.0007693	0.0412	0.0015257	0.0770	0.0006819	0.0340	0.0006865	0.0332	0.0146147	0.7406	4.5
Volatile organic compounds	0.0059	0.31	0.0032	0.16	0.0049	0.25	0.0043	0.21	0.0072	0.36	4.5
Hydrogen chloride	0.066	3.53	0.071	3.57	0.070	3.48	0.068	3.31	0.079	3.99	5.1
Hydrogen fluoride	0.00060	0.032	0.00018	0.009	0.00014	0.007	0.00015	0.007	0.00012	0.006	0.60
Carbon monoxide	0.038	2.03	0.030	1.51	0.045	2.26	0.042	2.01	0.062	3.15	16.8
Sulphur dioxide	0.13	6.70	0.16	7.93	0.13	6.59	0.11	5.49	0.14	7.16	18.9
Oxides of nitrogen	1.11	59.35	1.37	68.96	1.33	66.37	1.26	60.76	1.30	65.88	75.0
Ammonia	0.015	0.81	0.018	0.90	0.015	0.74	0.026	1.28	0.041	2.08	-
Cadmium and thallium	0.0000080	0.0004	0.0000080	0.0004	0.0000044	0.0002	0.0000046	0.0002	0.0000038	0.0002	0.015
Mercury	0.00000	0.0001	0.00000	0.0002	0.00000	0.0002	0.0000018	0.0001	0.0000021	0.0001	0.015
Sb, As, Cr, Co, Cu, Pb, Mn, Ni, and V	0.00044	0.024	0.00015	0.007	0.00074	0.037	0.00017	0.008	0.00019	0.010	0.15
PAH	9.9×10^{-06}	0.0005	3.8×10^{-03}	0.1897	2.8×10^{-06}	0.0001	3.0×10^{-05}	0.0015	2.8×10^{-05}	0.0014	-
Dioxins and furans	3.5×10^{-11}	1.9×10^{-09}	4.5×10^{-11}	2.3×10^{-09}	8.8×10^{-11}	4.4×10^{-09}	1.0×10^{-10}	4.9×10^{-09}	1.7×10^{-10}	8.4×10^{-09}	-
Dioxin-like PCBs	2.1×10^{-12}	1.1×10^{-10}	4.7×10^{-12}	2.4×10^{-10}	3.0×10^{-12}	1.5×10^{-10}	1.9×10^{-11}	9.0×10^{-10}	2.2×10^{-11}	1.1×10^{-09}	-
Greenhouse gases (tonnes CO_2)	1,010.0	54,088.8	1,008.4	50,901.4	1,014.8	50,529.6	1,004.8	48,621.9	1,006.2	50,985.4	-

* Tonnages allowed under licence conditions calculated using the waste disposal licence limit, average flow rate and hours the plant operated in the year.

Water emissions

	2012		2013		2014		2015		2016	
	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage	Kg per tonne of waste	Total tonnage
Suspended solids*	0.017	0.92	0.012	0.59	0.008	0.40	0.008	0.38	0.010	0.49
Biochemical oxygen demand*	0.0009	0.05	0.0017	0.09	0.0009	0.04	0.0008	0.04	0.0008	0.04
Chemical oxygen demand*	0.007	0.36	0.006	0.31	0.005	0.03	0.006	0.28	0.015	0.75

* Calculated from estimated flow rate.

glossary

Anaerobic digestion
The process by which organic matter is broken down by bacteria in the absence of oxygen.

Air Pollution Control Residue (APCR)
Particles from combustion gases, heavy metals and dioxins, carbon dust, salt 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 formed on the furnace grate when waste materials are incinerated.

BS EN 14181
A demanding European standard for sites operating under the Waste Incineration Directive. This standard describes the quality assurance procedures needed to ensure that a continuous emission monitoring system installed to measure emissions to air is capable of meeting the uncertainty requirements on measured values given by legislation.

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 by-products of uncontrolled burning, incineration and certain industrial processes, as well as volcanoes and forest fires.

Energy-from-waste (EfW)
The incineration (burning) of waste at high temperatures to reduce its weight, volume and toxicity. The energy from the incineration process is used to generate electricity.

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.

EMAS
The Eco-Management and Audit Scheme. An 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
Issued by the European Union, the directive relates to standards and methodologies required for incineration. The aim of the directive is to minimise the impact of negative environmental effects on the environment and human health resulting from the emissions to air, soil, surface and ground water from incineration.

Fly-ash
See Air Pollution Control Residue.

Furans
See dioxins.

Gasification
Gasification is a method for extracting energy from different types of organic material through thermal treatment.

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 wastes most harmful to people and the environment.

ISO 14001
The international standard for environmental management.

ISO 9001
The international standard for quality management.

Landfill
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 then be used for another purpose.

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.

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 biodegradable waste breaks down in a landfill site. 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 (i.e. wastes from municipal parks and gardens, beach cleansing, and fly-tipped materials).

MWh
Megawatt hour, equivalent to one million Watt hours, and a unit of energy (one Watt is equivalent to one Joule of energy per second).

OHSAS 18001
The international standard for health and safety management.

Recycling
The direct reintroduction 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.

WEEE
Waste electrical and electronic equipment. The WEEE Directive was introduced in the UK in January 2007 and aims to reduce the amount of electrical and electronic equipment being produced, and to encourage re-use, recycling and recovery.

The external verifiers' EMAS verdict

"Further to consideration of the documentation, data and information resulting from the organisation's internal procedures examined on a sampling basis during the verification process, itis evident that the environmental policy, program, management system, review (or audit procedure) and environmental statement meet the requirements of Regulation 1221/2009 (The EMAS Regulation)."

Signed: 

Date: 19 April 2017

SGS United Kingdom Limited
Rossmore Business Park
Ellesmere Port
Cheshire CH65 3EN

Verifier number UK – V – 0007

EMAS
Verified environmental management
UK-000145

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