

Odorisation Monitoring Activity in E.ON Gas Distribution

Brîndușa Mitroi, Elena-Raluca Stanimir, Radu E. Popescu

E.ON Gaz Distribuție, Tg. Mureș, P.ța Trandafirilor, nr.21, 540049, Tg. Mureș
e-mail: brindusa.mitroi@eon-romania.ro; raluca.stanimir@eon-romania.ro;
radu.popescu@eon-romania.ro

Abstract

Natural gas odorization is a requirement imposed by the in force legislation, being a customer protection measure.

According to the legislation, the odorization must be performed so that at the end of the distribution grid also, any gas leakage may be detected by smell. Currently, the odorant concentration is monthly monitored on the distribution grids of E.ON Gaz Distribuție in the large cities.

This work aims to expose this odorization monitoring activity.

Key words: *odorization, gas distribution, odorization monitoring activity*

Introduction

The absence of the natural gas's smell (with main component methane) does not allow the detection of gas leaks. The undetected gas leaks inside or outside homes can lead to real tragedies, through human lives losses or terrible mutilations.

The problem of the „natural gas smell” was imposed following a tragedy at a school from New London, Texas, where, due to a gas accumulation in the building's basement, an explosion destroyed the entire school. Out of 500 students and teachers, 298 persons died and around 130 were injured.

From the experience of the natural gas distributors, the gas smell is an alarming smell, signaling problems with the gas installations. The level of the smell must be strong enough to warn even someone who does not know it, but the substance that gives the gas smell must not be toxic and must have a level of concentration that does not allow it to produce harmful effects on the human body and environment.

Odorizing with organo-sulfur agents of thiol type was proposed in Germany in 1880 by Von Quagiols. Using these agents to odorize the natural gas lead to the association of their smell with the „gas smell” [5]. The requirements for using thiols and for detecting gas leaks by using thiols or other agents (including ones without sulfur) are different and are regulated through standards by each country.

According to standards existing in Romania, SR ISO/TS 16922/2005 and SR 13406/1998, gas odorizing „is a security measure” for consumers.

The natural gas is odorized by SNT Transgaz or Petrom, using ethyl mercaptan. In this case, the minimum concentration at grid extremity must be of minimum 3 mg/m^3 , corresponding to level 2 on Sales scale (alerting smell, perceivable, unmistakable). The above mentioned standards also foresee the monthly verification of the odorizing agent at the grid’s extremities in every locality [1].

Ethyl mercaptan, as odorizing agent, has a strong smell, unmistakable, but unfortunately it is chemically unstable thus the concentration decreases if the gas sits in the pipes for a long time or if the odorizing is done for long distances (centralized odorizing). This phenomenon is accentuated in the case of steel pipes compared to PE pipes. The age of the steel pipes also contributes to the decomposing of the ethyl mercaptan. Chemical reactions produce on the surface of the inside of the pipe between rust or dust and ethyl mercaptan, and the reaction products have a weaker smell or are without smell. This phenomenon is called „odor fade” in articles on this subject. [5].

Organization of the odorizing monitoring activity – E.ON Gas Distribution

The purpose of the odorizing monitoring activity in E.ON Gaz Distribuție (EGD) is to ensure, through a good collaboration with SNT Transgaz, the optimum level of odorizing in the localities where EGD distributes natural gas. EGD serves over 1.400.000 consumption points in the east, west, north and center of the country. Every consumer is important for our company.

EGD is structured in 21 Operation Centers (OC, organizational entities). For the development of the odorizing monitoring activity, the advantage of „home field”, knowledge of the localities, of the distribution grid by the person who measures, and the short reaction time in case of events, were taken in consideration. Thus, 21 persons were appointed (at OC level), who received specific equipments to measure the odorizing agent concentration. According to the legislation in force, the concentrations can be measured with gas chromatographs or with devices that have specific sensors [4].

EGD’s devices are foreseen with sensors for ethyl mercaptan, they can be connected to the distribution grid at pressures between 0.020 bar and 2 bar, through some hoses that have the role of regulating the pressure (gas flow) on the sensor.

Measuring point’s selection

Measuring the concentration of the odorizing agent is done on EGD’s distribution grid. Each measuring point is associated with a unique code.

