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sheffield energy

recovery facility

transforming our waste into energy

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energy recovery in sheffield

The city of Sheffield, along with the rest of the UK, is under ever-increasing pressure to manage and dispose of its waste in a more environmentally sustainable and cost-effective manner. The tightening of environmental legislation, both from Government and Europe and in particular the EU Landfill Directive, now means that the UK can no longer continue to send the majority of its household waste to landfill sites.



About the ERF

Unlike most other large regions Sheffield sends a relatively low level of waste to landfill. This is due to an innovative approach in the 1970s, integrating a waste incinerator with a network of pressurised hot water pipelines under the city to recover heat from household waste.

Although this system performed well for many years, it became apparent that change would be required, both to cope with increased waste arisings and to meet the stringent new requirements of the EU Waste Incineration Directive, introduced to the UK in 2005.

As Energy Recovery specialists, Veolia Environmental Services' integrated waste management contract included the design and construction of a new state-of-the-art facility and the expansion of the District Energy Network. Together with the introduction of waste reduction campaigns and widespread new recycling services, the Energy Recovery Facility (ERF) forms a crucial element of Sheffield's current integrated waste management system.

On average, Sheffield residents produce over 240,000 tonnes of waste every year. Of this over 21% is recycled and composted and less than 17% is landfilled.

62% of waste collected in Sheffield is taken to the Energy Recovery Facility where it is burnt at temperatures of over 850°C in a specially controlled environment.

The heat created from the process is converted to steam and used to generate heat and electricity.

- The ERF is designed to handle 225,000 tonnes of municipal solid waste a year
- Up to 60MW of heat is supplied to over 140 buildings connected to the District Energy Network. The number of buildings wanting to connect is continually growing
- The plant also generates up to 19MW of electricity for the National Grid; enough to power up to 19,000 homes



the energy recovery facility

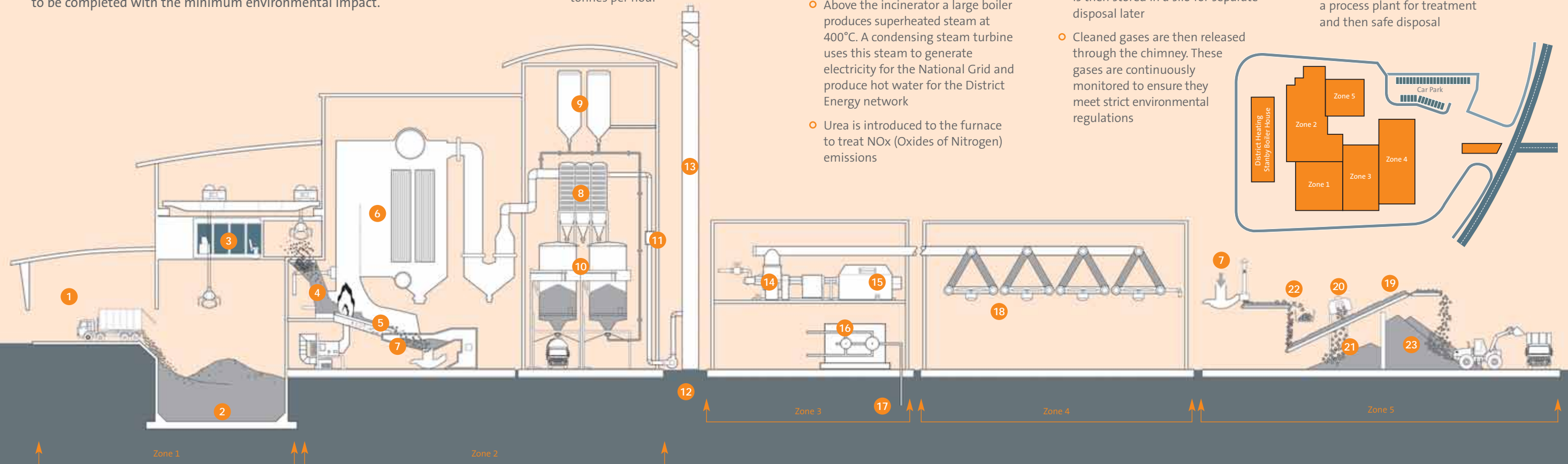
Sheffield's Energy Recovery Facility (ERF) is built using the latest technology and is designed to maximise the efficient generation of combined heat and power for the city's residents.

