MEASUREMENT OF GAS TEMPERATURE DISTRIBUTIONS IN A TEST FURNACE USING SPECTRAL REMOTE SENSING

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ABSTRACT. Measurement of a temperature profile of a hot gas is made using the Spectral Remote Sensing (SRS) method. Emphasis is placed on the accuracy of the SRS method in a test furnace with intense radiation emerging from the gas as well as from the rear wall. Kerosene is used as the fuel and a 2m long stainless steel (STS) tube is employed as the test furnace. In calculating spectral intensity, the CK-based WNB model is used. By minimizing the error between the measured spectral intensities and the computed ones, the temperature profile along the line-of-sight is recovered. To demonstrate the SRS method, the recovered temperatures are compared with measured temperatures using thermocouples. The recovered temperature profile and measured temperatures are in good agreement within an error of 4%. Especially, the hot rear wall is found to affect the overall performance of the SRS method significantly through relatively heavily weighted Plank distribution there. The SRS method, however, proves to be applicable in determining the temperature distribution of the gas with a reasonable accuracy whether the rear wall is hot or cold.