ASPECTS REGARDING THE AIR POLLUTION WITH POWDERS IN SUSPENSION (PM_{10} AND $PM_{2,5}$) IN ORADEA CITY AREA

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Abstract
Establishing the powders in suspension concentration in the air is being carried out at the same monitoring points as the gas polluters, namely: Bihor County Environmental Agency – headquarters, Children Hospital, Faculty of Environmental Protection.
Air pollution with powders in suspension is caused by the following activities: metallurgy and siderurgy industry which both free in the atmosphere substantial powder amounts, and the heating plants on solid fuels but also from traffic, spoils and fields, following the demolitions and the domestic activities. The nature of these powders is very diverse. They contain either iron oxide or hard metals (lead, cadmium, manganese, chromium) or other polluters.

Key words: air pollution, powders in suspension, monitoring points.

INTRODUCTION

The control of air quality is the concept that defines the quantitative, qualitative and regular measurement and monitoring process of the concentration of one or more air constituents. The data gathered from the monitoring network and checking system allows the identification of the polluted areas and the rapid taking of the strategic measures for air pollution combating and prevention. Thus, the air quality monitoring network chosen has to be created in such a manner that it seeks the cumulated effect of all the factors involved in air pollution: industry, traffic, and the heating of domestic and commercial areas.

The air quality monitoring is useful due to the fact that it provides direct information regarding the status, at a certain moment, of an important segment of urban environment.

Amongst the most active industries in air pollution, one mentions the following sectors: transportation, food industry, cars and machines building industries.

MATERIAL AND METHODS

At Oradea city level, the air quality monitoring and sampling process are ensured by the Agency for Environmental Protection, through its own monitoring system. Thus, they are three fix monitoring points for regular, daily monitoring, as following: at Dacia Blvd. - the Agency for Environmental Protection headquarters; at Corneliu Coposu Street – the Children Hospital, and at Magheru General Blvd. – within the Faculty for Environmental Protection premises. The substances monitored at the above mentioned three monitoring points are the following: sulphur dioxide, nitrogen dioxide and the powders in suspension. These polluters are provided by the industrial, transportation and domestic activities. The positioning of monitoring points was accomplished taking into consideration the sources of pollution in the above mentioned areas.

In Oradea city, the air quality monitoring is being accomplished by the intermediate of the monitoring of long term air pollution factors, 24 hours respectively.

For the air quality analysis, the presence of polluting agents at toxic concentrations and quantities is being taken into consideration, by comparing the maximum allowed concentrations, indicated by STAS 12574/1987 (see Table 1 beyond).

Table 1

The maximum allowed values in the case of suspension powders concentration

Indicator	C.M.A. (STAS 12574/1987)
Powders in suspension	0,150 mg/m^3/24 hours; 0,5 mg/m^3/30 minutes

RESULTS AND DISCUSSIONS

1. The annual evolution of the powders in suspension

The annual evolution of the powders in suspension in the analysed time span shows that the multi-annual average value in the above mentioned three monitoring points has the highest value at the Faculty for Environmental Protection premises, of 0.047 mg/m^3 respectively, while the lowest multi-annual value of the is being recorded at the monitoring point placed at the Children Hospital premises, of 0.038 mg/m^3, respectively. These values do not overcome the maximum allowed upper concentration thresholds.

Table 2

The annual evolution of the powder in suspension concentrations (mg/m^3) at the monitoring points in Oradea city, during 1994 – 2005 time span

Year/ Monitoring point	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average value
Children Hospital	0.032	0.033	0.033	0.036	0.042	0.036	0.043	0.040	0.040	0.041	0.034	0.046	0.038
nvironmental Protectio Agency - headquarters	0.037	0.040	0.058	0.048	0.037	0.024	0.037	0.028	0.055	0.034	0.028	0.056	0.040
Faculty for Environmental Protection premises	-	-	-	-	-	0.057	0.048	0.037	0.036	0.047	0.046	0.058	0.047
Average value	0.035	0.037	0.046	0.042	0.040	0.039	0.043	0.035	0.044	0.041	0.036	0.053	0.042
C.M.A.	Stas 12574/1987						0.150 mg/m^3/24 hours						

