RIKEN KEIKI

M210-17018

Applications in Food Product Market and Introduction to Gas Detectors and Alarms for Safety and Security

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Document contents

- About Riken Keiki
- Why do we need gas detectors?
  Risks associated with toxic gases
- Applications in food product market
- Major examples of accidents
- Product information
- International agents

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About Riken Keiki

About Riken Keiki

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RIKEN

1939

Riken Keiki

Headquarters
To be completed in September 2018 (conceptual drawing)

Riken Keiki was originally established to commercialize and sell detectors for preventing explosions in coal mines and on oil tankers.

About Riken Keiki

Methane gas measurements in coal mine

Optical Gas Indicator Model 3 (1939)

Certification

National heritage of analytical and scientific instruments
2014

Company profile

Company name	Riken Keiki Co., Ltd.	
Established	March 15, 1939	
Location	Headquarters: Development Center:	2-7-6 Azusawa Itabashi-Ku, Tokyo 2-3 Minamisakae-cho, Kasukabe-shi, Saitama
Factories	Hakodate-shi, Hokkaido; Sakurai-shi, Nara (affiliated company)	

Headquarters

To be completed in September 2018
(conceptual drawing)

Development Center

About Riken Keiki

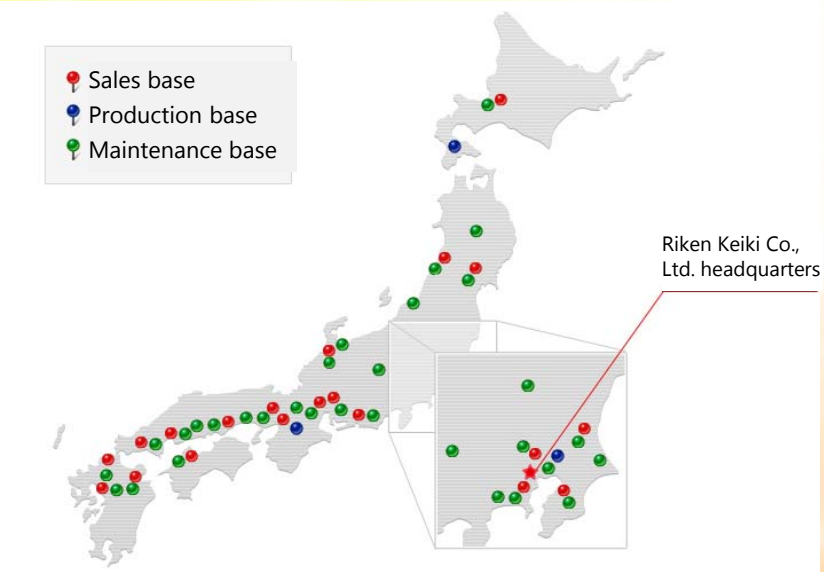
Headquarters
(Itabashi-Ku, Tokyo)

Development Center
(Kasukabe-shi, Saitama)

To be completed in September 2018
(conceptual drawing)

Locations of sales offices

◆Domestic◆



◆Global◆

Company profile

Various bases	Domestic sales and branch offices: 20 locations Service stations: 32 locations Global bases: 7 locations
Major sales items	Combustible gas detectors and alarms Gas detectors and alarms designed to prevent oxygen deficiency accidents Toxic gas detectors and alarms Combined gas detectors and alarms Various measuring instruments for environmental measurements and other instruments
Capital	2,565.5 million yen
Number of employees	965 (non-consolidated), 1,127 (consolidated) * As of September 30, 2017

Hakodate Factory
(Hakodate-shi, Hokkaido)

Nara Factory
(Sakurai-shi, Nara)

Company history

1939	Riken Keiki Co., Ltd. established to produce and sell optical gas detectors, photo-elasticity apparatuses, and other precision instruments invented and developed by RIKEN
1959	Start production and sale of combustible gas alarms and detectors (catalytic combustion type).
1967	Start production and sale of oxygen measuring instruments (OX-1).
1970	Start production and sale of monitoring tape type measuring instruments (FP-200).
1972	Start production and sale of non-dispersive infrared measuring instruments (RI-550).
1975	Start production and sale of electrochemical type measuring instruments (EC-231).
1986	Start production and sale of photoemission yield spectrometers (AC-1).
2009	70th anniversary of founding
2014	Start production and sale of portable X-ray diffractometers equipped with XRF (DF-01).
2015	Start production and sale of portable multi gas detectors (GX-6000), first product of its kind in Japan capable of housing photoionization detectors (PID).

