

EVALUATION OF AIR POLLUTION FROM MUNICIPALITY TG. JIU WITH SUBSTANCES IN SOSPENSION (PM₁₀) AS A RESULT OF AUTO TRAFFIC

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ABSTRACT. The paper presents a short introduction of the impact that auto transportation has on air quality and on the main pollutants resulting from fuel burning in the engines with internal combustion. Also here are presented the results obtained as a result of monitoring substances in suspension, fraction PM₁₀, realized in the proximity of the most important auto traffic roads of Tg.Jiu municipality. The comparison of the results obtained was realized according to Order M.A.P.M. 592/2002.

ОЦЕНКА НА ЗАМЪРСЯВАНЕТО НА ВЪЗДУХА В ОБЩИНА ТЪРГУ ЖИУ В РЕЗУЛТАТ НА АВТОМОБИЛНИЯ ТРАФИК

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РЕЗЮМЕ. Статията дава представа за влиянието на автомобилния транспорт върху качеството на въздуха и за основните замърсители от двигателите с вътрешно горене. Дадени са и резултатите получени при мониторинг на отделни вещества, фракция PM₁₀, реализирани в места с най- интензивен трафик в Търгу Жиу. Сравнени с резултатите с директивите от MAP N- 592/2002

Introduction

The main effect on the environment of the auto traffic is air pollution. The most sever fact is that air is inhaled by persons, provoking illnesses starting from simple irritations up to cancer.

Chemical substance from the air shouldn't exceed the maximum admissible concentration, not to become dangerous to human being. The auto-vehicles, through the gases exhaustion from the discharge, increase the concentration of these elements – azoth oxides, carbon monoxide and dioxide, particles in suspension, sulphur dioxide, lead, poly-aromatic hydrocarbon, volatile organic compounds (benzene), asbestos, acid aerosols, nitrous oxide, methane and others – which become dangerous for human being, animals and vegetation. (Gămăneci et al, 2008)

Not only air is polluted with auto exhaustions, but also the soil, by depositing chemical substances, as well as waters, by penetration of pollutants in water courses. Air pollution is due to auto traffic does not affect only areas where polluting substances are issued. Contaminated air is carried by the wind and produces more effects with impact on the entire planet.

Materials and methods

The statistic of the tests sampling points was realized according to norms mentioned into STST 10331-1992 – Air purity. Main principles and rules of supervising air quality.

From material particles in suspension, representing all particles in a stable air volume was determined by the PM₁₀ fraction, forming the mass of particles inhaled through the larynx.

The reference method for sampling and measuring the PM₁₀ fraction is the one described in the European Norm EN 12341 – Air quality – Testing procedure on the field to show the equivalence of the sampling methods for PM₁₀ fraction in substances in suspension.

The measurement principle is based on sampling on a filter the PM₁₀ fraction, separated from the particles in suspension from the air and their gravimetric determination. In the present case it was used a sampling system with small volumes of the type LVS –PM₁₀ (fig. 1). The sampling debit was established at 2m³/h.

$$PM_{10} = \frac{m_1 - m_2}{V} (\mu m^3) \quad (1)$$

where:

m₁ = mass of the filter after exposure, in mg;

m₂ = mass of the filter before exposure, in mg;

V = volume of absorbed air, in m³ (Popa R. et al, 2008)

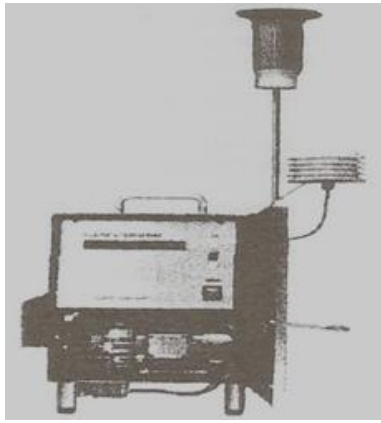


Fig.1. Sampling system, type LVS -PM₁₀

Results and discussion

From all particles in suspension in an air volume, it was determined the fraction PM₁₀ because these particles with dimensions below 10µm produce the greatest damaged on human health. The characterization of the three sampling points was realized according to Order M.A.P.M. no. 592/2002 for the approval of the Normative regarding the assessment of the limit values, of the threshold values and of the evaluation methods of the sulphur dioxide, azoth dioxide and azoth oxides, dusts in suspensions (PM₁₀ and PM_{2,5}), of lead, benzene, carbon monoxide and ozone in the environment.

According to this order, for the year 2008 it was foreseen a daily limit value for the protection of human health of 50µg/m³ PM₁₀ (Schiopu, Racoceanu, 2010).

So, from the sampling point "DN 66 -Vădeni", situated in the Northern part of municipality Tg. Jiu, registered values varies between 29,18 50µg/m³ and 125.05 50µg/m³. From the total of 23 ratings realized during June 2008, 18 exceeded the limit value, representing 78.26% (fig. 2). The monthly average value was of 66.02 50µg/m³; being the smallest value registered from the 3 sampling points.