Source: A.P.M. Bihor

During the 12 years contained in the study, the highest values for the powders in suspension were recorded at the headquarters of Oradea Agency for Environmental Protection, as following: 0.058 mg/m^3 in 1996, 0.055 mg/m^3 in 2002, and 0.056 in 2005; and at the Faculty for Environmental Protection premises, where the values of indicators were the following: 0.058 mg/m^3 in 2005 and 0.057 mg/m^3 in 1999. The lowest values for the powders in suspension were recorded at the headquarters of the Oradea Agency for Environmental Protection: 0.024 mg/m^3 in 1999 and the same value of 0.028 mg/m^3 were recorded both in 2001 and 2004. Regarding the Children Hospital monitoring spot, the values are relatively stable; the highest values being recorded in 2005, of 0.046 mg/m^3 (see Table 2, Figure 1).

At the monitoring point placed at the Faculty for Environmental Protection, the measurements started in June 1999.

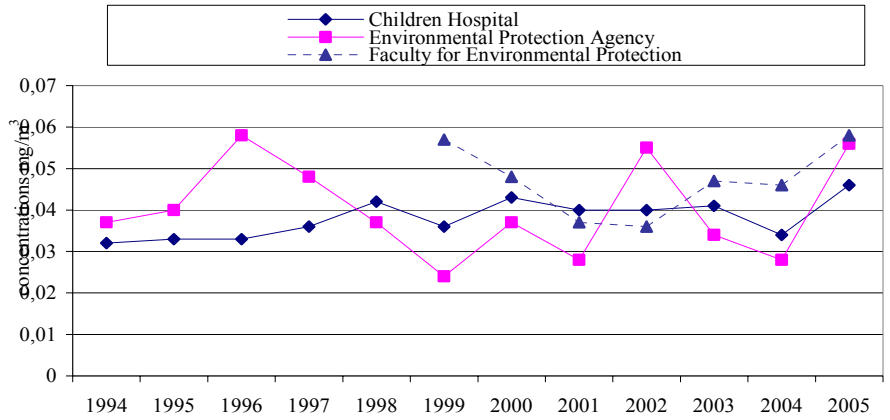

Figure.1 The evolution of the annual concentrations values for the powders in suspension (mg/m^3) in Oradea city monitoring points

No exceeding of the maximum allowed values was recorded, the values being set by STAS 12574/87.

2. The monthly evolution of the powders in suspension

In the analysed time span, the powders in suspension shows that the highest value was recorded in January at the premises of the Faculty for Environmental Protection, of 0.062 mg/m^3 respectively, and in May, at the headquarters of the Agency for Environmental Protection, of 0.059 mg/m^3 respectively. The lowest values, of 0.030 mg/m^3 was recorded in the months of June and September at the Children Hospital and at the headquarters of the Oradea Agency for Environmental protection, respectively (see Table 3, Figure 2).

Table 3

The monthly evolution of the powder in suspension concentrations (mg/m^3) at the monitoring points in Oradea city, during 1994 – 2005 time span.

Year/ Monitoring point	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average value
Children Hospital	0.045	0.047	0.035	0.040	0.035	0.030	0.034	0.034	0.033	0.035	0.041	0.047	0.038
nvironmental Protectio Agency - headquarters	0.041	0.041	0.040	0.036	0.059	0.036	0.038	0.040	0.030	0.038	0.041	0.043	0.040
Faculty for Environmental Protection premises	0.062	0.056	0.050	0.044	0.043	0.043	0.038	0.038	0.037	0.048	0.048	0.055	0.047
Average value	0.049	0.048	0.041	0.040	0.046	0.036	0.037	0.037	0.033	0.040	0.043	0.048	0.042
C.M.A.	Stas 12574/1987						0.150 mg/m^3/24 hours						