Selecting the measuring points for a locality depends on the lengths of the grid, its type, type of odorizing agent.

1. Number of consumers: approximate, we appreciate a number of measuring points for a locality. In the beginning of the development of this activity we approximated as superior limit 10 measuring points for localities with over 5000 consumption points and as inferior limit 2 measuring points for small localities with under 800 consumption points,
2. The type of the odorizing agent decides mainly the reference point for a locality. If the odorizing equipment is installed in the E.ON – Transgaz interface SRMP, the reference point selected will be at a distance of 500-1000 m from the SRMP. This way, the natural gas

– odorizing agent mix is homogeneous. If the odorizing is done in centralized system (for larger distances) the reference point can be installed in the SRMP (with Transgaz's approval), or in the close vicinity of the SRMP.

Conditions that must be met by the measuring points:

1. Permanent access,
2. Consumption throughout the year,
3. On the natural gas flow direction there must be at least 10-15 upstream consumers, to avoid gas sitting in the pipe,
4. Easy installation of the measuring connection sockets. The connection sockets are installed in the niches (at the regulation-measuring points of household consumers). Each connection is sealed and labeled.

For example: Odorheiu-Secuiesc:

1. grid length: approximately 110 km, steel pipe with PE extensions (circa 4 km) or steel extensions (circa 3.5 km),
2. number of consumer points: approximately 11000 on August 1st, 2010
3. odorizing agent type: sampling, automated
4. the nearest point from the SRMP is point 1, located at circa 1000 m of the SRMP. The points were selected to be representative for the areas far away from the SRMP, respectively from the odorizing equipment, and to cover the grid's extremities: points 2, 3, 5, 7, 8. Point 6, even though close to point 1, is located on the pipe that supplies the industrial area of the city, being representative for this area. The measuring done at point 4 covers the central area, where most of the apartment units and institutions are located. Point 9, headquarter of Odorheiu-Secuiesc District, is the point where the odorizing is monitored daily. Such measuring points (at the headquarter of OC or districts that have the device and trained person) exist in each OC and endure the daily monitoring of the odorizing in large cities like Timișoara, Arad, Cluj-Napoca, Iași, Suceava, Botoșani, Sibiu, Mediaș, Tg.Mureș, etc.

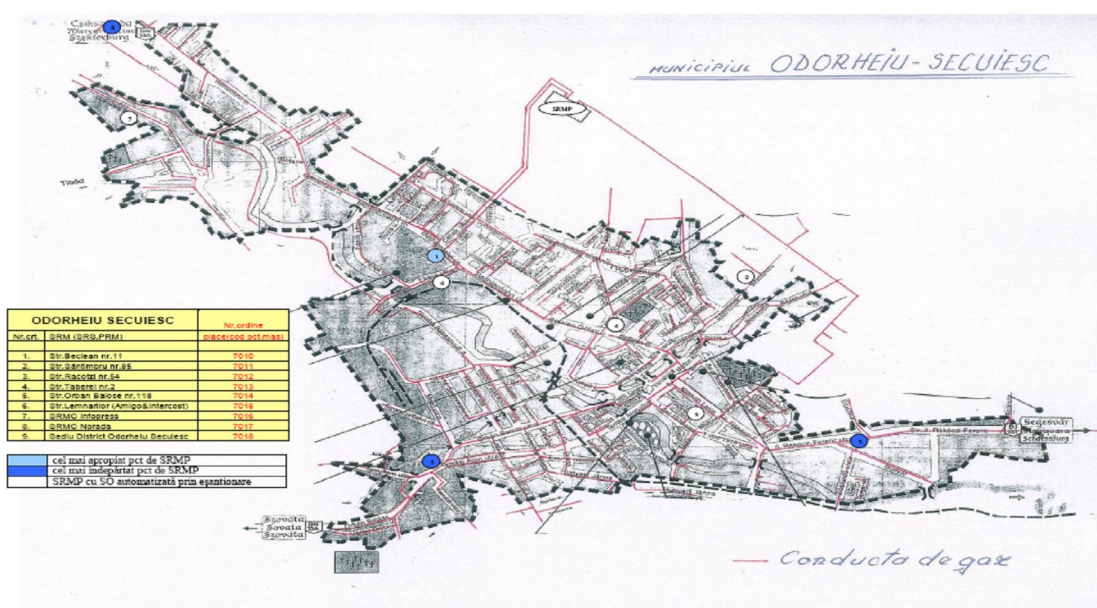


Fig. 1. Selection of the measuring points in Odorheiu-Secuiesc

Measurement results interpretation. Criteria for the evaluation of the odorizing degree.

