STAGE OF RESEARCHES REGARDING DIOXIN AIR CONTAMINATION AT NATIONAL LEVEL, IN THE PERIOD 2005-2010

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Abstract

Dioxins are environmental pollutants.To underline the dioxin air contamination stage, at national level, study cases have been realized in the period 2005-2010, in several possible affected counties from Romania. Counties into study have been: Giurgiu, Prahova and Salaj. For each county, air samples have been gathered from significantly polluted areas, in each year submitted to study and have been chemically analyzed from the point of view of persistent organic pollutants (POP), polycyclic aromatic hydrocarbons (HAP), polychlorinated biphenyl (PCB) and hexachlorobenzene (HCB). Values obtained (t/year or g/year) for each dioxin, have been graphically represented and results interpreted.

Key words*:* dioxins, pollution, Romania

INTRODUCTION

Dioxins are a group of chemically-related compounds that are persistent environmental pollutants.Once dioxins have entered the body, they endure a long time because of their chemical stability and their ability to be absorbed by fat tissue, where they are then stored in the body. Their half-life in the body is estimated to be seven to eleven years. In the environment, dioxins tend to accumulate in the food chain (Blumbach J. And Nethe L.P., 1996).

The chemical name for dioxin is: *2,3,7,8- tetrachlorodibenzo para dioxin (TCDD).* The name "dioxins" is often used for the family of structurally and chemically related *polychlorinated dibenzo para dioxins (PCDDs)* and *polychlorinated dibenzofurans (PCDFs)*. Certain dioxin-like polychlorinated biphenyls (PCBs) with similar toxic properties are also included under the term “dioxins”. Some 419 types of dioxin-related compounds have been identified but only about 30 of these are considered to have significant toxicity, with TCDD being the most toxic (Smolka A. And Schmidt C.G., 1997).

MATERIAL AND METHODS

To underline the dioxin air contamination stage, at national level, study cases have been realized in the period 2005-2010, in several possible affected counties from Romania. Counties into study have been: Giurgiu, Prahova and Salaj. For each county, air samples have been gathered from significantly polluted areas, in each year submitted to study and have been chemically analyzed from the point of view of persistent organic pollutants (POP), polycyclic aromatic hydrocarbons (HAP), polychlorinated biphenyl (PCB) and hexachlorobenzene (HCB). Values obtained (t/year or g/year) for each dioxin, have been graphically represented and results interpreted (Monitorul Oficial al României, 2005).

A. Case study: Giurgiu County

a. Emissions of persistent organic pollutants (POP) – in fig.1 are presented graphical representation. of the annual emissions of persistent organic pollutants in Giurgiu County, in the period 2005-2010.

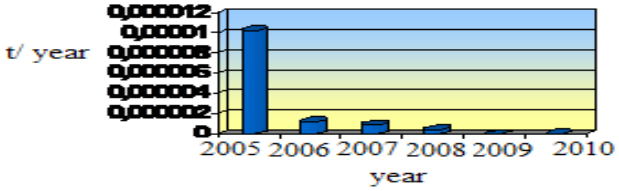

Fig.1 Graphical representation of POP emissions in Giurgiu County

b. Emissions of polycyclic aromatic hydrocarbons – in fig.2 are presented graphical representation of the annual HAP emissions, in the period 2005-2010.

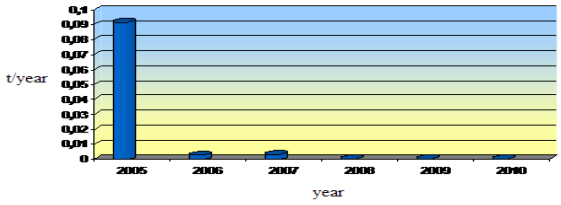

Fig.2. Graphical representation of annual HAP emissions in Giurgiu County

c. Emissions of polychlorinated biphenyls – in fig.3 are presented graphical representation of annual emissions of PCB (t/year) in the period 2005-2010.

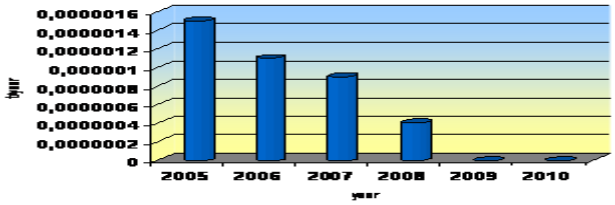

Fig. 3. Graphical representation of polychlorinated biphenyl emissions in Giurgiu County

d. Emissions of hexachlorobenzene – in fig.4 are presented graphical representation of evolution of HCB emissions.

