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BIOMETHANE AND NATURAL GAS ODOR CONTROL USING GAS DETECTION TUBES - REDUCTION TO REFERENCE CONDITIONS

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1 Introduction

The odorization of biomethane and natural gas is essential for public safety, as both gases are colorless and odorless.

For the purpose of odorization is used tetrahydrothiophene (THT).

For the purpose of measurement of THT concentration in gas are used gas detection tubes.





Reducing to reference conditions is typically account for temperature, atmospheric pressure, and gas pressure.

The aim of this study was to assess whether it is always necessary to correct the measured THT concentrations in gas distribution systems to reference condition.

The accuracy of measurements by gas detection tubes could be from +/-10% to +/-30%.



Relative difference between mass volume concentration at measured and normal conditions:

$$\varepsilon = \left(1 - K_n \cdot \frac{T}{p_{atm} + p_m}\right) \cdot 100\% \quad K_n = \frac{p_n}{T_n}$$

T – temperature [K] T_n – normal temperature [K] p_m – pressure gauge [Pa] p_{atm} – atmospheric pressure [Pa] p_n – normal pressure [Pa]



Dependence of relative difference between mass volume concentration at measured and normal conditions ε on temperature of natural gas t and atmospheric pressure p_a for pressure gauge $p_m=20$ mbar

<i>t</i> [°C]														
<i>E</i> [%]				5	6	7	8	9	10	11	12	13	14	15
[m] <i>h</i>	50	p _{atm} [mbar]	1010.6	-0.12	-0.48	-0.84	-1.20	-1.56	-1.92	-2.28	-2.64	-3.00	-3.36	-3.72
	100		1005.2	-0.64	-1.01	-1.37	-1.73	-2.09	-2.45	-2.81	-3.18	-3.54	-3.90	-4.26
	150		999.8	-1.18	-1.54	-1.90	-2.27	-2.63	-3.00	-3.36	-3.72	-4.09	-4.45	-4.81
	200		994.4	-1.72	-2.08	-2.45	-2.81	-3.18	-3.54	-3.91	-4.27	-4.64	-5.01	-5.37
	250		989.0	-2.26	-2.63	-2.99	-3.36	-3.73	-4.10	-4.47	-4.83	-5.20	-5.57	-5.94

5 Conclusion

The study's key finding indicated that when gas temperatures are below 10°C and the elevation is under 100 meters, corrections to the measured concentration are not required.

Under these conditions, the THT concentration measurements can be considered accurate without further adjustments, potentially simplifying the odorization monitoring process.