

Dioxins/furans and Hexachlorobenzene

This paper outlines the proposed changes for the reporting of dioxins/furans and hexachlorobenzene (HCB) to the National Pollutant Release Inventory (NPRI), commencing with the 2004 reporting year. Changes are proposed for both the reporting criteria and reporting requirements for these substances.

Historical Overview

Dioxins/furans and HCB were added to the 2000 NPRI. While discussions in 1999, with the NPRI Work Group on Substances focused on the adoption of a quantity-based threshold, Environment Canada's approach was to adopt activity-based threshold. Environment Canada, however, became aware of a number of missing sectors as a result of using activity-based threshold. Environment Canada's final decision was to adopt quantity-based threshold, that was consistent with the potential sources identified in Environment Canada's *National Inventory of Dioxin/furan Releases*.

More comprehensive reporting of these substances to the NPRI will assist EC with reporting under international obligations.

Reporting Criteria

Current Criteria

The current reporting criteria for dioxins/furans and HCB are based on the activity(s) at the facility, rather than the quantity that is manufactured, processed or otherwise used (MPO) or the quantity released or transferred. A facility is required to submit a report for dioxins/furans and HCB, if it satisfies one of the two following criteria:

1. the contiguous facility was used for one or more of the following activities:
 - non-hazardous solid waste incineration of 26 tonnes or more of waste per year, including small combustion units, conical burners and beehive burners;
 - biomedical or hospital waste incineration of 26 tonnes or more of waste per year;
 - hazardous waste incineration;
 - sewage sludge incineration;

OR

2. the contiguous facility had employees that worked a total of 20,000 hours or more, and was engaged in one or more of the following activities:
 - non-hazardous solid waste incineration of 26 tonnes or more of waste per year, including small combustion units, conical burners and beehive burners;
 - biomedical or hospital waste incineration of 26 tonnes or more of waste per year;
 - hazardous waste incineration;
 - sewage sludge incineration;
 - base metals smelting;

- smelting of secondary aluminum;
- smelting of secondary lead;
- manufacturing of iron using a sintering process;
- operation of electric arc furnaces in steel foundries;
- operation of electric arc furnaces in steel manufacturing;
- production of magnesium;
- manufacturing of portland cement;
- production of chlorinated organic solvents or chlorinated monomers;
- combustion of fossil fuel in a boiler unit with a nameplate capacity of 25 megawatts or greater of electricity, for the purpose of producing steam for the production of electricity;
- combustion of hog fuel originating from logs that were transported or stored in salt water in the pulp and paper sector;
- combustion of fuel in kraft liquor boilers used in the pulp and paper sector; or
- wood preservation using pentachlorophenol.

If facility satisfies either one of these criteria, it is required to submit a report to the NPRI for dioxins/furans and HCB, regardless of the quantity MPO'ed, or released or transferred.

Proposed Changes to Criteria

At this time, Environment Canada thinks there may be other potential sources of dioxin/furan and HCB releases in Canada, that do not satisfy the existing reporting criteria, and as such, are not currently subject to reporting to the NPRI. This includes industrial sources that are currently reporting to the U.S. Toxics Release Inventory (TRI).

Upon reviewing the U.S. TRI data, we understand that there may be potential gaps in the Canadian inventory for sources including: catalyst regeneration at petroleum refineries, asphalt mixing plants, secondary smelting of copper (copper-wire recycling), tire combustion, biogas combustion, carbon reactivation furnaces, pyrolysis of brominated flame retardants.

In order to capture these and other potential sources, Environment Canada is proposing to change the reporting criteria to a quantity-based threshold, as outlined below.

For facilities where employees worked a total of 20,000 hours (this clause, 20,000 hours, may require further assessment because there may be a situation where a facility could release sufficient amount of dioxins and furans and, yet, not captured under NPRI reporting), a report will be required if the quantity manufactured, processed or otherwise (MPO) used is:

- 0.1 grams total of the 17 dioxin/furan congeners [this refers to the sum of the quantities of the 17 individual congeners, not the quantity in units of toxicity equivalence (TEQ)].
- 5 kilograms of HCB [U.S. TRI has a threshold of 10 pounds]

Reporting Requirements

Current Requirements

The current reporting requirements for dioxins/furans and HCB are as follows:

- as with other NPRI substances, the quantities released to each medium, and transferred off site for disposal and recycling
- dioxins/furans are reported in units of grams in various toxic equivalencies
- HCB is reported in units of grams
- special for dioxins/furans and HCB
 - where monitoring or direct measurements were used, facility is required to report whether the concentration was above or below the LoQ (level of quantification)
 - if concentration is below LoQ, the facility is not required to report any quantities, only that the concentration was below LoQ

Proposed Changes to Requirements

The proposed revised reporting requirements are as follows:

- status quo for reporting , the quantities released to each medium, and transferred off site for disposal and recycling
- dioxins/furans reported in units of total grams rather than units of I-TEQ
 - reporting on quantities of each congener for the total quantity released and that transferred.
 - based on this information, the NPRI software would calculate the values for I-TEQ and WHO-TEQ.
 - reporting on quantities of co-planar PCBs released into the environment.
- HCB reported in units of grams

This change will assist Canada in meeting it's domestic and international reporting obligations. It will also result in harmonization with the reporting requirements for Ontario Regulation 127/01, which requires reporting specifically for the 2,3,7,8-dioxin and 2,3,7,8-furan congeners.