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Why Do We Need Gas Detectors?
Risks Associated with Toxic Gases

Need for gas detectors (combustible gases)

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Criteria set by United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

According to the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS), a combustible gas (or flammable gas) is defined as follows:

A combustible or flammable gas is a gas having an explosive (flammable) range when mixed with air under atmospheric conditions of 20°C and standard pressure of 101.3 kPa.

Gases falling under this definition are further subdivided into the following two categories based on the severity of the associated risk:

Category 1 (Danger: Extremely flammable gas)

Gases capable of igniting at 20°C and standard pressure of 101.3 kPa when occurring in a mixture of 13% or less by volume with air or having an explosive (flammable) range of at least 12% when mixed with air regardless of the lower explosion (flammable) limit

Category 2 (Warning: Flammable gas)

Gases, other than those in Category 1, which are gaseous at 20°C and a standard pressure of 101.3 kPa and have an explosive (flammable) range when mixed with air

We need gas detectors because flammable gas leaks can lead to explosions.

Need for gas detectors (definition of permissible concentration)

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Definition of permissible concentration

Even when workers are exposed to hazardous substances at work sites, no adverse health effects should emerge as long as the airborne concentration of the **hazardous** substance remains below the permissible concentration.

Recommended permissible concentrations have been set by the American Conference of Governmental Industrial Hygienists (ACGIH) and the Japan Society for Occupational Health. We use the **ACGIH** permissible concentrations.

Types of permissible concentrations

- **TWA (Time Weighted Average)**
  Time Weighted Average refers to time-weighted average concentrations over an 8-hour workday and 40-hour workweek of routine work to which workers may be repeatedly exposed without adverse health effects.

- **STEL (Short Term Exposure Limit)**
  Short Term Exposure Limit refers to exposure that does not lead to adverse health effects if each exposure does not exceed 15 minutes, the number of daily exposures does not exceed four, and the exposures are separated by at least one hour.

- **C (Ceiling value)**
  Ceiling Value refers to the upper limit that can never be exceeded.

We need gas detectors because leaks exceeding permissible concentrations can lead to accidents.

How human body reacts to oxygen-deficiency

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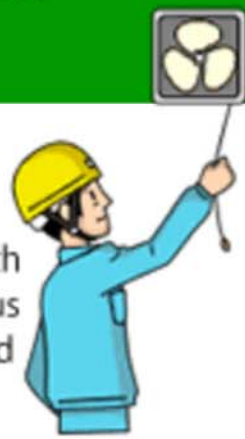
O2 Concentration 21%

Symptoms

Natural air

O2 Concentration 18%



Symptoms

Limit level for not causing serious health problems. Continuous ventilation is required

O2 Concentration 16%-12%

Symptoms

Rapid breathing, Increase in pulse rate, Loss of concentration, Headache, Nausea, Ear ringing

O2 Concentration 14%-9%

Symptoms

Stupor, Headache, Nausea, Cyanosis, Faintness on the entire body

O2 Concentration 10%-6%

Symptoms

Comatose, Loss of consciousness, Muscle spasm on the entire body

O2 Concentration 6% or less

Symptoms

Unconsciousness, Comatose, Cessation of breathing, Cardiac arrest, Die in 6 minutes

Effects of hydrogen sulfide (H_2S) on human body

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Concentration (ppm)	Effects and Toxicity
0.025	Smell vaguely. (It varies according to the individual.)
0.3	Smell clearly.
3 - 5	Smell moderate degree of objectionable odor.
10	Lower-level to irritate eyes' mucus membranes.
20 - 40	A strong odor. Lower-level to irritate lungs' mucous membranes.
100	Sense of smell is impaired in 2 - 15 minutes. Eyes and respiratory tract are irritated in 1 hour. 8 - 48 hours continuous exposure can lead to death.
170 - 300	1 hour exposure is the limit for not causing serious health problems.
400 - 700	Life-threatening exposure in 0.5 - 1 hour.
800 - 900	Bring on loss of consciousness, cessation of breathing and death.
1000	Bring on immediate loss of consciousness and death.

