ASSESSMENT OF PARTICULATE MATTER IN SUSPENSION (PM_{10} AND $PM_{2,5}$) MONITORED BY THE STATIONS MAKING UP THE NATIONAL AIR QUALITY MONITORING NETWORK = REFERENCE YEAR 2017 =

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ABSTRACT: After literally half a century of studies conducted in the western countries on the levels of pollutants in the atmosphere and their effects on human health, it is scientifically confirmed that a low quality of air quality leads to a state of Poor people's health. Particulate particles are criminated to have the most severe negative impact on the health of the population. In Romania it was updated according to European requirements, legislation in the field, by the adoption by the Romanian Parliament of Law No. 104 of 15 June 2011 on ambient air quality. This normative act aims to ensure support for the protection of human health and the environment, as a whole, by regulating measures intended to preserve ambient air quality, where this corresponds to the objectives for the quality Ambient air set out in that link.

KEY WORDS: PM10, PM2,5, Monitoring, Air, Quality

1. INTRODUCTION

The RNMCA comprises 41 local centres, which collect and transmit to the public information panels the data provided by the automatic air quality monitoring stations, and after the primary validation they transmit them to the National Laboratory for Certification Air quality Reference (LNRCA) of the National Agency for Environmental Protection.

An automatic station for fully equipped air quality monitoring shall consist of the following components:

• Thermal insulated cabin that hosts scientific equipment and auxiliary systems;
• Automatic analysers for CO, NOx, O_3, SO_2, BTEX, PM_{10};
• Sampling lines with conditioning and protection systems;
• PM_{10} samator with related accessories;
• Samm for $PM_{2,5}$ with related accessories;
• Weather station consisting of weather sensors and electronic purchasing system;
• System for purchasing data generated by analysers;
• Data transmission system to GPRS protocol-based server;
• Pneumatic system (Teflon pumps and tubing);
• Electrical distribution system and high capacity UPS;
• Air conditioning system inside the cab;
• Calibration cylinders with standard gases;
• Zero air generation system used in manual calibrations;
• Automatic system for indicative verification of analysers response.

At national level there are 107 public information points (48 external panels and 59 interior panels).

2. TYPES OF AIR QUALITY MONITORING STATIONS

A monitoring station provides air quality data that is representative of a particular area around it. The area where the concentration does not differ from the concentration measured at the station more than with a specific quantity (+/-20%) It's called area of representativity.

Given the need to reduce air pollution at levels that minimise harmful effects on human health, the European Parliament and the Council of the European Union have developed directive 2008/50/EC on ambient air quality and cleaner air for Europe, in force since 11 June 2008, paying particular attention to sensitive populations and the environment, with a view to improving the activity of monitoring and assessing the quality of air, including the deposition of pollutants, as well as For the purpose of providing information to the general public.

This directive was transposed into Romanian legislation by law 104 of 15 June 2011 on ambient air quality.

2.1.Particulate matter (powders), fraction PM10

The term particulate matter is widely used to describe a mixture of microscopic solid particles and liquid drops suspended in the air. Particulate matter is classified according to the aerodynamic diameter, mainly due to the different particle health effect of various sizes.

PM_{10} are particulate matter that passes through a size selection hole as defined by the reference method for the sampling and measurement of PM10, (SR EN 12341), with a separation yield of 50% for an aerodynamic diameter of 10 Micrometers.

Monitoring of particles smaller than 10 small (PM10) is particularly important. The smaller the particle size increases the likelihood of inhalation and storage in the deepest parts of the lungs (thoracic region).

Most county agencies for environmental protection simultaneously use two methods to measure the level of these particles in ambient air. To achieve fast results (hourly average values), the non-Felometric method (automatic) is used, the device being based on the phenomenon of light dispersion by aerosols. The disadvantage of this method is given by the possibility of altering the response of the electronic instrument, which requires a recalibration based on the reference method. This latter method, called the

Gravimetric method, makes use of a sampler with which a certain volume (approximately 55 m^3, measured accurately) of ambient air is aspirated for 24 hours, the particles trained in the sampler being retained on a filter made of fibre Quartz.

