



Waste...
our challenge,
our opportunity,
our future,
have your say

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Advanced Thermal Treatment (ATT)

Advanced Thermal Treatment (ATT) can be considered 'second generation' thermal treatment. ATT is a term that is applied to a range of thermal treatment processes including in particular gasification and pyrolysis.

Prior to treatment using ATT, the waste streams are usually subjected to a pre-treatment process such as Mechanical Separation or Mechanical Heat Treatment (MHT) to remove the non combustible materials. It is the biodegradable and plastics output from these processes that is generally treated using ATT. ATT can be coupled with a Combined Heat and Power (CHP) system to produce both heat and electricity.

Gasification and pyrolysis of solid materials is not a new concept and is used to produce fuels such as charcoal, coke and town gas. Gasification and pyrolysis of waste uses high temperatures to break down the waste without direct combustion. The resulting synthetic gas, known as 'syngas', is usually then combusted in a boiler to generate steam or in a dedicated gas engine producing heat and electricity directly.

Pyrolysis

Pyrolysis is the thermal destruction of waste material or biomass in the absence of oxygen. An external heat source is required. The process operates at temperatures between 300°C and 850°C. The by-products of the pyrolysis process are solid residue and 'syngas'. The solid residue is known as 'char' and is usually managed by landfilling although some markets

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for this material are becoming available, for example as a compost enhancer (fertiliser) or as a filler in concrete/brick type products. The syngas is a mixture of gases including a high proportion of combustible constituents such as carbon monoxide, hydrogen, methane and other Volatile Organic Compounds (VOCs) with a reasonably high calorific value.

Gasification

Gasification is sometimes used to break down the char and syngas residues from the pyrolysis process but can also be used as a stand-alone process. The difference to pyrolysis is that gasification involves heating waste at higher temperatures (generally above 650°C) using small amounts of oxygen. Low oxygen levels prevents the full combustion of materials occurring. The process is mainly exothermic but some heat may be required to initiate and maintain the process. Similar to pyrolysis, the main by products are a syngas and char. The syngas is a mixture of gasses with a calorific value generally lower than that produced by pyrolysis.

Whilst gasification and pyrolysis have established track records in treating other materials they are still in their infancy in being applied at a commercial scale to residual waste in the UK. A few small plants (<50,000 tonnes per annum) have been developed, including one at Avonmouth, near Bristol and one on the Isle of Wight, however there are examples of larger

plants internationally and proposals exist for other plants in the UK.

Advantages:

- Economic at a relatively small scale
- Suitable for modular development
- Can be more cost effective than direct Energy from Waste (EfW) at a small scale
- Plants are generally smaller than direct EfW
- Potentially more efficient production of power than direct EfW depending on configuration and degree of sophistication of the plant
- Electricity output currently classed as renewable energy under the renewables obligation scheme but only for the output derived from non-fossil fuel sources will be eligible

Disadvantages:

- Limited track record in treating MSW, particularly for medium - large size plants
- More expensive than direct EfW on a larger scale

Gasification and Pyrolysis

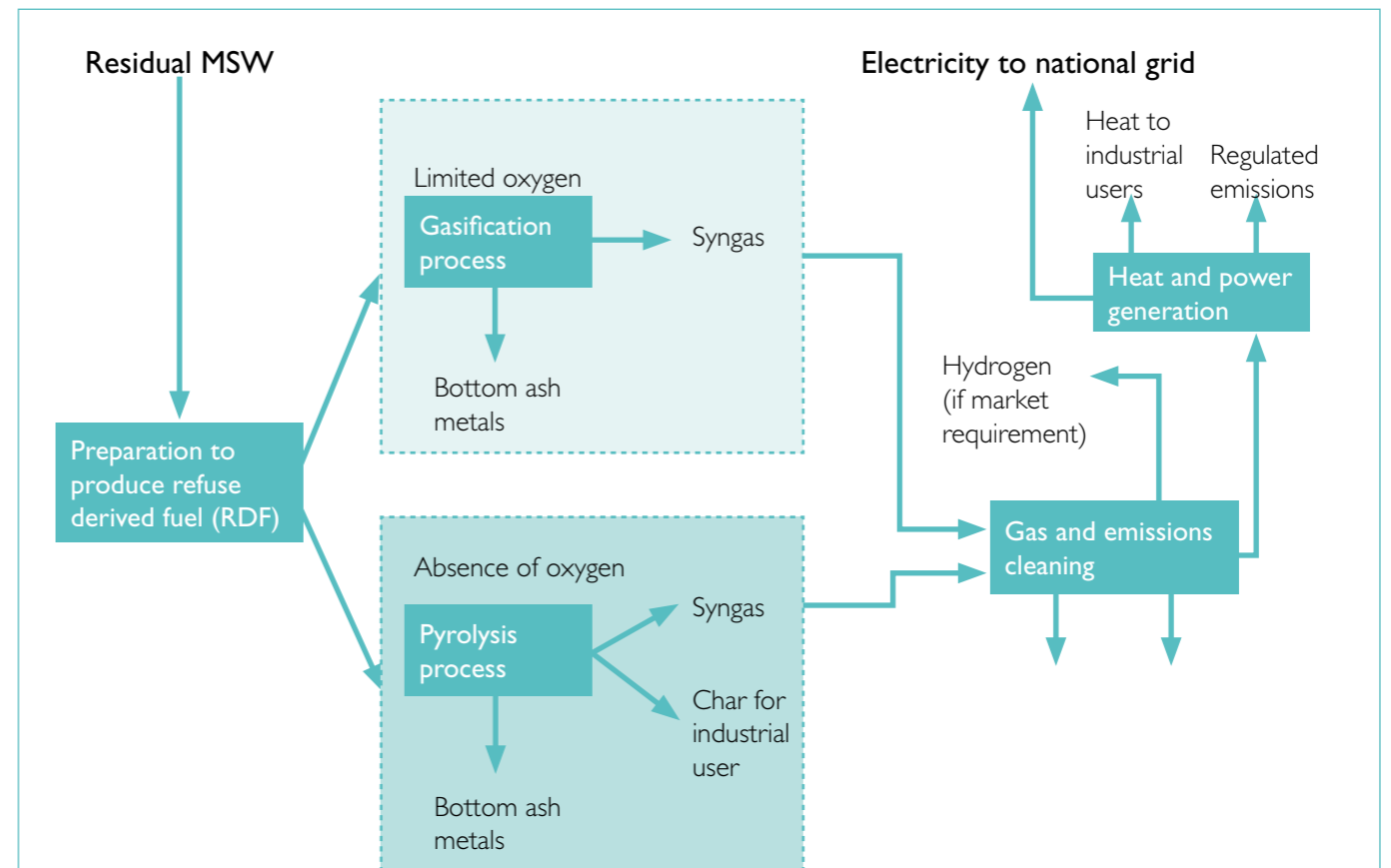


Diagram reproduced from Defra Waste Management Technology Brief on ATT of MSW.



- Works best on pre-sorted waste and therefore is best suited for use in conjunction with other treatment processes, eg MHT/autoclave and not as a stand-alone solution.

Further information on Advanced Thermal Treatment technologies is available from www.defra.gov.uk/environment/waste/wip/newtech/pubs.htm