

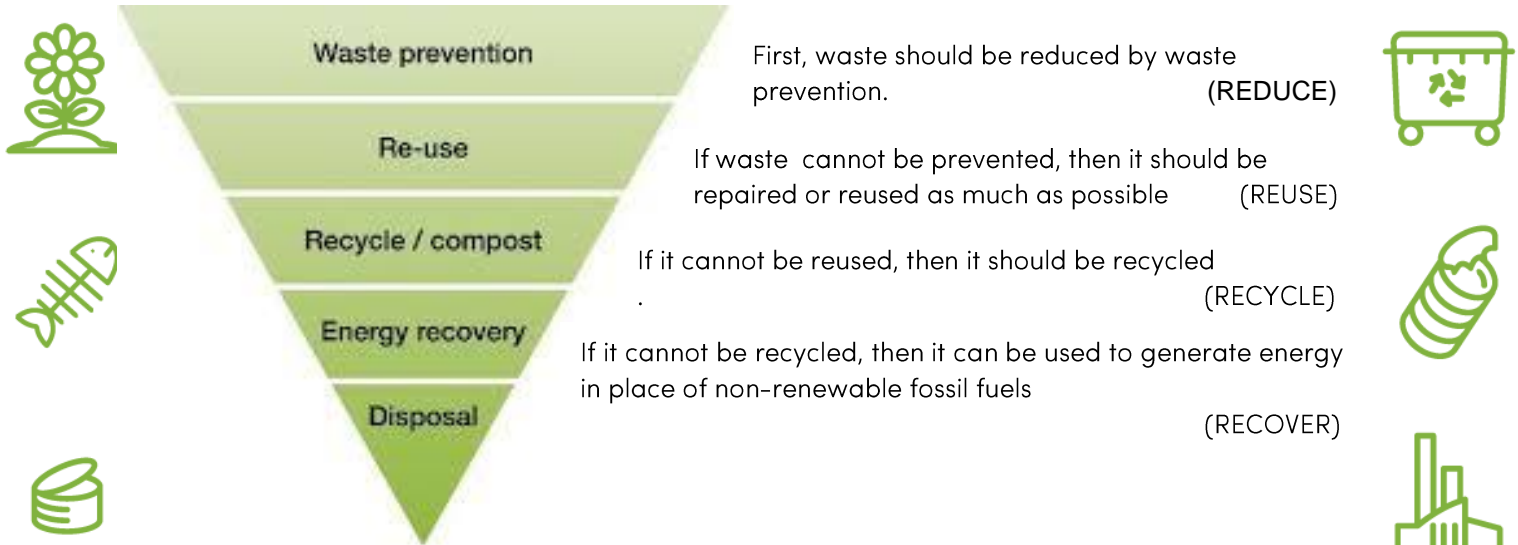


Teacher / older student information sheet

Burning of general waste

Most people in Greater Manchester think that their general waste ends up in landfill, but it doesn't. General waste is used to make energy.

Decisions about what to do with waste are based on something called the Waste hierarchy.



Waste calories

A little chemistry revision first! All materials contain chemical energy. This energy can be released when something is burned to create heat and light. Some materials have more energy than others, it depends on what they are made from. This is what happens at an Energy Recovery Facility, waste is carefully burned to generate energy. Every year, the average general waste bin contains enough potential energy for 500 baths, 3500 showers or 5,000 hours of television.

Energy from waste (incineration) introduction

Incineration (burning) of waste has always taken place. People used to burn their waste on their own open fires.

In 1874 the first "refuse destructor" (incineration facility) was built and this was soon followed by another 250 being built around the country. They were not very popular because of the ash, dust and charred paper that fell onto the surrounding neighbourhood. As the types of waste changed and the use of plastic increased,





there were more concerns about the burning of waste and the air pollution caused. Many incinerators were shut down through the 1960's and 70's.



New modern incinerators were designed using new technologies that are able to ensure that the gases leaving the chimney (emissions) are clean. These modern facilities are now known as Energy Recovery Facilities (ERF's).



Every ERF in the UK is very heavily monitored, checked and has the latest technology to ensure that any emissions are well within legal limits.



General waste in In Greater Manchester



The general waste from your home is delivered to a Mechanical Treatment Reception facility in Greater Manchester. The waste is shredded and then transported by train to the Energy Recovery Facility (ERF) in Runcorn.



Once the waste has arrived at Runcorn, it is unloaded at the tipping hall. The general waste is fed into the furnace, which creates heat as it burns. This heat is used to boil water to make steam, which spin turbines. The turbines are connected to generators that make electricity.



The electricity and heat produced from the facility is used to power the nearby INOVYN chemical factory. By using the heat and power from the facility, INOVYN now takes around 20% less energy from the National Grid.



(General waste from Bolton travels to a local Energy Recovery Facility in Bolton which generates electricity directly into the national grid)

The process at an average Energy Recovery Facility



The furnace

The general waste is loaded into the furnace. This is where incineration occurs.

The bottom grate is made up of fixed and moving bars supplied with air from below. This makes sure that the waste is spread out so that all of it is exposed to the air (oxygen) and is therefore combusted as fully as possible.

The waste in the furnace is burned at approximately 1000 °C. The temperature in the furnace must be kept above 850 °C by law, to reduce the formation of chemicals called dioxins.

There is some ash remaining after burning. This is called "Bottom ash". Often, the Bottom ash is passed under a magnet to remove any ferrous (iron based) metals for recycling.





Heating the water

Some ERF's have a separate water boiler and some have the boiler tubes surrounding the furnace. Heat from the hot gases from the furnace pass into the tubes of the boiler which converts the water into powerful superheated steam.



Generating the energy / electricity

The superheated steam is under pressure and very powerful and directed into a steam turbine. The discs in the turbine spin, which in turn spins the electrical generator mechanism. The ERF at Bolton is capable of producing around 9 megawatts (MW) of electricity which goes directly into the national grid. The ERF at Runcorn is ten times bigger than the Bolton ERF and produces electricity which supplies the INOVYN chemical factory next door. The heat is also transferred directly to the factory as well. This is why the ERF at Runcorn is described as a "Combined heat and power" facility (CHP).



Other ERF's in the country are able to transfer the heat to other schemes. For example, In Sheffield, 44km of underground pipes deliver energy generated by recovering energy from waste to some of the city's landmark buildings. This is called a District Energy Network. This means that these building are not using up fossil fuels for energy and so the District Energy Network prevents over 21,000 tonnes of CO₂ from being released across the city. This has a positive impact on preventing climate change.



The Incinerator that used to be in Rochdale – used to provide heating directly to the local swimming baths.



Cleaning the gas emissions

The gas given off from the burning waste contains many chemical emissions such as dioxins, mercury, heavy metals, particulates and acidic gases. Most ERF's have a system of using ammonia, lime and activated Carbon to remove these and clean and treat the gas. Bag filters then remove the dust before the air is released through a chimney stack.



Computer data probes located in the chimneys constantly monitor emissions and the Environment Agency also monitors emissions. The remaining dust / ash from this system is called Air Pollution Control Residue (APCR). This is then taken off site to be treated and can then be used to make construction materials.

