Coplanar PCB and dioxin emissions of 2 MSWI

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Abstract
Simultaneous measurements of dioxin, coplanar PCB and polychlorobenzene were performed on two MSWI. In all cases, toxic equivalent quantity of PCB is small compared to dioxin emissions.

Introduction
While numerous informations are available for dioxin emissions from municipal solid waste incineration, there is relatively few data for dioxin like compounds such as coplanar PCB and for dioxin precursor such as chlorobenzene (1). Due to the price of sampling and analysis, within the existing values, most of them come from laboratory scale incinerators rather than from on site experiments. Furthermore, in the case of on site measurements, relevant parameters for dioxin formation can't be controlled. Thus, the results obtained are seldom useful to gain a decisive knowledge on formation mechanisms.
Nevertheless, performing such on site experiments is the only way to near what is occurring in an actual MSWI. Such experiments could also be used to find out some relevant parameter monitoring or surrogates for dioxin emissions (2).

In 1995 and 1996, ADEME has commissioned dioxin measurement campaigns on two MSWI in order :

- to measure dioxin emissions
- to assess the relative importance of coplanar PCB in the toxic equivalent quantity of dioxins.
- to perform additional measurements of polychlorobenzene

Sampling part was performed by Ineris while analysis were performed by CARSO, which both have participated to WG1 of CEN TC 264.

The present paper gives the results obtained on these two MSWI.

Materials and methods

The characteristics of the plant are shown hereafter in table I.

	Capacity (t/h)	APCD	Number of samples
MSWI A	7.5	2 field electrostatic precipitator	6
MSWI B	3	2 field electrostatic precipitator 2 stage wet scrubber	3

Table I

The compounds analysed are shown in table II: Sampling was performed according to EN 1948-1 method B3 annex 2 - Filter condenser method. Adsorbent upstream the condensate flask. Analysis was performed according to EN 1948-2 and 3 using high resolution GC/MS (>10 000).

		TEF
PCDD/F	17 toxic	International
Polychlorobenzene	trichloro to hexachlorobenzene	
Coplanar PCB	33'44'tetra CB (PCB 77) 33'44'5'PentaCB (PCB 126) 3'44'55' hexe CB (PCB 169)	0.0005 0.1 0.01 according to (3)

Table II

Results and discussion

The results are shown in Table III. It is obvious that for all MSWI, PCB emissions expressed in I-TEQ are low compared to dioxin emission. As already observed, there is also a strong link between dioxin and chlorobenzene emissions.

Reference

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2) A Kaune, D. Lenoir, U. Nikolai (1994)
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3) UG Ahlborg, GC Becking, LS Birnbaum, A Brouwer, HJGM Derks, M Feeley, G Golor, A Hanberg, JC Larsen, AKD Liem, SH Safe, C Schlatter, F Waern, M Younes and E Yrjänheikki (1994)
Toxic equivalent factors for dioxin like PCBs. Chemosphere 28, 1049-1067

Dioxines ng/m3	MSWI A				MSWI B		
8CDD	13.98	10.97	15.00	15.19	22.95	307.31	37.14
2.3.7.8 4CDD	0.22	0.20	0.16	0.21	0.77	0.27	0.20
1.2.3.7.8 4CDD	0.81	0.70	0.57	0.68	4.12	5.36	4.93
1.2.3.4.7.8 6CDD	0.72	0.53	0.51	0.48	3.64	9.29	4.55
1.2.3.6.7.8 6CDD	1.43	0.77	0.78	1.06	10.58	34.49	14.23
1.2.3.7.8.9 6CDD	1.12	0.71	0.67	0.76	5.64	16.74	7.28
1.2.3.4.6.7.8 7CDD	8.09	4.54	5.64	7.05	29.30	146.09	41.22
8CDF	7.34	5.97	12.76	10.62	24.01	250.55	40.62
2.3.7.8 4CDF	1.09	0.91	0.69	1.08	6.95	0.44	0.00
1.2.3.7.8 5CDF	1.42	1.38	1.12	1.70	9.01	22.48	6.90
2.3.4.7.8 5CDF	3.07	2.22	2.14	2.54	24.46	54.48	28.38
1.2.3.4.7.8 6CDF	2.62	2.37	2.31	2.70	20.58	53.42	23.17
1.2.3.6.7.8 6CDF	2.92	2.51	2.60	3.05	24.31	72.62	29.39
2.3.4.6.7.8 6CDF	4.71	3.38	4.53	4.45	34.36	80.77	41.08
1.2.3.7.8.9 6CDF	0.28	0.19	0.22	0.21	1.63	5.17	2.14
1.2.3.4.6.7.8 7CDF	10.17	9.52	13.27	12.40	66.88	242.10	92.20
1.2.3.4.7.8.9 7CDF	1.82	1.26	1.81	1.76	8.06	47.25	12.17
Sum	61.81	48.13	64.78	65.94	297.25	1348.83	385.60
Sum I-TEQ	3.94	3.04	3.04	3.52	27.37	63.52	30.92
Coplanar PCB pg/m3							
PCB 77	1.76	0.80	0.70	0.77	13.92	41.92	6.03
PCB 126	1.08	0.52	0.50	0.50	13.24	49.41	3.22
PCB 169	0.37	0.19	0.18	0.18	4.02	17.03	1.12
Sum	3.22	1.50	1.38	1.45	31.18	108.36	10.38
Sum I-TEQ	0.11	0.05	0.05	0.05	1.37	5.13	0.34
Chlorobenzène mg/m3							
1.3.5 T	4	0	1	352	583	1273	349
1.2.4 T	120	0	104	221	1154	5505	352
1.2.3 T	460	0	327	307	1123	4858	578
1.2.4.5 Te	0	255	1	0	933	3355	233
1.2.3.5 Te	0	244	1	2	425	3232	215
1.2.3.4 Te	539	346	467	483	1414	4920	1008
Penta	1035	448	930	1005	1333	2665	3828
Hexa	14	294	435	437	888	2014	2605
Sum	2172	1587	2266	2807	7853	27822	9168

Table III