8.3 Automatic exhaust gas air pollutant measurer

8.3.1 Overview

The continuous measurement of the concentration of air pollutants in flue gasses is important to obey of the air pollution control law and ordinances, management of air pollutants emission sources. Furthermore, in the regions on regulation of total emission, some factories regulated by this rule have the obligation to measure continuously their air pollutants emission, and there are also occasions where continuous measurement takes place under the Agreement on Environmental Pollution Control.

8.3.2 Composition of the Continuous measuring system

The continuous analyzer for air pollutants in flue gas uses a flue gas sampling tube, which is inserted into a flue through which flue gasses flow, as shown in Fig.8.3.1, for example, the sample gasses are introduced to the main unit of the automatic analyzer (the intake part), and the electrical signal corresponding to the concentration of air pollutants that is detected by the main unit's detector part (the analyzer) is recorded by the indicating recorder. And the zero gas and standard gas are used for calibration.

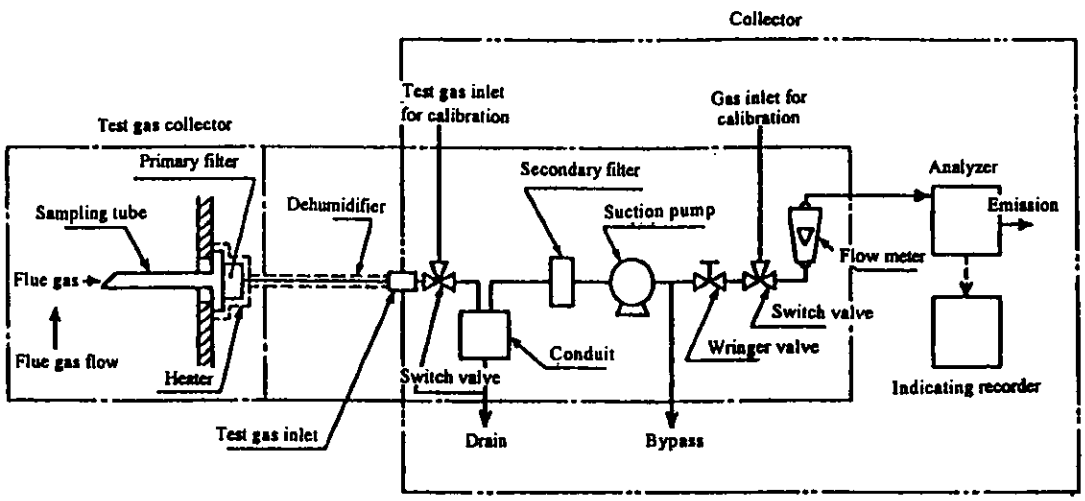

Fig.8.3.1 Example of measurer composition

8.3.3 Continuous sulfur oxides analyzer in flue gas

The types of continuous sulfur oxides analyzer in flue gas as shown in Table 8.3.1 are prescribed by JISB7981. Of these, the solution conductivity analyzer is made up of reference electrodes, a gas absorber, an absorbing port solution pump, an absorbing solution tank, an amplifier, a waste solution tank, and so forth, and records the changes of the conductivity due to sulfur oxides that are absorbed by the hydrogen peroxide absorbing solution. Further, the

infra-red absorption system (non-diffusion infra-red analyzer) uses a heated light source which passes a electric current through resistors such as Nichrome wire or silicon carbide, then passes the light through a reference cell that is held in either argon or nitrogen, and a measuring cell through both a revolving sector and an optical filter, converts the differences in the infra-red absorbed into an electrical signal, and records the results. This construction is shown in Fig.8.3.2. Moreover, the ultra-violet absorption system uses either a deuterium discharge tube or a medium pressure mercury lamp, collects the ultra-violet using a spectroscope, and continuously records the absorption of emitted flue gasses.

Table 8.3.1 Types of sulfur dioxide measurers

Types of measurers	Range (1) vol ppm	Notes
Solution conductivity system	0 to 25 ~ 0 to 2,000	To be applied when the effect of coexisting carbon dioxide, ammonia, hydrogen chloride and nitrogen dioxide is negligible or removable.
Infra-red absorption system	0 to 25 ~ 0 to 2,000	To be applied when the effects of coexisting moisture, carbon dioxide, or hydrocarbons is negligible or removable.
Ultra-violet absorption system	0 to 25 ~ 0 to 2,000	To be applied when the effects of coexisting nitrogen dioxide is negligible or removable.
Ultra-violet fluorometry system	0 to 10 ~ 0 to 1,000	To be applied when the effects of coexisting hydrocarbons is negligible or removable.

Note (1): The values within this range are divided appropriately according to the measurement objectives.

