Matsushima
Matsushima Measure Tech

Matsushima Measure Tech Co.,Ltd.

WEBINAR on "Dust Measurement Technologies"

for productivity improvement and environmental solution by continuous dust leakage monitoring at dust collector.

Please wait a little while until the webinar begins.

- Date & time: October 5th, 2020 / 17:00 – 17:50 (at Japan, UTC+9)
- Program:
  1. Typical dust measurement technologies
  2. Dust Monitor and Air Dust Monitor
  3. Q&A
- Presenter: Mr. Kazuhito Maeda, Marketing Manager at MMT
  Mr. Mamoru Omura, Area Sales Manager at MMT

WEBINAR

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PRECAUTIONS for the webinar

Your microphone is muted during the webinar.

Please use the Q&A column on the right side of the screen if you have any question.

Questions are welcome at any time.
You can send a text on the Q&A column at any time.

We will have the Q&A session at the end to reply to your questions.

If we don’t have enough time to reply to your question, we’ll send an answer later by separate email.

Who is Matsushima Measure Tech?

Company name	**Matsushima Measure Tech Co., Ltd.**
Founded	**1946**
Products and services	**Level Sensing** Radar level transmitter, Various level switches, Customized level measuring systems for harsh applications. **Dust Sensing** Various dust monitoring sensors for industrial dust collector, piping, stack, open workplace, clean room, etc. **Safety Sensing** Safety switches for belt conveyor, conveyor belt automatic adjusting carrier, belt tear detector, belt cleaner, etc. **Robot System** COBOT (Human Collaborative Robot) system, automation engineering, etc. **Others** Actuators, Position sensors, etc.
Network	**Subsidiaries** in: China and South Korea **Distributors** in: Taiwan, Indonesia, India, Thailand, Malaysia, Vietnam, Philippines, Australia, Mongolia, Russia and US
Reference	Steel, Cement, Power, Metal, Fertilizer, Chemical, Food, Mining, etc.

Today's topics

1. **Dust Measurement Technologies**

   for productivity improvement and environmental solution
   by continuous dust leakage or emission monitoring
   (Mr. Kazuhito MAEDA, Marketing Manager at MMT)

   a. Typical five dust monitoring methods
   b. Benefits on continuous monitoring
   c. Typical three continuous monitoring methods

2. Triboelectric **Dust Monitor** and **Air Dust Monitor**
   (Mr. Mamoru OMURA, Regional Sales Manager at MMT)

3. **Question and Answer** session

= Webinar =

“Dust Measurement Technologies”

for productivity improvement and environmental solution by continuous dust leakage monitoring at dust collector

- Date : October 5th, 2020
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- Presenter : Mr. Kazuhito MAEDA
  Marketing Manager
  at Matsushima Measure Tech Co., Ltd.

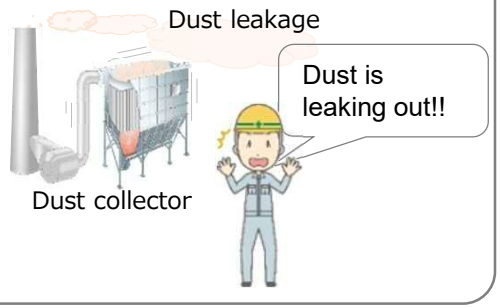
Question!

How do you monitor the dust leakage from your dust collector in the plant?

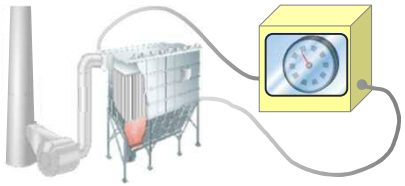
”How do you monitor dust leakage in the plant?”

Please choose from the following six options

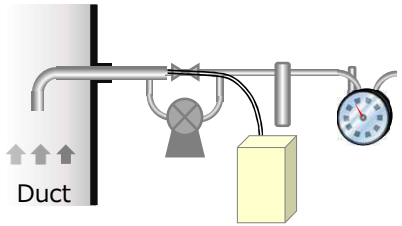
① Visual checking



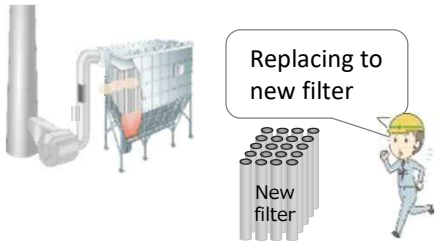
② Manometer



③ Isokinetic analysis



④ Periodical filter replacement

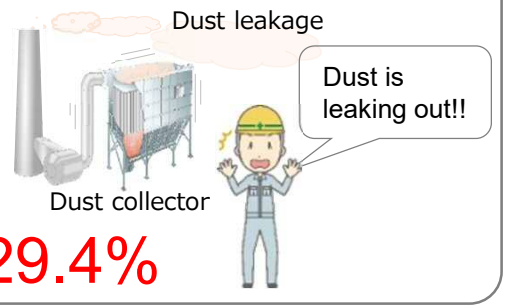


⑤ Continuous monitoring with Dust monitor

Result of survey in July 2020

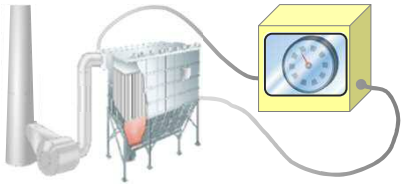
Question: How do you monitor dust leakage in the plant?

