Fugitive Emission Source Characterization Using Downstream Measurements

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Abstract

Fugitive emissions are important sources of both greenhouse gas emissions and lost product. Sources of these emissions are often simple and economic to mitigate once located and quantified. However, facilities typically have large numbers of seals, valves, fittings, tanks etc. connected by pipe that all function as potential sources of emissions. Detecting sources quickly and efficiently among these potential emitters if and when a leak occurs allows for repair prioritization, improved reporting and overall lower emission releases.

Traditionally, visual IR camera inspection or manual component testing are used, though in recent years mobile drive-by and airborne surveys have increased. These methods, however, provide intermittent screening or component snapshots by design. Due to long intervals between measurements, leaks could potentially go unnoticed for long periods. This poster presents a scalar transport adjoint-based optimization method for locating and quantifying emission sources from downstream measurements. This can be used in conjunction with an in-place sensor network to find and quantify emission sources on a quasi-contiuous and automated basis. The method is demonstrated on the experimental release data from Project Prairie Grass, as well as on simulated simultaneous releases over a 3D representation of a partial Alberta gas plant