2014-7

Probe Type Light Scattering Method

Dust Density Meter

(Relative continuous measuring monitor system)

DDM－HAL2

Technical introduction

R&D , Manufacture , Sale , Maintenance

Tanaka Electric Laboratory Co., Ltd.

1. Why you use dust density meter?

Even in Japan,many companies did not use dust density meter because of no legal duty.

However ,the companies can not produce their product by exhausting poisonous substance in the global economy.

In the present,dust density meter is becoming important monitor of producing process to protect air environment.

CEMS (Continuous Emission Monitoring System) is requiring continuous dust monitor in many countries.

Content of proposal:

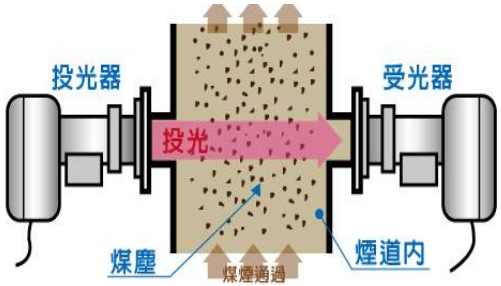
1） Measurement of dust concentration by the hand analysis method in the law (JISZ8808) is only analyses data in several-time per year. Can you say that it is daily data ?

2） In case of dust exhausting over air pollution limit level, residents near plants inform to the city office in any time. The officer requires the evidence to the companies about dust concentration. So the continuous dust concentration data is important to explain the plant conditions.

3） Preventive maintenance: By using continuous dust concentration trend data,you can maintenance of EP(electro static precipitator) and bag filter before exhausting a lot of dust to the atmosphere.

2. Kind of dust density meter

① Optical penetration type

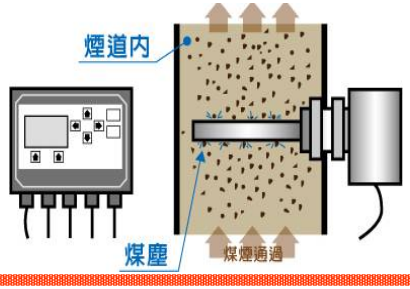


The advantage: cheap

The fault: The detection sensitivity is low,

optical axis shifts, and it takes time to maintenance.

② Electrode type・・



The advantage: Easy installation. (installation hole in one place)

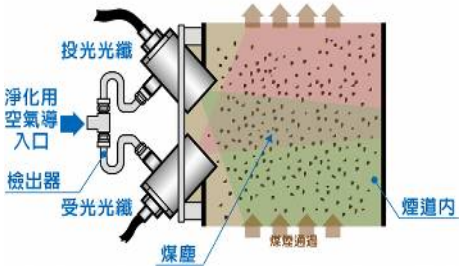
The fault: The moisture influences to the dust density output signal.

It is improper in the outlet of EP. This type cannot calibrate of zero & span adjustment.

③ Light scattering type・・

The advantage: The dust density in the low concentration can be measured.
The correlation coefficient is high.

The fault: Multiplex scattering appears over about 500mg/m3N .
Under this condition,the correlation coefficient will be low.



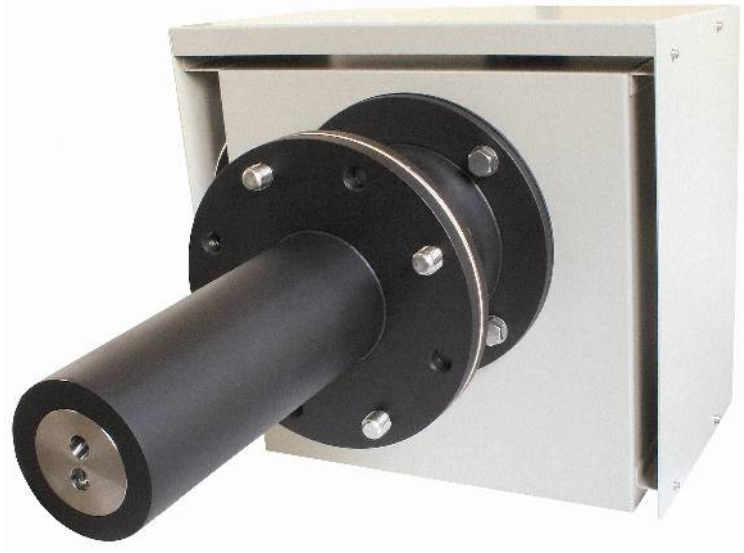
Our DDM-HAL2 is non-sampling method dust density meter, so easy installation by one side of duct wall and easy maintenance.