① Visual checking



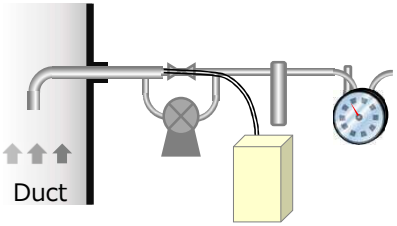
29.4%

② Manometer



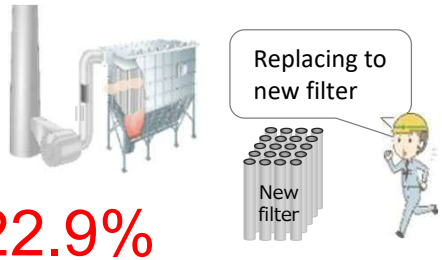
12.4%

③ Isokinetic analysis



3.5%

④ Periodical filter replacement

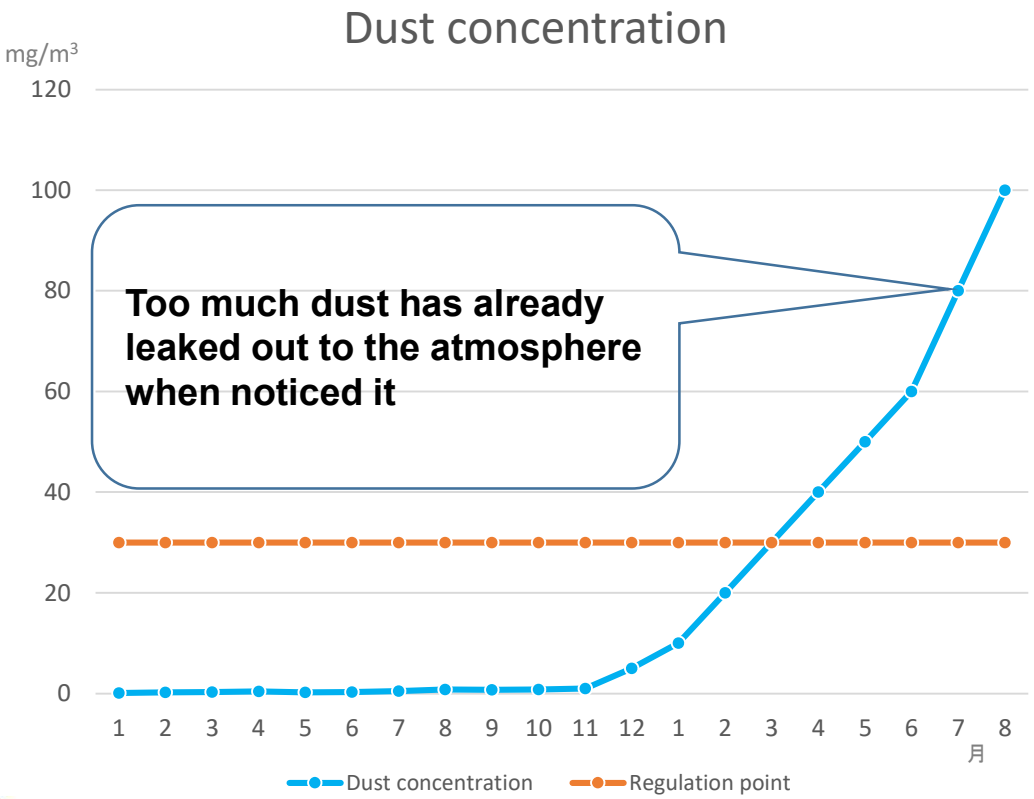


22.9%

⑤ Continuous monitoring with Dust monitor

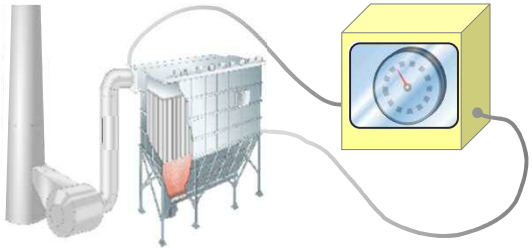
18.2%

① Visual checking

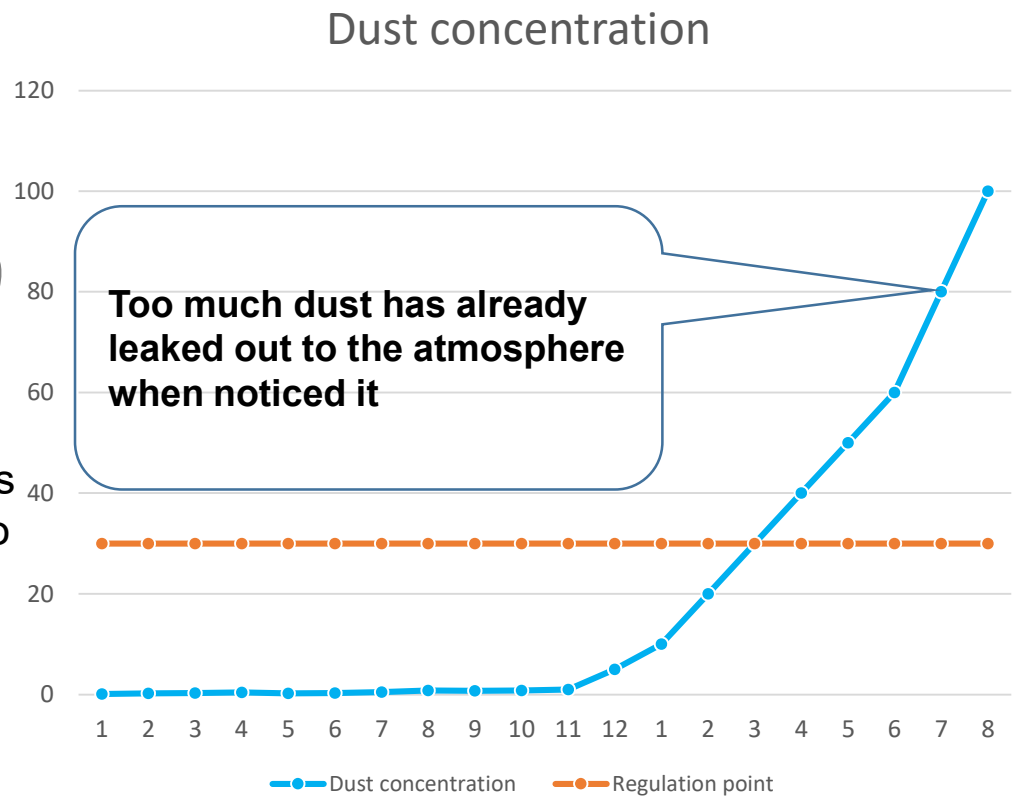


Dust has already leaked out and gone above the regulation point when you noticed by your eyes.

② Manometer monitoring



Manometer is a differential pressure system that detects clogging of the filter built into the dust collector.



