

Material and Process Conditions for Successful Use of Extractive Sampling Techniques

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Industrial gas emissions monitoring is accomplished by examining the gaseous components directly within the exhaust stack or by extracting a sample using a probe located in the stack and transporting the gas to the analyzer by using a pump. Both methods have weaknesses but an extractive sampling method does not require precise alignment in a cross stack that needs to be monitored for shifting mirrors. Fourier Transform Infrared (FTIR) analyzers use the extractive method which provides continuous monitoring of multiple gaseous species all at the same time, reducing the overall cost of ownership.

Most regulatory bodies require some type of verification that the analyzer can measure the component of interest at the permitted concentration levels. In the United States a certified gas composition is used to verify that the analyzer is reporting properly. For an FTIR using the extractive technique, a known concentration of an analyte (generally from a gas cylinder) is transported to the sample probe and into the gas sampling stream, displacing at most 10% of the native exhaust emissions stream. This technique is referred to as analyte spiking or dynamic spiking and is one of the best methods used to determine if the analyte is actually reaching the analyzer at the proper concentration.

In the extractive sampling technique materials of construction, equipment handling and flow rate become very critical. Reactive gases such as HCl, NO₂, NH₃ and Formaldehyde tend to be the most difficult of gaseous components to verify since they stick to the sample and calibration gas transfer line surfaces and any unheated spot on the sample train can cause the component to drop out of the gaseous phase along with moisture. This presentation will focus on providing the best materials of construction and sample line conditions that should be used to avoid loss of these constituents. In some cases the sampling material did not make any difference but equipment handling and flow rate were the most critical parameters of successfully validating an extractive sampling system, these cases will be presented as well.