2.2.Fine particles and ultrafine (PM1 and PM2,5)

PM2,5-particulate matter passing through a size selection hole as defined by the reference method for the sampling and measurement of PM2, 5 (SR EN 14907), with a separation yield of 50% for an aerodynamic diameter of 2.5 Micrometers.

It was mentioned earlier that the smaller the particles, the probability of being inhaled and stored in the deepest parts of the lungs (the thoracic region).

Theoretically, the PM_{10} indicator should quantify all particulate matter, but in practice it does not happen at all because of the limitations imposed by the technology of analytical determination. In other words, the methods used to determine the PM_{10} parameter show Low analytical recovery of very small particles.

The standards for the sampling of particulate matter indicate a capacity of dimensional discrimination (cut-off) at least 50%. As such, special procedures are needed to measure precisely the concentrations of small fractions. For example, for determining the indicator $PM_{2,5}$ an analytical balance with accuracy ± 0.00001 g is not appropriate if the volume of air taken is about 25 or even 50 m^3 (so-called low volume sampling). In this case there is a need for a microbalance (accuracy ± 0.000001 g).

3. RESULTS AND DISCUSSIONS

From the analysis of the data referred to in the annual air quality Monitoring reports, the following conclusions may be drawn up for the year 2017:

1. Eight county agencies for environmental protection (Bihor, Brăila,

Covasna, Giurgiu, Ialomiţa, Prahova, Sălaj and Vâlcea) have not posted on their website The annual Air Quality Report until 30 March 2018.

2. Although it is mentioned in the Air quality report in Romania in the year 2017 that air quality in the year 2017 was achieved through 148 stations, in reality only 147 is functional because the HD3 station has stopped working since 2010 due to a severe damage resulting from a flood.

3. The APM Călăraşi, in the annual report for the year 2017, makes no reference to the results of the pollutants monitored by the CL3 station.

4. In many monitoring reports drawn up in 2017, the county environmental protection agencies State that there have been exceeded in indicator PM10/$PM_{2,5}$ but without specifying the value of these overviews and/or the number of overviews.

5. Not all annual monitoring reports shall include the results of automatic monitoring and gravimetric particulate monitoring, although reference is made in the annual reports to the fact that both types of monitoring have been carried out.

6. Not all annual monitoring reports shall include data on particulate monitoring of $PM_{2,5}$ although they are monitored in that county.

7. In consultation with the available reports on particulate monitoring $PM_{2,5}$ for the year 2017, it was found that 23 results on the average annual concentration are mentioned in these.

8. Analyzing the 23 annual average concentration results recorded following the particulate monitoring PM2, 5 we found:

• 3 average annual concentrations were above the annual maximum limit of 25 μg/m^3:

-BV2 (25.9 μg/m^3) with 3.6% higher than the maximum limit of 25 μg/m3/year.

-HR01 (30.87 μg/m^3) with 23.48% higher than the maximum limit of 25 μg/m^3/year.

-IS2 (28.7 μg/m^3) with 14.8 greater than the maximum limit of 25 μg/m^3/year.

• 13 measurements of the 23 and 56.52%, respectively, were above the higher rating threshold of 17 μg/m^3.

• 22 measurements of the 23 and 95.65%, respectively, were above the higher assessment threshold of 12 μg/m^3.

9. In consultation with the available reports on gravimetric monitoring of the average annual concentration, recorded in particle of PM10, for the year 2017, it was found that the records from 85 monitoring stations in the 148 of the National Air quality Monitoring system, respectively 57.43 %, were mentioned therein.

10. Analyzing the 85 annual average concentration results recorded following the gravimetric monitoring of PM_{10} particles we found:

• A single average annual concentration was above the 40 μg/m^3 limit, which was recorded at the IS1 station and was 43.87 μg/m^3 and 9.67%, respectively, higher than the maximum limit.

• 27 measurements of the 85 and 31.76%, respectively, were above the higher assessment threshold of 28 μg/m^3.

• 66 measurements of the 85 and 77.64%, respectively, were above the lower assessment threshold of 20 μg/m^3.

11. In consultation with the available reports on automatic (non-felometric) monitoring of the average annual concentration, recorded in particles of PM10, for the year 2017, it was found that the records from 55 monitoring stations in the 148 of the National Air quality Monitoring system, respectively 37.16%, were mentioned.

