BEHAVIOR OF DIOXINS/FURANS AND COMBUSTION GASES AT EMISSION CONTROL DEVICES IN NATION-WIDE FIELD TESTS OF INDUSTRIAL WASTE INCINERATORS IN KOREA

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Introduction

Industrial waste generation in Korea has increased dramatically last decades, resulting in serious disposal problems. Due to the limited landfill sites, incineration is becoming more important alternative to cope with this situation. Public concern is, however, growing specially among nearby residents.

A nation-wide investigation program was performed to get the basic information to establish improvement plan in Korea. 20 large-scale Industrial Waste Incinerators(IWIs) were selected and investigated in detail. Unit processes were tested in terms of performance and emission gases including dioxins and furans. Dioxins are one of the most toxic and persistent human-made organic chemicals and their density increase in the natural world by incineration of chlorinated carbons and other chemicals [1)]

Research results showed that A/C injection has a significant effect on dioxin removal in control devices[2), 3)]. Fujji et al reported that the capacity of adsorption relates to operation temperature and gas velocity at the bag filter surface[4)].

In this test research, we have tried to relate these parameters to emission performance in large-scale incinerators in operation.

Materials and Methods

20 large-scale Industrial Waste Incinerators(IWIs) were selected and dioxins were investigated in cooling unit(waste heat boiler, cooling tower), control devices(EP, Cyclone, B/F, Wet Scrubber, SDR et al.) and stacks .

Sample extraction and clean-up were carried out following Standard Method in Korea. The analysis was performed on selected ion monitoring mode with a MicromassAutospecUltima high resolution mass spectrometer connected with high resolution gas chromatography.

Results and Discussion

Different type of control devices were tested and compared;, centrifugal cyclones showed increase of dioxins/furans by average of 57.1% and dry-type EP showed increase level of 314%, indicating quite unexpected results. On the other hand, Bag Filter system relatively reliable control efficiency of 72.6% by average. By the other test results, semi-dry absorber showed 19.9% of dioxins/furans control efficiency, while wet scrubber showed 62.8%. Other acidic gases and combustion gases were monitored at the same time. Also, almost all incinerators safisfied dioxin level standard in Korea(capacity>4ton/h:20ng-TEQ/Nm^3, 2ton/h3).

Some data of theses tests showed that the maintaining optimum operational conditions is essential to obtain good combustion and emission control performance. Several other factors were also investigated and analyzed, which were utilized to establish improvement plan and guidance of IWIs installation/operation in Korea.

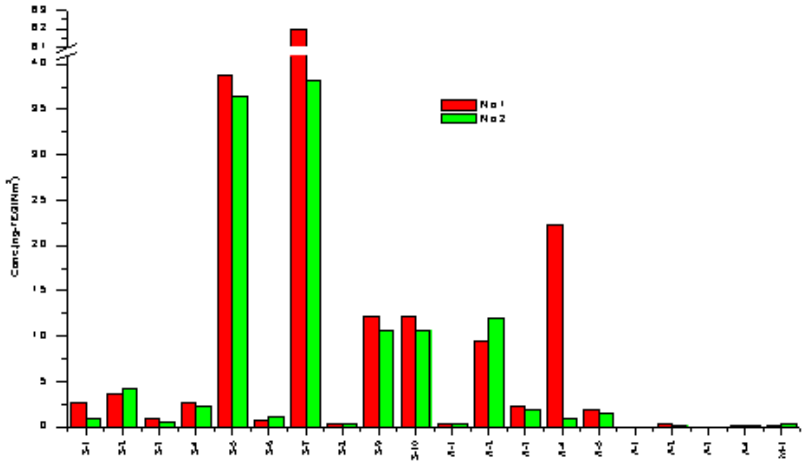
Gas and particulate concentrations in flue gas by furnace type were analyzed and compared.

Removal efficiency of dioxin emissions by control devices

Device	Average	Lange
Cyclone(n=6)	-57.1	-260.7~11.6
EP(n=2)	-314.0	-568.8~-59.1
B/F(n=9)	72.6	-66.3~95.9
SDR(n=7)	19.9	-180.5~54.6
WS(n=9)	62.8	-123.2~92.9

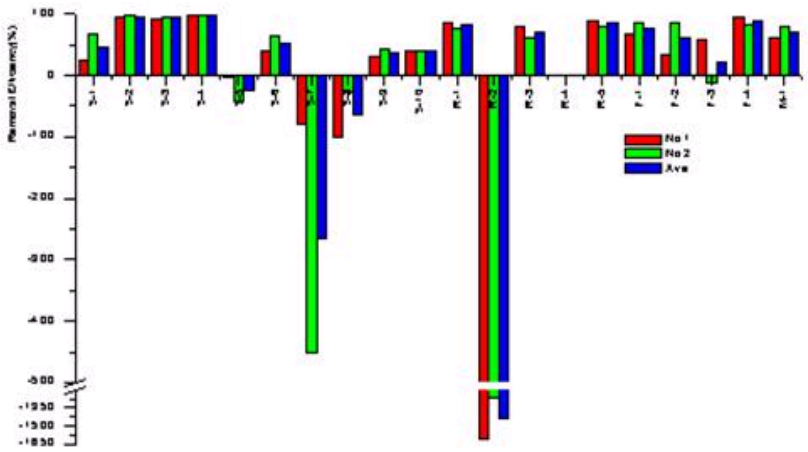
Gas and particulate concentrations in flue gas by furnace type

Compound	S(n=10)	R(n=5)	F(n=4)	M(n=1)	Ave.
CO(ppm)	117.5	23.2	12.6	174.4	73.6
NOx(ppm)	74.8	58.5	36.0	50.0	61.0
SOx(ppm)	6.9	0.4	13.6	1.0	6.3
HCl(ppm)	24.6	9.6	9.1	3.3	16.3
Dust (mg/Sm^3)	52.7	36.3	61.8	113.0	53.5
Hg(mg/Sm^3)	0.02	0.05	0.04	0.03	0.03
Cd(mg/Sm^3)	0.05	0.04	0.03	0.01	0.04
Pb(mg/Sm^3)	0.30	0.37	0.03	0.15	0.25
Cr(mg/Sm^3)	0.04	0.24	0.05	0.19	0.10
Cu(mg/Sm^3)	0.30	0.70	0.13	0.56	0.38
As(ppm)	0.06	0.03	0.10	0.16	0.06



(S:Stoker, R:Rotary kiln, F:Fluidized bed combustor, M:Rotary-bed combustor)

Results of dioxin emission levels in stack



(Removal Efficiency =($C_{cooling\ unit}$-C_{stack})/ $C_{cooling\ unit}$ * 100)

Removal efficiency of dioxin emissions

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