

Is Waste Gasification Finally Coming of Age?



The 50 MW Teesside plant will be the first of its kind in the UK and the largest in the world

Spurred by government incentives and a stable regulatory environment, Air Products has begun construction of a 50 MW plasma gasification facility in Teesside. With the company already planning a second such plant at the site - as well as others around the country - is the waste industry entering the age of gasification?

by Ben Messenger

Over recent years there has been growing interest in the use of gasification technologies to treat solid waste. The concept is not a new one. Indeed gasification itself has been used for over 180 years, and was once in common use to provide gas for heating and lighting. However, these systems typically gasified coal or peat. Early attempts to use municipal waste as a feedstock ran into problems when scaled up unless the input was suitably homogenous. But with its lure of low emissions and a greatly reduced, environmentally sound residue, the story was never going to end there.

Today a number of companies offer technologies which are claimed to solve many of the problems and make the large-scale gasification of mixed solid wastes an environmentally sound reality. Nor is it just the potential environmental benefits which are pushing gasification up the waste treatment agenda. While public opinion in some countries, such as Denmark, is very favourable to traditional thermal treatment facilities for waste, in others, such as the U.S. and UK, incinerator plans often face fierce opposition.

For governments and politicians then, the ability to 'sell' a project to the public as being 'not incineration' can be appealing. A perfect example of this can be seen in the request for proposals made earlier this year by New York City's mayor, Michael Bloomberg, which specifically excludes traditional mass burn technologies. While many highly regarded figures in the industry have questioned this approach, it certainly provides a foot in the door for the gasification industry.

In the UK too, gasification is being given a leg up by government, **with such facilities eligible for double support following the latest Renewables Obligation (RO) banding review** (See Dr. Matthew Aylott's article on page 24 for a full explanation). Combined with the European Landfill Directive, the UK has become an attractive place to build a waste gasification facility. So much so that Allentown, Pennsylvania based gas processing technology developer, Air Products has chosen to build a 50 MW plasma gasification facility in Teesside in the North East of the country.

Thinking Big

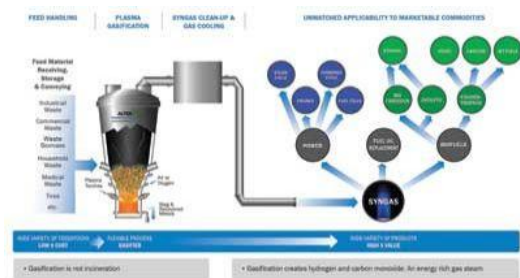
According to Air Products, the facility - currently under construction at the New Energy and Technology Business Park, near Billingham - will be the first of its kind in the UK, and the largest of its kind anywhere in the world. As well as generating enough electricity for 50,000 homes, the plant is expected to divert up to 350,000 tonnes of non-recyclable waste from landfill per year - helping to meet the UK's waste diversion targets.

The company claims that the Westinghouse advanced gasification technology provided by AlterNRG offers a more efficient, cleaner conversion of waste into power than traditional waste to energy technologies and has the potential to generate a wider range of useful products, including heat, hydrogen, chemicals and fuels.

The facility will process residual commercial, industrial and municipal waste, which will be continuously fed into a gasifier that is also supplied with oxygen and nitrogen via an air separation unit. The waste is pre-shredded to avoid blockages. Once in the gasifier the waste is thermally treated by the system's plasma torches to generate a synthetic gas (syngas) which is then put through a gas cleanup stage. The end product is a clean syngas consisting of carbon monoxide and hydrogen which is used to fuel a Solar Turbines gas turbine driven generator.

Longer term, the company says that the facility has the potential to generate renewable hydrogen which could be deployed for commercial use, such as fuelling public transport.

"One of the nice things about these advanced gasification technologies is that they provide a really neat link back into the industrial gases sector that you could potentially use as a resource for renewable hydrogen in the future," explains Lisa Jordan, bio-energy Europe business manager at Air Products.



One of the key advantages offered by plasma gasification is its ability to produce a range of products including renewable hydrogen Credit: Alter NRG

"Having that clean syngas is the key to unlocking all those future end products, and that's where for us this is exciting, because it ties back into our hydrogen business in the future if we need a source of renewable hydrogen, whether that's for industrial or for vehicle fuelling applications. But right now the way these things get built is through power generation because that's where the need is," she adds.

