

Application News

CGT-7100 Transportable Gas Analyzer

Measurement of CO Concentration in Cement Manufacturing Plant by CGT-7100: Study of Specifications for Introduction of CEMS

M. Tanaka, T. Iharada

User Benefits

- ◆ It is possible to collect data with high reliability and convertibility, as the CGT-7100 gas analyzer uses the same measurement principle as CEMS.
- ◆ Simple measurement is possible at any location because the CGT-7100 is a transportable type with a built-in sampling pump and sample preparation function.
- ◆ Collected data can be saved to a USB flash drive, enabling easy editing on a personal computer and sharing with other departments.

■ Introduction

Cement is manufactured by calcining raw materials at a high temperature of approximately 1450 °C using a rotating-type furnace called a rotary kiln. The large amount of thermal energy required by the rotary kiln is supplied by coal and, in addition, incineration of combustible waste in a combined waste treatment/heat supply process.

At cement manufacturing plants, the concentrations of several types of gas are monitored at several points from the viewpoints of operation control and prevention of air pollution. Among those gases, the concentrations of CO and O₂ are indexes that directly reflect the condition of fuel combustion, and thus are essential monitoring targets for close operation control aiming at high efficiency and low environmental impact. In particular, since CO is an index that reacts quickly to incomplete combustion, fast and accurate measurement is required.

Assuming installation of a CEMS for this purpose, this article introduces an example of measurement of the CO concentration in a cement plant using the CGT-7100 transportable gas analyzer in order to study the specification of the measurement range before installation of the CEMS.



Fig. 1 CGT-7100

■ Measurement Method

Using a copper tube and PTFE tube (see Fig. 2), sample gas was introduced into the CGT-7100 from the sampling nozzle of a flange provided on the suspension preheater at the gas outlet of the rotary kiln.

Table 1 Measurement Conditions

Analyzer	: CGT-7100
Measured compound	: CO
Measurement range	: 0 - 5000 ppm
Sample gas flow rate	: 2.5 L/min



Fig. 2 Condition of CO Concentration Measurement by CGT-7100



Fig. 3 Cement Manufacturing Plant

■ Results

Fig. 4 shows results of the CO concentration measurement by the CGT-7100. The CO concentration generally trended in the range from 500 to 2500 ppm, but sometimes exceeded this range, reaching 4000 ppm or more.

■ Conclusion

It was possible to decide the specification of the CEMS planned for installation based on the CO concentration measurement results shown in Fig. 4. Since both the CEMS and the CGT-7100 use the non-dispersive infrared absorption method (ratio photometry), the data obtained with the CGT-7100 accurately reflect the measurement performance of the CEMS, and thus can be considered appropriate for preliminary measurements.

Although this article describes a study of the specifications of a CEMS, the CGT-7100 is also actively used in cross-checks during inspections and as a backup when a CEMS malfunctions, taking advantage of its simplicity and transportability. Moreover, because it is possible to cover a wide range from low to high concentrations of any of the compounds CO, CO₂, CH₄ with a single instrument, the CGT-7100 can also support measurements and surveys of unexpected concentrations.

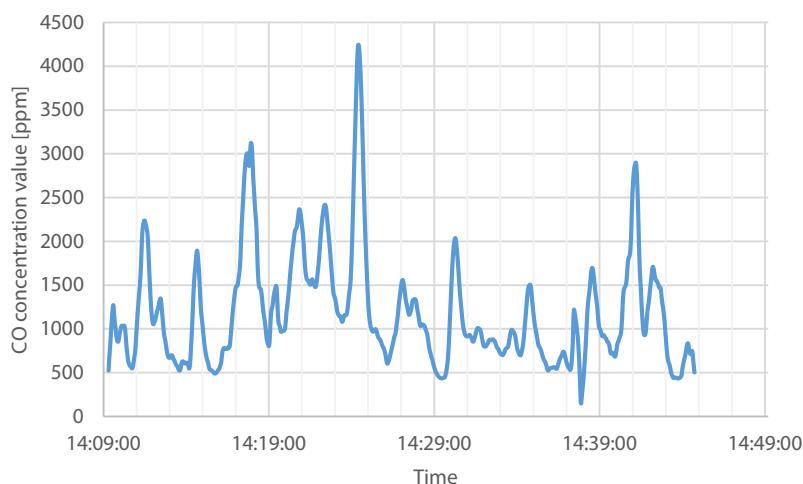


Fig. 4 Results of CO Concentration Measurement of Rotary Kiln Gas

Table 2 Specifications of CGT-7100

	Type 1	Type 2	Type 3
Measured components	CO, CO ₂	CO, CH ₄	CO, CO ₂
Measurement range	CO: 0-1000/5000 ppm CO ₂ : 0-5/15 vol%	CO: 0-5 vol% CH ₄ : 0-20 vol%	CO: 0-10/20 vol% CO ₂ : 0-10/20 vol%
Measurement principle	CO, CO ₂ , CH ₄ : Single light source dual beam non-dispersive infrared absorption method (ratio photometry)		
Repeatability	Within ±0.5 % of full scale		
Zero drift	Within ±1 % of full scale per day		
Span drift	Within ±1 % of full scale per day		
Linearity	Within ±2 % of full scale	CO: Within ±2 % of full scale CH ₄ : Within ±3 % of full scale	Within ±2 % of full scale
Response time (Td + T90)	CO, CO ₂ , CH ₄ : Selectable from 15, 30, or 60 seconds		3 minutes or less (at sample gas flow rate of 100 mL/min)
Sample gas flow rate	Approx. 2.5 L/min (gas flow rate into sample cell: 1.0 L/min)		100 - 400 mL/min (variable)
Transmission output	0 - 1 V DC, 3-channel insulated output (however, non-insulated between channels)		
Wireless signal output	Yes		
Data storage to external media	Allows data in CSV format to be saved to a USB flash drive.		
Permitted ambient temperature	5 - 40 °C. Should be protected from direct sunlight and radiant heat.		
Power requirements	100 V AC, 50-60 Hz, 130 VA		
Dimensions	W260 × H452 × D420 (excluding protruding parts)		
Weight (main unit)	Approx. 16 kg		
External drain separator	Yes	No	

Please consult with Shimadzu Corporation for combinations of measured components, measurement ranges, sample gas flow rates, and other specifications not included in the above-mentioned Types 1 to 3.



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