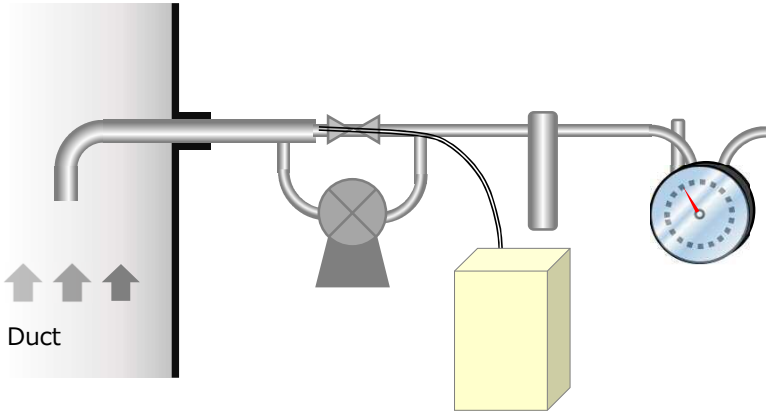
This Manometer (differential pressure) system can detect filter bag breakage because pressure becomes same when it breaks.

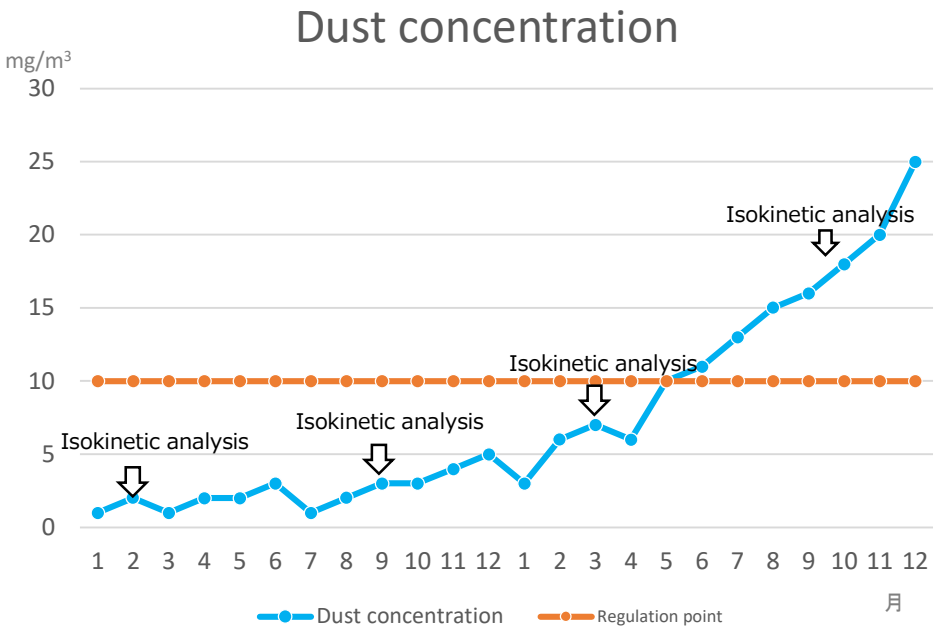
But

It is difficult to detect a small amount of leakage by the small pressure difference. When Manometer find the filter breakage, the leaked dust must go beyond the regulation point.

That

③ Isokinetic analysis





Analysis method based on environmental standard or government regulation (e.g. JIS Z 8808). (Periodical check once every few months)

But

- **Because it takes several hours to analyze it, it cannot get real-time data.**
- **If dust suddenly leaks out by filter breakage during an interval, it cannot be detected.**

④ Periodical filter replacement

(Preventive maintenance)

It's time to replace the filter

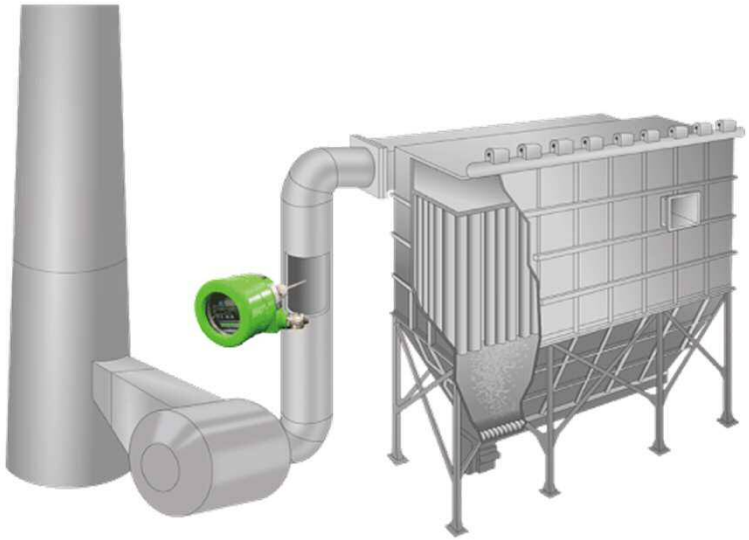
These filter can be still used. It's a waste of filter and time to replace it!

It's a good counter-measure for environment.

But

- You may miss a sudden dust leak
- Maintenance costs are high
- The exchanged filter may be continuously used for a few more years.

⑤ Continuous monitoring with dust monitor



Monitoring method as predictive maintenance!!

- **Prevents environmental damage by detecting sudden leaks.**
- **Since the dust sensor monitors on behalf of workers, it results in eliminating regular inspections and labor saving.**
- **Since filters can be used by maximum lifespan, it results in cost saving.**

But

All dust sensors for dust collectors indicates relative values.

Therefore, it may be difficult to set the threshold of the dust sensors.

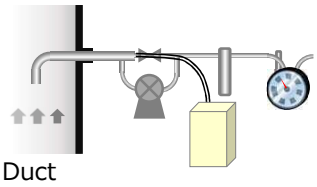
Summary of each monitoring method

Monitoring method	Techniques and benefits	Disadvantage
① Visual checking	Visual	Already go beyond regulation point
② Manometer	It monitors pressure difference, and it detects the filter breakage when the pressure does not have difference between before and after the filter.	It is difficult to detect a small amount of leakage by the small pressure difference. When Manometer find the filter breakage, the leaked dust must go beyond the regulation value.
③ Isokinetic analysis	Analysis method based on the environmental standard (e.g., JIS Z 8808)	Because it takes several hours to analyze it, it cannot get real-time data. If dust suddenly leaks out by filter breakage during an interval, it cannot be detected
④ Periodical filter replacement	Preventive maintenance considering the frequency of use and life	May miss a sudden leak. Maintenance costs are high. The exchanged filter may be still used for a few more years.
⑤ Continuous monitoring with dust monitor	It prevents environmental damage by detecting the sudden leakage. It is predictive maintenance, resulting in labor and cost saving.	Since all dust sensors indicates relative values, it is difficult to set the threshold value.

What is the best way?

