SLUDGE UTILISATION AS FUEL FOR ELECTRIC POWER GENERATION

BRITAIN'S FIRST IGCC POWER STATION IN FIFE, SCOTLAND

H.H. Graves

In recent years new emphasis has been placed on problems of the environmental aspects of waste disposal, especially investigating alternatives to landfill, sea dumping and incineration. There is also a strong emphasis on clean, economic and efficient processes for electric power generation. These two topics may at first appear unrelated. Nevertheless, the technological advances are now such that a solution to both can be combined in a novel approach to power generation based on waste-derived fuels, including refuse-derived fuel (RDF) and sludge powder (SP) by utilising a slagging gasifier and Advance Fuel Technology (AFT).

The most appropriate gasification technique for such waste utilisation is the British Gas/Lurgi (BGL) high pressure, fixed bed slagging gasifier where operation on a range of feedstocks has been well-documented. This gasifier is particularly amenable to briquette fuel feeding and, operating in an integrated gasification combined cycle mode (IGCC), is particularly advantageous.

When comparing the relative merits of incineration and IGCC, the efficiency, environmental aspects and economics all need to be considered. On all three counts, the IGCC route has the advantage over incineration.

With regard to efficiency, the IGCC route enables more of the fuel thermal input to be converted to useful electrical output. The reducing environment in the gasification process prevents the formation of dioxins and furans which may be formed in the oxidising atmosphere of an incinerator if conditions are not carefully controlled. Similarly, NO_x, SO_x and particulate levels exiting from an IGCC plant are significantly lower than for an incinerator and less than 10% of the US EPA New Source standard. In the case of the incinerator, output ash may have to be disposed of as a hazardous waste depending on the components in the feed materials, while for the slagging gasifier the fate of the majority of the trace metals is that they end up in the slag frit which is environmentally inert and is a saleable by-product. The particular economic advantage of an AFT-IGCC power plant, relative to coal firing, is that a revenue can be generated in the form of a tipping fee for the waste, resulting in a fuel that can be produced at a much lower cost, perhaps even zero cost or 'free fuel'.

The IGCC route comprises the following major components: Fuel Island for receiving the fuel raw materials and producing/storing the fuel briquettes, the Gas Island containing the gasifier, cooling streams and gas purification plant and, finally, the Power Island with its gas turbine/generator, heat recovery steam generator (HRSG) and steam turbine/generator.

Fuel briquettes are prepared as follows: The sludge is first dewatered and then dried to form sludge powder before being mixed with coal and binder in a briquetting plant to produce robust briquettes that can be readily stored and shipped. The term Advanced Fuel Technology has been adopted to encompass the patented production and use of fuel briquette feedstocks derived from both SP and/or RDF.

The complete AFT-IGCC Power Station is capable of delivering low cost power generation and low cost waste elimination, all within an environmentally superior, clean coal technology facility. The world's first AFT-IGCC and Britain's first IGCC Power Station is now under development at Fife Energy Ltd., in Scotland, the former British Gas Westfield Development Centre.

H.H. Graves is President and Chief Executive of Global Energy Europe Ltd.
Westfield Development Centre, Cardenden, Fife KY5 OHP

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