PERFORMANCE TESTING OF A 15-MW WOOD CHIP-FIRED BOILER USING BOILER AS A CALORIMETER

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I have a special interest in preparing a discussion of this paper because I am the Chairman of PTC 33.1, Large Incinerators by the Boiler/Calorimeter Method. This new committee was formed as a project of the ASME Research Committee on Industrial and Municipal Waste. We put together a session at this conference in 1986 in Denver, and the papers are in the *Conference Discussion Book.*

The authors are to be congratulated by providing us with another example of the boiler calorimeter test procedure. As a reminder, it is the procedure that has been in use in Germany and other European countries for MSW fired boilers for the last twenty years.

It is our hope that the Boiler–Calorimeter Method will become the standard for the industry. We believe this will occur with the adoption of an ASME PTC Code. We met at this conference to start that activity. Unfortunately we do not now have an ASME approved Performance Test Code on the procedure. What has been used to date here in this paper is a procedure prepared by the authors.

If I may, I'd like to make some observations and raise some questions. In providing us with calculations, the authors have arrayed the test results on the basis of Btu/lb fuel, as is typically done in the PTC 4.1 Short Form. We presume this is done for the convenience of the reader. We would point out that the output, losses and credits could be calculated in terms of Btu/hr with actually using the fuel rate or total fuel fired during the test period. The efficiency and the thermal capacity could be computed without the fuel feed.

In reviewing the data, the loss in the ash is unburned carbon and sensible heat in the residue. Did the authors also measure similar losses in the fly ash? We would also inquire if such data were taken to attempt an ash and moisture balance, so that the heat value of the fuel could be calculated on a moisture and ash-free basis which tends to be fairly consistent for wood. We would also inquire if wood chip samples were obtained and analyzed to compare with the Boiler–Calorimeter Computed Heating Value.

Before leaving, let me say that this is indeed a significant contribution to our knowledge of the Boiler Calorimeter Method, and I trust you all are as excited about making this an approved procedure as I am.

AUTHORS' REPLY

We appreciate receiving the discussion from Mr. Sommerlad. As members of the newly formed com-

mittee for PTC 33.1 Boiler–Calorimeter Method, we agree that the adoption of an ASME PTC Code will cause this method to become the standard of the industry. We look forward to participating in the preparation and adoption of the Code.

In regard to the questions raised, we have the following responses:

(a) The results of the test are reported on the basis of Btu/lb as fired (A.F.) because we believe this is a more meaningful unit than Btu/hr when using the BAC procedure. When applying the BAC procedure to refuse, wood chips, or other solid fuels, the heating value of the fuel is generally within a relatively narrow range. By using Btu/lb A.F., the relative results can be compared without regard for the size of the unit being tested. For example, the net heat output to primary steam should be in the range of 2000–4000 Btu/lb A.F. when firing wastes ranging from 4000 to 5700 Btu/lb. In most cases, when firing solid waste, the range should be between 2700 and 3700 Btu/lb A.F.

If Btu/hr were used, the same heat in primary steam would vary over a wide range, depending on the size of the unit being tested. The firing rate would have to be reported in addition, to be able to compare results from different sized units. When making such a comparison, the results are often put on a common basis, which, in this case, would be Btu/lb A.F. Reporting the results in this manner eliminates an unnecessary step in the calculations. If Btu/hr is a desired value, the Btu/lb A.F. can be multiplied by the feed rate.

In addition to the above, efficiency can be calculated from the Btu/lb A.F. as indicated in the paper, without converting to Btu/hr. We agree that the efficiency could alternatively be calculated without knowing the feed rate, and using Btu/hr.

(b) At the Pinetree Power facility, all ash is combined prior to entering the conditioner. Therefore, the losses due to unburned carbon and sensible heat in the fly ash were included in the reported values.

(c) We did not attempt to calculate a heating value based on an ash and moisture balance and the moisture- and ash-free higher heating value of wood. Hourly wood chip grab samples were taken and analyzed for moisture and higher heating value during the test. The results are as follows:

Average HHV:	5790 Btu/lb (range: 5158–6476)
Average moisture:	32% (range: 22.8–44.7)

The laboratory results are suspect, since the wood chips fired during the test were green chips which were delivered on the day of the test. The HHV should have been lower and the moisture content higher. During testing of a similar unit in March, 1988, a rigorous sampling and testing procedure was followed. The results of those analyses were in close agreement with the results obtained using the BAC procedure.