Effects of carbon monoxide (CO) on human body

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Concentration (ppm)	Effects and Toxicity
100	No noticeable effects even after breathing for a few hours.
200	A mild headache in around 1.5 hours.
400 - 500	Headache, nausea and ear ringing in around 1 hour.
600 - 1000	Loss of consciousness in around 1 - 1.5 hours.
1500 - 2000	Headache, vertigo and disabling nausea in around 0.5 - 1 hour, and losing consciousness.
3000 - 6000	Headache, vertigo, disabling nausea...etc. in a few minutes. 10 - 30 minutes exposure can lead to death.
10000	Bring on immediate loss of consciousness and death.

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Applications in Food Product Market

Applications in food product market

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1. Overall flow of food plant processes
   - 1-1: Arrival of raw materials to filling and packing
   - 1-2: From pressurization to shipment
2. Details of each process
   - 2-1: Pretreatment
   - 2-2: Blending and cooking
   - 2-3: Filling and packaging
   - 2-4: Pressurization, heat sterilization, and cooling
   - 2-5: Storage
   - 2-6: Transportation
   - 2-7: Other processes

1-1: Arrival of raw materials to filling and packing

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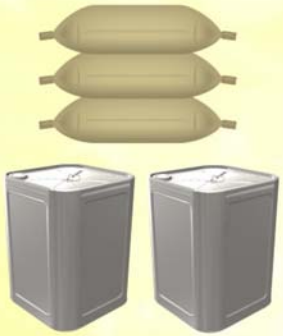
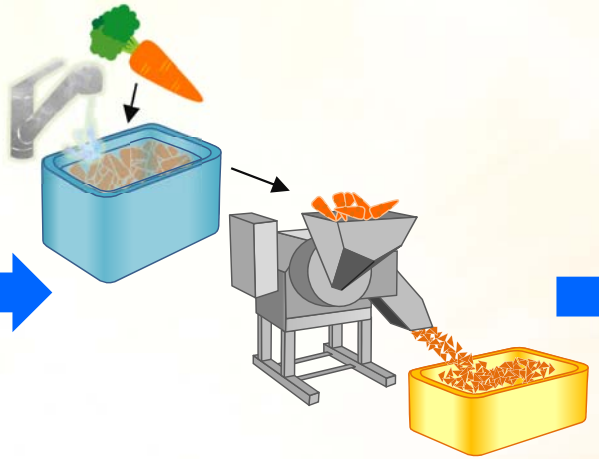


Arrival of raw materials

Raw materials acceptance inspections

* Refer to the document on fumigation by market.



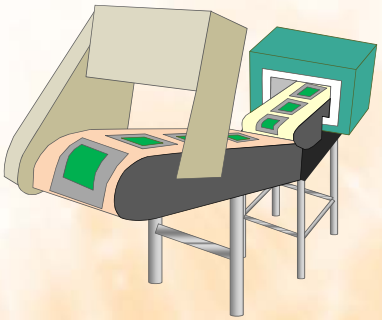
Pretreatment

⇒ Go to 2-1.

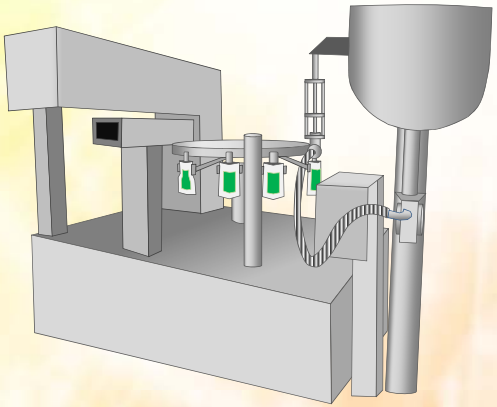
Blending and cooking

⇒ Go to 2-2.

Quality inspection



Metal detector



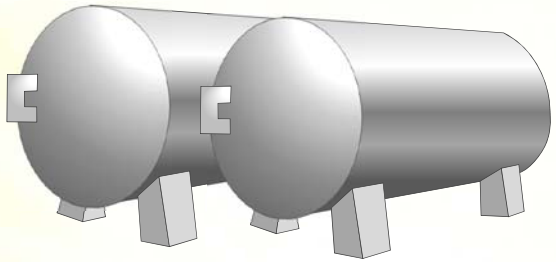
Filling and packing

⇒ Go to 2-3.

To heating

1-2: From pressurization to shipment

From filling and packaging



Pressurization, heat sterilization, and cooling

⇒ Go to 2-4.

Product inspection

Packaging

Storage

⇒ Go to 2-5.