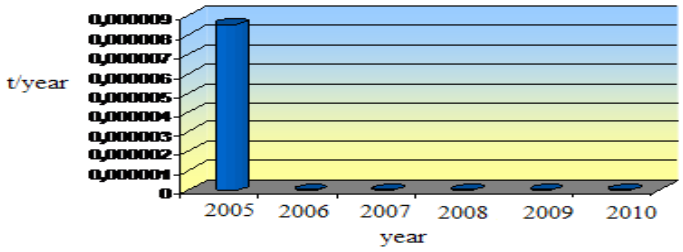

Fig. 4. Graphical representation of annual emissions of hexachlorobenzene in Giurgiu County

B. Case study: Prahova County

a. Emissions of persistent organic pollutants (POP) – in table 1 are given the POP concentrations in the period 2004 – 2010 in Prahova County, and in fig. 5 graphical representation of the HPA emissions from the same period.

Table 1

POP emissions in Prahova County, in the period 2004-2010

Year	2004	2005	2006	2007	2008	2009	2010
Annual emission of POP(t/year)	0.000006	0.000003	0.0000054	0.0000030	0.0000027	0.0000016	0.0000079

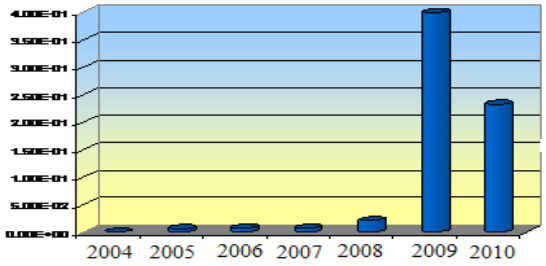

Fig.5. Graphical representation of HAP emissions in Prahova county, in the period 2004 – 2010

C. Case study: Sălaj County

a. Emissions of persistent organic pollutants – the dioxins emissions present a light decrease in the year 2009, in comparison with the previous year. In Salaj County, wastes incineration is the main dioxins air pollution source, but small quantities of dioxins emissions come from processes in cast iron and steel industry (Ioan C., 1995). In fig. 6 are presented graphical representation.of information regarding the situation from Sălaj County, starting with 2005

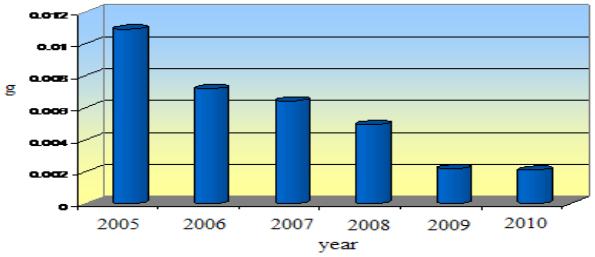

Fig. 6. Graphical representation of annual POP emissions in Sălaj County

b. Emissions of polycyclic aromatic hydrocarbons - in the year 2010, the emissions of polycyclic aromatic hydrocarbons (HAP) at maintained at the level of the year 2009. Air pollution with HAP emissions is due to production processes – processes from cast iron and steel industry. In fig.7 is presented graphical representation of the level polycyclic aromatic hydrocarbon.

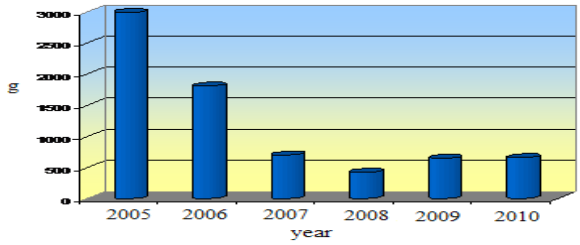

Fig. 7. Graphical representation of annual polycyclic aromatic hydrocarbons in Salaj County

c. Emissions of polychlorinated biphenyls – sector that is responsible for generating PCB emissions in the year 2010, is wastes treatment and storage – wastes incineration. In fig.8 is presented information regarding the situation of Sălaj county, polluted with polychlorinated biphenyls in the period 2005 -2010
(the graphical representation of persistent organic pollutants from the same period)

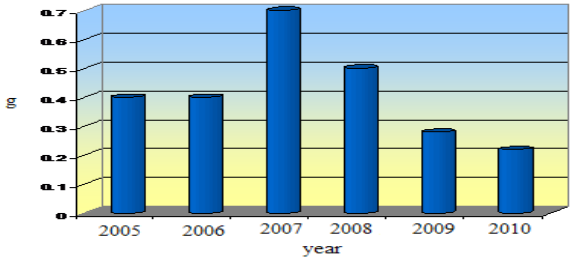

Fig. 8 Graphical representation of annual emissions of polychlorinated biphenyls in Salaj Count

RESULTS AND DISCUSSION

Monitoring air quality from the point of view of dioxins contamination, at national level, was realised by manual sampling and chemical analyse of tests. As a result of gathering samples from possibly affected counties and of determinations, it was shown that emissions of persistent organic pollutants have a descendant evolution for the last years.

a. Emissions of persistent organic pollutants

The dioxin shows a decrease in the year 2010, with over 20g in comparison with 2009, but the value exceeds the emission from the year 2008 with about the same value.

