Investigation of an Electrohydrodynamic Atomization system for use in Natural Gas Odorization

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Natural gas is one of the most widely used domestic commodities. Given its odourless nature, to facilitate easy detection of leaks, artificial odorization is carried out by conventional drip injection of odorant through orifices in the pipeline. Despite the widespread usage of this method by the natural gas industry, it allows poor control of droplet size and thus has limited effectiveness with respect to diffusion of the odorant in the gas. It has been observed that, given the large droplet size produced in such systems, only a part of the odorant diffuses in the gas flow leading to accumulation of odorant at the bottom of the pipeline.

In this work an Electrohydrodynamic Atomization (EHDA or electrospray) system was investigated as an alternative to allow control and manipulation of the odorant's droplet size and dispersion with the intention to provide better diffusion and prevent accumulation of odorant at the bottom of the pipeline. Results of pilot scale experiments carried out in a 1200 cm long natural gas pipeline section have shown a 66% increment in the diffusion of odorant, mainly due to reduction in droplet size and better dispersion, when compared to a drip injection situation. Experiments have shown that, despite the perpendicular flow of natural gas (to the direction of the electrospray) and operation under restricted conditions, a cone-jet mode was achieved, with a narrow droplet size distribution (RSD ~ 0.26). If EHDA can be implemented in such systems, reduction of ~ 50% in the consumption of the odorant compared to conventional systems seems possible.

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