Domestic and International Reporting Obligations

The U.S. TRI requires reporting of dioxin and furan congeners as the total mass, and the quantity of each of the 17 congeners. This is a difference between the NPRI and TRI, as far as dioxins and furans are concerned, and makes comparisons or the data very difficult, except for U.S. facilities that supply complete congener information.

It is important to note that the NPRI data for dioxins/furans and HCB is currently used for various domestic and international obligations. Domestically, it is used to track the progress of Canada-Wide Standard (CWS) dealing with these substances.

Below is a summary of the various international obligations, and the TEQ scheme used:

- Canada-Wide Standards (CWS) - ITEQ
- North American Regional Action Plan (NARAP) - WHO98

- United Nations Environment Programme (UNEP) - WHO98
- UN ECE POPs Protocol - ITEQ
- NPRI - ITEQ
- Great Lakes agreements - ITEQ
- U.S. Toxics Release Inventory (U.S. TRI) - not reported in TEQ
- U.S. Dioxin Reassessment - ITEQ and WHO98, and
- Stockholm Convention

Table 1: Toxic Equivalency Factors (TEFs) for Dioxins, Furans and Co-planar PCBs

	CONGENER	I-TEF	WHO TEF					
			HUMANS/MAMMALS	FISH	(a)	BIRDS	(a)	
	Dioxins							
1	2,3,7,8-TCDD	1	1		1		1	
2	1,2,3,7,8-PeCDD	0.5	1		1		1	f
3	1,2,3,4,7,8-HxCDD	0.1	0.1	a	0.5		0.05	f
4	1,2,3,6,7,8-HxCDD	0.1	0.1	a	0.01		0.01	f
5	1,2,3,7,8,9-HxCDD	0.1	0.1	a	0.01	e	0.1	f
6	1,2,3,4,6,7,8-HpCDD	0.01	0.01		0.001		<0.001	f
7	OCDD	0.001	0.0001	a	<0.0001		0.0001	
	Furans							
8	2,3,7,8-TCDF	0.1	0.1		0.05		1	f
9	1,2,3,7,8-PeCDF	0.05	0.05		0.05		0.1	f
10	2,3,4,7,8-PeCDF	0.5	0.5		0.5		1	f
11	1,2,3,4,7,8-HxCDF	0.1	0.1		0.1		0.1	c,f
12	1,2,3,6,7,8-HxCDF	0.1	0.1		0.1	c	0.1	c,f
13	1,2,3,7,8,9-HxCDF	0.1	0.1	a	0.1	c,e	0.1	c
14	2,3,4,6,7,8-HxCDF	0.1	0.1	a	0.1	c	0.1	c
15	1,2,3,4,6,7,8-HpCDF	0.01	0.01	a	0.01	b	0.01	b
16	1,2,3,4,7,8,9-HpCDF	0.01	0.01	a	0.01	b,e	0.01	b
17	OCDF	0.001	0.0001	a	<0.0001	b,e	0.0001	b
	Co-planar PCBs							
18	3,4,4',5'-TCB (81)	n/a	0.0001	a,b,c,e	0.0005		0.1	e
19	3,3',4,4'-TCB (77)	n/a	0.0001		0.0001		0.05	
20	3,3',4,4',5'-PeCB (126)	n/a	0.1		0.005		0.1	
21	3,3',4,4',5,5'-HxCB (169)	n/a	0.01		0.00005		0.001	
22	2,3,3',4,4'-PeCB (105)	n/a	0.0001		<0.000005		0.0001	
23	2,3,4,4',5'-PeCB (114)	n/a	0.0005	a,b,c,d	<0.000005	b	0.0001	g
24	2,3',4,4',5'-PeCB (118)	n/a	0.0001		<0.000005		0.00001	
25	2',3,4,4',5'-PeCB (123)	n/a	0.0001	a,c,d	<0.000005	b	0.00001	g
26	2,3,3',4,4',5'-HxCB (156)	n/a	0.0005	b,c	<0.000005		0.0001	
27	2,3,3',4,4',5'-HxCB (157)	n/a	0.0005	b,c,d	<0.000005	b,c	0.0001	
28	2,3',4,4',5,5'-HxCB (167)	n/a	0.00001	a,d	<0.000005	b	0.00001	g
29	2,3,3',4,4',5,5'-HpCB (189)	n/a	0.0001	a,c	<0.000005		0.00001	g

Notes re. WHO TEQ

"-" indicates no TEF because of lack of data

a) limited data set

b) structural similarity

c) QSAR modelling prediction from CYP1A induction (monkey, pig, chicken, or fish)

d) no new data from 1993 review

e) in vitro CYP1A induction

f) in vivo CYP1A induction after in ovo exposure

g) QSAR modelling prediction from class specific TEFs

http://www.who.nl/download/doc7/txt1_1.htm

Issues for consideration:

The Key issues related to the reporting of dioxins/furans and hexachlorobenzene to the NPRI may require further consideration of the following key issues:

- Should the activity based threshold be replaced by a MPO threshold?
- Should the employee threshold be removed for certain facilities?
- Should we consider 0.1 g MPO (for dioxins/furans) threshold so as to harmonize with the TRI?
- Should the dioxins/furans be reported in units of total grams rather than units of I-TEQ?
- Should we consider the same MPO threshold (as dioxins/furans) for HCB? Or harmonize with the TRI threshold of 5 kilograms?