PERSISTENT ORGANIC POLLUTANTS: RUSSIAN REALITY

Fedorov Lev A.
Union for Chemical Safety, 8-2-83 Profsojuznaja Str.,
117292 Russia, Moscow, E-mail:lefed@glasnet.ru.

INTRODUCTION

Among the dangerous persistent organic pollutants (**POP**s), typical for Russia, are dioxines, many types of pesticides etc. Dioxines and dioxin-like compounds are especially dangerous in sites of manufacture and processing of organochlorine production. Vast territories were polluted by organochlorine pesticides. In particular it concerns to DDT etc. All POPs were collected in an environment and represent an ecological danger up to our days.

CHEMICAL INDUSTRY

The pollution by dioxines and dioxin-like compounds are especially serious in sites of former chemical weapons production (Novocheboksarsk, Volgograd, Dzerdzinsk, Chapaevsk, Berezniki, Novomoskovsk etc.), in sites of last production of polychlorobiphenyles and condensers on their basis (Dzerdzinsk, Novomoskovsk, Serpukchov etc.), in sites of last and present manufacture of organochlorine pesticides (Ufa, Chapaevsk, Volgograd, Novocheboksarsk, Dzerdzinsk, Vurnary etc.) [1-6].
Problems caused with technogenic formation of dioxines are similar to known problems of other world but with evident delay on years and in absent of official estimation for ecological safety. Russian plants of mass chlorine products turned out to be the most powerful dioxin sources.
In Chapaevsk at the Plant of chemical fertilizers the appearance of dioxines mainly caused to the treatment of low toxic hexachlorocyclohexane isomers. All processes were realized on unhermetic equipment, with a lot of hand operations and thus were accompanied with dioxin affectation of many hundreds employees [1-4].

In Ufa at plant "Khimprom" the dioxin formation was caused with production of many chemicals. The powerful appearance of dioxines was caused with industrial production of Bu-ether of 2,4,5-T. The hermetically of the operation was not provided. Nowadays that section produces another chemicals, but section proper was never cleaned. Simultaneously the production 2,4,5-Cl_3-phenol was begun in Ufa in another section and continued up to 1988. The section was not cleaned from dioxines after stoppage. From 1960ths up to now the large amount of dioxines forms in Ufa during the production and purification of pesticides of group 2,4-D [1-3,5].
The serious dioxin control of chemical industry was not yet carrying on. There was not carried out the detailed control of vinyl chloride produced on plants "Kaustik" (Sterlitamak), "Khimprom" (Zima), "Kaprolactam" (Dzerdzhinsk) and others.

PCB

PCB were produced in Russia during some tens years up to 1989-1990 mainly at plants "Orgsteklo" (Dzerdzhinsk), "Orgsynthesis" (Novomoskovsk).
The production capasitors with different fillers: Sovol (PCB) and Sovtol (mixture PCB with trichlorobenzene) - falls on several years, but mass production began at 1960ths and continued up to 1989-1990 [1].
Sovol was produce on a plant "Orgsynthesis" (Novomoskovsk) by side with other organochlorine compounds. The method of production was chlorination of biphenyl. On the same plant was produce Sovtol-10.
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.
The sewage of plant "Orgsynthesis" contain many organochlorine compounds (polychloroethylenes, polychlorobenzenes, chlorotoluenes, polychloroethanes, polychloromethanes, etc.) [6].

The filling of capacitors was executed on capacitor plant of Serpuchov. Any data about working electrical devices dislocations are absent. The exhaust capacitors are not yet gathered in special dumps.

DDT USAGE

The production of DDT was adjusted in 1946-1947ths in Moscow and Vurnary. During 1950-1970ths DDT was intensively used in amount more than 20 thousand metric tons in a year. It has resulted in the serious pollution of large areas, dangerous levels of contamination of the food and biological tissues of the inhabitants, especially of children [8].
Since 1969-1970ths, according to the recommendations of international organizations, DDT was excluded from the official "List of chemical and biological means of pest control, recommended in an agriculture in the USSR". After "ban-1970" the DDT production and usage were not stopped, but proceeded in the confidential mode. The scales of DDT production not only were kept, but also were extended at the plant in Novocheboksarsk.
Nominally residual DDT quantities in meat, butter, milk, eggs "were not admitted" in general. However, as DDT was actually determined all time in meat-milk food, there was a system of temporary sanctions. In global DDT pollution of the environment one of major factors is use of DDT in former Soviet Union, especially, in years after "DDT ban".

A FIRE IN IRKUTSK REGION IN 1992

In Russia has taken place of some serious industrial fires for the last 20 years with participation of organochlorine compounds. One of the last fires has happened in 1992 in small Siberian city Shelekhov (Irkutsk oblast). The fire on a plant "Irkutskcable" began on December 24, 1992 in the fourth hour in the package-assembly shop. The first beginning to burn oil, then have begun to burn the cable drums and at last have begun to burn and to blow up barrels with a paint. The fire

spreaded from package-assembly shop in neighboring shops and warehouse. 600 metric tons PVC in the several forms was in a warehouse. Actually the fire proceeded 10 days.
In the putting out participated 599 persons. Use of oxygen insulating gas masks was forbidden during a fire because of presence of oils. Thus, the firemen were poisoned by the toxic chemical compounds through lungs and through skin. The first firemen have addressed to the doctors already on December 28. The first estimation of a situation was carried out on February 7-12, 1993 (conclusion: "Was not revealed of attributes, showing of action of substances as dioxines on the health") [7]. Actually, in 1992 on a fire at burning PVC worked most powerful "dioxin reactor". From general number of firemen have died already 29 persons by winter 1997-1998, more than 70 firemen already have turned in occupational invalids. On a preliminary data, some children (which were born after 1992) have genetic disturbance.Thus, at correct research in the organisms of firemen and city dwellers will be found out the dioxines in quantities, dangerous to health.

