Development of Emission Factors and/or Correlation Equations for Gas Leak Detection, and the Development of an EPA Protocol for the Use of a Gas-Imaging Device as an Alternative or Supplement to Current Leak Detection and Evaluation Methods

TCET RFP 02-R04

PROJECT ABSTRACT

In August and September 2000, an intensive field study was conducted in the Houston-Galveston Area (HGA) to study ozone and other air pollution issues in that region. As part of this study, aerial surveys of chemical species in the atmosphere above the HGA showed higher ozone and ozone-precursor concentrations than would be expected from the emission inventory of volatile organic compounds (VOCs). One possible source of these unreported emissions are fugitive emissions from industrial facilities. Fugitive emissions are normally relatively small and hard-to-detect emissions from valve packings, pump seals, compressor seals, and piping connections that occur as part of normal industrial plant operations. Fugitive emissions from refineries and chemical plants have historically represented a large percentage of the volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions from these facilities.

At present, federal and state fugitive emission monitoring programs are based on EPA Method 21, which involves the use of a portable hydrocarbon analyzer to monitor for a leak at the leak interface of fugitive emission components. Monitoring is performed so that leaks can be identified – this is done by comparing the hydrocarbon analyzer reading, or screening value, with the leak definition in the applicable regulation. Generally if a component is found to be leaking, an attempt to repair the component must be completed within a specified time frame. The actual number of components to be tested in a refinery or chemical plant can be quite large, making Method 21 monitoring both time intensive and expensive.

An emerging class of technology, generally referred to as optical imagers, offers an operator the ability to monitor components from a distance and identify – in some cases instantaneously – leaking components (of a sufficient mass) within the line of sight of the optical imager. The remote sensing and instantaneous detection capabilities of optical imaging technologies allow an operator to scan areas containing tens to hundreds of potential leaks, thus eliminating the need to visit and manually measure all potential leak sites.

In this project, three specific work areas will be undertaken. These areas include:

- Evaluation of various optical gas-imaging technologies to determine the detection sensitivity of these devices to certain chemicals and to various factors that would be encountered during routine use at petroleum and chemical plants. In addition, efforts will be made to develop and demonstrate the ability of these optical imagers to estimate fugitive mass emissions.

- Collect data of sufficient quality to develop emission factors or correlation equations for individual ethylene/propylene sources.

- Develop an EPA protocol for the use of a gas-imaging device as an alternative work practice or a supplement to current leak detection and evaluation methods.