

Summary

This report presents results from single-blind experiments evaluating the University of Calgary Rapid Vehicle-based Methane Emissions Mapping System (hereafter PoMELO), conducted at the Colorado State University Methane Emissions Technology Evaluation Center (hereafter METEC).

PoMELO is a system for mapping emissions points on upstream oil and gas pads. The maps of emitting equipment are then used to guide close-range inspections, usually while onsite. Testing was designed to evaluate the ability for the PoMELO system to correctly identify both emitting and not emitting equipment.

Mock upstream pads were configured with 0-6 emissions points and the PoMELO system was used to detect and map the emissions locations at the equipment group and equipment unit scale. Over 5 days of testing, 105 individual experiment pads were surveyed. Individual units of equipment consist of wellheads, tanks, and separators. Equipment groups consist of two or more units of equipment in close proximity. The PoMELO team was unaware of emissions configurations until after all experiments were finished, ensuring that the PoMELO team executed surveys blind.

At the equipment scale, the total sum emissions rates detected by PoMELO was 4.75 g/s, with 0.198 g/s missed (96.0 % of sum emissions rates detected). At the equipment group scale the total sum emissions rates detected by PoMELO was 4.90 g/s, with 0.0541 g/s missed (98.9 % of sum emissions rates detected). At the equipment unit scale, 95.6% of emitting equipment were correctly detected for close-range follow-up, but 47.1% of clean equipment were also detected. At the equipment group scale 98.5% of emitting equipment groups were detected with 16.7% of clean equipment groups erroneously detected.

The minimum equipment group emissions rate that was detected was $0.00158 \pm 8.29 \times 10^{-5}$ g/s (0.301 ± 0.0159 scfh CH₄, 0.201 ± 0.0106 m³/day CH₄). Detection frequency was near to 100% across the full range of emissions rates tested, limiting inference about the causes of non-detections. It is likely that the PoMELO minimum detectable emissions rate is below the minimum controllable flow rate at METEC.

Results suggest the PoMELO system is very sensitive within the context of detecting emissions sources on upstream oil and gas pads, and attributing emissions sources to equipment units; pairing PoMELO with a close-range follow-up method could provide near equivalent emissions reductions when compared against a close-range only survey mode. However, there is room for enhancements in system efficiency to reduce unnecessary follow-up of non-emitting equipment.