Probe type detector head. No optical axis shifts .

It is possible to calibrate zero & span under plant operation.

Automatically span calibration by CPU.

3. DDM-HAL2 WHOLE PICTURE



Our dust density meter DDM-HAL2 is manufactured as the same quality of the Fuji electric company's nuclear instruments in our Tochigi factory . Our design concept is easy maintenance for a long time .

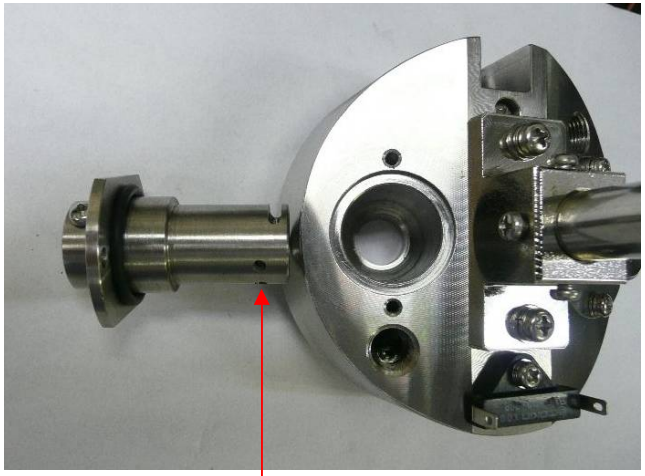
① **Very easy installation to the duct by JIS 10k 100A flange.**

② **Light source is red color LED (625nm). Life cycle is about 30,000 hours.**

③ **This dust density meter can be used under open air, because of synchronous detection method.**

④ **Non contamination of dust by peculiar air purge structure and heated probe.**

4. Structure of detector head



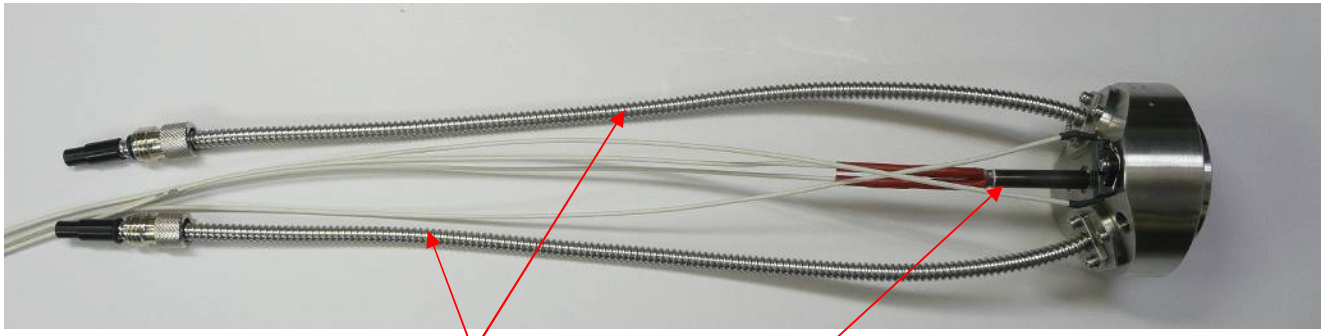
Patent: Oct/2004

No. 3604496 (Japan)

The silica glasses are built in the detector head. By separate from Optical fiber cables, there are prevented from contamination by peculiar air purge system.

Peculiar purge discharge hole

Opposed double-layered and different height hole structure achieves complete air purging.



Inside of probe: Optical fiber cables and heater

Detector silica glasses are prevent from contamination by peculiar air purge system.

At very sticky & wet high concentration flue gas.

5. Easy installation

The installation on the duct is only one place by standard flange, electrical wiring & air piping also.

The construction cost will be half level of the optical penetration type.

Attach the DDM-HAL2 unit

A hole making to the duct, and welding of probe attachment flange JIS 10K 100A (standard size)

Search the installation point.

