

## DIOXIN POLLUTION IN TULA REGION, RUSSIA

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### Introduction

Many industrial branches producing or using chlorine or bromine compounds of Russian chemical industry also are origins of numerous organochlorine compounds, including polychlorinated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polychlorinated biphenyls (PCBs)<sup>1-3)</sup>. Such plants operate in the many Russian cities - Ufa and Sterlitamak (Bashkiria Republic), Zima and Usolje-Sibirian (Irkutsk region), Chapaevsk (Samara region) and Novomoskovsk (Tula region), Dzerzhinsk (Nizhnii Novgorod region) and Volgograd and so on.

Russian problems caused by formation PCDD and PCDF in industrial and other processes are similar to those in other countries. Unfortunately the assessment of the danger dioxins caused to the society was delayed by many decades. Up to now in Russia there are not clear official assessments of the ecological safety of organochlorine compounds and dioxins and efficient programs of health protection<sup>1-3)</sup>.

It is known some information concerning dioxin's danger in Ufa<sup>2,3)</sup>, Chapaevsk<sup>2-4)</sup> and Dzerzhinsk<sup>3)</sup>.

In this paper we report the preliminary information about environmental pollution in Novomoskovsk and Tula by organochlorine compounds and dioxins.

### Tula region

The Tula region enters number of Russian territories which are polluted by organochlorine compounds and dioxins. In the cities of Tula region (Tula, Novomoskovsk, Shchekino, Aleksin etc) there are many chemical, metallurgical and other industrial plants with very outdated technologies. In Tula city are available numerous uncontrollable dumps for burial of municipal and industrial wastes. The plants frequently use for destruction of industrial wastes out-of-date technologies of incineration, not providing clearing of exit gases.

In this region were never carried out the inventory of sources organochlorine compounds and dioxins and the planned large-scale study of a degree of pollution by these compounds. The episodic researches, fulfilled in cities Tula and Novomoskovsk, have confirmed pollution of region by dioxins.

### Pollution of Novomoskovsk city

In Novomoskovsk there is a few of chemical plants - "Orgsynthesis", "Azot", "Novomoskovskbytkhim" etc.

Sovol (Russian version of PCB) was produce on a plant "Orgsynthesis" long time side by side with other organochlorine compounds. The method of production was chlorination of biphenyl. On the same plant was produce sovtol-10 (mixture of sovol with trichlorobenzene).

According to the official and very understated data, in result more than 20-year production of sovol and sovtol, was formed approximately 250 metric tons of stillage residue. These rests were transported on the unauthorized burial dump of industrial wastes.

The stillage residue of other facilities of a plant "Orgsynthesis", in which as the stock were used chlorobenzene and dinitrochlorobenzene, were burn down in the primitive furnace without clearing of exit gases and without control of their chemical composition.

The sewage of plant "Orgsynthesis" contain many organochlorine compounds: chloroform, dichloroethanes, tetrachloroethane, dichloroethylenes, trichloroethylene, tetrachloroethylene, chlorobenzene, dichlorobenzenes, chlorotoluenes, 2,5-dichlorothiophen etc.

The chlorine are produce many years on a plant "Azot" by means of the common salt electrolysis. The chlorine is using for the vinyl chloride's production and then for the PVC production. The inhabitants of the neighbour villages are using for heating houses the crushed coal electrodes after using, which polluted by dioxins. The exit gases, containing many vinyl chloride, openly are burn out in flame jet.

The sewage of plant "Azot" contain the numerous organochlorine compounds: chloroform, dichloroethanes, trichloroethane, tetrachloroethane, hexachloroethane, dichloroethylenes, trichloroethylene, tetrachloroethylene, dichlorobenzenes, tetrachlorobutadienes, pentachlorobutadiene, bromobenzene etc.

All of listed and not mentioned archaic technologies are the sources of dioxines.

The real situation in Novomoskovsk with air pollution by organic and especially by organochlorine compounds is defined by the following data of 1994:

- under the official reports of plants in the exit gases are contained 55 organic compounds,
- actually in air samples around of the plants is identified 108 organic compounds,
- actually in samples of atmospheric air in the inhabited zone of city is identified no less than 153 organic compounds, including more than 50 compounds in significant quantities,
- the traditional monitoring system of Russian meteorological organization provides determination only 9 compounds.

One of the most dangerous sources dioxin in Novomoskovsk is unauthorized dump of industrial wastes, located near to a plant "Polimerkontainer". On this dump during several decades took out the wastes of all industrial plants of city. The list of wastes includes stillage residue of all industrial plants, fouled catalysts, rubber wastes, PVC wastes and so on. The detail list of wastes was never made and the level of them pollution by dioxines was never supervised.

Actually this dump is the independent and, probably, the most dangerous source of dioxins. It is practically constantly functioning dioxin reactor: on dump occur numerous fires of industrial wastes. These fires proceed sometimes during a few days.

The similar danger represent also the urban dumps of municipal wastes. The wastes on these dumps do not supervised, and on them also there are the fires.

#### **Preliminary dioxin's measurements**

The preliminary research of pool samples of breast milk, cow milk and butter was carry out in 1994 in Novomoskovsk. The dioxin's content in these samples exceeded the Russian hygienic standards in 2-3 times.

In 1995 the scientific-industrial association "Typhoon" has carried out inspection of Tula's burial dump for municipal wastes. Objects of research were samples of soil, sediment and water around dump<sup>9</sup>. This research has confirmed, that the dump is a powerful source of the environment pollution by the toxic isomers of PCDD and PCDF.

In particular, as it has become clear, PCDD and PCDF seriously pollute the ground of territory near dump. At samples of soil, selected on territory close dump, there was the large set of PCDD and PCDF. The toxic isomers PCDD 2,3,7,8-Cl<sub>4</sub> and 1,2,3,7,8-Cl<sub>5</sub> are found out

in a soil's sample on distance 800 i from dump in quantity 62 pg/kg and 80 pg/kg accordingly; the toxic isomers PCDF 2,3,7,8-Cl<sub>4</sub> and 1,2,3,7,8-Cl<sub>5</sub> - in quantity 108 pg/kg and 2181 pg/kg accordingly. The general content of PCDD and PCDF in this sample was 3,6 ng/kg of TEQ.

The dump is also the source of the pollution of waters. The presence of 1,2,3,7,8-Cl<sub>5</sub>-DD in quantity 2,7 pg/l is found out in one of samples of superficial water. The selection of samples was made in winter period. It is possible to believe, that in the spring the level of pollution of waters will be higher.

The maximum TEQ in the samples of sediments in the neighbour river was 5447 pg/kg.

### Conclusions

The numerous sources of the environment's pollution by organochlorine compounds and dioxins are available on the territory of Tula region, particularly in Novomoskovsk city. The preliminary analyses testify to gravity of scales of dioxin's pollution.

### References

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