



**ESi**

**TECHNICAL NOTES**

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# Fuel Gas Odorant Analysis Validation Study Overview

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## Summary

The ESi Fuel Gas Odorant Analysis Lab underwent extensive development and testing prior to deployment.

The following information documents the methodology used to incorporate scientific protocols and the validation undertaken to ensure the highest levels of accuracy with the sample results.

Upon completion of initial external validation, the ESi laboratory capabilities were found to meet or exceed current output from leading laboratories in the industry.

## Methodology

A gas chromatograph with a pulsed flame photometric detector with specialty valving for precise gas sampling was procured and installed in the Seattle ESi laboratory.

For initial development, the laboratory focused its efforts on commonly found odorants, their degradation products, and some light hydrocarbons. The first compounds for which analysis methods and calibration curves were developed included ethyl mercaptan, methyl mercaptan, hydrogen sulfide, carbonyl sulfide, dimethyl sulfide, diethyl sulfide, methyl ethyl sulfide, n-propyl sulfide, dimethyl disulfide, diethyl disulfide, methyl ethyl disulfide, methane, ethane, propane, n-butane, and isobutane.

Representative testing of a commercially available propane cylinder was conducted as an initial validation. The results obtained were reasonable for properly prepared and odorized commercially available liquid propane gas (LPG). Upon completion of calibration and initial testing, a duplicate LPG sample was sent to an external laboratory and the internal laboratory for a Round Robin test. The results were withheld from the chemist conducting the in-house validation at ESi to reduce any chance of bias.

## Validation

External validation was conducted with a popular mercaptan analysis laboratory (Lab A). Three identical samples of LPG were taken at the same time by the same person. One sample was sent to Lab A, and one sample was kept internally for testing. The third sample was retained and stored.

Once all external and internal testing was completed, results from internal and external labs were compared (Table 1).

The variation in quantifiable ethyl mercaptan in PPM was well within expected variation (<5%). Both labs also accurately identified the same components in the LPG samples. Other identified components included: methyl mercaptan, dimethyl disulfide, ethyl methyl disulfide, diethyl disulfide, ethane, propane, propylene, isobutane, n-butane, and pentane.

	Lab A	ESi Lab
Ethyl Mercaptan (PPM)	34	32.4
Ethyl Mercaptan (lb/10,000 gal)	1.94	1.88

All ESi calculations for the conversion of the analytical output (ppm) to the commonly used pound ethyl mercaptan per ten thousand gallons propane were verified and documented in house. Utilizing values at 25°C, the conversion used is 17.2 ppm ethyl mercaptan = 1 pound ethyl mercaptan per ten thousand gallons propane.

Upon completion of initial external validation, the ESi laboratory capabilities were found to meet or exceed current output from leading laboratories in the industry.

### **Full Study**

For questions or to request the full validation study contact:

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