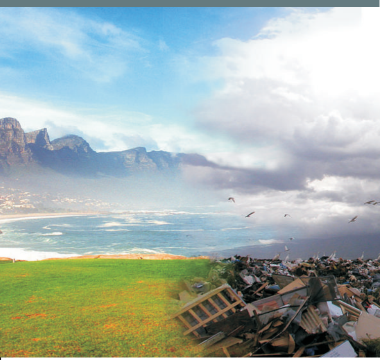
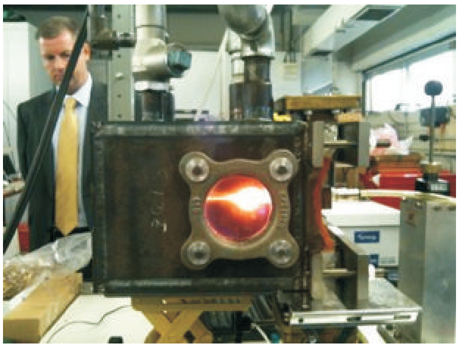
Microwave Plasma Gasification

Capabilities in:

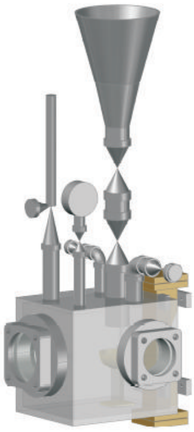
- Green Technology Development
- Energy from Biomass & Waste
- Waste Consultancy
- Environmental Consultancy
- Energy Consultancy
- Resource Use Efficiency
- Low Carbon Solutions
- Training



The Technology



Plasma Arc Gasification is an emerging technology that is being used to generate energy from carbonaceous materials. The Plasma Arc Gasification process operates under sub-stoichiometric oxygen conditions, using a carbonaceous feedstock, to produce low energy synthesis gas (syn gas), comprising of hydrogen, carbon monoxide and an inert silicate slag. The syn gas can then be used as a fuel to generate electricity or alternatively as a precursor for chemical synthesis and fuel production. The vitrified slag is an inert glass which can be used in a number of applications, ranging from tile manufacture to a construction filling material. Gasification serves as a very valuable process for transforming low value feedstocks into marketable products and fuels. Furthermore due to the high operating temperatures of the reactor, emissions and waste streams from this process are much lower compared to that of conventional gasification and thermal oxidation plants. Therefore plasma gasification presents itself as a commercially and environmentally sustainable technology for waste treatment and green power generation.



Conventional plasma gasification systems use direct current (DC) plasma torches to achieve the high temperatures required for energy recovery (> 1000°C). Whilst the use of such torches is viable for large plasma gasification projects (> 40 MW) their application for smaller plant is compromised by their cost, their significant parasitic load, and the footprint of ancillary equipment. Therefore to date such systems have only been successfully demonstrated at a large scale.

As such Stopford and Liverpool John Moores University have developed a novel plasma gasification technology using highly efficient microwave induced plasma as an alternative to DC plasma torches. The advantages of microwave induced plasma compared to conventional technologies are:

1. It can be generated using significantly less energy compared to that of conventional technologies. This results in a much reduced parasitic load on the plant, serving as a real opportunity to improve the efficiency of advanced gasification processes.

2. The technology has a significantly lower CAPEX compared to conventional DC plasma torches and as such makes plasma gasification a commercially viable option for smaller scale systems.

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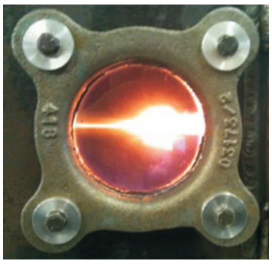
3. The torches have a significantly longer operational lifespan compared to that of conventional DC plasma torches, resulting in extended periods between plant shutdown and maintenance.

4. The application of microwave induced plasma significantly reduces the footprint of such high-temperature gasification systems making the technology suitable for smaller regional based projects and specialist field deployment.

The operational pilot reactor is currently being used to conduct gasification trials with a number of waste streams including municipal solid waste, refuse derived fuel, commercial and industrial waste and biomass.



It is envisaged that microwave induced plasma may also have additional applications in the waste to energy sector. As well as providing a highly efficient heat source for high temperature gasification, microwave induced plasma can also be used in pyrolysis systems (e.g. for the processing of waste tyres) and for torrefaction (to convert biomass into a biocoal). Alternatively microwave induced plasma could be used to replace conventional DC plasma torches in some proprietary gasification systems that use this technology to clean the syn gas prior to electricity generation in gas engines/turbines. The application of microwave induced plasma for syn gas cleaning would offer greater plant operating efficiencies reflected in both the OPEX and the initial CAPEX.

In summary the application and further development of microwave induced plasma for energy recovery technologies presents the waste to energy sector with significant opportunities. Successful commercialisation of this technology will serve to revolutionise the thermal treatment sector by increasing energy generation efficiencies above and beyond that of all currently available technologies. Furthermore the operation of this novel technology will enable the diversion of waste from landfill, produce the next generation of syn gas and assist in meeting global green energy generation and CO_2 abatement targets.

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