

**ZERO  
WASTE  
SCOTLAND**

**Power for the people**

# **Gasification & Plasma Arc**



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[zerowastescotland.org.uk](http://zerowastescotland.org.uk)

## Overview

Gasification is a type of thermal treatment which produces energy from waste. Unlike incineration, the input material is not burned. Instead it is heated in a special chamber with limited oxygen which prevents full burning (combustion). Gasification is known as an advanced thermal treatment (ATT).

Plasma arc gasification uses an extremely high temperature torch or “arc”. When the arc comes into contact with the feedstock (waste), the extreme temperature causes the feedstock to break apart at a molecular level (known as cracking) forming a gas called syngas and a small amount of vitrified material which is similar to glass. Plasma arcs can be used to treat hazardous or healthcare waste.

## What goes in?

**Non-recyclable waste (general waste)** from households and businesses.

Gasification works with smaller amounts (tonnages) than incineration however, it only works efficiently with a well-prepared feedstock. Preparation includes: shredding, removing incorrect materials and checking that the feedstock is made up of the correct mix of material types.

This preparation makes sure the feedstock is made up of the right sized pieces and that it is the right mix of materials for the process to work efficiently. If material isn't well prepared, facilities can experience difficulties.

# What happens?



Material arrives and is prepared for treatment (e.g. removal of incorrect materials and shredding).

Material is put into a chamber with limited oxygen and is heated at over 700°C.



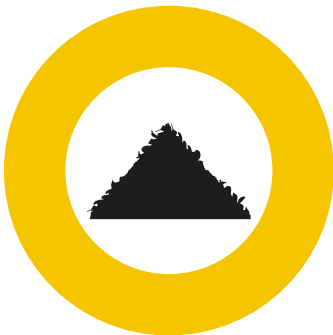
Heating produces synthetic gas (syngas).



Cleaned gas is then burned to produce electricity and heat.



At the end of the process, there is only a small amount of solid material left for recycling or disposal.



# What comes out?



**Energy:** Gas is produced when the waste is heated. The gas is cleaned and is then put through a turbine to produce electricity which can be fed into the national grid to be used by homes and businesses.

**Heat:** Gasification and plasma arc produce a lot of waste heat. This can be used to heat water which can then be used by local homes and businesses. Where both the heat and energy outputs are used, the facility is known as a Combined Heat & Power (CHP) facility.



**Solid residue:** The leftover solid material is known as char and is recycled where possible or sent for disposal.

# Glossary

## **Advanced thermal treatment (ATT)**

Types of thermal treatment which prevent full combustion (burning) by limiting the amount of oxygen present in the process.

## **Char**

The solid material that remains after waste materials are treated in gasification and pyrolysis facilities.

## **Combined heat and power (CHP)**

Treatment facilities create heat and electricity, and CHP facilities use of both of these to supply electricity to the grid and directly heat homes and businesses.

## **Non-recyclable waste (general waste)**

Often known as black bag waste or mixed waste, it is a mixture of discarded materials (rubbish) collected within the same bag or container and which is not recycled.

## **Synthetic gas (syngas)**

A gas produced by some thermal treatment facilities. It can be used to generate electricity.

## **Treatment**

A type of process which reduces the quantity of input material either by using heat (thermal treatment) or a biological process. They also produce heat, electricity, fertilisers or other outputs.

# Further information

## Zero Waste Scotland (ZWS)

For more information on Zero Waste Scotland, its work and research, please visit: [www.zerowastescotland.org.uk](http://www.zerowastescotland.org.uk)

For more information on waste facilities and how they are developed, please visit: [www.zerowastescotland.org.uk/infrastructure](http://www.zerowastescotland.org.uk/infrastructure)

## Scottish Environment Protection Agency (SEPA)

For information on waste regulation, licencing, data and more detailed technical information on facility types and the standards they are required to achieve, please visit:

[www.sepa.org.uk](http://www.sepa.org.uk)

## Recycle for Scotland

For more information on how to reduce, re-use and recycle, please visit: [www.recycleforscotland.com](http://www.recycleforscotland.com)

## Videos

To watch videos explaining what different facilities do, please visit: [www.recycleforscotland.com/facts-figures/facts-figures](http://www.recycleforscotland.com/facts-figures/facts-figures)

## Chartered Institution of Wastes Management (CIWM)

For more detailed and technical information on different facilities and on waste management issues in general, please visit:

[www.ciwm.co.uk](http://www.ciwm.co.uk)

## Renewable Energy Association

For more information on thermal and biological treatment facilities which create energy from waste, please visit:

[www.r-e-a.net/renewable-technologies](http://www.r-e-a.net/renewable-technologies)

## Environmental Services Association

For more information on waste management and the different types of facilities, please visit: [www.esauk.org/](http://www.esauk.org/)



For more information about Zero Waste Scotland's terms and conditions, please visit [www.zerowastescotland.org.uk/content/terms-conditions](http://www.zerowastescotland.org.uk/content/terms-conditions)

If you have any questions please contact [data@zerowastescotland.org.uk](mailto:data@zerowastescotland.org.uk)