

EMISSION OF DIOXIN AND RELATED GASES
FROM INTERMITTENT OPERATION INCINERATORS FOR MUNICIPAL SOLID WASTE

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ABSTRACT

Concentration of CO and THC was monitored in an intermittent operation incinerator for municipal solid waste under the stable and also not-stable operating conditions. The result suggested, in an incinerator which starts and stops every day, it is not proper to judge the whole emission of dioxin by the measurement during the stable operation.

KEY WORDS

PCDD ; municipal solid waste incinerator ; small intermittent-operation plant ; CO ; THC ; start-up ; shut-down

INTRODUCTION

In Japan, a large number of intermittent operation incinerators repeat their start up and shut-down every day, and they presumably emit a certain concentration of dioxin. Therefore, for intermittent operation plants it is essential to know the quantity of dioxin emitted during the whole day including the not-stable operation conditions to establish effective countermeasures against the emission. Regarding the issue, we firstly conducted a study on emission of CO and THC, which are known to have a close relation to the emission of dioxin. Also we reviewed the existing data concerned.

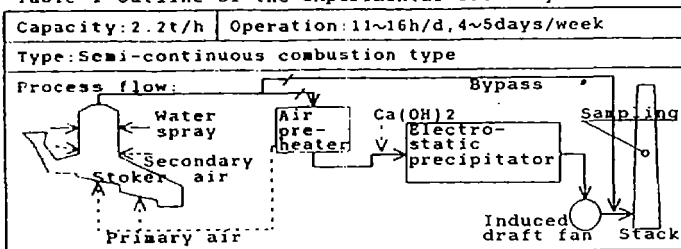
CONCENTRATION OF CO AND THC

METHODS

Table 1 illustrates the outline of the experimental facility. After 4 days maintenance shut down the plant was started up from cold condition and at the same time we started to monitor the CO concentration in the flue gas at the middle of stack continuously for 51 hours. Referring to the CO level, gas sampling for the THC were conducted with a hand sampler from time to time to draw a sufficient profile of concentration change. In most intermittent operation incinerators, a small quantity of waste is fed on the stoker, as "stock fire at night", to keep a certain temperature for the smooth start up in the next morning. However, in the experimental facility most of all waste on the stoker was

burnt out at every day shut-down in order to be low dust concentration in flue gas during night. In this investigation, we proceeded shut-down without "stock fire" as usual.

Table 1 Outline of the experimental facility



RESULTS

Change of CO concentration and O₂ concentration are plotted in Fig. 1 along with the change of furnace outlet temperature. Data of CO were read from the observed chart at every 15 minutes and were classified to every operating mode as shown in Table 2. During start up period, a high peak of CO concentration appeared. The peak lasted for 30 to 40 minutes and dropped down to a stable operation level. Since the automatic start up device¹⁾ was installed, the start up of the furnace was carried in a short period smoothly and it reported a short duration of the CO peak emission.

At a stable operation, the CO concentration was at a 10-20 ppm level, which showed proper combustion in a usual stoker furnace. Shut down period had a high CO peak similar to the start up period. After the peak, CO concentration gradually decreased. However, CO continued to emit a relatively high concentration level until the next day morning.

THC concentration showed a positive correlation to CO concentration. (Fig. 2)

Table 2 Temp. O₂, CO and THC in each mode

MODE	Item	Furnace outlet Temperature	O ₂		CO		THC		NON-CH ₄	
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
START UP	Unit	°C	1	18	18	18	3	3	3	3
	No. of data		18	18	18	3	3	3	3	3
	Max.		990	21	15500	48600	540	200	340	340
	Min.		220	8.75	20	20	8.9	2.3	6.3	6.3
	Ave.		628	15	2360	5090	186	68	118	118
STABLE OPERATION	No. of data		102	10.2	102	102	3	3	3	3
	Max.		970	16.2	4350	4230	10.1	2.8	8.6	8.6
	Min.		750	11.2	10	10	7.8	1.5	5.5	5.5
	Ave.		881	13	270	310	9	2	7	7
SHUT DOWN	No. of data		12	12	12	12	4	4	4	4
	Max.		950	21	2900	25650	130.5	30.5	100	100
	Min.		350	13.5	30	40	11.4	2.4	9	9
	Ave.		566	19	740	5396	58	14	44	44
NIGHT	No. of data		68	68	68	68	0	0	0	0
	Max.		350	11	500	4500				
	Min.		220	11	150	1350				
	Ave.		274	11	310	2780				