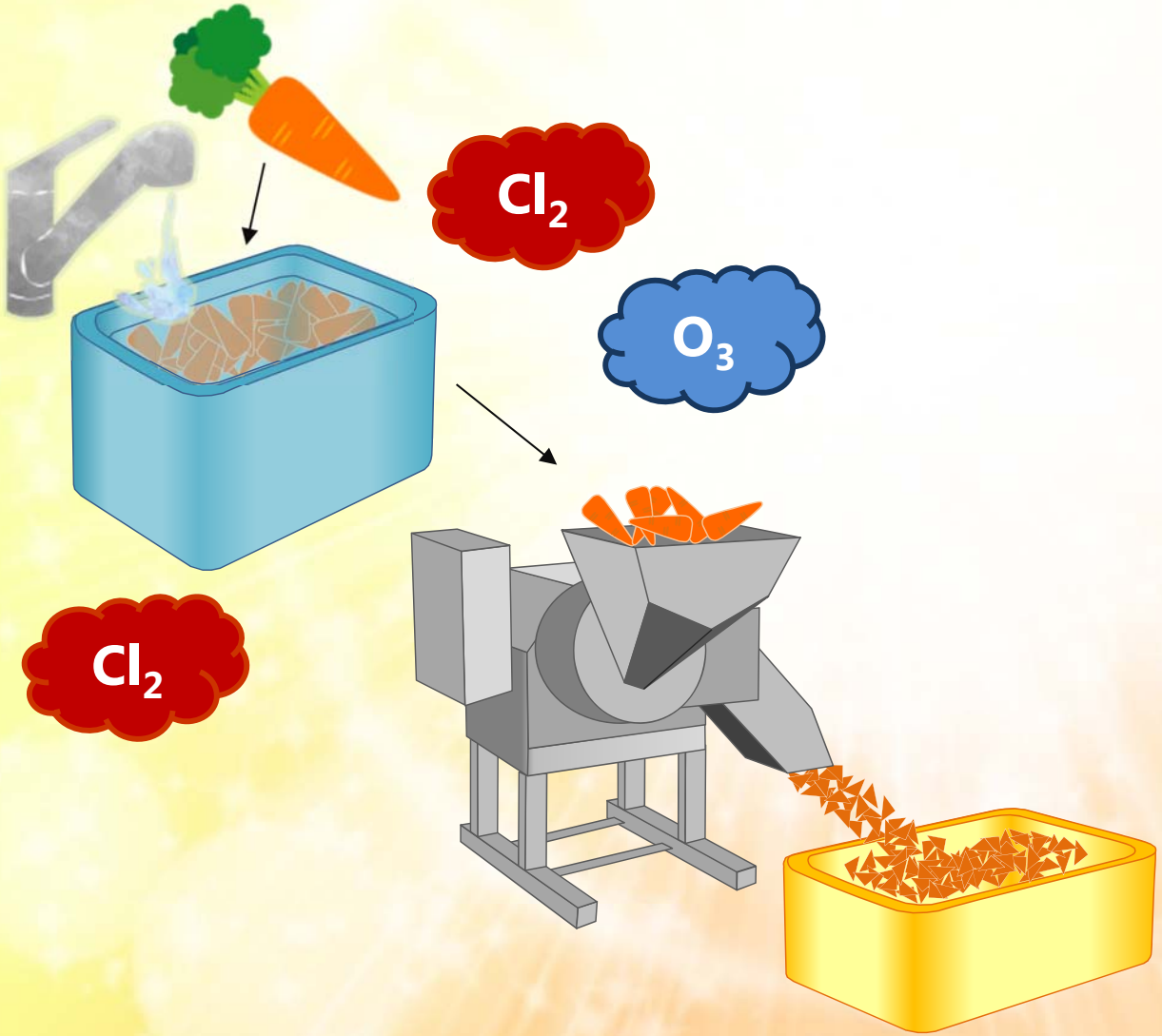
Shipment

⇒ Go to 2-6.

2-1: Pretreatment

Description: The materials are pretreated by washing and cutting.

