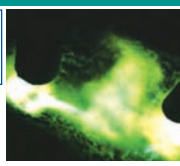

# Using thermal plasma technology to create a valuable product from hazardous waste

As work to recover energy from waste increases in the UK, an important issue for the industry is the development of sustainable methods for managing air pollution control (APC) residues. These are a hazardous waste generated by cleaning gaseous emissions to the levels required by regulation. Tetronics Ltd is leading a consortium to research the use of plasma technology in creating an integrated solution that produces an ecologically stable glass-ceramic product for use in the construction industry.

**Key benefits**

- Reducing hazardous waste in the UK – APC residue currently totals 128,000 tonnes annually, with an expected increase of 40,000 tonnes per year over the next four to seven years
- The creation of a proven, commercially viable waste management technology that allows treatment close to source with minimal environmental impact
- The development of an integrated process that transforms APC residues into a useful product, with the potential of saving 170,000 tonnes of virgin raw materials each year

Air pollution control (APC) residues are a highly alkaline hazardous waste, containing volatile heavy metals, dioxins, furans and a high soluble salt content, that result from the commercial recovery of energy from waste (EfW). In the UK, the current APC disposal methods in use are likely to become commercially unsustainable, due to increasingly stringent environmental regulations. At the same time, new energy recovery capacity is expected to add to the 128,000 tonnes of APC residues currently produced in the UK each year, by an additional 40,000 tonnes every year for up to seven years.

Tetronics Ltd, a world leader in DC plasma technology, and Imperial College London have created a consortium to run a three-year collaborative project exploring the potential of applying plasma technology to the APC disposal challenge. Plasma technology is an advanced thermal conversion technology that delivers high destruction efficiencies to produce a stable vitrified slag with exceptional ecological performance characteristics. Costing £2.4 million, the project is part-funded by the DTI under the Technology Programme and was launched in late 2005.

Tetronics Ltd and Imperial College London, leading researchers in process development, waste reuse and materials science, are running the project in partnership with incinerator operators Onyx SELCHP and Grundon, environmental consultants Enviros, Hampshire County Council, and industrial symbiosis companies Akristos and Ballast Phoenix.

## Objective

The current market value of APC residue landfill disposal is some £21 million-a-year, and with rising volumes and increasing levels of landfill tax this may reach £47 million-a-year within three to six years.

The team believes that a plasma-based technology addressing the environmental issues will take a significant percentage of this market, creating a major commercial opportunity alongside its environmental and social advantages.

It also expects that applying plasma technology to APC management will significantly reduce reliance on landfill disposal and cut the use of raw materials in construction. In addition, the efficiency of the process minimises the scale of treatment plants, enabling economically viable local waste management.

## Solution

Thermal plasma technology offers a wide range of advantages over other waste management solutions due to the very high temperatures it generates, changing the state of wastes to destroy hazardous materials. It is also highly flexible and easy to control, with a low environmental impact of its own. In addition, it enables the production of a valuable vitrified slag that may be used in construction and other applications.

With thermal plasma treatment forming the core of the process, the team is also seeking to develop and implement innovative pre and post-treatment processes to minimise the extent of any secondary effluent streams.

## Results

According to Tetronics' Dr David Deegan, early results have been promising, confirming the validity and likely value of the project. Prototype-scale experimentation is underway, and work is progressing on gaining confirmation of the suitability of the proposed solution within an industrial context.

"APC residue sourced from the UK has been vitrified, with the resulting slag undergoing successful landfill inert waste acceptance criteria (WAC) testing," he says. "It seems likely that the slag product will exhibit material properties exceeding those of typical granite or basalt products.

"Overall, we are confident this project delivers both commercial and community benefits, aligning a number of needs to resolve the economic, environmental and social difficulties involved in APC residue disposal."

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### Collaborative Research & Development

Collaborative Research & Development is one of two business support solutions within the Technology Programme, the other being Knowledge Transfer Networks (KTNs). Its primary objective is to enable the industry and research communities to work together in strategically important areas of science, engineering and technology in order to develop successful new products, processes and services. It also enables the latest thinking and understanding to flow between universities, other research centres and business.

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