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Sampling and Measuring the Temperature of Boiler Exit Gases

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SUMMARY

In the assessment of boiler performance, the temperature and composition of the flue gases are among the most difficult measurements to make with sufficient accuracy.

Errors in both temperature measurement and gas sampling can arise from stratification in the gas stream; a comprehensive survey is necessary before a point which will give a representative average reading can be selected.

The measurement of gas temperature is further complicated: the detecting instrument has heat capacity and therefore must exchange some heat with its surroundings. This error, which is often serious, is reflected in the unaccounted loss in the heat balance.

The present report describes steps taken at B.C.U.R.A. to overcome these difficulties when carrying out routine trials on the experimental boiler.

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(1) Introduction

Errors of considerable magnitude may occur in the determination of gas temperatures at the boiler exit. Their magnitude depends upon the type of instrument used, and the general conditions under which measurements are made; it is often indicated by high unaccounted loss in the heat balance.<sup>1</sup> Inaccuracies can be minimised by exercising great care in the choice and use of pyrometers.

(2) The Problem

It is more difficult to measure the temperature of a gas than of a solid or a liquid<sup>2</sup> because of the lack of thermal equilibrium within the system, i.e. the temperature of the surrounding wall surfaces may be either higher or lower than that of the gas. As gases, in