Specific dust
(harmful to human health)

Isokinetic analysis

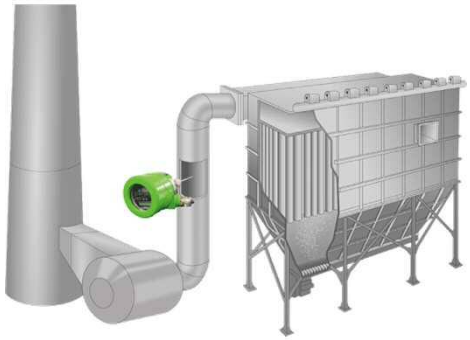


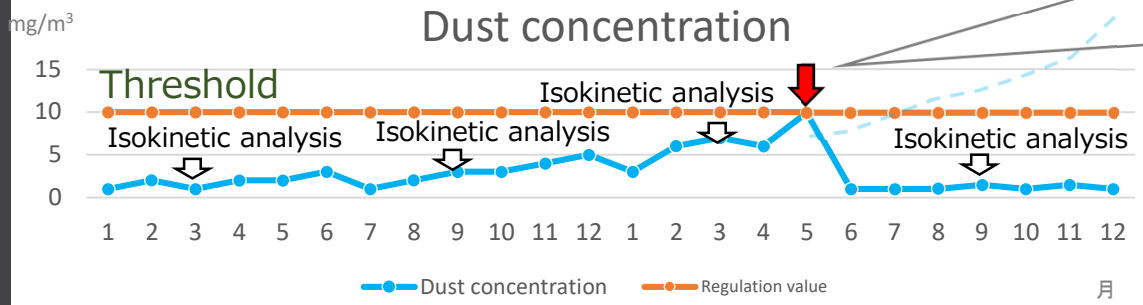
+

Dust Monitor

General dust
(nonharmful)

Dust Monitor





Even during intervals of isokinetic analysis, dust leakage can be detected by monitoring with a dust monitor.

Benefit of continuous monitoring

- Prevent environmental damage to detect even small leaks!
- Continuous monitoring during intervals of isokinetic analysis.
- Labor and cost saving through predictive maintenance!

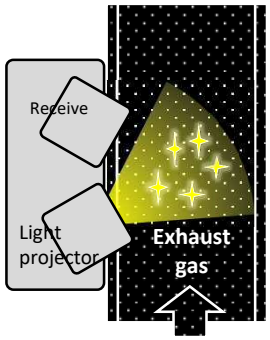
Kinds of continuous monitoring

DUST MONITOR

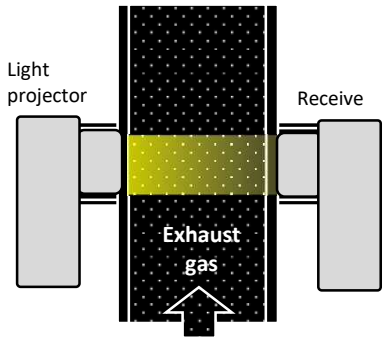
Typical 3 methods of dust monitor

In JIS Z 8852, the below 3 methods are specified as the continuous measurement for dust concentration.

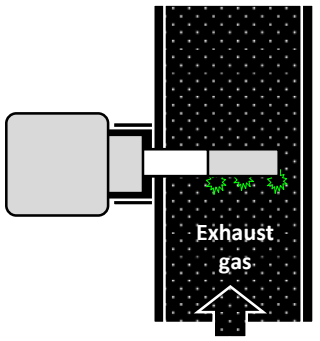
Light scattering



Light transmission



Triboelectric Dust Monitor

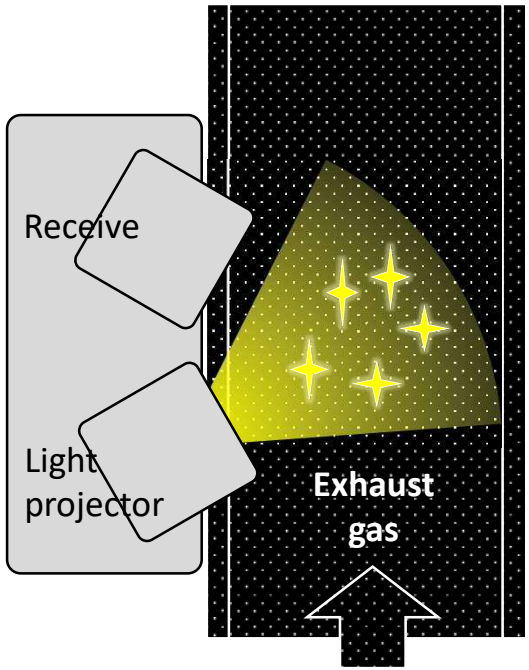


Optical principle

Light scattering principle dust monitor

When the measuring light is irradiated to dusts flowing the pipe, the light is absorbed and scattered.

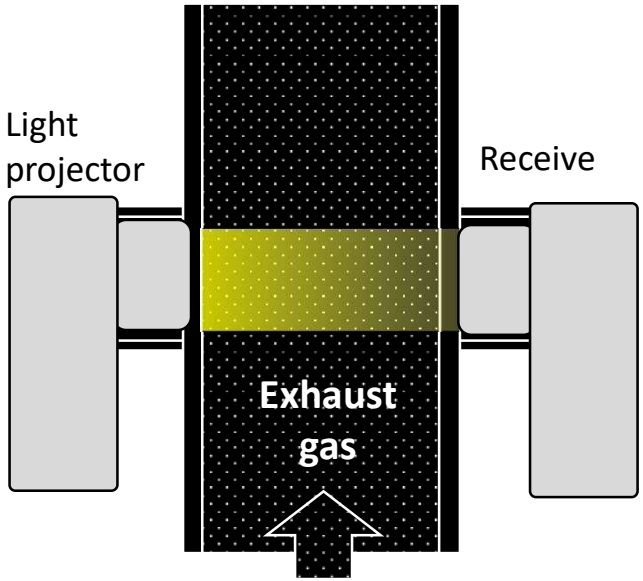
In this situation, the scattered light intensity is measured because it is correlated with the dust concentration.



Light transmission principle dust monitor

When the measuring light is irradiated to dusts flowing the pipe, it is blocked by dust and the original light is attenuated.

In this situation, the measuring light intensity is measured because it is correlated with the dust concentration.

