THE ANALYSIS OF EFFLUENT GAS FROM ETHYLENE FURNACE BY NEAR-INFRARED SPECTROSCOPY

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Usually there are many furnaces in a ethylene plant and the performance of total furnaces can be improved if that of each furnace is monitored and controlled. For this purpose real-time data for the effluent of each furnace is necessary. However, it is very difficult to analyze the total effluent stream of a ethylene furnace by real-time because it is composed of so many components including heavy hydrocarbons. Fortunately, component data for lighter hydrocarbons is much more important than that of heavier ones for ethylene furnace.

In ordinary case, the on-line measurement of light hydrocarbons is performed by on-stream gas chromatography, after separating gas-phase part from effluent. The main and important components of gas-phase are Methane, Ethane, Ethylene, and Propylene. If we can use Near-infrared spectroscopy for measuring those components within good reproducibility, shorter analysis time, better repeatability, easier maintenance and lower cost will make Near-infrared (NIR) analyzer replace on-stream gas chromatography in this process.

Although it is known to be very difficult to measure gas components because of very weak absorption in Near-infrared region, we have studied the feasibility of the application of NIR for the measurement of gas-phase hydrocarbon in the effluent of ethylene furnace.

The samples were obtained from actual process and NIR spectra were collected over 1100 to 2500nm range. NIR spectra and calibrations showed and demonstrated the possibility of extending NIR spectroscopy to the measurement of gas-phase hydrocarbon in the effluent of ethylene furnace.