For example Upstream 2D, Downstream 1D

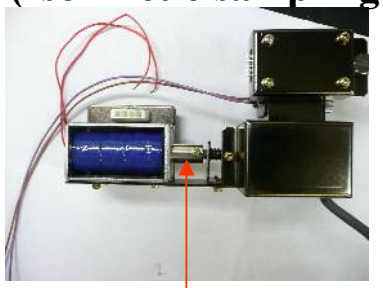
Electric wiring and air piping

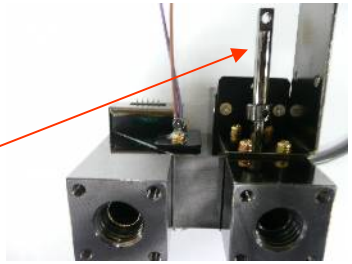
Adjustment under flue gas flowing (plant operation)

6. Calibration

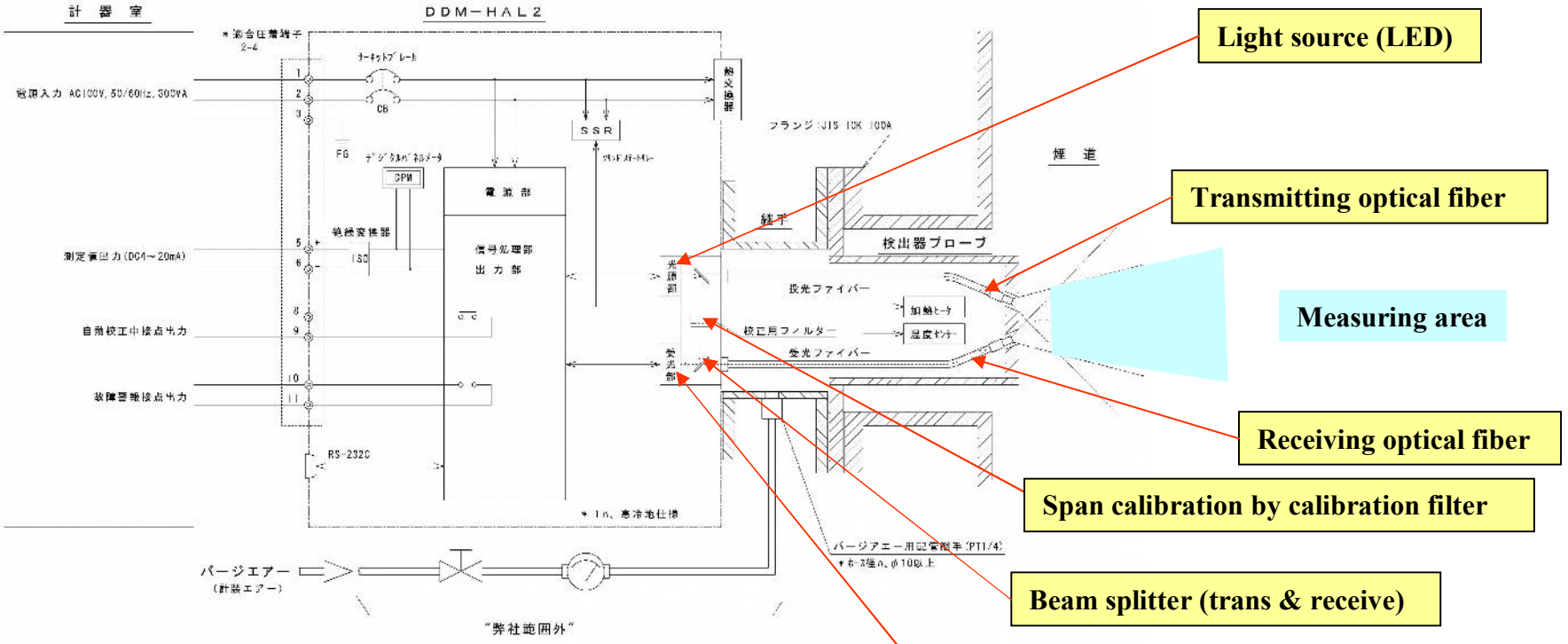
(It is possible to adjust zero & span under plant operating.)

This dust monitor is a relative continuous instrument that by adjusting with hand analysis method (Isokinetic sampling)data of dust concentration in the chimney or duct.