Several value reference points given by the legislation in force, SR 13406/1998, Grid Code, Regulation for the measuring of the natural gas quantities traded in Romania, are taken in consideration to interpret the results:

1. **The inferior limit** of the ethyl mercaptan concentration (level 2 on Sales scale): concentration for which the „gas smell” can surely be felt (SR 13406-1998):
Ethyl mercaptan (EtSH)– 3 mg/m³
Tert-Buthyl mercaptan – 3 mg/m³
tetrahidrotiofene – 8 mg/m³
2. **The minimum ethyl mercaptan concentration upon exit from SRMP** according to the natural gas quality requirements (Grid Code and Regulation for the measuring of the natural gas quantities traded in Romania): minimum 8 mg/m³
3. **Maxim level of the ethyl mercaptan concentration in case of supplementary odorizing** according to SR13406/1998: three times the normal level [1]:
3*8 mg/cm EtSH = minimum 24 mg/m³

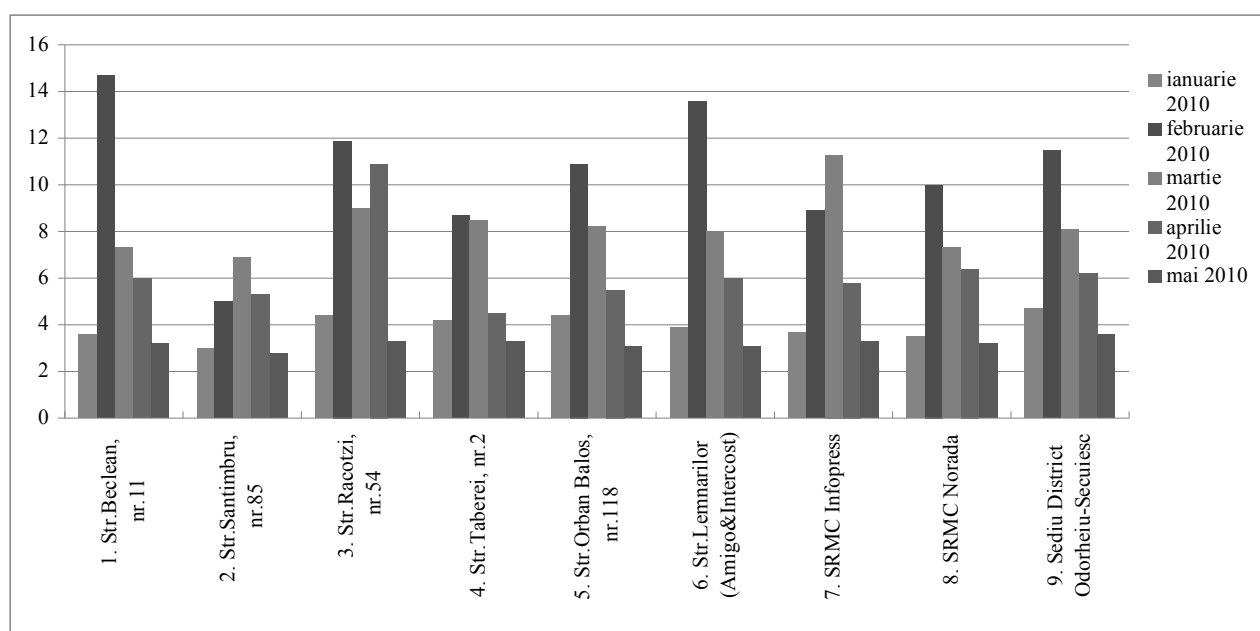
Taking in account the above mentioned values, we define:

1. **Sub-odorizing:** the ethyl mercaptan concentration is under 3 ms EtSH/ m³. We appreciate that at city level, if at least 50% of the measurings have values bellow 3 mg/m³, the distribution grid is under-odorized.
2. **Weak odorizing:** We appreciate that at city level, if 75% of the measurings have values between 3 and 4 EtSH/m³, the distribution grid is weakly odorized.
3. **Odorizing according to regulations in force:** the ethyl mercaptan concentration is between 3 and 16 mg EtSH/m³.
4. **Over-odorizing:** We appreciate that at city level, if 75% of the measurings are above 16 mg EtSH/ m³, the distribution grid is over-odorized.
5. **Uniform odorizing:** the measurings are around the average value
6. **Fluctuating odorizing:** We appreciate that at city level, if at least 25% of the measurings have 50% differences compared to the average value, the distribution grid is unevenly odorized.

The type of the odorizing agent used for that location must be considered when interpreting the results obtained after measurings.

Example:**Table 2.** Odorizing monitoring /2010 - Odorheiu Secuiesc:
Local odorizing (in SRMP), odorizing through sampling, automated

ODORHEIU SECUIESC		26.01.10	24.02.10	23.03.10	22.04.10	20.05.10
Meas.p t. code	Meas. pt. address	mg EtSH/m ³	mg EtSH/m ³	mg EtSH/m ³	mg EtSH/m ³	mg EtSH/m ³
7015	1. 11 Beclean Str.	3,6	14,7	7,3	6	3,2
7016	2. 85 Sântimbru Str.	3	5	6,9	5,3	2,8
7017	3. 54 Rackotzi Str.	4,4	11,9	9	10,9	3,3
7018	4. 2 Taberei Str.	4,2	8,7	8,5	4,5	3,3
7019	5.118Orban Balos Str.	4,4	10,9	8,2	5,5	3,1
7020	6. Lemnarilor Str. (Amigo&Intercost)	3,9	13,6	8	6	3,1
7021	7. SRMC Infopress	3,7	8,9	11,3	5,8	3,3
7022	8. SRMC Norada	3,5	10	7,3	6,4	3,2
7023	9. Odorheiu-Secuiesc District Hq.	4,7	11,5	8,1	6,2	3,6
ODORIZING CHARACTERISATION		Proper Odorizing	Proper Odorizing	Proper Odorizing	Proper Odorizing	Weak odorizing (1 meas. with val.<3 mg/ m³)

**Fig. 2.** Monthly monitoring of the odorizing activity – Odorheiu-Secuiesc

Conclusions

1. A level of the odorizing according to regulations in force can only be ensured with automated odorizing equipments, with sampling,
2. The level of the odorizing cannot be maintained within standards with odorizing equipments using dripping, wick, evaporation,
3. From our expertise, a correct appreciation of the odorizing level can only be done in conditions of high natural gas consumption (winter). During summer, because the odorized natural gas sits for a long time in the pipes, the „odor fade” phenomenon produces,
4. The modernization of the odorizing equipments of the SRMP's is necessary, firstly those serving large cities
5. A national regulation regarding odorizing is necessary, and the methodology for the application of its provisions,
6. Replacement of the odorizing agent with another one with a higher chemical stability,
7. Reevaluation of the odorizing agent concentration level at the extremities of the grid,
8. Reevaluation of the odorizing agent concentration level in case of supplementary odorizing.

References

1. SR 13406/1998 – *Natural gas odorizing*
2. Grid Code
3. *Regulation for the measuring of the natural gas quantities traded in Romania*
4. Gas law 351/2004
5. Michael J. Usher MJ - *Odor Fade - Possible Causes and Remedies*, CGA Gas Measurement School, London, June 1999

Monitorizarea activității de odorizare în cadrul E.ON Gaz Distribuție

Rezumat

Odorizarea gazelor naturale este o cerință impusă de legislația în vigoare fiind o măsură de protecție a consumatorilor.

Conform legislației, odorizarea trebuie efectuată astfel încât și la capetele rețelei de distribuție orice scăpare de gaze să fie detectată prin miros. În momentul de față, este monitorizată lunar concentrația de odorizant pe rețelele de distribuție E.ON Gaz Distribuție din marile orașe.

Lucrarea de față își propune să prezinte această activitate de monitorizare a odorizării.