Public Opinion and Planning

When it comes to waste projects most developers will tell you that public support is almost always difficult to come by in the UK. And that is particularly true of large scale waste to energy projects. Yet according to Jordan, Air Products' Teesside facility has not only received cross party political backing, but has also been given the thumbs up by the public.

"We've had an unprecedented level of support from the public on Teesside and we've had a fantastically good experience with the planning system. We didn't have a single objection to our planning application," she says.



The Teesside facility will utilise Alter NRG plasma gasification technology
Credit: Alter NRG

As part of the planning process, the company conducted a series of technical and environmental studies, consulted local and national organisations about the project and shared its plans with local residents and businesses. In October 2010 it held public exhibitions in Stockton and Port Clarence and distributed leaflets to more than 7500 households in the area.

The public backing for the project is also partly explained by its location in a highly industrial area, which has been designated for new energy technologies. Another benefit of the chosen site is that it's close to Teesside landfill, from which it will divert waste, and has good road and electrical infrastructure. Interestingly, the landfill operator, Impetus Waste Management is also Air Products landlord and waste partner for the project, and will benefit from the extended life span of the landfill.

In August 2012 the company secured planning permission for the facility from Stockton Borough Council and received an environmental permit from the Environment Agency.

Bright Future for Advanced Gasification

According to Jordan the project fits with the country's climate and energy goals. "This was the perfect storm that brought us to the UK. In terms of the need for additional capacity in the electricity market, the targets around renewable energy production and the financial incentives which exist to support that, and the EU Landfill Directive," she explains.

The government then seems to be firmly behind the use of gasification to treat waste, and Deputy Prime Minister, Nick Clegg has even publicly backed the technology as having a key role to play in delivering renewable energy. As such, Air Products is confident of the rapid development of additional facilities in the UK and recently unveiled plans for the first of those - a second 50 MW plant in Teesside.

According to Jordan, as with the first plant, the availability of skilled labour, industrial land, good access to electrical infrastructure and excellent road links were important factors in the decision to pursue an additional plant in Teesside. The company also has grander plans to build five or so facilities of this type in the UK.

"One project doesn't make it a business," explains Jordan. "We actually want to do more of these. The UK now has, as we see it, a very stable regulatory environment to enable us to make those future investments."

Conclusions

Air Products' 50 MW Teesside facility may be the first of its kind in the UK, and the largest of its kind in the world, but there are numerous other waste gasification projects either under construction or in planning both in the UK and around the world.

CHO Power, a subsidiary of the Europlasma Group, recently completed the development of its 12 MW plasma gasification facility in Morcenx, France and is planning four similar plants in the UK with a total output of 37.5 MW. Meanwhile, IES - a joint venture between European Metal Recycling and New Jersey based advanced gasification technology manufacturer, Chinook Sciences is developing a 40 MW gasification plant to treat shredder fluff from end-of-life vehicles in the UK's West Midlands. Biossense, INEOS Bio and British Airways are working on gasification projects of their own.

In the U.S., Science Applications International and alternative asset manager, Carlyle Energy Mezzanine Opportunities have agreed to provide financing for construction of the \$225 million Plainfield Renewable Energy project which will gasify wood waste to produce some 37.5 MW of energy. Also in the U.S. Covanta recently completed commercial demonstration testing on a gasification technology that it claims to be 'first-of-its-kind' and which will gasify unprocessed post-recycled municipal solid waste in a commercial setting (see Tom Freyberg's WTER Conference review on page 12).

In Sri Lanka a \$248 million 40 MW plasma gasification facility, which is planned to treat 1000 tonnes per day of waste, is reported to be under construction.

Around the world a great many more projects are in the pipeline. Not all will make it to fruition, but it would seem to indicate that waste gasification is a technology which may just be coming of age.

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150,000 TPA Plasma Arc Gasification Waste to Energy Plant for Ottawa



18 December 2012

Ottawa, Ontario based Plasco Energy has signed an agreement with the City of Ottawa to build a 150,000 tonnes per year plasma arc gasification [waste to energy](#) facility.

