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MINIMIZING EMISSIONS FROM EXISTING ESP EQUIPPED MWCs

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ABSTRACT

A number of municipal waste combustors [MWCs] built before the mid-1980's, when local permitting processes resulted in the application of acid gas control technology, were equipped with electrostatic precipitators to minimize particulate emissions and comply with the then applicable New Source Performance Standards for Municipal Waste Incinerators (40 CFR 60, Subpart C). Polychlorinated dibenzo-p-dioxins and dibenzofurans [PCDD/F] emissions can be minimized from these facilities by improving combustion to minimize furnace carryover and flame formation. Unfortunately, this can do nothing about the gas and particle phase formation of PCDD/F when the products of combustion are held in the "dioxin formation window"--250 to 400°C or 482 to 752°F.

A proof-of-concept demonstration test program was conducted under the direction of the ASME Research Committee on Municipal and Industrial Waste by the ASME Center for Research and Technology Development. The work was supported by the United States Department of Energy's [DOE] National Renewable Energy Laboratory [NREL] and several electrostatic precipitator [ESP] equipped facilities. The purpose of this program is to demonstrate that flue gas temperature entering existing ESPs can be practically reduced below 175°C (350°F) to minimize PCDD/F formation in the air pollution control system [APCS]. At the same time, the performance of powdered activated carbon [PAC] and dry acid gas control reagent injection are demonstrated to establish the practicality of bringing existing ESP-equipped MWCs into compliance with the USEPA's Emissions Guidelines without scrapping the sunk investment in functional, high efficiency ESPs. The practical difficulties to be overcome include avoiding surface wetting (which leads to plugging and accelerated wastage) while reducing the APCS inlet temperature enough to minimize PCDD/F formation and enable the PAC to polish the effluent.

The test program includes baseline testing to establish as-is conditions as well as an extensive battery of tests at different APCS operating temperatures, with and without acid gas reagent and PAC injection. Emissions testing utilizes Methods 23, 26 and 29. CEMS are employed to monitor routine combustion parameters, SO_x and NO_x. Plant operating data are captured for the test period.

INTRODUCTION

On December 19, 1995, the USEPA promulgated final air standards for municipal waste combustors [MWCs]. These standards regulate the emitted concentration of criteria and hazardous air pollutants listed in Section 129 of the Clean Air Act. These regulations have taken a long time to develop and along the way many stakeholders have become involved. As a result of this effort, requirements to control PCDD/Fs, mercury and acid gases (HCl and SO_2) to very low levels have emerged.

There are at least 54 existing MWC units in 25 plants that are jeopardized by the new regulations. These facilities were built before dry scrubbers and ultra-high efficiency electrostatic precipitators [ESPs] or fabric filters became the ***de facto*** standard for MWCs in the mid-1980's prompted by state environmental impact hearing processes and national carryover via Federal Prevention of Significant Deterioration regulations. These facilities, which serve a useful function in their communities, are equipped with ESPs and need to find an economical way to meet the new standards without wasting the residual value in the APCS that exceeded regulatory requirements when they were built. The problem is particularly acute for the large waste-to-energy plants with MWC units smaller than 250 TPD that are currently equipped with dry (duct) sorbent injection [DSI] and ESPs. These plants have already made a significant investment that achieves much of the new emissions limitations. The incremental cost effectiveness of retrofitting these facilities is much worse than ESP-only plants because a nominal 50% acid gas control is already being achieved.

In an effort to assist communities operating ESP-equipped MWCs, the Department of Energy's [DOE] National Renewable Energy Laboratory [NREL] supported an American Society of Mechanical Engineers [ASME] Center for Research and Technology Development [CRTD] project to conduct a proof-of-concept demonstration test on an innovative method of achieving the Emissions Standards in these facilities. This program is intended to demonstrate the technical performance and viability of flue gas temperature control in combination with dry acid gas reagent and activated carbon injection at an existing MWC equipped with an ESP.