Source: A.P.M. Bihor

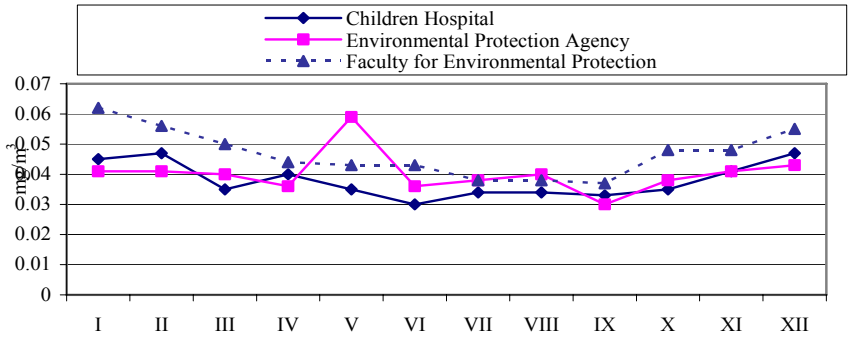

Figure.2 The evolution of the monthly concentrations values for the powders in suspension (mg/m^3) in Oradea city monitoring points, during 1994 – 2005 time span

3. The monthly evolution of the powders in suspension in correlation with rainfalls

Amongst the meteorological phenomena that influence the spreading of the powders in suspension one mentions the rainfalls. The rainfalls, function of their amount and duration, contribute substantially in air purification process, by the fact that, the dust may constitute condensation nucleus for the water vapours, thus leading to air droplets formation that, while falling, draw the air impurities with them.

The link between these two phenomena, the evolution of the amount of powders in suspension, and the rainfalls is showed in Figure 3, which presents a non proportionality between these two phenomena. Thus, the lowest amount of powders in suspension is recorded in summer season when the rainfalls amount is the lowest, while the highest amount of powers in suspensions (of 0.049 mg/m^3) is recorded in January, when the amount of rainfalls (31.8 mm) is the lowest.

Table 4

The evolution of monthly average concentrations for the powders in suspension and rainfalls in Oradea city

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Multi-annual average value
Powders in suspension	0.049	0.048	0.041	0.040	0.046	0.036	0.037	0.037	0.033	0.040	0.043	0.048	0.042
Rainfalls	31.8	38.7	36.8	60.8	51.7	78.1	82.5	69.4	73.6	35.7	47.1	63.6	55.8

Source: Bihor Environmental Protection Agency and National Meteorology Agency archive

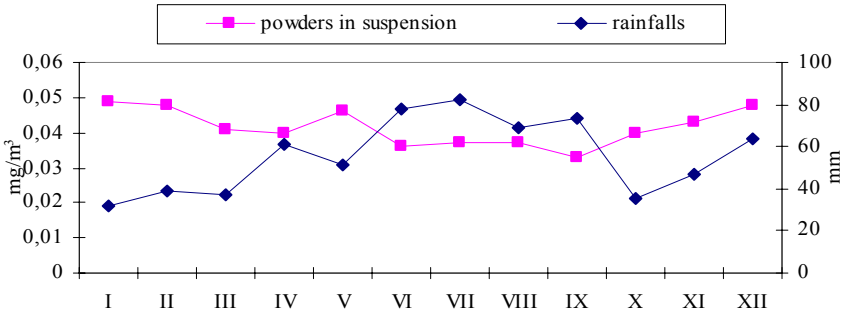

Figure 3 The evolution of monthly average concentrations for the powders in suspension and rainfalls in Oradea city

CONCLUSIONS

For the analysed time span, the values for the powders in suspension amounts did not exceeded the maximum allowed values other than accidentally and/or for very short periods of time. The dominant direction of winds (from the south) has contributed to this fortunate situation, the winds dissipating the polluting agents.

The critical areas from the air pollution point of view are located in the vicinity of the main traffic channels, large traffic crossroads, industrial waste dump, uncontrolled domestic waste dumps, animals' farms, chemical industry venues, although the latest decreased substantially their production capacities.

The lowest level of air pollution with powders in suspension is recorded in summer seasons when the amount of rainfalls records minimum values, while the highest level of pollution is recorded in winter (January), being of 0.049 mg/m3 when the rainfalls amount has the lowest during a year (31.8 mm). This fact highlights the role of rainfalls as air purification agent.

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