12. Analyzing the 55 annual average concentration results recorded following the automatic (non-felometric) monitoring of PM10 particles we found:

• No exceeding of the maximum limit of 40 □ G/M3 was recorded.

• 5 measurements of the 55 and 9.09%, respectively, were above the higher assessment threshold of 28 μg/m^3.

• 29 measurements of the 55 and 52.72%, respectively, were above the lower assessment threshold of 20 μg/m^3.

13. Comparing the results recorded in the monitoring of particles PM_{10} through the two methods (Gravimetric and non-

felometric), there is a very high gap between the number of overages of the annual maximum limit, the upper and lower assessment threshold, recorded in gravimetric monitoring from the automatic. Importing to be noted is that the daily quality index and the respective information to the population on air quality are made on the basis of the results recorded in the automatic (non-felometric) monitoring and not on the basis of the gravimetric monitoring, the monitoring at which the most surges were recorded.

14. Analyzing the number of daily overdoses of the maximum limit of 50 $\mu g/m^3$, for PM_{10} we found:

• For gravimetric monitoring, the results from 87 stations of the 148 and 58.78% are recorded respectively.

• For automatic (non-felometric) monitoring, the results from 51 stations of the 148 and 34.45% are recorded respectively.

• The number of overdoses in gravimetric measurements, the maximum daily limit of 50 $\mu g/m^3$, was recorded in 80 monitoring stations of the 87 which provided data in the annual reports, respectively 91.95%

• Of the 80 stations that have exceeded the maximum limit, 9 recorded a greater number than the maximum limit of 35 overlays/year, namely:

-BV1 (37 overtake),
-BV2 (38 overtake),
-BV3 (42 overtake),
-DJ3 (40 overtake),
-IS1 (83 overtake),
-IS2 (40 overtake),
-B3 (57 overtake),
-B5 (44 overtake),
-B6 (50 exceings).

• The number of overdoses in automatic measurements (non-felometric) of the daily maximum limit of 50 $\mu g/m^3$ was recorded in 34 monitoring stations of the 51 which provided data in the annual reports, respectively 66.66%

• Of the 34 stations that have exceeded the maximum limit, 4 recorded a greater number than the maximum limit of 35 overlays/year, namely:

-AG1 (36 overtake),
-HD2 (37 overtake),
-MS1 (51 overtake),
-MS2 (38 overtake) (ANNEX 6)

15. With a few exceptions (steel, surface mining units, electrothermal and thermoelectric plants), the industrial sector is no longer an important contributor to air pollution, the main role has been taken over by car traffic, with Mostly in large cities.

16. Also, common air pollution problems are created by waste-managed and ash-deficient sewage dumps.

17. Currently, in Romania there are over 7.5 million cars, and about 800 thousand heavy vehicles (trucks, buses, construction machines), and in recent years the year-on-year growth was exponential.

18. The carriage of goods shall be carried out almost entirely on the roads.

19. It should also be borne in mind that we already have about 10 times more Diesel-powered vehicles than in 1990, as the World Health Organisation has declared exhaust gases from Diesel engines as carcinogenic.

20. Although, at least theoretically, we have increasingly good pollution rules for Diesel Motoring, we are certainly in a situation where quantity beats quality due to the very large number of vehicles.

21. For all air quality monitoring stations, the increased weights related to the maintenance of the technical systems are detected and as such, the monitoring programme cannot be carried out as originally conceived.

22. Thermal inversions are an intrinsic characteristic of climatic conditions specific to certain regions of the country, with a higher manifestation frequency in the cold period of the year, but thermal inversions cannot generate atmospheric pollution in Lack of natural or anthropogenic emissions.

3. CONCLUSIONS

Comparing the results recorded in monitoring the daily concentration of PM_{10} particles through the two methods (Gravimetric and non-felometric), there is a very large difference between the number of overdoses of the daily maximum limit, the

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Thermal inversions are an intrinsic characteristic of climatic conditions specific to certain regions of the country, with a higher manifestation frequency in the cold period of the year, but thermal inversions cannot generate atmospheric pollution in Lack of natural or anthropogenic emissions.

In order to meet the commitments made by Romania on ambient air quality, it is very important for each person to realise the importance of these commitments and to contribute to the joint effort to improve air quality and Good health of the population.

