ONE YEAR CONTINUOUS MONITORING OF PCDD/F AND PCB AMBIENT AIR CONCENTRATIONS IN THE VICINITY OF STEELWORKS IN AUSTRIA.

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Introduction

PCDD/F-Emission Inventories for Austria[1,2] revealed, that the two Austrian iron ore sinter plants account for more than 25 % of the total annual PCDD/F emissions in Austria. One of these sinterplants is located in the industrial area of Leoben/Donawitz, situated northwest of Leoben a Styrian county town of approximately 32000 inhabitants. In summer of 1995 the Federal Environment Agency Austria on behalf of government authorities started an ambient air sampling program in this area. These measurements[3,4] showed obviously elevated PCDD/F ambient air levels, compared to average levels in austrian major conurbations as known from previous measurements[5,6].

Based on these findings measures have been undertaken resulting in a significant reduction of particulate matter in the atmosphere of this area. In 1999 the Federal Environment Agency started a new ambient air monitoring programme. The objectives of the new programme were the determination of real annual average ambient air concentrations of PCDD/F and PCBs based on continuous sampling at one station in the vicinity of the steelworks.

Experimental

The sampling site chosen was in the immediate vicinity of the production facilities. Air has been sampled with a modified two-stage high volume air sampler with reduced suction speed of app. 1.5 m^3/h allowing a sampling duration of one month. Several parallel measurements have been carried out to assure the comparability of the data gained with the modified sampler with our standard sampling method (suction speed app. 14 m^3/h, sampling duration 72 h). The methods for analysis are described in a previously published report[4].

Results and Discussion

Annual Average:

The PCDD/F and PCB ambient air concentrations of the 12 one-month sampling periods and the calculated annual average concentrations are shown in table 1.

Table 1 PCDD/F and PCB ambient air concentrations in Leoben /Donawitz

	PCDD/F		PCB	
	TEQ (I-TEF)	TEQ (WHO-98)	TEQ (WHO-98)	Σ Ballschmiter
	fg / Nm³	fg / Nm³	fg / Nm³	pg / Nm³
Nov. 1999	213.0	223.3	11.8	182.8
Dec. 1999	274.5	287.8	17.1	191.1
Jan. 2000	490.6	507.2	25.3	280.1
Feb. 2000	249.8	268.9	15.4	149.0
Mar. 2000	266.3	273.3	n.a.	n.a.
Apr. 2000	183.3	188.9	17.2	474.1
May 2000	125.8	129.3	19.7	706.6
Jun. 2000	82.0	84.2	17.2	304.6
Jul. 2000	115.2	118.9	18.8	573.6
Aug. 2000	161.9	166.6	17.2	476.8
Sept. 2000	81.6	84.6	3.0	359.7
Oct. 2000	85.9	91.3	6.4	295.2
Annual Average	194.2	202.0	15.4	332.8

The results show a clear seasonal trend with the highest levels during winter for PCDD/F, whereas the PCBs calculated as Σ Ballschmiter show the maximum levels during summer. No significant seasonal trend could be recognized for PCBs calculated as TEQ according to WHO-98. The annual average at the sampling site Leoben/Donawitz with 194.2 fg TEQ/Nm³ (I-TEF) is clearly higher compared with levels in other Austrian conurbations ranging from 80 fg TEQ/Nm³ (I-TEF) in Vienna to 120 fg TEQ/Nm³ (I-TEF) in Graz.

Parallel Measurements:

For quality assurance purposes during the sampling in February 2000 seven parallel measurements have been carried out. The first half of the one-month sampling period was covered by one parallel sampling lasting two weeks, whereas the second half was covered by five consecutive sampling periods lasting three days each and an additional sampling lasting two weeks. This had to be undertaken to assure that reduced suction speed would not deteriorate the sampling efficency. The results of these parallel measurements are summarized in table 2.

Table 2 Results of the parallel measurements in Leoben/Donawitz in February 2000

	PCDD/F		PCB	
	TEQ (I-TEF)	TEQ (WHO-98)	TEQ (WHO-98)	Σ Ballschmiter
Sampling Days Feb. 2000	fg / Nm³	fg / Nm³	fg / Nm³	pg / Nm³
one-month sampling day				
1 - 29	249.8	268.9	15.4	149.0
parallel sampling day				
1 - 14	238.9	247.3	16.9	369.9
14 - 29	244.1	249.5	20.5	218.9
Avereage	241.5	248.4	18.7	294.4
day				
14 - 17	179.6	189.1	15.8	188.1
17 - 20	225.0	234.0	47.1	154.5
20 - 23	267.2	275.3	16.7	161.1
23 - 26	222.4	229.8	15.3	177.5
26 - 29	249.7	256.7	6.0	145.1
Average 14 - 29	228.8	237.0	20.2	165.3

The results show a good agreement of the results of the one-month sampling period with the parallel samplings. Only the results of the PCB measurements calculated as Σ Ballschmiter show some discrepancy which cannot be explained so far. Nevertheless the parallel measurements proved the reliability of the extended sampling duration for PCDD/F and TEQ-PCBs which makes the results of this study comparable to previous studies carried out with our standard method.

References

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