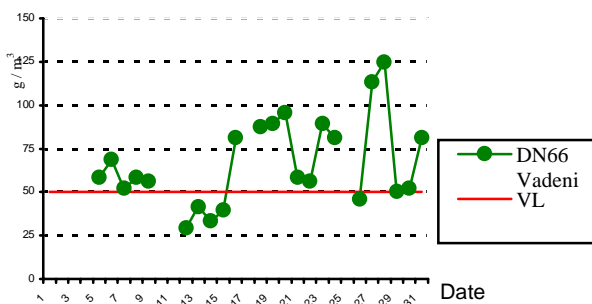


Fig. 2. Values of PM₁₀ registered in the area Tg. Jiu – DN 66 Vădeni

Correlating the results obtained for PM₁₀ with certain meteorological parameters, it can be observed that the smallest values have been registered when the atmospheric pressure was smaller, and the wind speed higher. So, for the smallest values (29.1850µg/m³ and 33.3450µg/m³) corresponded an atmospheric pressure of 982.1mb, namely 983.2 mb and a wind speed of 5m/s. For PM₁₀ values of

113.51 µg/m³ and 125.05 µg/m³, the registered atmospheric pressure was of 984 mb, namely 985 mb, and wind speed of 3m/s.

Also, positioning this sampling point upstream, on the predominant direction of the wind (NNE-SSW), the absence of obstacles from the direction of the air drafts made that registered values be smaller than the ones from other points.

In the sampling point "Victoria – Center", even if an intense area of auto traffic, it was realized one of the highest values during year 2008 (168.82µg/m³). The obtained values are presented in fig. 3.

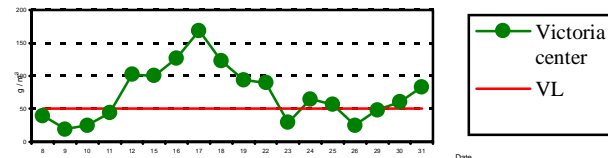


Fig. 3. Values PM₁₀, registered in the area Tg. Jiu – Victoria center

Examining the values obtained during the mediation period of 24 hours, it is observed that these vary between 18,76 µg/m³ and 168.82 µg/m³. Exceeding of these limit values (50 µg/m³) have been registered regarding 61.1% of the tests. The monthly average value was of 72.13 µg/m³. Also, here can be observed a correlation between values obtained for PM₁₀ and certain meteorological parameters, like atmospheric pressure and wind speed.

So, at small values of dusts in suspension, for example 18.76 µg/m³ and 39.01 µg/m³, the atmospheric pressure was of only 998.8mb, namely 999.7mb, and wind speed of 4m/s. At an atmospheric pressure of 1033.3mb and a wind speed of 2m/s the value obtained for PM₁₀ was of 127.14 µg/m³.

The sampling point "Crossroads Tudor Vladimirescu" characterizes an area with intense auto traffic, with a high density of population and with an intense passenger's density. In this area, the quantity of dusts in suspensions is directly and predominantly influenced by road traffic on the main arteries forming this crossroads.

The values registered in this sampling point vary between 40.43 µg/m³ and 131.06 µg/m³. From the totality of 15 measurements realized, only in two cases was not exceeded the limit admissible value, which represents 13.3%. At this point, the average monthly value was of 84.03 µg/m³ (fig. 4).

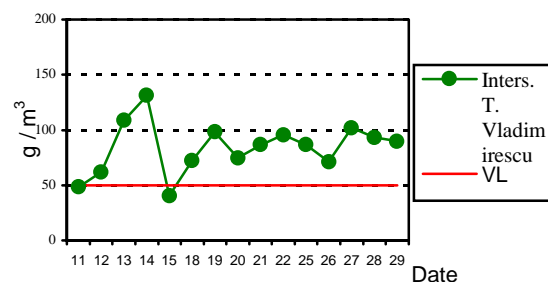


Fig. 4. Values PM₁₀ registered in the area Tg. Jiu – Crossroads T. Vladimirescu

Also, it is observed that the highest values for PM10 have been obtained during Tuesdays, Wednesdays and Thursdays, considered to be the most representative working days, with intense traffic. In this crossroads was realized a traffic countdown at 14 June 2008 and for 3 hours (interval 7⁰⁰ – 10⁰⁰), through the crossroads passed 3179 vehicles.

Conclusions

- By establishing the 3 sampling points it was observed the data supply for exposure at different levels of pollution due to road traffic.
- Values obtained for point positioned on great traffic arteries are directly and predominantly influenced by emissions from road traffic on the main arteries.
- In all 3 sampling points have been registered exceeding of the limit values (50µg/m³);

- In the majority of the sampling points, the highest values for PM10 have been obtained, generally during Tuesdays, Wednesdays and Thursdays, considered to be the most representative working days, when road traffic is the most intense.

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