Solenoid actuator moves shutter from measuring mode to calibration mode by CPU signal, and use calibration filter .



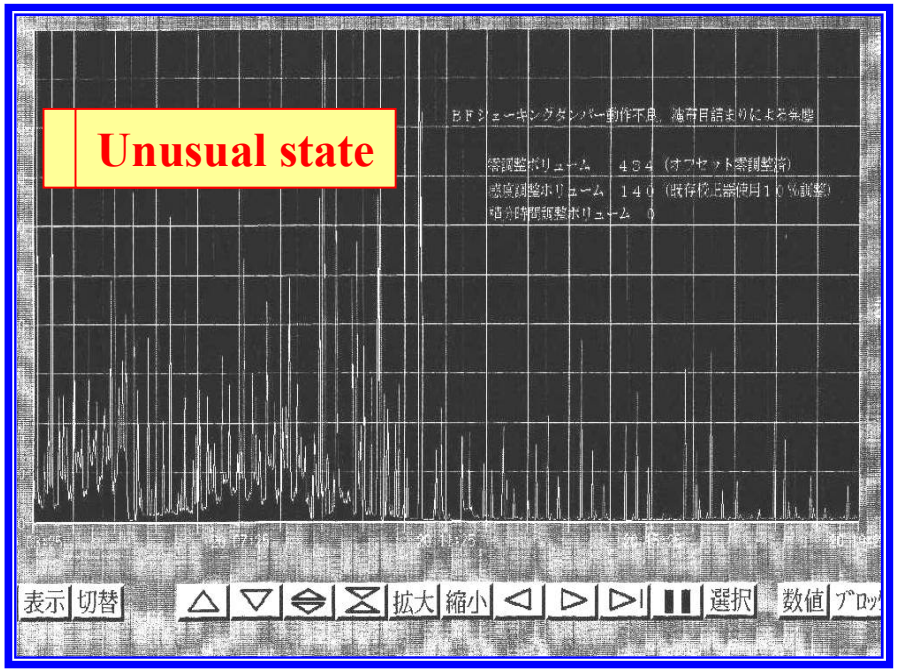
DDM-HAL2　Composition figure

7. Comparison of specification with other maker's dust density meter

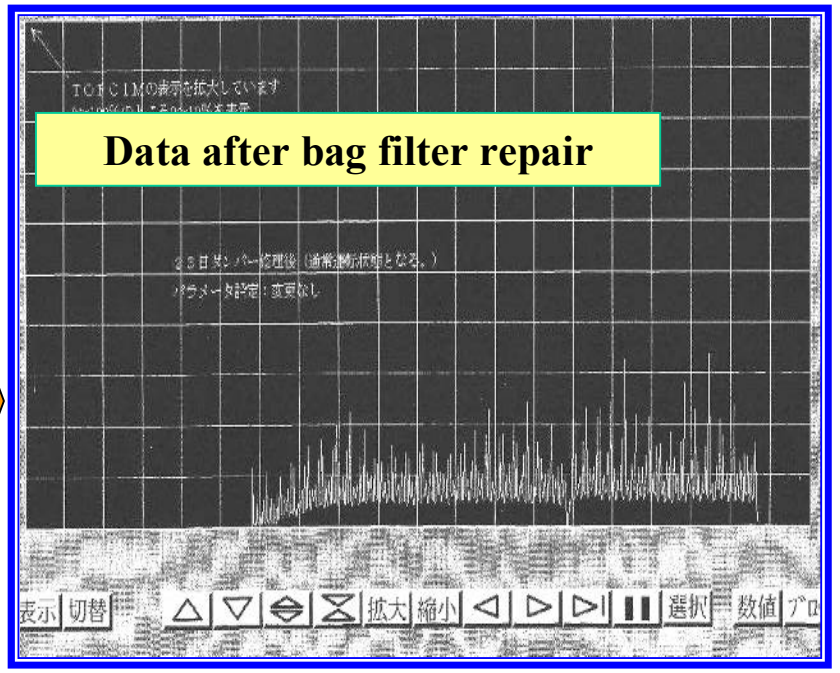
Maker / Type	Tanaka (Japan) DDM-HAL2	SICK (Germany)OMD41	PCME (UK) DT270
Principle	Non-sampling light scattering	Optical penetration	Electrode
Installation procedure	◎	×	◎
	・Cut the one hole to the duct. ・Detector attaches to the one place ・ No optical axis shifts ・No electric wiring to the detector head。 ・Only one air piping to the detector. ・Installation cost is not costly.	・Cut the 2 holes of transmitting and receiving unit with regarding light axle. ・It is necessary to re-check the light axle under high temperature plant operating. ・2 electric wiring and air piping to the detector. This is costly.	・Very easy installation because of one flange attach to the duct.
Installation place	◎	×	○
	・Detector head is installed in any place because of synchronous detection method. ・The measurement is possible without being affected by the sun light.	・The measurement is impossible by affecting the sun light.	・Electrode is not separated by the electric unit, so it is impossible to install at the high temperature ducts.
Flue gas condition	◎	△	△
	・Standard：~250℃ ・Maintenance free under moisture flue gas condition. ・The flue gas flow changing does not influence to the dust density signal.	・ Temperature Standard： ~250℃ ・ maintenance is necessary under moisture flue gas condition. ・The flue gas flow changing does not influence to the dust density signal.	・ Temperature Standard： ~250℃ ・Cannot measure well under moisture flue gas condition. ・The flue gas flow changing does influences to the dust density signal.