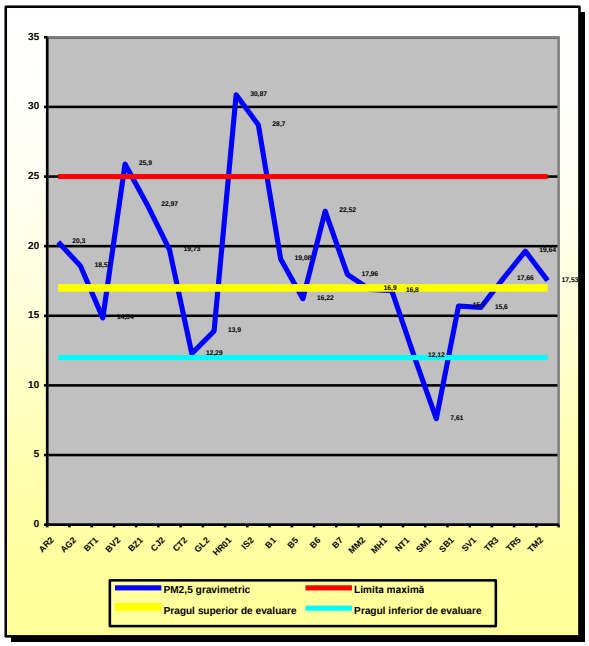

Fig. 1. The concentration of $PM_{2,5}$ measured gravimetric

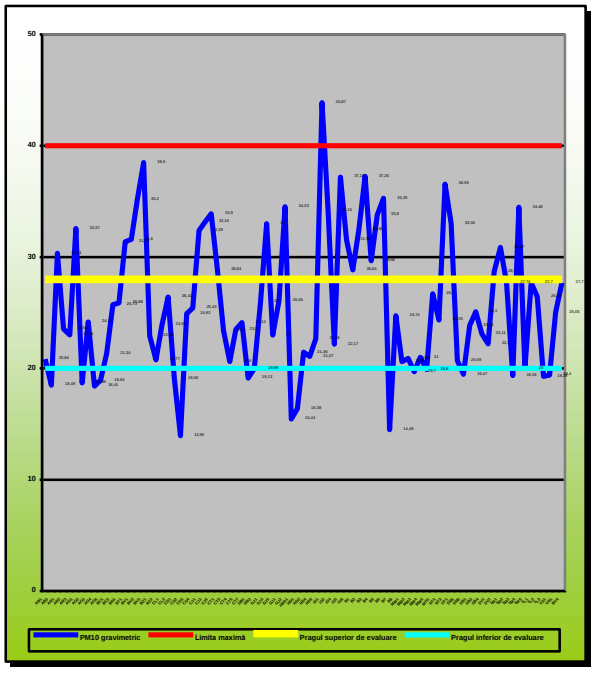

Fig. 2. The average annual concentration of PM_{10} measured gravimetric

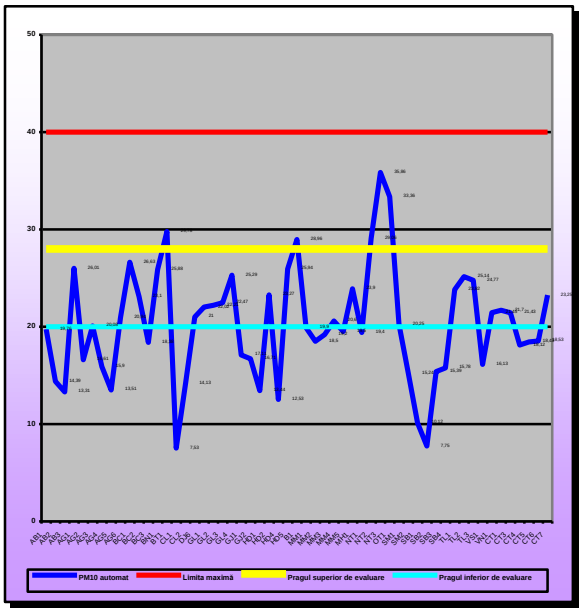

Fig. 3. Average annual concentration of PM_{10} measured automatically

4. REFERENCES

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