Measurements of Benzene Destruction Efficiency In a Lab-Scale Flare

Nicholas T. Brooker, Brian M. Crosland, Matthew R. Johnson
Energy and Emissions Research Laboratory, Carleton University

Abstract

Raw natural gas is generally saturated with water vapour that must be removed, typically using glycol dehydration units, before the gas can be introduced into the sales pipeline. The glycol used in the dehydration process also absorbs hydrocarbons, which can include BTEX compounds benzene, toluene, ethyl benzene, and xylene. In the dehydration process BTEX are often removed in a flash tank and then burned, along with other absorbed hydrocarbons, in a flare. Benzene is a health concern among humans, as it is classified as a known human carcinogen and can cause leukemia and abnormalities of the blood. Knowing the amount of benzene that escapes the flaring process is important.

Unfortunately there is currently a notable lack of quantitative information on the destruction efficiency of benzene in a flare. The objective of this project under FlareNet is to provide a useful model for benzene destruction efficiency in flares. This will be done using the Carleton Lab-Scale Flare by injecting vapourized benzene into gas compositions representative of what is found in glycol dehydrator flash gas. A Baseline 9100 Gas Chromatograph specially customized to quickly measure benzene concentrations above typical ambient levels is used to detect benzene concentration in the combustion products, allowing the destruction efficiency to be determined within calculated uncertainties.

Preliminary results are presented for benzene destruction in simple methane flares seeded to contain up to 1.2% benzene. Future work on this project will include further testing with pure fuels as well as industry representative gas compositions.