

Roadside air pollution measurement - the new EU approach also in Romania -

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Abstract: Within the framework of AMTRANS program, a large group of specialists from SC ICPE SA, SC ECOPROIECT SRL, SC Caloris Group SA, the Pollution Preventing Centre, UAUIM Bucharest and the Municipal Council of Constanta, materialized a prototype for an air quality monitoring station which will be running in Constanta.

In the national context regarding the European legislation implementation, based on some other EU research results, we believe of the viability of the proposed solution in this project, in connection with the prospect of founding a national network for air quality monitoring and with the world-wide research.

In Constanta there is now only one mobile laboratory for monitoring the ambient air quality, which belongs to Environmental Protection Agency, and in the next two years will be installed a network of air monitoring stations, EU compatible, for the Seaside of Romanian Black Sea towns.

The sensors based systems we design assure the monitoring of the following parameters: CO, SO₂, NO₂, ozone, temperature, relative humidity, wind rate, wind direction, and there are fitted for safety monitoring, toxic limit detection, leak detection, personal safety instead of the gas analysers which are applicable for exposure assessment and ambient air quality monitoring of urban traffic.

Introduction

One of the objectives of the URBECOMANAGEMENT project, developed in AMTRANS frame national program, is to promote the sustainable development concept in a touristique Romanian municipality in connection with the air quality monitoring.

One of the most important targets of the National Strategy regarding the environmental protection are the following:

- Maintaining the environmental air quality in the areas where the pollutants harmonize with the national legislation;
- Improving of air quality in the areas where the pollutants do not harmonize with the national legislation;
- Taking the proper action for reduction or removing the negative effects for environment, including transboundary effects;
- Fulfilling the commitment established in the international agreements which Romania is part from, and participation at the international cooperation in the environmental protection field.

In accordance with OUG no.243/2000 regarding air protection and Law no. 655/2001, the Romanian Government adopted a legislation regarding the National Plan for Action in the Atmosphere Protection as a result of the National Strategy for Atmosphere Protection.

Within the framework of the first objective of the mentioned plan - maintaining the environmental air quality in the areas where the pollutants harmonize with the national legislation – the action no.1.1 consist of making the national network for air quality monitoring according to the requirements of the national legislation harmonized with the European legislation.

The European Union has taken over the values for the different air pollutants from Health World Organization (HWO) and imposes these values as limit values for the air quality. Romania took over these objectives in its national legislation, and assigned time limit for fulfilling these objectives in accordance with the European legislation.

In Constanta there is only one network for monitoring the ambient air quality, which belongs to Environmental Protection Agency.

Such of these devices are able to measure maximum 3 gaseous pollutants in aqueous solutions or particulate on filters. The sampling and analysis methods and procedures are also standardized.

The international and European methods for measuring the ambient air quality are classified {1} in the following two categories:

- Discontinuous methods;
- Continuous methods.

The discontinuous methods are often manual methods where the sampling and the analysis represent two separate steps.

The continuous methods involve stationary automatic equipment for sampling and also for analysis. Using such automatic sampling equipment, it allows continuous measurements carried out into an analysis laboratory.

The main advantages of these continuous measurements consist of the continuous monitoring of air pollutants for an established time.

These measurements are the proper for the stationary using, but this equipment is also able to place into a mobile monitoring laboratory.

The continuous measurements for ambient air quality are carried out in essence for implementing the governmental legislation.

In the table bellow is shown comparatively the characteristics of monitoring sensors and the continuous measurement devices according to the no.592/2002 regulation of MMGA.

Table 1

Characteristics	Sensors				Gas analyzers			
	CO	SO ₂	NO ₂	O ₃	CO	SO ₂	NO ₂	O ₃
Measure domain (ppm)	0-1000	0-20	0-20	0-10	0-200	0-10	0-10	0-10
Resolution (ppm)	0,5	0,1	0,1	0,02	0,01	0,001	0,001	<0,0001
Response time (s)	<30	<15	<40	40	<60	<120	<90	<80
Interference errors:	per substance							
CO	-	<1%	0	0	-	LD	LD	<6%
SO ₂	0	-	<-0,1%	0	<3.2%	-	<-4.9%	<6%
NO ₂	0	>-100%	-	100%	<3.2%	<5,5%	-	<6%
O ₃	LD	LD	LD	-	<3.2%	<5,5%	LD	-
NH ₃	LD	LD	LD	LD	<3.2%	<5,5%	<-4.9%	<6%
H ₂ S	0	>100	<-10%	0	LD	<5,5%	<-4.9%	<6%
CO ₂	LD	LD	LD	LD	<3.2%	<5,5%	<-4.9%	<6%
CH ₄	LD	LD	LD	LD	<3.2%	<5,5%	<-4.9%	<6%
C ₆ H ₆	LD	LD	LD	LD	<3.2%	<5,5%	<-4.9%	<6%
C ₃ H ₈	LD	LD	LD	LD	LD	LD	LD	<6%
C ₂ H ₆	LD	LD	LD	LD	LD	LD	LD	<6%
C ₂ H ₄	LD	0	0	LD	LD	<5,5%	<-4.9%	LD
H ₂ O	LD	LD	LD	LD	<3.2%	<5,5%	<-4.9%	>6%
SF ₆	LD	LD	LD	LD	LD	LD	LD	<6%
H	3%	0	0	LD	LD	LD	LD	LD
Cl	LD	50	-100%	100%	LD	LD	LD	LD
Stiren	LD	LD	LD	LD	LD	LD	LD	>6%
CNH	LD	50%	0	LD	LD	LD	LD	LD
HCl	LD	LD	0	LD	LD	LD	LD	LD

Where: “-“refers to the measured parameter;

“LD”: no date.

