DESIGN, INSTALLATION AND OPERATION OF THE WAINWRIGHT REGIONAL WASTE-TO-ENERGY AUTHORITY COMBUSTOR

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ABSTRACT

A state-of-the art municipal Waste-to-Energy (WTE) combustor began operation in the town of Wainwright, Alberta, Canada in 1995. This 30 Tonne Per Day (TPD) system is the first small scale facility built to meet the Canadian Council of Ministers of the Environment (CCME) 1989 operation and air emission standards for Municipal Solid Waste combustors.

The combustor design utilizes a radiant waterwall, multi-chamber, multi-stage combustor design, followed by a convective boiler section, a flue gas economizer and an air to air heat exchanger. The air pollution control system consists of an all dry lime injection system followed by a fabric filter collector. The system has the capability for delivering activated carbon, if needed, for the control of various pollutants. The pulse-jet fabric filter collector utilizes GORE-TEX® membrane/ TEFLON® B fiberglass filter bags for highly efficient capture of the Particulate Matter (PM), which includes lime reaction and absorbent products, unreacted lime, and fly ash which is rich in trace metals and other fine particulates.

Compliance testing revealed that the system is providing low outlet emission levels and would meet the proposed U.S. EPA New Source Performance Specifications for Municipal Waste Combustor's in the United States for all categories. This includes acid gases, trace heavy metals including Pb, Cd, Hg, and PCDD/PCDF as measured by toxic equivalency factors. PM levels were measured at 9.8 mg/Rm^3. Lead, cadmium and mercury emission levels were measured at 0.37 µg/Rm^3, <0.001 µg/Rm^3, and 0.24 µg/Rm^3 respectively. PCDD/PCDF emissions were measured to be 0.044 µg/Rm^3 (TEQ). Finally, HCl and SO_2 emissions were measured to be 11 mg/Rm^3 and 13 mg/Rm^3 respectively. All levels are corrected to 11% O_2 with a reference temperature of 25°C. This paper presents the methodology for achieving cleaner combustion which takes full advantage of a completely dry acid gas scrubbing system.

INTRODUCTION

Municipal Solid Waste (MSW) is a worldwide problem. Various solutions have been attempted: landfills; gasification; combustion only for volume reduction; energy from waste. For example, in the 1980's, Tsukishima Kikai Co., Ltd. constructed a 200 TPD pyrolysis plant in Japan (Igarashi, 1984). After operating successfully for a number of years, it was concluded that producer gas and char by-products could be generated from the pyrolysis, but the economics could never compete with recovering energy from waste in solid waste fired boilers. Today the emphasis is on environmental standards and the perceived impact in the Biosphere. Wilson, D.J. et al (1995) postulated that a correctly designed and operated Municipal Waste Combustor would emit fewer PCDD/PCDF compounds than an equivalently sized hazardous waste combustor. The goal then is to design a combustion system that emits lower levels in every pollutant category.

HISTORY

Faced with substantial increases in the cost of landfill by the Town of Wainwright, and Alberta's recognition of this on a Provincial scale, funding for a capital project to assess the viability of a *Waste-To-Energy Plant* was made in 1984. Wainwright, located in the western Canadian province of Alberta, initially selected two modular starved air systems at a capital cost of approximately 4.0 million $CAN. Despite incurring numerous problems in combustion that subsequently resulted in the disposal of the two units, the Wainwright Regional Waste-to-Energy Authority and the Province believed that waste-to-energy would be a proper solution to complement its landfill, composting, and recycling programs. Stanley Industrial Consultants Ltd. of Edmonton, Canada were retained to assess small scale waste-to-energy technology to replace the previous units. Inherent in the analysis was the capability to burn other fuel mixes such as biomedical, industrial, and tires.