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DB2) RESOLUTION OF AIR POLLUTIONAL GASES BY ENER(or BROWN) GAS

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1. RESOLUTION OF HARMFUL GASES BY ENER GAS(OR BROWN GAS)

1-1. ABSORPTION OF π-RAY AND ELECTROLYSIS

Each atom is enclosed with π-rays, which were produced by the alternating magnetic field that is made by the electron's going and returning between atoms.

If some resonant π-rays are supplied to and suppress the fencing π-rays, the bonding will be broken because the equilibrium distance for the electron moving between atoms can not be maintained. Electrolysis process supplies π-rays of Gibb's free energy to the reactant atoms and then the component atoms are divided into and are induced to both electric poles.

1-2. PRODUCTION OF Π-RAYS AND CELL REACTION

Electric cell produces Gibb's free energy between two poles by their chemical reactions. For example $AB+CD \rightarrow AC+BD+\triangle G$

By the change of the equilibrium distances for the electrons' moving between atoms some remaining π-rays (Gibb's free energy) can be produced.

Table of Standard Electric Pole Potentials shows the sequence of the oxidants and reductants and suggests the possibility of the cell reactions.

1-3. ENVIRONMENTAL IMPROVING REACTION AND BROWN GAS

Brown gas is produced when water (H_2O) is electrolyzed without separation membrane.

Hydrogen atoms and oxygen ones are mixed in atomic states.

Brown gas is very safe in an mixture state without explosion because of the crystallizing π -bonding of hydrogen atoms and oxygen ones.

The atoms of the crystallizing π-bonding absorb more π-rays than the atoms of covalent bonding, which needs more electric energy than the conventional water electrolysis and provokes more current reduction during the electrolysis.

When Brown gas is burned much π-rays are generated because of the alternating magnetic fields due to the crystallizing π-bondings. The generated π-rays can induce chemical reactions. If Brown gas applies in any airpollutional smokes of environmental reactions, any harmful gases (CO, NO, etc) can be ceased to be produced.

2. EXPERIMENTAL RESULTS

☐ Major Purpose of Test

• How much CO and dust (unburned carbon) in flue gas could be reduced by Enerpec Gas Treatment, when pulp sludge and waste tyre were incinerated.

☐Testing Methods

• Gases ($CO, SO_X, NO_X, O_2, CO_2$) and Temperature

:were monitored by portable on-line monitoring device (IMR Ltd, Model: IMR 1400)

• Dusts

:were collected in the cylindrical filter by isokinetic sampling, according to Korean Official Testing Method for Dust.

• Elemental Compositions (C, H, N, S)

:were further analyzed for collected dusts by Elemental Analyzer (Perkin Elmer Ltd, Model: PE 2400 Series Ⅱ)

□Sampling Method for Flue Gas

• Three time samplings for Gases and Dust were simultaneously performed at 2 points (furnace and stack) for 1 hour in order to check DREs (Destruction and Removal Efficiencies) of pollutants

• Each gas components were monitored every 1minute over the whole sampling times.

• Dynamic and static pressure heads were also checked every 5 minutes for isokinetic sampling of dust over the whole sampling periods.

□Incineration Test

• About 3 kg/hour pulp sludges, of which moisture contents were approximate 60%(w/w), were manually input into the furnace.

• For the stable combustion of high-moisture pulp sludge, LPG gas was supplied into the furnace through the narrow tip of torch.

• Enerpec Gas was supplied into the separate treatment chamber through the single torch. Total amounts of Enerpec Gas could not be measured because flowmeter was not prepared.

※ In the future pilot-scale experiment, total amounts of Enerpec Gases used will be checked in order to investigate the energy efficiency of Enerpec Gas.

• DREs of each case for CO and Dust were calculated on the basis of measured concentration at furnace(Cin) and stack (Cout) by the equation of {[Cin- Cout]/[Cin]} 100(%).

□Testing Results

• Temperature(℃)

-Furnace: The temperatures in the furnace were in the range of 364~417℃ (Average 385℃).

-Stack: The temperatures at the stack were in the range of 195~263℃ (Average 222℃).

• CO

-Furnace: Very high concentrations of CO such as 1,000ppm to above 2,000ppm were generated in the furnace due to incomplete combustion of high-moisture pulp sludge.

But, CO was monitored only in its concentration of less than 2,000ppm due to the monitor' s detection limit (Max 2,000ppm).

Therefore, the real concentrations of CO might be much higher than those listed in Table 1 because CO concentration were mostly in the upper detection limit.

-Stack: After flue gases passing through the Enerpec Gas treatment chamber, CO concentrations were drastically decreased to 1 or 0 ppm. It showed that Enerpec gas burned out almost all of unburned carbons and leaded to complete combustion.

• Dust

-Furnace: As shown in Table 1, very high concentrations of dust such as 484 to 159 mg/Nm^3 (average 269 mg/Nm^3) were generated in the furnace due to the incomplete combustion of high-moisture pulp sludge. Apparently, the colors of collected dusts in filters were black. From this fact, it could be guessed that these black dusts might be unburned carbons, which were resulted from the incomplete combustion of pulp sludge and waste tyre.

-Stack: As shown in Table 1, very low concentrations of dust such as 3.12 to 6.88 mg/Nm^3 (average 4.79 mg/Nm^3) were showed at the stack. Apparent colors of collected dusts in filters were white when the pulp-sludges were burned, while those were grey when the waste tyre was burned. From this fact, it could be guessed that most of unburned carbons were almost burned out after flue gases passing through the Enerpec Gas treatment chamber.