MUNICIPAL AND MEDICAL WASTE INCINERATORS

In 1997, the U.S. Environmental Protection Agency acknowledged that “[s]everal studies have identified strong correlations between chlorine content and CDD/CDF [dioxin] emissions during combustion tests.” At the same time, the Agency confirmed that PVC is a dioxin precursor.


At the Bielefeld municipal waste incinerator in Germany, effective measures for reducing dioxin emissions included “exclusion of PVC and computer scrap in the input.”

The U.S. Environmental Protection Agency acknowledges that, for laboratory- and pilot-scale studies, their “review of experimental data clearly indicates an association between chlorine content of feed/fuels and the potential synthesis of CDDs and CDFs.”

Many studies with laboratory- and pilot-scale combustors have found that increased chlorine input leads to greater dioxin formation.


STUDIES OF SMALL-SCALE AND OTHER COMBUSTION SYSTEMS HAVE FOUND THAT INCREASED CHLORINE INPUT LEADS TO GREATER DIOXIN FORMATION


“An important measure to reduce dioxin emissions is the reduction of chlorine in fuels used for small and smallest firing installations. Dioxin emissions of domestic households and the agriculture and forestry sector can be reduced primarily by the use of "clean" fuels such as untreated wood, oil and gas together with modern firing installations. Therefore, the joint combustion of different types of waste in such installations should be banned in the view of the Austrian Federal Environment Agency.”

STUDIES OF FULL-SCALE COMBUSTION SYSTEMS HAVE FOUND THAT INCREASED CHLORINE INPUT LEADS TO GREATER DIOXIN FORMATION

Dioxin Formation Increases with Elevated Chlorine Input


Lower chlorine input has been found to correlate with reduced dioxin formation in studies carried out in

* laboratory- and pilot-scale combustion systems
* small-scale combustion systems,
and
* full-scale combustion systems.
In the specific case of full-scale waste incinerators, some studies have found decreased dioxin formation with reduced chlorine input, while others have not. This has led many policymakers and others to surmise that, for this particular category of combustion systems, chlorine input has little or no influence on dioxin formation.
No scientific theory has been advanced to explain how or why the chlorine/dioxin relationship in full-scale waste incinerators should differ from that in other combustion systems.
A very practical explanation for the inconsistent findings among studies of waste incinerators can be found among the various factors that are known to weaken and confound the results of such studies:

- study design flaws;
- sampling and analytical methods that yield highly uncertain data;
- delayed release of dioxins (memory effect); and
- high variability of waste contents and incinerator operating conditions.
These and other extraneous factors create a background of experimental `noise’. This background noise is simply too great to allow consistent characterization of the relationship of chlorine input and dioxin formation in full-scale waste incinerators.

Taking this background noise into account, the many studies that have been conducted in a variety of different combustion systems, including full-scale waste incinerators, constitute a compelling body of evidence that dioxin formation in waste incinerators decreases when chlorine input is reduced.
In the Convention on Long-Range Transboundary Air Pollution, the Parties have agreed that reducing inputs of plastics, e.g., PVC and other chlorine-containing materials, is an effective and often low-cost method for reducing dioxin formation in full-scale combustion systems including iron/steel production, sinter plants, primary and secondary copper production, aluminum production, utility and industrial boilers, motor vehicles and domestic appliances.

THE COMMITTEE’S CONSENSUS JUDGMENTS ABOUT WASTE INCINERATION AND PUBLIC HEALTH ... Dioxins, furans, and mercury are examples of persistent pollutants for which incinerators have contributed a substantial portion of the total national emissions. ... Whereas one incinerator might contribute only a small fraction of the total environmental concentrations of these chemicals, the sum of the emissions of all the incineration facilities in a region can be considerable. The primary pathway of exposure to dioxins is consumption of contaminated food, which can expose a very broad population. In such a case, the incremental burden from all incinerators deserves serious consideration beyond a local level.

Thus, the committee has a substantial* degree of concern for the incremental contribution to dioxins emissions from all incinerators on a regional level and beyond. “[Emphasis added]

* “The term “substantial” is used to express the committee’s highest degree of concern ...” The committee expressed this, its highest degree of concern about dioxin releases from incinerators, irrespective of the implementation of Maximum Achievable Control Technology.
Total Dioxin Releases to All Media = 44,058 g I-TEQ per year

Total Dioxin Releases to All Media = 7,917.8 g I-TEQ/year
Total Dioxin/Furan Releases = 43,558 g I-TEQ per year
to air = 5,228 g I-TEQ per year
European Union Dioxin Releases to Land,
Total = 38,330 g I-TEQ/year

- Accidental fires: 21%
- Municipal incinerators: 19%
- Municipal landfills: 10%
- Pesticide production: 34%
- Pesticide use: 4%
- Wood burning, domestic: 2%
- 2nd Lead: 3%
- 2nd Copper: 1%
- Electric furnace steel: 1%
- 2nd Aluminum: 1%
- Other: 4%
U.S. Dioxin Releases to Air from `Quantified' and `Unquantified' Sources in 1995  USEPA (2000)

- Municipal waste incinerators: 23%
- Backyard barrel burning: 24%
- Other: 11%
- Landfill fires: 21%
- Medical waste incinerators: 9%
- Secondary copper smelters: 5%
- Forest, brush & straw fires: 4%
- Cement kilns (hazwaste): 3%

Total Estimated Releasees to Air = 4,884.7 grams I-TEQ per year

PVC = Primary Source of Chlorine
SOURCES OF DIOXINS AND FURANS

- WASTE INCINERATION
- FERROUS AND NON-FERROUS METAL PRODUCTION
- POWER GENERATION AND HEATING
- MINERAL PRODUCTS
- TRANSPORT
- UNCONTROLLED COMBUSTION
- CHEMICAL PRODUCTION
- MISCELLANEOUS
- DISPOSAL / LANDFILL
- HOTSPOTS / RESERVOIRS
WHAT IS THE ENVIRONMENT?

**EU Dioxin Inventory**
- All dioxin releases are reported as being to either air, water or land.
- Dioxins in products are not addressed.

**US Dioxin Inventory**
- Dioxins in residues sent to landfill are not considered to be releases to the environment and are not reported.
- Dioxins in products are reported separately from releases to air, water and land.

**UNEP Dioxin Toolkit**
- Dioxins in residues sent to landfill are reported but are not considered to be releases to the environment
- Dioxins in products are reported separately from releases to air, water and land.
GREENPEACE Reports
http://ww.greenpeace.org/~toxics/

* Chlorine, Combustion and Dioxin: Does Reducing Chlorine in Wastes Decrease Dioxin Formation in Waste Incinerators?

* Incineration and Human Health

* Dioxin Elimination: A Global Imperative

* The Burning Question: Chlorine & Dioxin

* The Relationship Between Chlorine Input to Combustors and Dioxin Output: An Annotated Bibliography

* Technical Criteria for the Destruction of Stockpiled Persistent Organic Pollutants

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