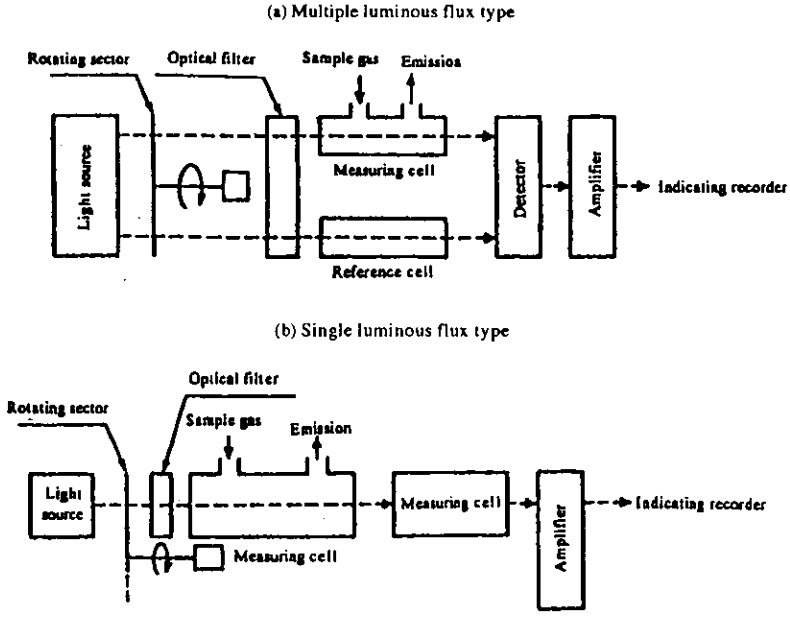

Fig.8.3.2 Examples of continuous infra-red gas analyzer composition

8.3.4 Continuous nitrogen oxides analyzer in flue gas

The systems of continuous nitrogen oxides analyzer in flue gas as shown in Table 8.3.2 are prescribed in

JISB7982. Of these, the chemiluminescence is a practical application of chemiluminescence which ozone reacts with nitrogen oxide in the flue gasses. In other words, this instrument uses the phenomenon that when nitrogen dioxide excited by the electrons generated by this reaction return to ground state, the light across a spectrum 600 to 3000 μm in proportion to the concentration of nitrogen oxides in flue gas is emitted. This construction is shown in Fig.8.3.3.

Table 8.3.2 Types of nitrogen oxides measurers

Types of analyzer / Principle	Range (1) vol ppm	Target substances for measurement	Applicable conditions
chemiluminescence system	0 to 10 ~ 0 to 2,000	Nitrogen monoxide Nitrogen oxides (2)	To be applied when the effect of the coexisting CO_2 is negligible or removable.
Infra-red absorption system	0 to 10 ~ 0 to 2,000	Nitrogen monoxide Nitrogen oxides (2)	To be applied when the effects of the coexisting CO_2, sulfur dioxide, moisture, or hydrocarbons can be ignored, or when those effects is negligible or removable.
Ultra-violet absorption system	0 to 50 ~ 0 to 2,000	Nitrogen monoxide Nitrogen dioxide Nitrogen oxides (3)	To be applied when the effects of the coexisting sulfur dioxide and hydrocarbons is negligible or removable.

Note (1): The values within this range are divided appropriately according to the measurement objectives.
(2): Nitrogen dioxide shall be measured by converting it into nitrogen monoxide.
(3): The values given as take value of nitrogen dioxide and nitrogen oxide.

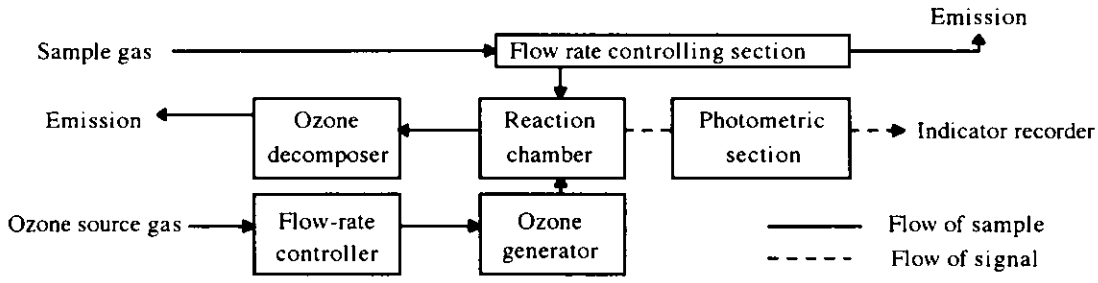

Fig.8.3.3 Example of chemiluminescence analyzer