BLACKBODY TEMPERATURE CALCULATIONS FROM VISIBLE AND NEAR-IR SPECTRA FOR GAS-FIRED FURNACES

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ABSTRACT

The goal of this research work is to develop a system capable of measuring multiple factors of interest in the operation of gas-fired furnaces. The primary focus is the development of a model for calculating wall or flame temperatures from furnaces using a blackbody radiation approach in the visible spectral range. One simple and two advanced methodologies have been developed to provide the needed corrections to use a two-color method for temperature calculations. The results for temperature calculations in the visible range are compared with those taken in the near-IR range under the same conditions, which indicate that visible temperatures are as accurate as the near-IR temperatures for furnaces. The ultraviolet spectrometer allows the monitoring of hydroxyl emission lines that can be correlated to changes in NO_X and oxidizer/fuel ratios. The methodologies are first applied to various research source types using the visible range to establish a baseline for the technique, and to develop a dynamic empirical correction model for use at industrial settings. The results of the dynamic empirical correction model show that the accuracy and practicality of such a dynamic model is quite good.