ASSESSMENT OF DIOXINS AND FURANS EMISSIONS RESULTING FROM SOME INDUSTRIAL PROCESSES

Submitted By

Hend Mostafa Abdel Salam Elrefaie

B.Sc. of Science (Chemistry/Physics), Faculty of Science, Cairo University, 2002

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

2017

APPROVAL SHEET

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Abstract

Background:

In the past 10-15 years, the world has encountered new types of pollutants (Dioxins and Furans) are present throughout the environment, and may be released during fuel combustion in several industries such as cement production and fossil fuel power plants also release from hazardous waste incineration in cement kilns, medical waste incineration, iron and steel production, thermal non-ferrous metal production and petroleum industry (Refineries).

Method:

In this thesis, we applied modeling technique by using Standardized Toolkit for Identification and Quantification of Dioxin and Furan release developed by United Nations Environment Programme (UNEP) for estimating the annual releases of Dioxins and Furans in the different media (Air and Residue) resulting from some industrial processes in the Red Sea regions (Suez, Red Sea, and South Sinai Governorates).

Results and discussion:

From the following sources and according to calculations using the Toolkit it was found that:

- **Hazardous waste incineration**

  There was one factory incinerate hazardous wastes in cement kilns in Suez Governorate as a fuel with annual expected releases of 0.270 g Toxic Equivalent (TEQ)/year to air and 12.135 g TEQ/year to residue.

- **Medical waste incineration**

  There were nineteen health administrations that responsible for medical waste incineration and we estimated the expected annual levels of dioxins and furans emissions from these sources in the Red Sea Governorates as 0.917 g TEQ/year to air and 0.245 g TEQ/year to residue.

- **Iron and steel production**

  The inventory includes two iron and steel companies in Suez Governorate with annual release of 0.08 g TEQ/year to air and 1.2 g TEQ/year to residue.

- **Thermal non-ferrous metal production**

  It was found one company in South of Sinai Governorate for the production of ferro manganese with annual expected releases of 1.65 g TEQ/year to air.

- **Fossil fuel power plants**

  The obtained data showed that there were nineteen fossil fuel power plants for generating electricity in the Red Sea Governorates with annual expected releases of 0.102g TEQ/year to air. Suez Governorate has the largest expected emission of dioxins and furans to air (0.097 g TEQ/year), as compared with what expected from the Red Sea & South Sinai Governorates, and this is due to the old technology used in the fossil fuel power station in Suez Governorate and the high power production.

- **Cement production**

  The calculations included four plants of cement production in the Suez Governorate with annual expected releases of 0.7865 g TEQ/year to air.

- **Petroleum industry (Refineries)**

  The inventory was made on petroleum companies in Red Sea Governorate with annual expected releases of 0.069 g TEQ/year to air.

Conclusions and recommendations:

From the previous results, we can arrange the releases of PCDDs and PCDFs to magnitude as follow:

- Ferro manganese production in South of Sinai.
- Medical waste incineration in Suez Governorate.
- Cement production in Suez Governorate.
- Hazardous waste incineration in cement kilns in Suez Governorate.
- Fossil fuel power station in Suez Governorate.
- Ferrous Metal Production in Suez Governorate.
- Petroleum refineries in the Red Sea Governorate.

So, we recommended applying the proper best techniques for safe environmental practices (BAT/BEP) to reduce the emission of dioxins and furans into the environment.

Keywords: Dioxins, Furans, Toolkits, TEQ, Inventory, PCDDs, PCDFs.

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