

Towards Quantitative Optical Gas Imaging of Volatile Organic Compounds

Finding leaks using conventional "sniffers" (e.g. EPA method 21) is both labour intensive and time consuming. In addition, surveys must be performed in close proximity of the installations under test which put the operators at high risks from exposure to high concentrations of hazardous chemicals. To overcome these drawbacks, new leak detection methods have been developed based on optical gas imaging (e.g., using a single narrowband infrared camera). Optical gas imaging technique enables the measurement of gas emission at far distances in real-time, thereby providing health and operational safety to personnel conducting the leak detection. It is based on the strong infrared absorption, at a specific wavelength range, of gases like volatile organic compounds (VOCs) such as methane, methanol, benzene, etc.

Petrochemical industry and environmental agencies such as DCMR in the Netherlands have rapidly adopted this new technology. Currently, such cameras can only be used to obtain a qualitative image of the leak. However, as the uptake of this new detection technology increases, there is a pressing need to obtain more quantitative measurements. Within the IMPRESS project, VSL together with DCMR are working towards realizing such reliable quantitative gas emission detection using such infrared camera. A traceable test facility, where known leak rates of VOCs will be generated under a range of different conditions (e.g., wind speed and ambient radiance) and the camera response will be recorded. Concurrently, a camera response model will be developed and later will be validated during laboratory and real-field measurements.

The picture below shows an experiment carried out in the VSL laboratory.



Test of the infrared camera in the laboratory. In front of a blackbody radiator a small cup containing liquid methanol is shown. The white plastic is transparent for infrared radiation. The inset shows the picture taken by the camera.