A condensing steam turbine takes 40bar steam to produce the electricity. Pressure take-offs allow a variety of combinations to be used to optimise the use of energy between heat and electricity.

Air cooled condensers, sized for full load rejection, allow the thermal cycle to be completed with the minimum environmental impact.

How it works

- Waste from households, Local Authority services and some local businesses is brought to the ERF. It is tipped into the waste storage bunker
- From the bunker the waste is lifted into a feed hopper by an overhead crane at a rate of 28 tonnes per hour
- The hopper feeds the waste into a single incineration unit where it is burned at temperatures in excess of 850°C
- Gas fired auxiliary burners ensure that the correct temperature of 850°C is reached before any waste can be fed into the unit
- Above the incinerator a large boiler produces superheated steam at 400°C. A condensing steam turbine uses this steam to generate electricity for the National Grid and produce hot water for the District Energy network
- Urea is introduced to the furnace to treat NOx (Oxides of Nitrogen) emissions
- Lime and activated carbon is introduced to neutralise the acidity of the flue gas and adsorb other pollutants
- The cooled flue gases pass through a filter house where the particulate (dust) is captured by 1760 filters. Particulate collected in this process is then stored in a silo for separate disposal later
- Cleaned gases are then released through the chimney. These gases are continuously monitored to ensure they meet strict environmental regulations
- An electromagnetic overband separator removes metal from the ash. The metal is delivered to a local company for recycling
- Ash from the incineration process goes into a bunker
- Particulates removed from the filtering process are taken to a process plant for treatment and then safe disposal



Key to the plant diagram

- | | | | | | | | |
|----------------|---------------|------------------|-------------------------|------------------|----------------------------|-----------------------|-------------------|
| 1 Tipping hall | 4 Feed hopper | 7 Ash discharger | 10 Residue silos | 13 Chimney | 16 Heat exchangers | 19 Ash conveyor | 22 Oversize items |
| 2 Refuse pit | 5 Grate | 8 Bag filters | 11 Emissions monitoring | 14 Steam turbine | 17 District Energy Network | 20 Magnetic separator | 23 Bottom ash |
| 3 Control room | 6 Boiler | 9 Reagents silos | 12 ID fan | 15 Generator | 18 Air cooled condensers | 21 Ferrous scrap | |

the energy recovery facility emissions and monitoring



Daily average emissions limits

Dust (Particulates)	10mg/m ³
Total Organic Carbon	10mg/m ³
Hydrogen Chloride	10mg/m ³
Carbon Monoxide	50mg/m ³
Sulphur Dioxide	50mg/m ³
Oxides of Nitrogen	180mg/m ³

See our performance in recent months online at www.veolia.co.uk/sheffield

Technical summary

- Capacity 225,000t
- Bunker Storage Capacity - 2,700t
- Throughput rate of 28 tonne/hour at NCV of 9,210 kj/kg
- Fully Automatic Grab Loading Crane
- Martin Reciprocating Grate with 5 rows and 13 steps
- CNIM 4 Pass Vertical Boiler with Radiant Superheaters
- Superheated steam production of 86 tonne/hour at 400°C and 40 bar
- Furnace Temperature >850°C
- 2 x 20MW Gas Fired Auxiliary Burners
- Chimney Height 75m
- Maximum Electrical Export 19MW
- Maximum Thermal Output 60MW
- Dry Lime and Powdered Activated Carbon Flue Gas Treatment System with Recirculation
- SNCR NOX Abatement System using 32% Urea Solution

As part of our Pollution Prevention and Control (PPC) permit, Sheffield's Energy Recovery Facility must meet stringent emission limits. Our own monitoring systems operate 24 hours a day to allow us to ensure the performance of the ERF meets all EU regulations and legislation. The results are posted on our website on a weekly basis enabling anyone to monitor our performance.