The main sources of dioxins emissions are represented by combustions in the residential sector, wastes incineration, burnings in energetic industries and production processes[6]. In fig. 9 are represented the dioxins emissions in the main industrial transportation and waste sectors, in the period 2009-2010.

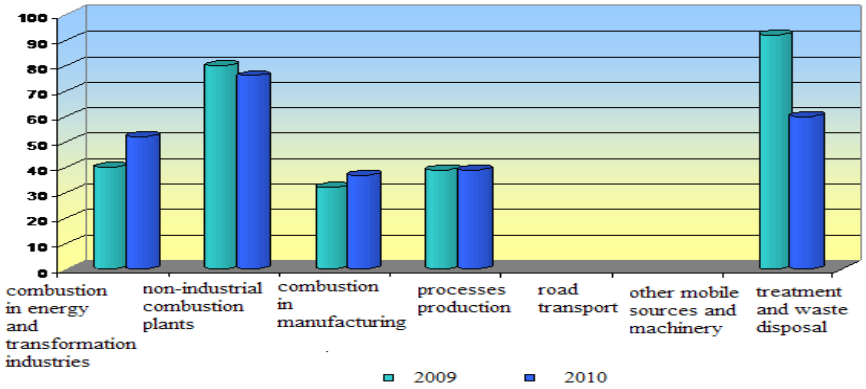

Fig. 9 Graphical representation of annual dioxins emissions from industrial, transportation and wastes sectors, in the period 2009-2010

b. Emissions of polycyclic aromatic hydrocarbons

Annual, national, polycyclic aromatic hydrocarbons emissions (HAP) decrease in the year 2010, with 0.71 and with 0.86 tons in comparison with the previous years 2008 and 2009. The weight factor of emissions is represented by combustion processes in the residential sector, followed by production processes. In fig.10 is given the quantity of annual emissions of polycyclic aromatic hydrocarbons (t) in the period 2008-2010.

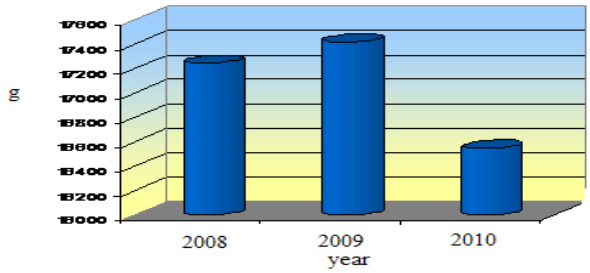

Fig. 10. Graphical representation of annual polycyclic aromatic hydrocarbons emissions in the period 2008-2010

c. Emissions of polychlorinated biphenyls

In comparison with 2009 the sector of "using solvents and other products" registers an increase of 54%, and the sectors of "road transportation" and "wastes treatment and deposits" present decreases of 16% and namely 11%. In fig. 11 are given emissions of polychlorinated biphenyls (t) in the period 2009-2010.

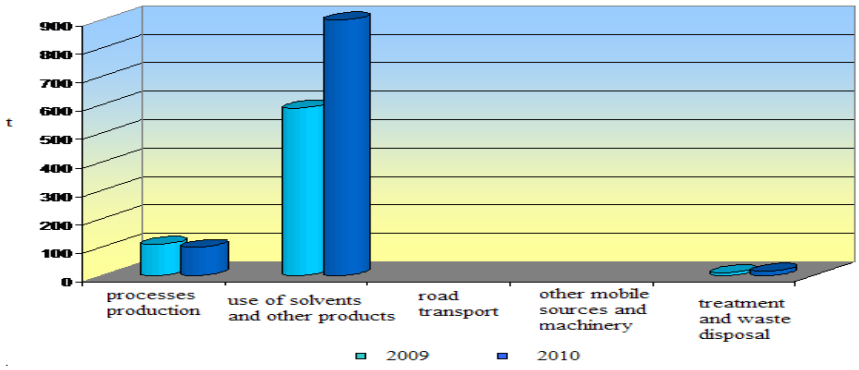

Fig. 11. Graphical representation of polychlorinated biphenyls in the period 2009-2010

For PCB emissions, it can be observed a generally decreasing trend, from 1.754 g in 2007, to 1.519 in 2010. The main source of polychlorinated biphenyls emissions is represented by metallurgy of iron, followed by wastes incineration. In fig.12 is graphically represented the evolution of annual emissions of PCB (g) in the period 2007-2010.