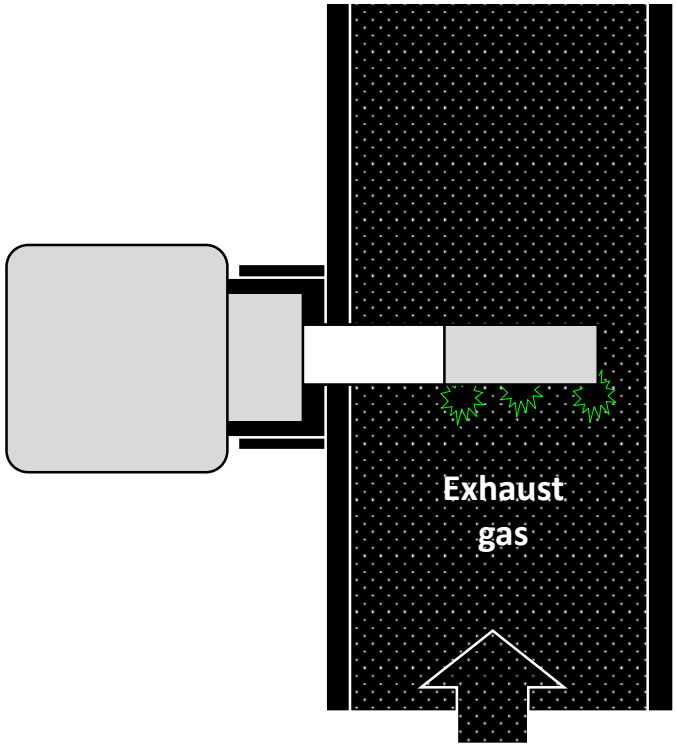


Triboelectric principle dust monitor

When two solids come into contact, electrical charge transfers between them. This charge transfer is known as "**friction static electricity**" or "**contact charging**".

Similarly, when the particles flowing in the pipe contact or pass through the electrode probe, induction phenomena (electrical charge transfer) occurs between the particle and the probe.

In this situation, this transferring electrical charge is measured because it is positively correlated with the dust concentration.



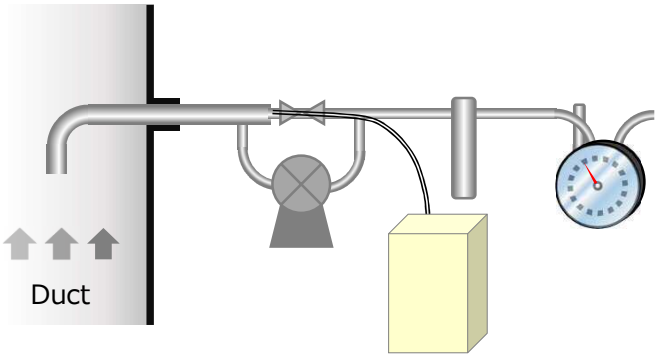
Features of 3 principle

Method	Light scattering	Light transmission	Triboelectric
Correlation coefficient (r)	0.994	0.989	0.969
Measuring concentration (mg/m^3)	0～10、0～500 Low concentration	0～20、0～10000 Middle – high concentration	0～10、0～1000 Low to middle concentration
Advantage	- Available for charged dust - No influenced by flow velocity - It can be calibrated during plant operation	- Available for charged dust - No influenced by flow velocity	- No influenced by a color of dust - Easy installation - No need air-purge - No need special technical knowledge
Disadvantage	- Influenced by particle size and a color of dust - Adhesion to lens makes inaccurate measurement - Air-purge is required - Special technical knowledge is required	- Light axis adjustment is required. - Adhesion to lens makes inaccurate measurement - Air-purge is required - Special technical knowledge is required.	- Influenced by charged dust (eg., after electric precipitator) - Influenced by flow velocity
Maintenance	Cleaning lens is required. (Air-purge type as cleaning function)	Cleaning lens is required. After cleaning, light axis adjustment is also required.	Just wipe off adhesion on probe No need any readjustment
Price	High	High	Low

Absolute value measurement?

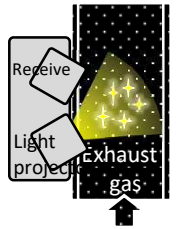
Absolute value

Isokinetic analysis

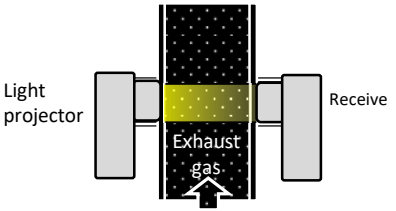


Relative value

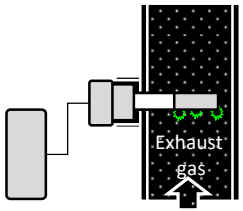
Light scattering



Light transmission



Triboelectric

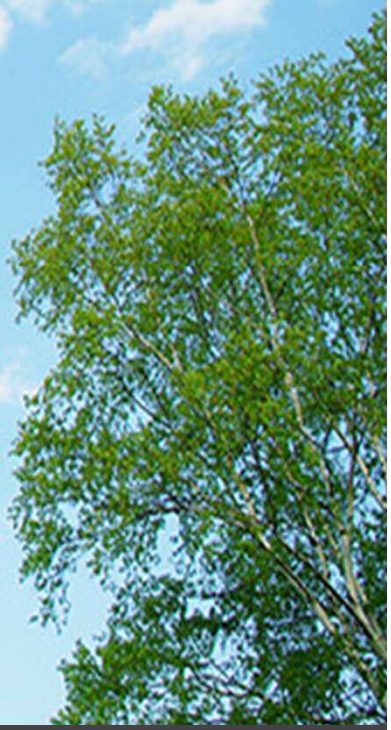


The absolute value is only the value measured by the isokinetic method of the official analysis.

All other dust sensors are relative values. Each sensor can output closer value with the isokinetic measurement by their own correction function.

Thank you for your attention.

We will answer to your questions after next session for our Triboelectric DUST MONITOR and AIR DUST MONITOR presented by Mr. Mamoru Omura.



