

MAIN POTENTIAL SOURCES OF DIOXINS/FURANS GENERATION AT THE TERRITORY OF ARMENIA

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Abstract

As potential sources of Dioxins/Furans at the territory of the Republic of Armenia the following branches of industry were considered: production of ferrous and non-ferrous metals; production of blister copper; production of molybdenum; production of steel; production of aluminum; production of goods from mineral raw materials; production of lime; production of household chemicals/consumer goods; production of paper.

The assessment and quantitative evaluation of Dioxins/Furans was done in the Republic of Armenia using calculations-based method according to "Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases" prepared by UNEP Chemicals .

The study revealed that main sources of Dioxins/Furans unintended generation in Armenia embrace:

- forest fires;
- biomass burning in fields;
- uncontrolled burning of household wastes.

Introduction

The Republic of Armenia was always characterized by developed industry sector.

It is known that unintended generation and emission of polychlorinated dibenzo-*p*-dioxins (PCDD) and dibenzofurans (PCDF) occurs during the thermal processes in presence of organic matter and chlorine as a result of incomplete burning and thermal reactions.

In order to obtain background information on types of economic activity in the Republic of Armenia and to evaluate the processes and branches, which are potential sources of dioxins and furans releases into the environment, the analysis of 354 industrial enterprises of Armenia was performed¹.

For environmental impact assessment different industrial entities of Armenia were analyzed according to activity types and inventory of Dioxins/Furans generation sources was prepared. Taking into account the technology level of enterprises, as well as the state of technological equipment, the factors of emission were characterized

Materials and Methods

The study was performed in the following branches of industry: ferrous and non-ferrous metals production; blister copper production; molybdenum production; steel production; aluminum production; mineral products; lime production; household chemicals/consumer goods production; paper production.

The quantitative evaluation of Dioxins/Furans emissions in the Republic of Armenia was done by calculation according to Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases" prepared by UNEP Chemicals².

Results and Discussion

At enterprises of ferrous and non-ferrous metals production the source of generation is the process of melting scrap metal polluted by dyes, plastic masses, oils or other organic compounds. The annual production of steel in 2002-2006 made 3000-4000 tonnes.

Dioxins/Furans emissions at the appropriate production sites occurred through effluent (furnace) gases into atmosphere and achieved from 50 to 200 mg TEQ/year into residue and achieved 50-125 g TEQ/year into air.

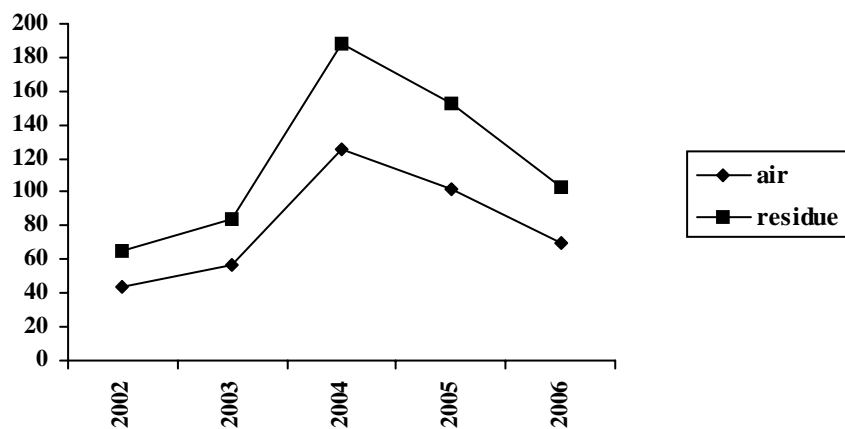


Figure 1. Emissions at Cast Iron and Steel Production (mg TEQ/year)

Calculations done at molybdenum production sites with the industrial capacity of 3100 tonnes elucidated that emission of Dioxins/Furans into air made 0.031 mg TEQ/year.

