

NAWTEC16-1938

PLASMA GASIFICATION : A PROVEN TECHNOLOGY

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INTRODUCTION

Plasma gasification is an efficient and environmentally responsible form of thermal treatment of wastes. In the plasma gasification process, extremely high temperature gases are used to break down the molecular structure of complex carbon-containing materials – such as municipal solid waste (MSW), tires, hazardous waste and sewage sludge – and convert them into synthesis gas (syngas) containing hydrogen and carbon monoxide that can be used to generate power or other sustainable sources of energy. Gasification occurs in an oxygen starved environment so the waste is gasified, not incinerated.

Plasma gasification facilities produce emissions far below the most stringent regulatory requirements in North America. A small amount of bottom ash or fly ash is generated that requires treatment or landfill disposal. Predominantly, the metals and non-combustible inorganic components are melted and captured in an environmentally benign slag, which can be used as construction aggregate. Westinghouse Plasma Corporation (WPC) has developed a plasma gasification system which uses plasma heat in a vertical shaft cupola adopted from the foundry industry.

PLASMA GASIFICATION COMMERCIAL PLANTS

The advancement of plasma gasification has been an international and collaborative effort. Commercial applications have been in operation in Japan since 2002. The Eco-Valley plant in Utashinai, Japan, which Hitachi Metals, Ltd. partially owns and fully operates, uses WPC technology. Eco-Valley transforms up to 280 tons per day (tpd) of MSW and auto shredder residue into steam and electricity which is used internally. Maximizing power output isn't the primary objective of the Eco-Valley facility, and if the plant was designed to optimize power output using a combined cycle mode, it could produce up to 12.0 MW.

Hitachi Metals also commissioned a facility between the towns of Mihama and Mikata in Japan that processes 20 tpd of MSW and 4 tpd of sewage sludge.

OPERATING PLANT PERFORMANCE

Both Japanese facilities meet all environmental regulatory requirements including extremely low levels of dioxins and furans in the stack emissions (less than 0.01 ng/nm³, 10 times lower than Japanese regulations and below North American standards). Typical emissions at these plants are shown in Tables 1, 2, & 3.

Table 1: Stack Emissions

Emission Limits (Stack)		Regulation value	Target	Measured Value	
Item	Unit			Test # 1	Test # 2
Dust	g/m ³ N	0.15	0.02	<0.003	<0.003
HCL	ppm	430	100	39	22
NOx	ppm	250	150	62	82
SOx	ppm	-		<1ppm	<2ppm
CO	ppm	-	30	<29	<27
Dioxins	ng-TEQ/m ³ N	5	0.05	0.00059	0.00067
Dry gas basis; O ₂ =12%					