Matsushima Measure Tech

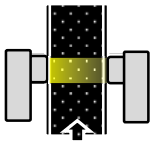
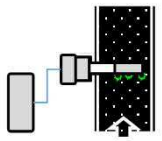
Dust Monitor

PFM series

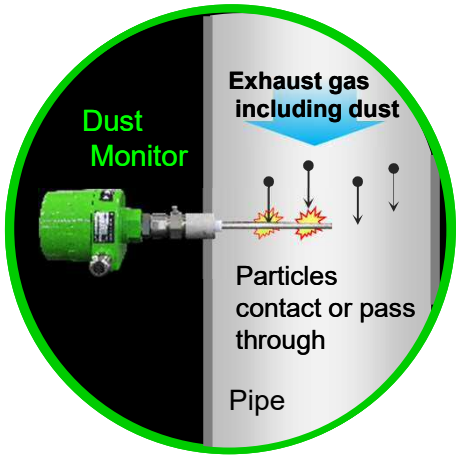
Immediately detect even small leakage by continuous monitoring

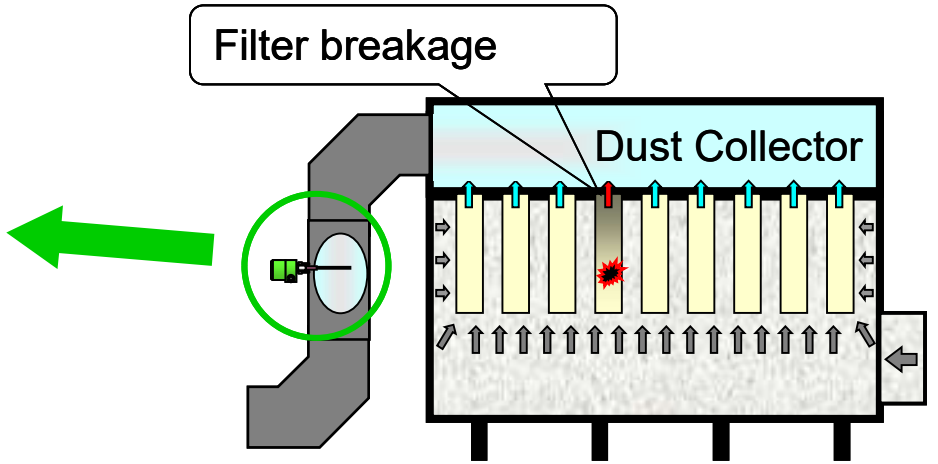
Dust Monitor, which is installed after dust collectors, is an **environment monitoring instrument** to prevent dust emission by filter breakage in advance or minimize the leakage.

What is benefit to select **triboelectric sensor?**

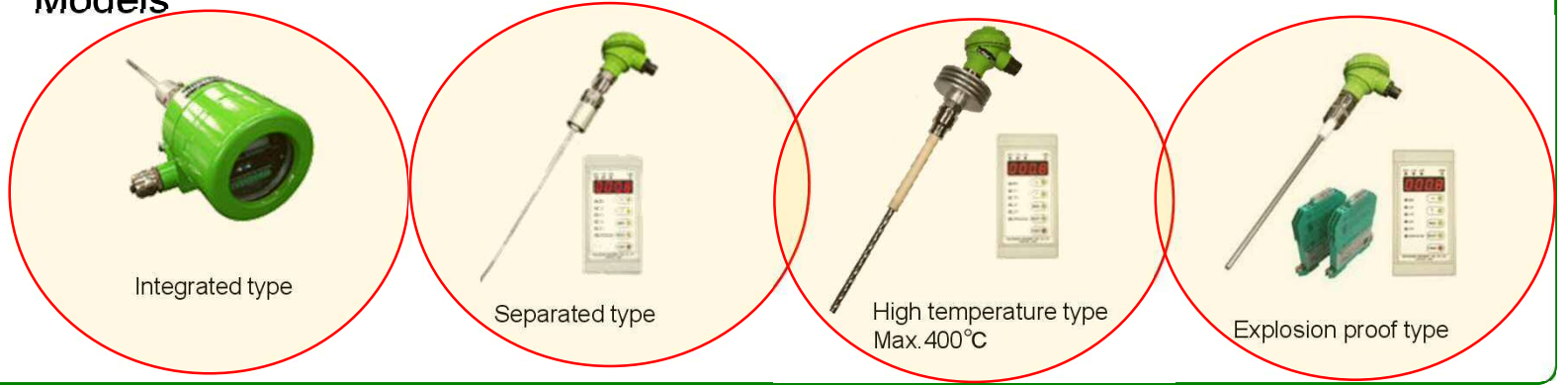
	Light scattering	Light transmission	Triboelectric
			
Special technical knowledge	Required	Required	Not necessary
Easy maintenance	△	×	○
Price	High	High	Low

Dust Monitor





Models



Specifications

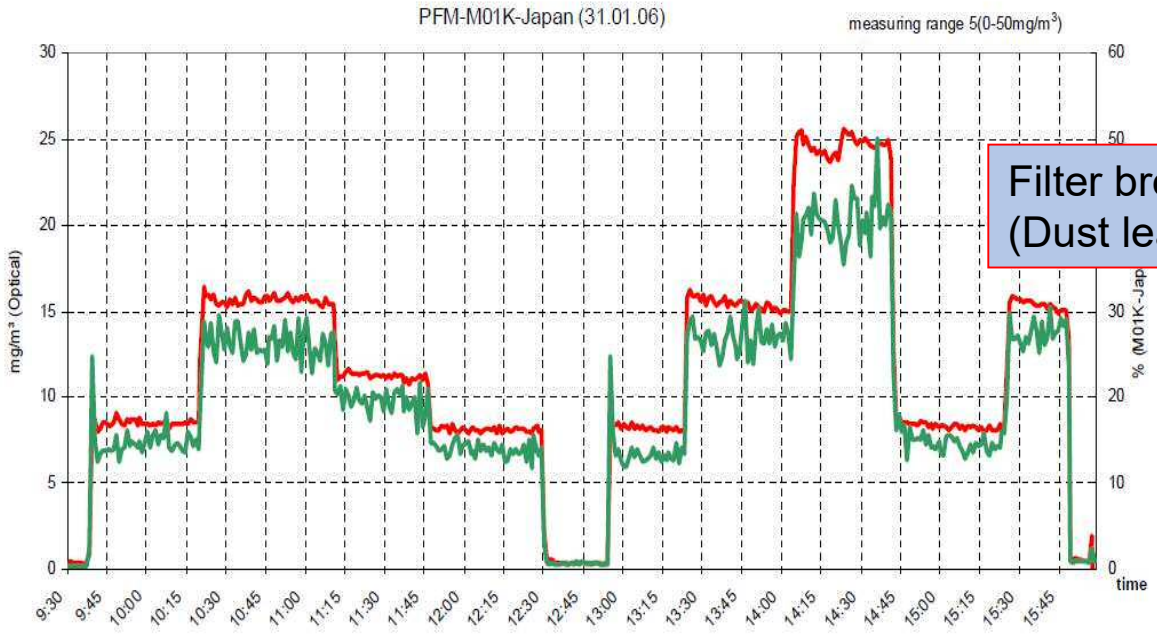
Sensor Type	Sensor with Integrated Transducer	Remote Sensor Type	
	Standard	Standard	High-temperature
Model No.	PFM-M01E	PFM-M11P	PFM-M11PT
			