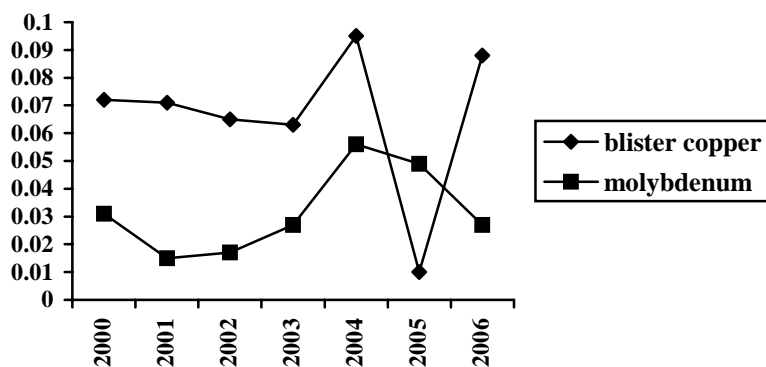


Figure 2. Emissions to air at Blister Copper and Molybdenum Production (mg TEQ/year)

Aluminum production (secondary, rolling) ranged from 90.6 tonnes in 2001 to 387 tonnes in 1998. The comparative analysis performed in order to reveal main pathways of Dioxins/Furans penetration to different environmental media elucidated that the probability of their emission into residues 3-fold exceeds the quantity of Dioxins/Furans in atmospheric air.

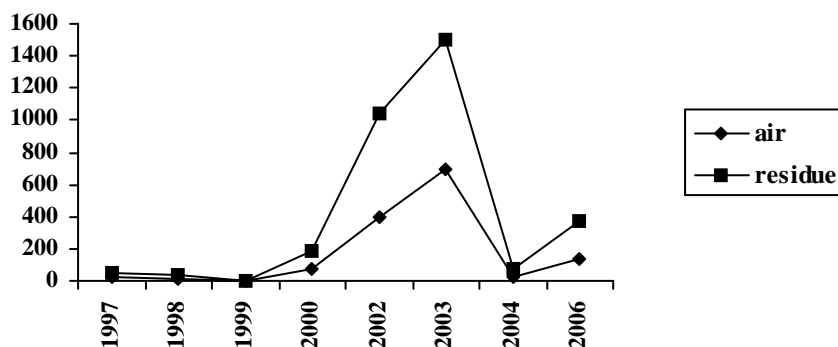


Figure 3. Emissions at Aluminum Production (secondary, foil) in mg TEQ/year

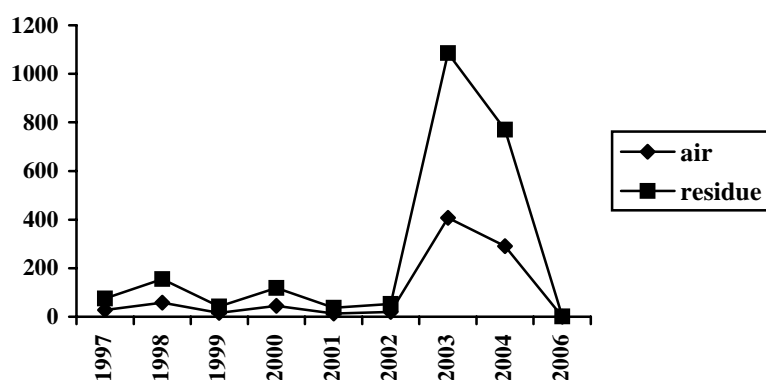


Figure 4. Emissions at Aluminum Production (secondary, rolling) in mg TEQ/year

At the production sites of mineral produce the main sources of generation and emissions into the environment are production entities of cement and lime, to a lesser degree production of bricks, glass and asphalt mixes. The volume of Dioxins/Furans emissions into atmosphere upon cement production makes 10-250 mg TEQ/year, while Dioxins/Furans content in residue equals 0.65-1.88 mg/year.