Type	DDM-HAL2	OMD 41	DT 270
Calibration method	◎	×	×
	・ Calibration is possible under plant operation. ・Zero check and adjust by manual. ・Auto span calibration mode by CPU is equipped.	・ It is impossible to zero calibrate under plant operation.	・ It is impossible to calibrate including electrode and electronics circuit.
Consumables	○	△	◎
	・LED lamp assy. Easy changeable of LED mounted PCB.	・LED lamp and blower are special made by maker.	・No consumables.
Maintenance	◎	○	◎
	・ No optical axis shifts ・ Opposed double-layered and different height hole structure achieves complete air purging	・The gap of a small optical axis is corrected by an auto collimator, and it is not small gap ,the optical axis suiting work is required any more by two people.	・Maintenance free. (It is not sure)
Running cost	○	△	◎
	・Instrument air required.	・ Special made LED lamp and blower are costly than general purpose parts.	・Nothing.
Total cost	◎	△	◎
	・There is an advantage as a whole cost about equipment procurement cost + installation expense + calibration cost. ・Maintenance cost is not costly.	・A whole cost is high because the construction expense is very high .	・A whole cost is very low because the construction expense is also cheap . ・However the cost of adjustment with hand analysis data in several times per year is costly.

8. Measurement data (tendency management)



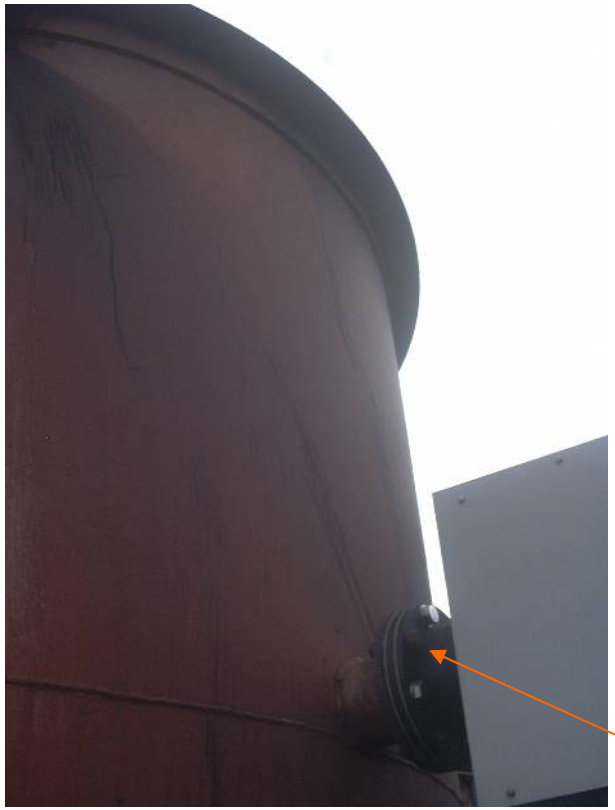
Since the dust density meter was installed in bag filter exit duct, it became clear that directions are swaying greatly. The filter was got blocked and it was proved that the defect of the damper was the cause.

