Quantum Analytical Services Inc.

Technical Note: 103

High Heating Value (BTU) Analysis: Fixed Gases and C_1-C_9 Hydrocarbons

Applications:

Refinery gas ***Reformed gas***
Natural Gas ***Combustion gases***
Combustion Products ***Purity of gases***

Determination of the chemical composition of fuel gases (refinery, natural, and reformed gases) is very important in calculating the high heating value (HHV) of a gas mixture. The gas mixture may contain the following components: hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide, methane, ethane, ethylene, propylene, propane, n-butane, isobutane, n-pentane, isopentane, and other hydrocarbons.

A complete speciation of the fuel sample is required to calculate the HHV or the BTU value. A gas chromatograph (GC) with multiple detectors is used. Fixed gases such as hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide, and methane are determined using gas chromatograph equipped with thermal conductivity detector. The detection limit of these gaseous may vary from 100 ppmv to 1000 ppmv.

Hydrocarbons including methane, ethane, ethylene, propylene, propane, n-butane, isobutene, n-pentane, isopentane and other hydrocarbons are determined using gas chromatograph equipped with flame ionization detector. The detection limit for hydrocarbons is 100 ppmv. Separation of C1-C9 hydrocarbons is achieved using a PLOT column.

After the determination of the composition of the fuel gas sample (refinery gas, natural, and reformed gases), the following properties of the gas mixtures are calculated: high heating value, relative density and compressibility factor (F) at base conditions (14.696 psia and 68 ^{o} F).