Construction	Sensor with integrated transducer	Sensor & Transducer separated	
Power supply	AC80 – 240V 50/60Hz	Supplied from transducer	
Signal cable length	-	Standard 5m (can be extended to max.100m)	
Display	10-segment LED (Lights up per 10%)	-	
Analog output	DC4 - 20m A (Load resistance 500Ω)	Output from Transducer	
Contact output	1a for upper limit, 1b for fault (Contact capacity AC250V 2A)	Output from Transducer	
Particle size	Min. 0.3μm		
Measuring range	0.1 – 1000 mg/m^3 (Relative concentration)		
Process temperature	Max.250 deg.C		Max.400 deg.C
Measurement level	9 levels	Set on Transducer	
Probe length		300 – 1000mm	

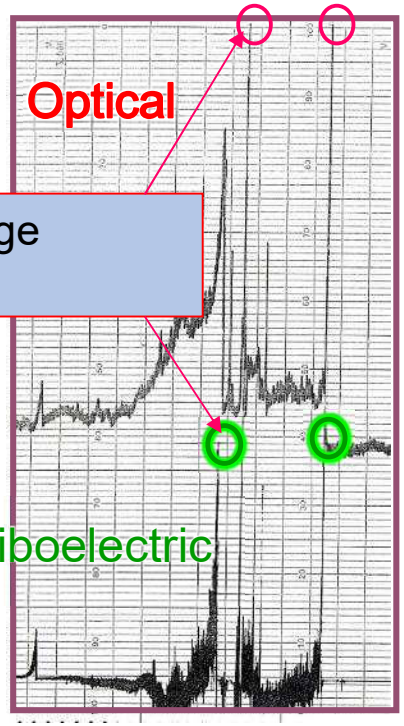
Specifications

Transducer type	Standard	With Concentration-level correction	
Model No.	PFM-KCU11	PFM-KCU12	PFM-KCU14
			
Power Supply	AC110V/220V -15%/＋10%　50/60Hz		
Unit	%		mg/m^3
Output contact	Upper limit: 1c x 2, Fault alarm: 1c x 1 (Contact capacity AC250V 2 A)		
Correction range	–	0.1 - 2 .0 times (per 0.1)	
Measurement level	9 levels		

※Intrinsic safety type(Ex ib ⅡB T4）is also available.

Comparison between triboelectric and optical type





■ Optical type
■ Triboelectric type (Matsushima Dust Monitor)

Triboelectric type makes the same trend with expensive optical type.

Correlation between Dust Monitor and Isokinetic analysis (JIS Z 8808)

In the process of JIS standardization, Matsushima Dust Monitor is applied for performance evaluation tests of triboelectric sensors.

Test Material	Concentration mg/m³	Display value (PFM-M01E) %	Correlation coefficient
Fly Ash	7.5	12.665	0.969
	7.4	12.588	
	7.4	12.454	
	7.5	12.067	
	14	20.481	
	15	20.645	
	14	21.676	
	13	22.550	
	19	32.041	
	22	31.219	
	24	30.995	
	22	30.789	
	28	54.598	
	28	52.249	
	32	55.193	
	31	54.234	

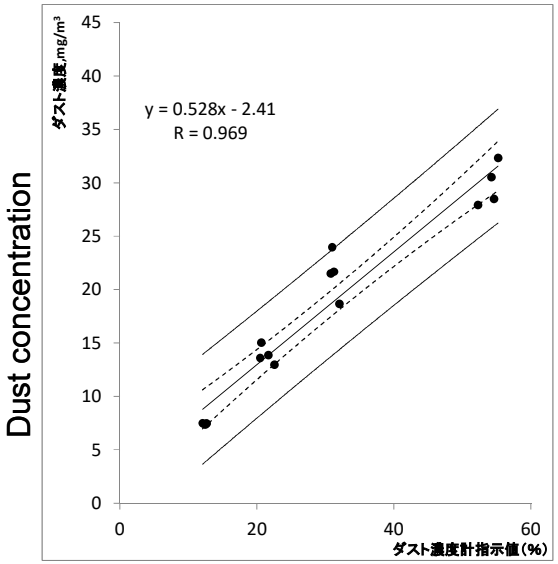


Fig 1. Correlation

Ref. JIS B 7996

< Reference >
Correlation coefficient

0.0～0.2:	Little correlation
0.2～0.4:	Weak correlation
0.4～0.7:	Some correlation
0.7～0.9:	Strong correlation
0.9～1.0:	Almost perfect correlation

Correlation coefficient = 0.969
It proves almost perfect correlation.

Feature of Dust Monitor

1. It is affordable, but equivalent performance with isokinetic analysis
2. Online dust sensor defined by environmental standards (e.g., JIS Z 8852)
3. Easy maintenance and easy installation due to low cost and no special technical knowledge

Air Dust Monitor

“Monitoring dust concentration in the atmosphere”

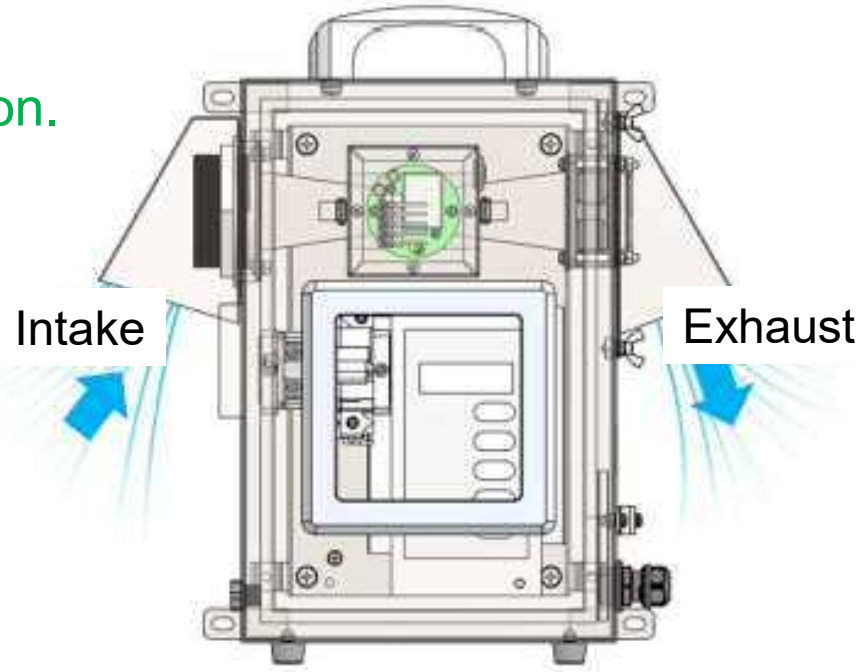
- **Prevent dust from spreading in the neighborhood**
- **Improve indoor working environment**
- **Power saving by controlling dust collectors**

What is Air Dust Monitor?