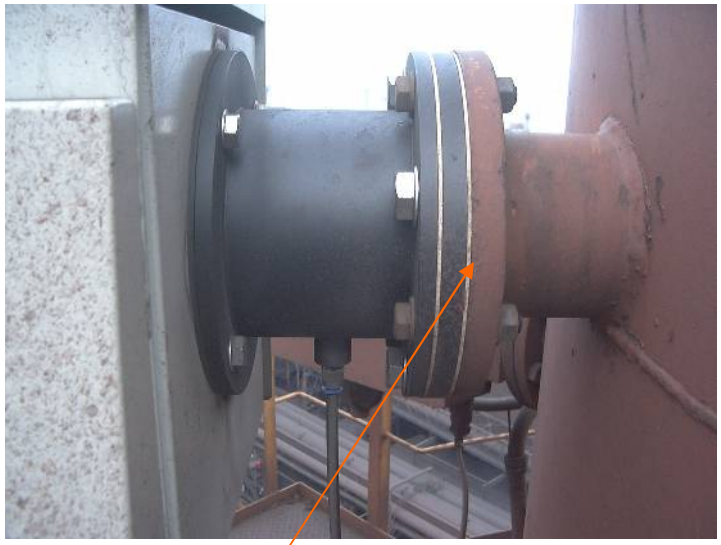


When repair of the bag filter cloth and the damper was performed, change of directions decreased. (The sensitivity of dust density meter is the same as before.) The above-mentioned graph extends a vertical axis to 0-10%, and is looking at it.

As a result of dust density meter directions performing operation management of a dust-collecting machine(bag filter & EP), a lot of dust discharge to environment was able to be prevented in advance.

