

Optical Gas Imaging: A New Perspective to Hydrocarbon Emissions in North Dakota

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Abstract

In 2015, the North Dakota Department of Environmental Quality (NDDEQ) received its first optical gas imaging (OGI) camera to determine compliance with state air regulations and federal Clean Air Act regulations for certain hydrocarbon gases. Hydrocarbon gases can consist of volatile organic compounds (VOCs) which are regulated as both an indoor and an outdoor pollutant. Indoors, the primary concern from VOCs is their effect on human health, while outdoors the primary concern is from VOCs ability to create photochemical smog through the formation of ozone. Built upon a thermal camera base, the OGI camera uses a cryogenically cooled detector in conjunction with a spectral filter to restrict wavelengths to those commonly absorbed by hydrocarbon gases. This camera has allowed state inspectors to observe and clearly document the emission of hydrocarbon gases that would otherwise only be detected using traditional audio, visual, and olfactory (AVO) inspection methods. Weather, complicated industrial layouts, and safety concerns meant that many such emissions previously went undetected with traditional AVO methods or were impossible to trace back to a source. However, these issues are largely alleviated by the camera's ability to both quickly survey large numbers of possible emission sources and to do so from a safe distance. Since adoption of the camera, a wide variety of sources both within and outside the oil and gas industry have been surveyed by the NDDEQ, leading to a surprising number of previously unknown sources of hydrocarbon gases. Traditional emission sources such as unlit flares, open tank hatches, and open-ended lines have been expanded to include emission sources such as improperly tightened gaskets, inadequately designed piping, and inefficient control devices. This presentation covers a brief introduction to optical gas imaging technology, followed by various case studies of different types of emissions and their possible sources as observed by NDDEQ staff during compliance inspections.