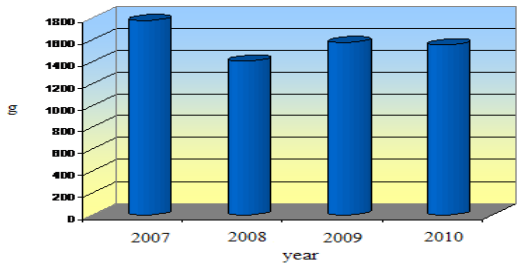

Fig. 12 Graphical representation of annual emission of PCB in the period 2007-2010

d. *Hexachlorobenzene emissions*

Hexachlorobenzene emissions (HCB) are an exception from the decreasing trend of persistent organic pollutants, they representing a constant increase from 2008 up to 2010, with 0.1-0.2 kg annually. In fig.13 is graphically presented the annual evolution of hexachlorobenzene emissions (t/year) in the period 2008-2010.

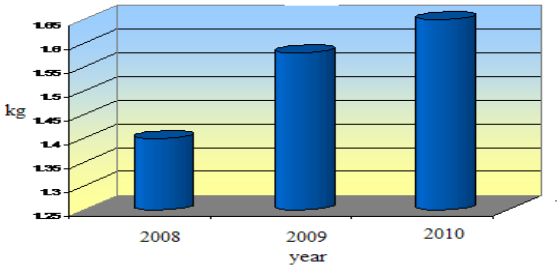

Fig. 13 Graphical representation of annual hexachlorobenzene emissions in the period 2008-2010

CONCLUSIONS

1. Monitoring air quality from the dioxins pollution point of view, at national level, in the period 2005-2010, was realised from manual sampling and chemical analyze of tests. As a result of gathering samples from counties possibly affected and of determinations, it was shown that persistent organic pollutants have a descendant evolution for the last years. The dioxin presents a decrease in the year 2010, with over 20g in comparison with 2009, but the value exceeds the emission from year 2008 with about the same value.

2. The main sources of dioxin emissions are represented by combustions in the residential sector, wastes incineration, combustions in energetic industries and production processes.

3. The national emissions of polycyclic aromatic hydrocarbons (HAP) decrease in the year 2010, with 0.71 and with 0.86 tons in comparison with the previous years 2008 and 2009. The weight of emissions is represented by combustion processes from residential sector, followed by production processes.

4. For PCB emissions, it can be observed a generally decreasing trend, from 1.754 g in 2007, at 1.519 in 2010. The main source of polychlorinated biphenyls is represented by metallurgy of iron and metallurgy, followed by wastes incineration.

5. The hexachlorobenzene emissions (HCB) are an exception from the decreasing trend of persistent organic pollutants, they represent a constant increase since 2008, until 2010 with 0.1 – 0.2 kg annually.

REFERENCES

1. Blumbach J., Nethe L.P., 1996, Chemosphere, Chlorinated Dioxins, PCB and Related Compounds
2. Capatina M., 1994, Influence of temperature profiles on the formation postcombustie on the formation of PCDDs, PCDFs and PCBs in a pilot incinerator, rev. Chiminform, nr. 4
3. Hess P., Asshauer J., Hollander H., 1982, Ecotoxicology and Environmental Safety
4. Ioan C., 1995, Contradictory conclusions regarding dioxin toxicity in Industrial Ecology, Rev. Chiminform nr.1
5. Jan-Ake G., Magnus Ingelman-Sundberg, 1979, Biochemical Pharmacology, 28
6. Korfmacher W.A., Hansen E.B. Jr., Kenneth L. Rowland, 1986, The Science of The Total Environment
7. Monitorul Oficial al României, nr. 86 bis, partea I, 26.01.2005
8. Popa R.G., 2006, Pollution, Ed. Sitech, Caiova
9. Smolka A., Schmidt C.G., 1997, Chemosphere, Chlorinated Dioxins, PCB and Related Compounds
10. www.anpm.ro
11. www.chim.ngo.ro
12. www.dioxins-r-us.ucdavis.edu/TCDD
13. www.ecomagazin.ro
14. www.mmediu.ro