Additionally, we are subject to independent monitoring from the Environment Agency to verify our own monitoring data.





benefits to the community

On average, every UK household produces over one tonne of waste a year. Sheffield's Energy Recovery Facility can take up to 225,000 tonnes of municipal waste per annum, directly from residents in the city. The ERF manages the waste in a sustainable way, achieving a number of key environmental objectives.



- Energy is recovered from the waste, supplying heat through the District Energy Network to over 140 buildings. These include offices, leisure facilities, hotels, houses and apartments

- Heat provided by the District Energy Network in Sheffield saves 12,000 tonnes of carbon emissions from being released into the atmosphere every year
- Waste is diverted from landfill, helping Sheffield to meet Government and environmental targets
- One tonne of municipal solid waste has an energy content equivalent to 1/3 tonne of coal, so the facility has a significant role to play in reducing dependence on fossil fuels
- The ERF is centrally located, reducing the mileage covered by refuse vehicles and minimising congestion and pollution

Community relations

As part of our waste management strategy, we endeavour to maintain good relationships with the community we serve. Through various communications campaigns and external activities we raise awareness of waste issues in Sheffield. Our Waste Awareness Officer visits schools and community groups across the city delivering a variety of programmes to people of all ages and abilities; from one-off presentations to a series of interactive sessions designed to fit within the National Curriculum.

Whirlow Hall Farm Trust



Whirlow Hall Farm is a well-established charity providing residential and day visits for 10,000 children every year.

Veolia Environmental Services began working in partnership with Whirlow Hall Farm in 2006, delivering recycling and sustainability workshops. As a member of the Farm's 480 Club, we donated money to sponsor a school on a residential visit, where children can take part in a range of practical environmental workshops, from hands-on activities that look at the 3Rs - reduce, reuse and recycle - to the 'Waste Free' lunch session.

The Farm is an excellent venue for promoting recycling to children, in a setting which allows them to experience the countryside, sometimes for the first time.

Business in the Community

The purpose of being a member of Business in the Community is to inspire, challenge, engage and support business in continually improving its positive impact on society.

As an active member, Veolia Environmental Services helped create a cycle track for Valley Park Primary School in Sheffield, saving the school an estimated £30,000 whilst creating an innovative, healthy, educational outdoor space for pupils. Construction incorporated recycled materials, such as recycled aggregate and rubber chips made from tyres.

Veolia Environmental Services' project engineer, Delphine Canning, was acknowledged for her outstanding contribution to the Valley Park



playground scheme and was hailed 'Volunteer of the Year' at the recent Business in the Community Cares Awards. The Volunteer of the Year tribute recognises those who are strongly committed to 'putting something back' through company volunteering schemes.

veolia environmental services in

sheffield

Veolia Environmental Services is an international, market-leading waste management company providing a comprehensive range of services for organisations and Local Authorities across the UK. Our global experience and in-depth local knowledge help us to work in partnership with Sheffield City Council to formulate an effective long-term waste strategy which takes into account the city's population and environment. [Please visit: www.veolia.co.uk/sheffield](http://www.veolia.co.uk/sheffield)

Recovering energy from waste

Energy Recovery provides a long-term sustainable solution for waste management. Once the options of waste reduction, reuse and recycling are exhausted, residual waste can be sent to Energy Recovery Facilities to produce power for the National Grid, providing us with renewable energy.

Veolia Environmental Services is an experienced Energy Recovery operator, managing successful facilities across the UK and abroad. In total we recover energy from nearly 1.5 million tonnes of waste per annum from 6 Energy Recovery Facilities in the UK and return 110MW of electricity to the National Grid.

In August 2001, Veolia Environmental Services was awarded the integrated waste management contract for Sheffield and took over the day to day management of the existing services on the same day. A development team was established to deliver the range of facilities that were needed to meet the demanding targets agreed under the new contract.

Successful integrated waste management depends on a combination of up to date technology and infrastructure, reliable and appropriate services and community participation. In Sheffield we are responsible for efficient refuse collection services, encouraging waste reduction and improving recycling rates in the city, through kerbside collections, bring banks and Household Waste Recycling Centres (HWRCs). We also operate a Materials Recovery Facility (MRF) to sort 20,000 tonnes of waste paper and card.