The company said that under the [contract](#) with Ottawa, the City will supply 109,500 tonnes of municipal solid waste and has a right of first refusal to supply the balance of plant capacity.

The site for the facility has been leased to Plasco for nominal cost by the City, which will pay a tipping fee for each tonne processed of \$83.25 per tonne, escalating annually at the rate of increase in the Consumer Price Index.

The first 20 years of the contract are fixed and the City has options for a further four five year extensions.

The company added that the City of Ottawa has made no other financial contribution and has no other risk or obligation.

The City estimates that the deal will extend the life of Ottawa's existing [landfill](#) by at least 28 years saving the City approximately \$250 million in future landfill capital costs.

Construction is expected to commence in the second half of 2013 with commercial operation planned for the first half of 2015.

Plasma arc technology

The company said that the new facility will be built to the Plasco Conversion System (PCS) design and will incorporate three proprietary Integrated Converting and Refining System (ICARS) modules.

According to Plasco the PCS breaks down garbage using its patented ICARS system, which gasifies the waste and refines the resulting gas using plasma technology.

The synthetic gas created from the waste fuels General Electric Jenbacher internal combustion engines, together with a steam turbine driven by heat recovered from the process and engines, which the company said will produce approximately 15MW of net electricity that will be sold to the grid.

Further to this any residual solids are refined using Plasma to produce slag which meets requirements for a range of applications, including construction aggregates and abrasives.

Moisture in the waste is recovered, cleaned and made available for reuse in the community.

Effective throughput of the facility will be 130,000 tonnes per year.

The company claimed that there are no emissions to atmosphere in the conversion process, with any unused gas sent to a flare. Exhaust from the engines and flare have emission levels significantly below the most stringent standards in the world.

The ICARS modules will be manufactured in Ontario and, according to Plasco, site construction and assembly of the PCS will create about 200 construction jobs.

Once complete the facility will permanently employ 42 operations technicians.

Plasco added that construction and operation of the Facility will be subject to receipt of and compliance with the terms of Environmental Compliance Certificates to be issued by the Ontario Ministry of the Environment.

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[Pollution Control System for Canadian Plasma Gasification Firm](#)

Plasco Energy has selected Ontario based air pollution control systems company, Macrotek to design and engineer a commercial gas cleanup system.

[Plasma Gasification of Waste Meets Desalination Onboard Ship](#)

Vision Plasma Systems is in discussions to retrofit retired ocean vessels to function as floating waste remediation sites and water desalination plants powered by waste gasification.

Waste to Energy Project in Kazakhstan Awarded Development Loans

The European Bank for Reconstruction and Development has awarded a loan of \$15.9 million to develop a waste to energy plant facility and a sanitary landfill in Aktau, Kazakhstan.

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Rise of Plasma Gasification Boosts Revenue at Alter NRG

14 August 2012

Plasma gasification technology supplier, Alter NRG (TSX - NRG; OTCQX - ANRGF) has increased revenues for the second quarter of 2012 by 225% over the previous year on the back of 50 MW Teesside project.

Alter NRG [markets](#) and sells Westinghouse Plasma Technology for the treatment of all types of wastes through its wholly owned subsidiary, Westinghouse Plasma Corp.

According to the company the impressive increase in revenue is reflective of a maturing business plan with significant long-term potential.

Westinghouse Plasma technology is currently used in two commercially operating facilities in Japan that have been converting waste into energy for more than 9 years, as well as facilities operating in India and under construction in China and the UK (see WMW story).

Walter Howard, Alter NRG's chief executive officer explained that order for a full scale gasifier by Air Products for use at its 50 MW [waste to energy](#) facility currently being built in the UK has upped the profile of the company's technology globally.

"Late last year we announced the sale of a late-scale gasifier to a large Fortune 500 Company which I believe was a major commercial tipping point," he said in a statement.

"The Tees Valley project is providing us the opportunity to substantiate our technology and engineering in a very big way - not only to Air Products and Chemicals, but to the industry as a whole," added Howard.

During the second quarter of 2012 the company said that it had revenues of \$4.0 million - the largest quarterly revenues in its history for plasma gasification.

