1201
Fires

Process description

Fires can be described as uncontrolled combustion processes. The fuel and oxygen supplies and the mixing are determined by the fire itself and its surroundings. At a fire, usually insufficient air is available near to the seat of fire to get good burning. At some distance from the seat of fire, the combustion gases, however, are mixed very quickly with a great overmeasure of air, so that the flue gases get cooled before a good burn-out can take place. Due to these effects, high emissions occur compared to the emissions of controlled incineration. Besides to the mentioned "poor" combustion conditions, the presence of chlorine is important for the forming of dioxins. Chlorine occurs naturally in building materials, such as wood ‹; 1› and many buildings also contain PVC, a significant source of chlorine. Whether PVC actually influences the formation of PCDD/F in accidental fires has been discussed unequevocally during the recent past ‹ 2- 7›. High yields of PCDD/F are generally observed when the burnt material contains aromatic compounds which may serve as precursor substances.

Abatement technologies:

Not applicable

Plant data/European situation

Fires of buildings, chimneys and vehicles certainly occur in all countries, probably to different extent depending on the degree of motorisation and on the distribution of heating systems and fuels. Of course forest fires and other natural fires are likely to take place more often in the southern countries of Europe.

Activity data

Only four countries (Belgium, Germany, The Netherlands and United Kingdom) provided activity data (shown in 1201—Table 3) in national inventories or other publications.

Emission factors

The few emission factors obtainable for landfill fires (only from Switzerland and Sweden) and for fires of vehicles, buildings and chimneys (only from Belgium) are shown in 1201—Table 2. Due to the few data available and the broad range of the emission factors no default values were calculated. The emission factors are presented here only for the sake of completeness; they were not used for the recalculation of the annual dioxin emissions from fires in the considered countries.

Emission estimation

The activity rates per capita from the Germany study were taken as the base for the estimation of the annual emissions in each country; the results are shown 1201—Table 4. For all 17 countries considered the following total result is obtained (1201—Table 1):

	TOTAL
Re-evaluation, total	379.8

1201—Table 1 Re-evaluated total PCDD/F air emission [g I-TEQ/a] from fires in Europe

Conclusions/recommendations

Dioxin emissions from fires are at the most of moderate relevance for the total PCDD/F emissions in Europe. However, as only a few emission factors were available and activity rates per capita had to be applied all calculations in this chapter are associated with considerable uncertainties.

More complete statistic data from all 17 countries on the number of incidents (best separately for buildings, vehicles and chimneys) would be very helpful. Moreover, in view of their broad range considerable uncertainties exist with regard to the applied emission factors. Investigations of PCDD/F emissions from fires in some countries would give the required data for calculating quite reliable default emission factors (for buildings, vehicles and chimneys).

		Flue gas conc. [ng I-TEQ/m³]			Emission factors [µg/t]			Remarks
		typ	min	max	typ	min	max	
landfill fires	**CH**				450			EF calculated from PCDD/F content of msw filter dust and dust emission during open air landfill fires
	S		66	518	0.18	0.066	0.518	Dimension of EF: µg N-TEQ/m³;
vehicles, buildings, chimneys	**B**				170	113	225	

1201—Table 2 PCDD/F air emission factors for fires applied in the national dioxin inventories

		Activity rates (number of fires)			
		incidents	**fires per 1000 capita**	**fires per 1000 households**	
buildings,vehicles, chimneys	**B**	9228	0.92	2.3	
appartments	**D**	500000	6.1	13.8	insurance statistics report 200,000 fires in private housholds; thus used activity rate may be too high by approx. factor 2
buildings	**NL**	11940	0.78	1.9	
buildings	**Uk**	90000	1.55	3.9	
		incidents	**fires per 1000 capita**	**per 1000 vehicles (cars, buses, trucks)**	
vehicles	**B**	1819	0.18	0.40	
vehicles	**D**	1185	0.015	0.03	
containers, cars, ships	**NL**	10803	0.70	1.69	high contribution from container fires?
chimneys	**B**	2664	0.26		
chimneys	**NL**	2229	0.14		

1201—Table 3 Activity rates releated to fires

Emission estimation on basis of German study and per capita considerations	
German per-capita emission:	**1µg I-TEQ/ cap**
A	7.9
B	10.0
CH	7.1
D	81.0
Dk	5.3
E	39.4
F	57.5
Gr	10.2
I	56.5
Irl	3.5
L	0.4
N	4.3
NL	15.3
P	9.8
S	8.7
Sf	5.1
Uk	57.8
TOTAL	**379.8**

1201—Table 4 Calculation of PCDD/F air emission estimates [g I-TEQ/a] for fires (reference period: 1993-1995)

1201

Fires

References to 1201

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