ECOLOGICAL PROBLEMS

The functioning of different chlorine technologies on Russian chemical plants not secure nowday the ecological safety for employees, people health and environment. The most part of chlorinated wastes are extremely toxic and contain the different dioxin contaminants.In Ufa the wastes of 2,4,5-T production, are very contaminated with 2,3,7,8-TCDD. In the 1960ths those wastes were buried on the plant territory directly and were not revised in following. Beside this, the destruction of chlorophenols sewage in production of 2,4-D is carrying out by chlorination, and the result of such purification is the unavoidable formation of PCDD and PCDF in addition to those, naturally arising during the processing [1-3,5].In Chapaevsk wastes of chemical processing, contaminated by PCDD and PCDF, never were correctly disposed but piled without special treatment directly in the natural hollow near the section. Over the quarter of a century in this spontaneous dump there were accumulated some tens thousands ton of high toxic dioxin-containing wastes. [4].In Serpuchov in 1988 at 2 km distance to the nord side from plant the PCB concentration in soil was up to 35.7 ppm, and at 0.3 km to the south side - up to 11000 ppm. The penetration of dioxines in food chains towns under consideration is unavoidable result of dioxin pollution of soils, air and water. In the end of the 1980ths it was shown that PCB content in yolks of hen eggs in farms located in zone of plant influence increased the background values in 100-200 times. In women milk the PCB concentration achieved 2.39 mg/l and in the whole the PCB level in milk of mothers working at the plant or living near it is in 80-460 times the children safe level [1-3].
The real situation in Novomoskovsk with air pollution is defined by the 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. The results of research of pool samples of breast milk, cow milk and butter: the dioxin's content in these samples exceeded the Russian hygienic standards in 2-3 times. In 1995 carried out inspection of Tula's burial dump for municipal wastes (objects - samples of soil, sediment and water around dump) [6]. 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 PCDDs and PCDFs seriously pollute the ground of territory near dump. The toxic isomers of PCDD (2,3,7,8-Cl_4 and 1,2,3,7,8-Cl_5) are found out in a soil's sample on distance 800 m from dump in quantity 62 pg/kg and 80 pg/kg

accordingly. The toxic isomers of PCDF (2,3,7,8-Cl_4 and 1,2,3,7,8-Cl_5) - in quantity 108 pg/kg and 2181 pg/kg accordingly. The general content of PCDDs and PCDFs 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_5-DD in quantity 2,7 pg/l is found out in one of samples of superficial water. Ufa's incinerator built in the early 1970ths for chlorinated wastes destruction has the designed to of combustion 1300-1400^oC, but the real one is 800-900^oC. The similar problems caused with the work of incinerators for destruction of chlorinated wastes in some other towns - Dzerdzhinsk, Zima, Usolje-Sibirian etc. [1-3].

CONCLUSION.

Problem of POPs is the very serious problem of Russia and must become the object of fundamental investigation.POP were not the object of special attention of authorities and of serious scientific study. The complete picture of pollution does not exist. The population and ecological organizations are not practically informed about a level of pollution and of its danger. The local authorities do not understand the importance of ecological danger, caused with POPs, and do not accept necessary measures for its revealing.
The solution of ecological problems, given birth with chemical industry, when and if it begins, will demand a lot of attention, time and moneys.

REFERENCES

1. Fedorov,L.A. Dioxines as ecological danger: retrospective and perspective. Moscow: Nauka Publishers, 1993, 266 pp., in Russian.
2. Fedorov,L.A. Dioxin problem in Russian chemical industry. *Chemosphere* 1993;**27**:477-481.
3. Fedorov,L.A. Ecological problems in Russia caused by dioxin emission from chemical industry. *Chemosphere* 1993; **27**: 91-95.
4. Fedorov,L.A., Tyler,A.O. and Vasjuchin,P.M. Dioxin problem in Russia. Levels and profile of PCDDs and PCDFs in soils from Chapaevsk. *Organohalogen compounds* 1993; **12**: 195-198.
5. Amirova,Z.K., Kruglov,E.A. Dioxin's situation in the Republic Bushkortostan. Ufa: Reactive Publishers, 1998, 116 pp., in Russian.
6. Scientific-industrial association "Typhoon", report "Determination of an Tula's environmental pollution by polychlorinated dibenzo-*p*-dioxines and polychlorinated dibenzofurans ", Obninsk, 1995, in Russian.
7. Information on examination of danger of pollution by dioxines after the fire on the plant "Irkutskcable". 18 February, 1993, 6 p., in Russian.
8. Fedorov,L.A., Yablokov, A.V. Pesticides - the toxic blow against the biosphere and man. Moscow: Nauka Publishers, 1999, in Russian (in press).