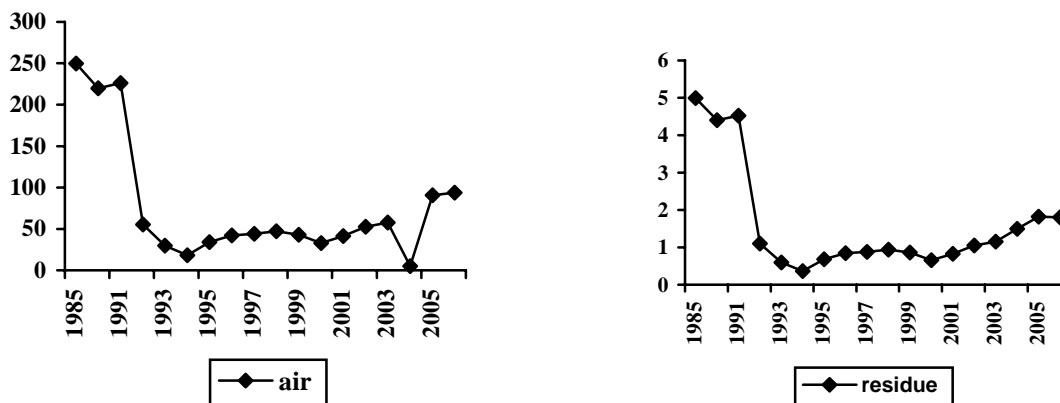


Figure 5. Emissions to Air and Residue at Cement Production (mg TEQ/year)

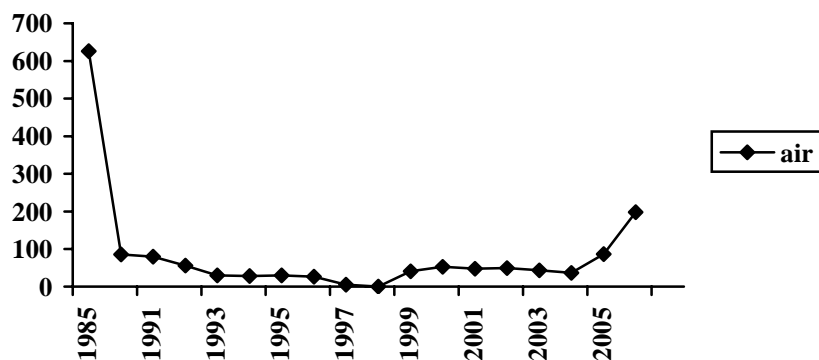


Figure 6. Lime production: Emissions (mg TEQ/year)

Current production of lime as compared to 1985 decreased 12-14 times and makes 4107-5273 tonnes/year. The content of Dioxins/Furans in emissions from lime production does not exceed 197.9 /year.

In 1996-2000 the annual country production of bricks made 47000-77000 tonnes and the emission of Dioxins/Furans to atmosphere achieved from 9.4 to 15.4 mg TEQ/year.

As to paper production, in Armenia toilet paper is mainly produced by processing waste paper at small and medium size private entities. According to our calculations upon paper production depending on amounts/capacity of production sites the emissions of Dioxins/Furans in product ranges from 0.28 mg TEQ to 7.5 mg TEQ.

Similar situation is observed in production of leather goods.

As a rule, dry-cleaners' use perchloroethylene (about 100 tonnes/year). The emission of Dioxins/Furans into residue at dry-cleaners' made 150 mg TEQ.

At numerous smoke-houses of the country the emission of into residue made 150 mg TEQ.

Dioxins/Furans emissions at forest fires are mainly associated with absorption of organochlorine compounds by foliage and roots of trees and other plants from the air after aviation-based spraying of pesticides over forests. Incomplete oxidation in case of humid plant raw material burning in presence of high concentrations of chlorides (in wood mass) creates conditions favourable for Dioxins/Furans generation and their accumulation in soils.

The study indicated that annually at the dump sites of Armenia there occurs uncontrolled low-temperature burning (smoldering) almost all types household wastes.

As a result of fires at waste dumps 4.317 g are generated and penetrate into the atmospheric air, while in 2001 the amount was 2.756 g. As a result of intended burning of wastes Dioxins/Furans emission into atmospheric air made 21.673 g TEQ, whereas the emission to soil was 43.46 g TEQ and in residue 43.346 g TEQ. It should be mentioned that the greater share of emissions is Yerevan the capital city of Armenia.

According to calculations, emissions of Dioxins/Furans as a result of intended burning of household wastes in Armenia made 0.417 g TEQ into atmosphere, в почву-0.834 g TEQ into soils and 0.834 g TEQ in residue.

The obtained data signify that main sources of Dioxins/Furans unintended generation in Armenia are as follows:

- forest fires;
- biomass burning in fields;
- uncontrolled burning of household wastes.

References

1. Republic of Armenia National Implementation Plan for the Stockholm Convention on persistent Organic Pollutants. Yerevan 2005. 104p.
2. Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases. UNEP Chemicals