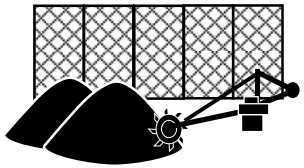
Dust is taken from the atmosphere by self-suction, and converted to dust concentration, which applies triboelectric function.

It is easy to carry and install it.

It continuously measures dust concentration in the atmosphere 24 hours a day in real time.

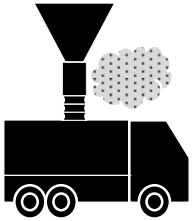


Applications

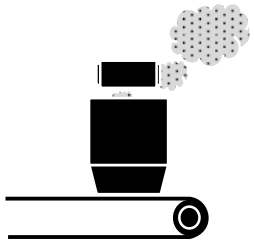


Dust from raw material yard

Working environment



Truck transportation facility



Dust from conveyor transportation

Dust from packing process

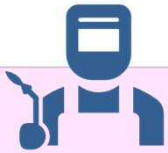
Dust from construction or disassembling site

Secure safe workplace at welding fume!

Ventilation problem at welding

Symptoms of pneumoconiosis from welding fume suction do not appear immediately but gradually get worse.
Dust musk and ventilating fan are not enough as the treatment for worker's working environment.

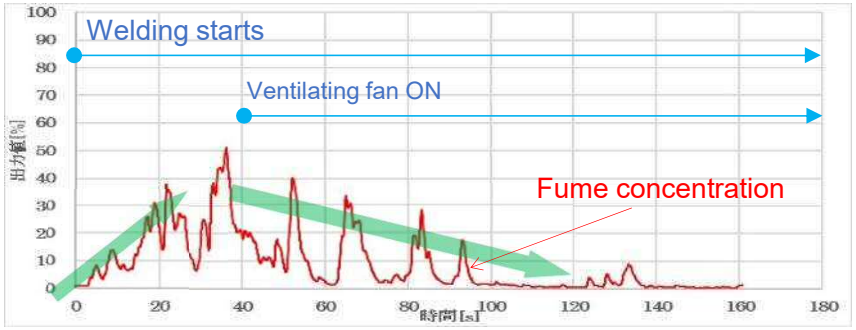
Requirements・・・



- ✓ **Ability to detect welding fume**
- ✓ **Continuous monitoring**
- ✓ **Portability to relocate monitoring position**

Air Dust Monitor provides solution.

It is portable instrument and possible to measure air dust concentration continuously 24h.



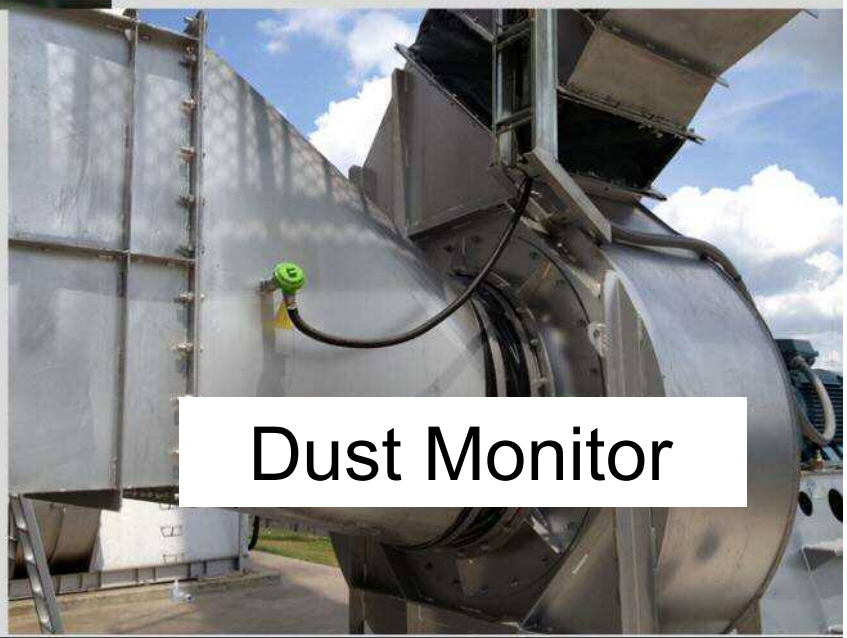
Specifications

Model No.	PFM-AD12
Principle	Triboelectric function
Condition	Particle size: ≧0.3 μm, Concentration: 0.1 – 1000mg/m^3, Humidity: ≦40vol%
Power supply	AC110V/220V -15%/+10% 50/60Hz
Output signal	DC4 - 20mA x 1 (Max.23.3mA)
Fault alarm	1c x 1 (AC250, 2A / DC30V, 2A)
Upper limit	1c x 2 (AC250, 2A / DC30V, 2A)
Display	Concentration: digital 4 digit display (0.0 - 118.5%)
Measuring range	0.1 - 1000mg/m^3, 9 range adjustment: Range 1 (lower sensitivity) - Range 9 (higher sensitivity)
Integration time	0 - 30s adjustable
Protection	IP54 (under the condition the cover and lead outlet are tightened)
Mass	Approx. 6.6kg

Powder concentration sensor

Matsushima

Matsushima Measure Tech



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Matsushima Measure Tech. designs, develops, and manufactures our original products.

We always continue to focus on most suitable solution and service to satisfy every request.

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= Webinar =

“Dust Measurement Technologies”

Question-and-answer session

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Thank you for joining to our webinar.

- Questionnaire will be sent to you via email just after this.
- It takes about only a few minutes.
  So, please kindly answer or send you opinion to those for our future improvement.
- After receiving your questionnaire, then we will send the presentation by return.

Again thank you for joining us this time.

We are looking forward to serve you in the near future.