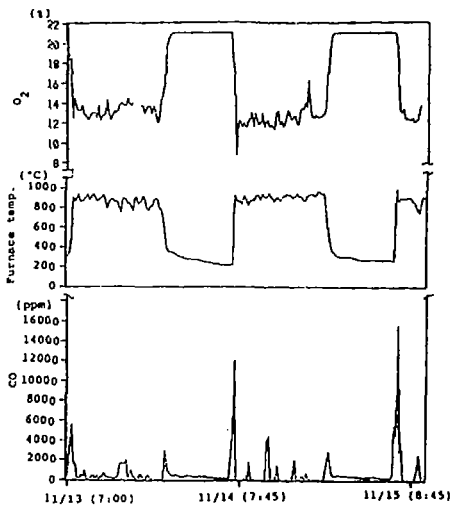


Fig. 1 Trends of CO, O₂, Furnace Temperature

PLUE GAS COMPOSITION DURING "STOCK FIRE" PERIOD

REFERENCE DATA

We had carried out a survey of flue gas composition during the "stock fire" period in 1986²⁾. Fig. 3 is a typical example of the survey result, which are helpful to consider the emission of dioxin during night time.

CONSIDERATION

In this study we measured the emission of CO and THC under not-stable operation conditions, which gave some information for the succeeding study of dioxin generation and emission. In concrete terms, for intermittent operation plants the totally emitted dioxin shall be estimated by the measurement during not-stable operation as well as during stable operation. We will measure PCDDs and PCDFs in June 1990 and will report the results at DIOXIN '90 symposium.

REFERENCES

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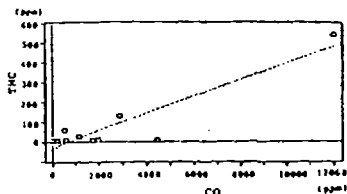


Fig. 2 CO - THC

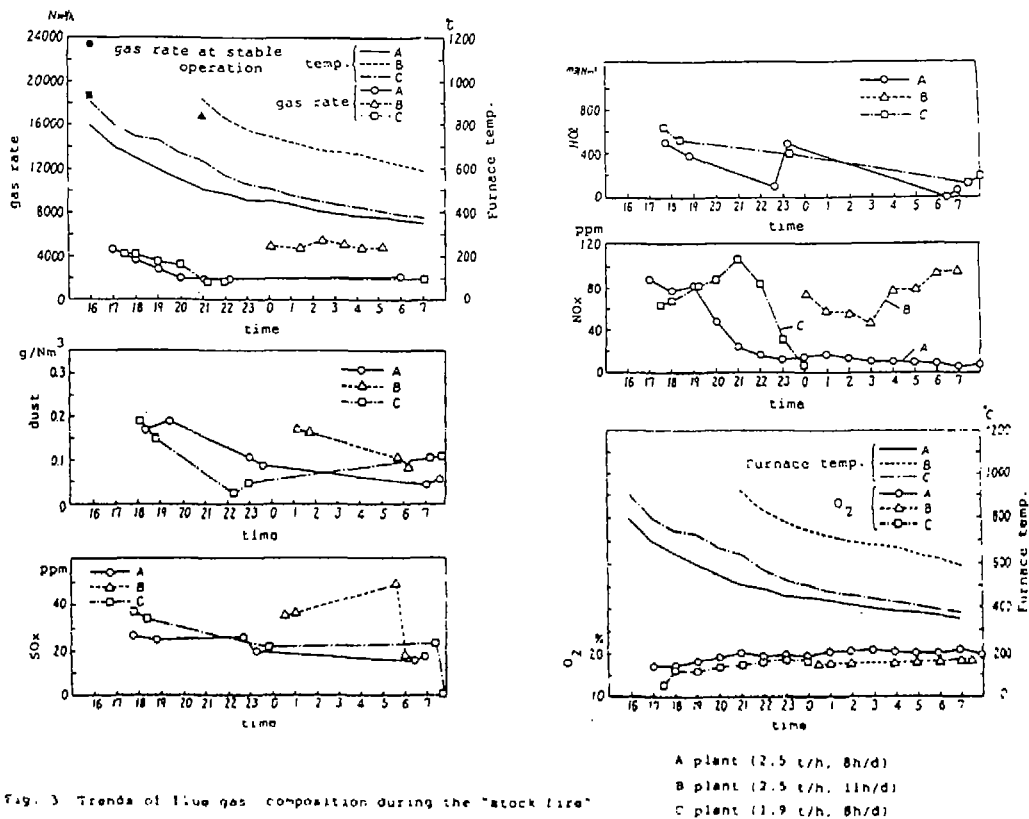


Fig. 3 Trends of flue gas composition during the "stock fire"