9. Installation at Iron furnace plant



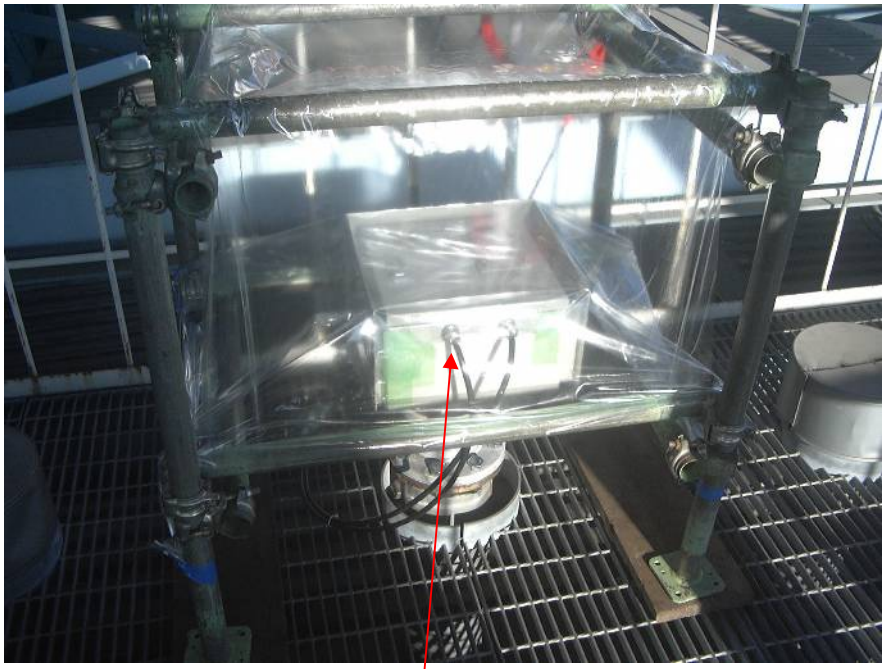


Standard JIS 10K 100A flange

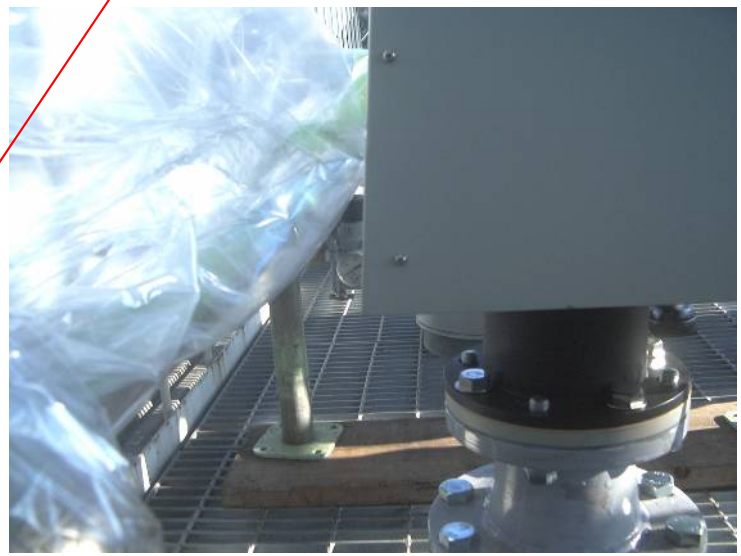
Detector head installed at duct open end.

The measurement is possible without being affected by the sun light.

10. Installation at Electric power plant



Coal electric power EP outlet



Install at duct top flange

11. Installation at Paper mill

Test at under -20℃ atmosphere

Test by isokinetic sampling (JISZ8808)

12. Customer list (DDM-2001,DDM-HAL2) 1/2

Mitsubishi material Corp. Yokoze	Sludge incinerator Jyounanjima Tokyo
Mitsubishi material Corp. Kyusyu	Sumitomo osaka cement Co. Kochi
Cyugoku electric power Co. Ube	Iwaki daio paper Co. Iwaki
Onoda cement Co. Tsukumi	Sumitomo osaka cement Co. Tochigi
Ube kosan Co. Kanda,Kyusyu	Sumitomo metal industries Co. Kokura
Sumitomo metal industries Co. Kashima	Hachinohe cement Co. Hachinohe
Aso cement Co. Kanda,Kyusyu	Okinawa electric power Co. Kin
Ryukyu cement Co. Okinawa	Oji paper Co. Kasugai
Chichibu onoda cement Co. Chichibu	Nippon Seiko Co. Nakase
Mitsubishi material Corp. Kurosaki	Chichibu taiheiyo cement Co. Chichibu
Myojyo cement Co. Itoigawa	Mitsubishi material Corp. Kyusyu
Dai showa peper making mfg.Co. Fuji	Kyoei steel Co. Yamaguchi
Taiheiyo cement Co. Chichibu	Asahi glass Co. Keihin
Asahi glass Co. Sagami	Mitsui mining/Mitsui mike manufactureCo. Omuta
Nippon steel Co. Kimitsu	Mitsubishi material Corp. Naojima
Nissshin steel Co. Kure	

12. Customer list 2/2

Industrial garbage incinerator Kagoshima

Nikko metal Co. Saganoseki

Birla cement works chittorgarh

Tokuyama Corp. (soda) Tokuyama

Bridgestone Corp. Hikone

Tokuyama Corp.(cement) Nanyo

Shinryo alumi recycle Co. Oyama

Taiheiyo cement Co. Saitama plant

J-power Co. Matsuura power plant

Kyoei steel Co. Nagoya

Eco energy Japan Co. Chiba

JFE steel Co. Chiba

Oji paper Co. Kasugai/MHI Yokohama

Kobe steel Co. Kakogawa

DC Co. Kawasaki cement plant

Kansai thermo chemical Co, Kakogawa

220 units in June.2014

Hokkaido electric power Co. Naie plant

Iwaki daio paper Co./ MHI Yokohama

Cyubu electric power Co, Atsumi plant

Kyusyu electric power Co. karita plant

Cyubu electric power Co, Chita plant

JFE Bars & Shapes Corp. Sendai

Taiheiyo cement Co. Tosa plant

Taiheiyo cement Co. Saiki plant

Hokkai steel Co./Nippon steel Muroran

Ube kosan Co. Ube IPP electric plant

Cyubu electric power Co,Nishi nagoya plant

Hokuriku electric power Co,Nanaooota plant

Nippon paper Co. Ishinomaki ,Iwakuni plant

Yoshino Gypsum Co. Saitama plant

Asahi carbon Co. Nigata plant

EGAT MAE MOH #12 FGD

Nippon steel sumitomo Co.