

ADAPTATION OF THE BOILER AS CALORIMETER METHOD TO TWO-STAGE MUNICIPAL WASTE COMBUSTORS

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ABSTRACT

The Boiler As Calorimeter (BAC) method was adapted for use with two-stage municipal waste combustors. For this purpose, a special thermodynamic input-output model was developed, together with a related work methodology. The latter draws on the guidelines set forth in the ASME Test Codes, but was supplemented by improvised field procedures. The Hartford County Resource Recovery Facility (HCRRF) with a processing capacity of 360 tons per day served as the test bed.

Extensive calculations were carried out for five different BAC test periods spread over a period of several years. To some extent, data shortages were overcome by coupling the records of the plant computer with the results of annual emission testing. Other supplemental data sources included front loader calibrations and ash analyses.

In addition to the higher heating value (HHV), the system thermal efficiencies and the specific steaming rates were calculated. Insofar as possible, they were correlated to each other. All were presented in consistent tabular format and augmented with diagrams. Several key parameters, such as losses from radiation and unburnt carbon, exceeded expectations. On the other hand, the designer's efficiency goals were not met. Potential causes for these shortcomings were identified and discussed.

Historical trend analysis indicated a declining HHV as determined by the BAC test work. In this context, the hypothesis is advanced that mandatory materials recycling may have had a negative effect. In support of this hypothesis, the results of computer modeling and an actual waste sort are taken into consideration.

Scores of recommendations are made

about how to facilitate future BAC analyses in facilities equipped with two-stage combustors. They run the gamut from improved accuracy to reduced work effort. In addition, a method for better burn-out is proposed which could lead to increased thermal efficiency.

INTRODUCTION

The Boiler As Calorimeter (BAC) method to determine boiler efficiency has received much attention in prior ASME publications. Its purpose is to determine the higher heating value (HHV) of waste fired when it is not possible to collect a representative sample.

Usually, application of the BAC method has been limited to large municipal waste combustors (MWC's) which are equipped with articulated grates and waterwall boilers. This raises the question: Can the BAC method be adapted for use in small MWC's which feature two-stage combustion in multiple-hearths? Is this possible even though small MWC's tend to have less sophisticated in-plant instrumentation?

In order to find the answer, the Hartford County Resource Recovery Facility (HCRRF) was selected for an in-depth investigation. It has four two-stage MWC's for an installed facility capacity of 360 short tons per day (STPD). These MWC's have been in operation since January 1988. More descriptive details may be found in another publication [1]. The facility was financed through the Northeast Maryland Waste Disposal Authority (NEM) and is operated by a private company, i.e. Waste Energy Partners as part of a Service Agreement [2].

The plant instrumentation has a mix of sensors which monitor some operat-