According to Alter NRG this revenue reflected the progress on the fabrication of the large scale gasifier as well as license revenues from the addition of a strategic customer in the Czech Republic and Slovakia.

Progress to date

- The company said that it has now executed approximately 23% of the purchase order from Air Products, [which intends to build 5 advanced gasification facilities in the UK over the coming years](#)
- Executed an agreement with PGP Terminal for site licenses in the Czech Republic and Slovakia for \$4.375 million, with 10% being paid upfront. PGP has been working for several years on waste to energy projects and has a portfolio of projects that it is currently advancing in its home market, with engineering on the first facilities expected to commence in late 2012 orders for equipment placed in 2013
- SMS Infrastructure has advanced two projects into the formal regulatory approval phase with an expected equipment order in late 2012 or early 2013
- Supported a demonstration facility in Shanghai China, for which the company said it has delivered the detailed engineering and torches. [The facility has finalised its feedstock agreement with a large Chinese waste company and its site location](#)
- Finalised the detailed engineering on the standard design of the 200 tonne per day Westinghouse Plasma Gasification Solution for a project in Minnesota being developed by the Koochiching Development Authority. The company said that the standard gasifier is expected to sell for \$12 million and the project has now applied for regulatory approval
- Continued the regulatory process and financing efforts for the Dufferin County energy from waste project in Ontario, using the standardised 200 to 400 tonne per day gasification solution. Alter NRG said that it is currently developing this project through a subsidiary called Navitus Plasma.

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[Fuel Cell Demonstration Facility at 50 MW Plasma Gasification Plant](#)

Waste2Tricity, which is developing ways to increase the efficiency of waste to energy technology through the use of fuel cells, to develop a demonstration plant at the Products 50 MW plasma gasification on Teesside.

[50 MW Plasma Gasification Plant to be the First of Many in UK](#)

[Air Products' 50 MW plasma gasification facility on Teesside could be the first of many advanced waste gasification facilities to be built in the UK according to waste to energy and biofuel consultancy NNFCC.](#)

[Unilever Utilises Pyrolysis to Create Fuel from Sachet Packaging](#)

Unilever is developing pyrolysis technology to make it economically viable to recover fuel from the difficult to treat laminate sachet packaging used for a growing number of products.

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British Airways first-of-its-kind waste to jet fuel project finds technology provider

Europe's first waste to jet fuel production plant came a step closer to construction this week as UK-based [Oxford Catalysts](#) were selected as the sole technology suppliers to the joint British Airways and Solena GreenSky project.

Date Posted 04 Jul 2012
Story Source Dr Matthew Aylott, NNFCC
Relevant Industries [Biofuels](#)

British Airways and US bioenergy group Solena have been working together since 2009, in order to build Europe's first sustainable jet fuel production plant, GreenSky London.

Now, after a formal evaluation of the available technologies, Oxford Catalysts have been selected as the sole supplier of Fischer-Tropsch (FT) technology for the project.

Solena has also entered into an understanding with the group for the supply of FT units to all its future biomass to liquids projects, [including GreenSky California, Rome and Stockholm.](#)

The decision is a major coup for Oxford Catalysts, who were chosen because their technology offered modular sizing and the advantages of high-efficiency, fixed bed reactors.

Following the announcement Roy Lipski, Chief Executive of Oxford Catalysts, said: "Our selection for this project ahead of conventional technology from larger companies is further evidence of the superiority of our offering. We are pleased to be part of the GreenSky London project and to contribute to British Airways' strategy for sustainable aviation and Solena's worldwide roll out plan."

The company estimate that the successful implementation of the GreenSky London project will generate revenues for the group in excess of \$30 million during the construction phase and more than \$50 million over the first fifteen years of the plant's operation.

[The plant to be built in an as yet unnamed site near London could eventually convert 500,000 tonnes of locally-sourced waste biomass feedstock into 16 million gallons of jet biofuel, 8 million gallons of BioNaphta and 40 MW of power of renewable electricity.](#)

British Airways hope the project will be [operational by 2015](#) and produce [at least half of the airline's fuel needs for its London City Airport operations.](#)

NNFCC have been advising British Airways on the sustainability implications of their venture and have provided technology support to ensure the project delivers value for money.

By [Matthew Aylott](#).

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