Sensors are fitting for:

- Safety monitoring;
- Toxic limit detection;
- Leak detection;
- Personal safety.

The gas analyzers are applicable for:

- exposure assessment;
- Ambient air quality compliance monitoring.

In accordance with no. 592/2002 regulation of MMGA, for assessment of pollutant values, besides of used reference methods (measurements in stationary places) there are also acceptable some alternatives methods (indicative measurements) for air quality measurements in order to complete the information obtained by references methods.

The competent institution for establishing a correspondence between an air quality evaluation method and the reference method is Reference National Laboratory for Air Quality apart of I.N.C.D.P.M. This institution are establishing and reviewing the methods and work instructions for indicative measurements in accordance with European Union guides.

The traductors used in the prototype assure the measurement of the concentrations of the following parameters: CO, SO₂, NO₂, ozone. This equipment is provided with temperature, relative humidity, wind rate, wind direction measurement modules .

Generally, the traductor contain the sensor (the sensitive element for certain physical parameter), a protective frame, a connector or a connection cable and different other specialised accessories.

Regarding the referring installation, it will be used transmitters, which make a local processing of signals from sensors, and assure a unified signal at the terminals.

The advantages of using transmitters consist of:

- Better immunity for noise;
- Easier processing of signals;
- It does not involve calibration, which is assured by the producer of transmitter;

For this referring experimental model, there are sensors for the following parameters:

- Temperature (sensor from ECAS);
- Relative humidity (sensor from Honeywell);
- CO, NO₂, SO₂, O₃ (sensor from City Technology - UK);
- Wind rate and wind direction (own production);
- Temperature sensor LM35CZ;
- Temperature domain: -55⁰C...+150⁰C;
- Unlinearity: ±0,25%;
- Ending signal: 10 mV/⁰C;
- Feeding: 4..30V;

The concept of prototype construction is presented in the figure 1.

Roadside air pollution measurement

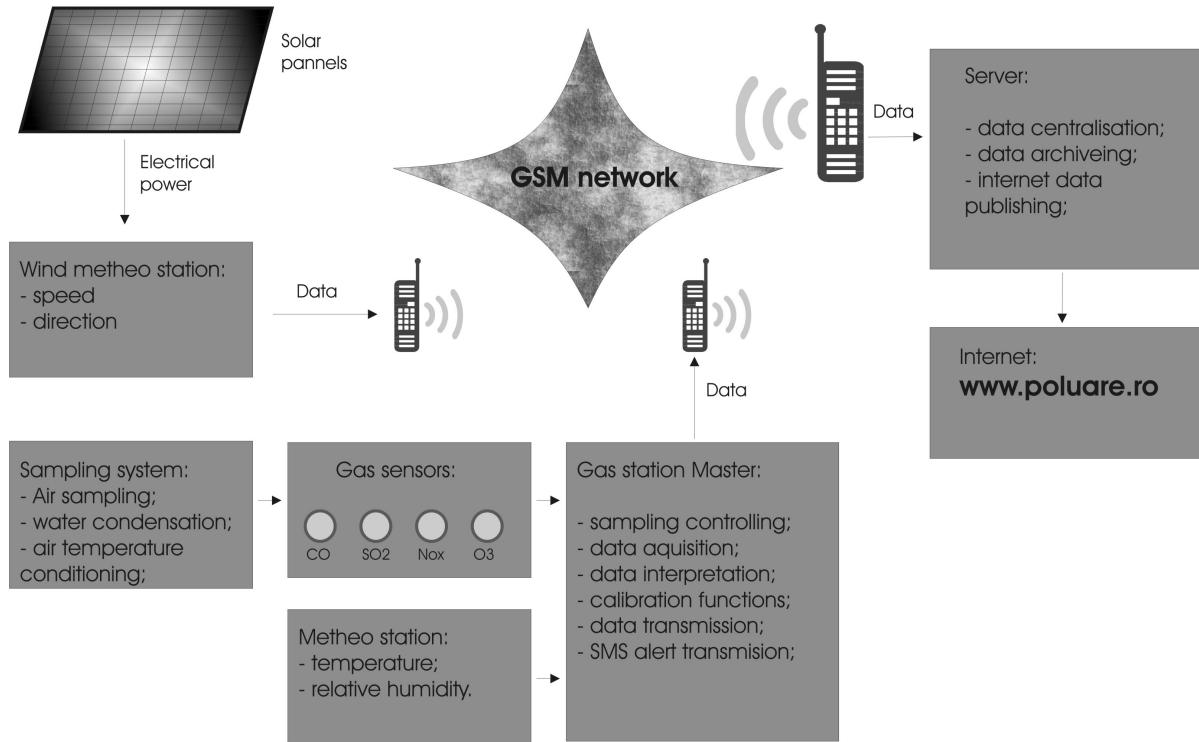


Fig. 1

References

- [1] D.Eickelpasch, Determination and Evaluation of Ambient Air Quality- Manual of Ambient Air Monitoring in Germany- Third revised Edition, Research Report 200 42 261, UMWELTBUNDESAMT, Berlin , February 2004.