Hazardous risks: **Sodium hypochlorite (specifically, the chlorine generated therefrom) and ozone used to wash and sterilize raw materials may result in cases of poisoning.** ⇒ **To prevent poisoning due to the chlorine and ozone generated**



Highly Sensitive Toxic Gas Monitor
Model: FP-300

Smart Transmitter/ Gas Detector
Model: GD-70D

Portable Toxic Gas Monitor
Model: SC-8000

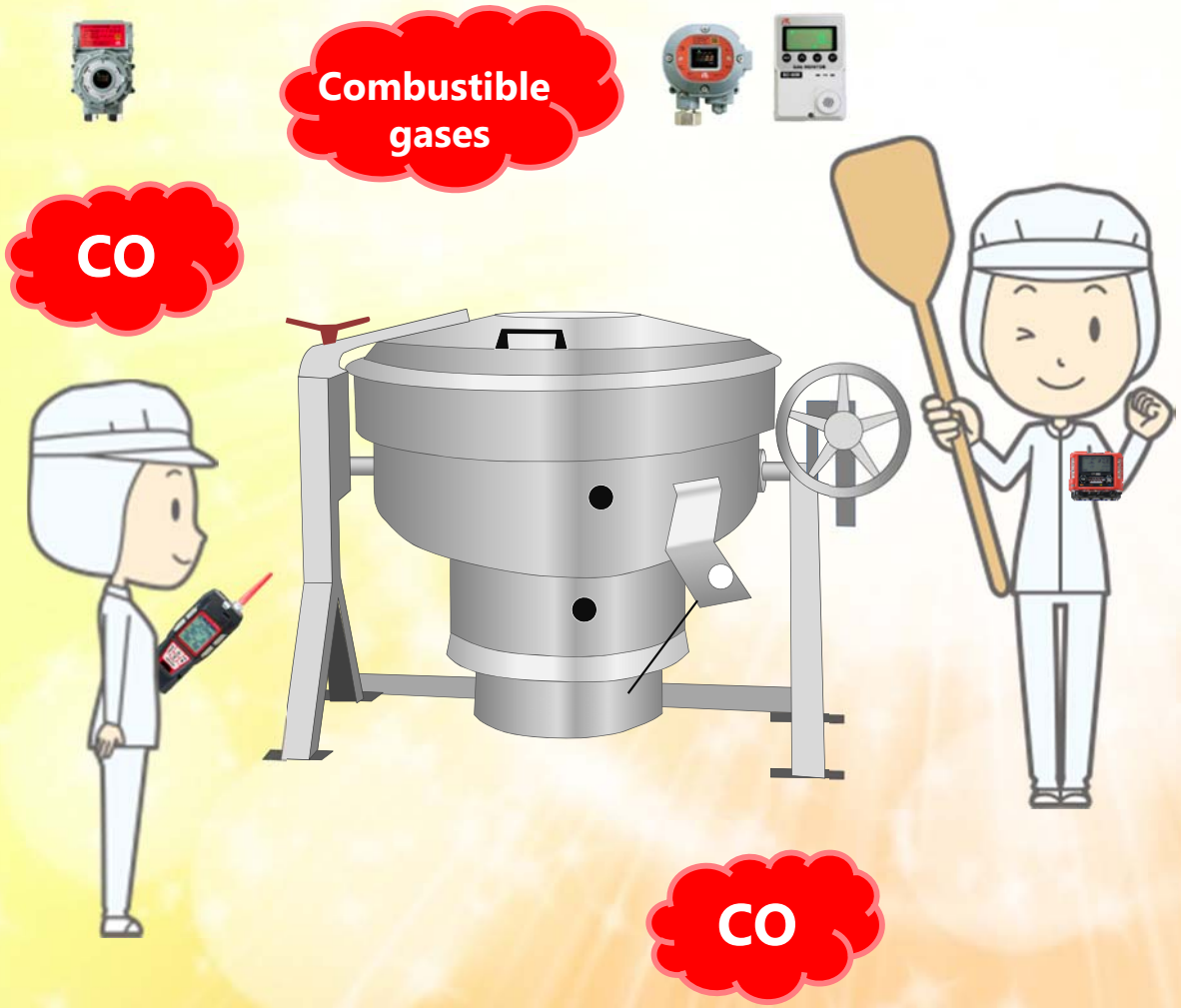
2-2: Blending and cooking

Description: The materials and seasoning are weighed and placed in a cooking vessel, then heated and cooked by sauteing, boiling, mixing, and stewing.

Hazardous risks:

During heating and cooking processes, CO generated from the materials and cooking combustion may cause CO poisoning. ⇒ **Detecting CO to prevent poisoning**

LPG and town gas generated from the cooking equipment used to heat the materials may cause explosions. ⇒ **To prevent explosions caused by LPG and town gas leaks**



Flame-proof Suction Type Gas Detector
Model: SD-D58

Smart Transmitter/ Gas Detector
Model: SD-1

Indoor Carbon Monoxide Monitor
Model: EC-600

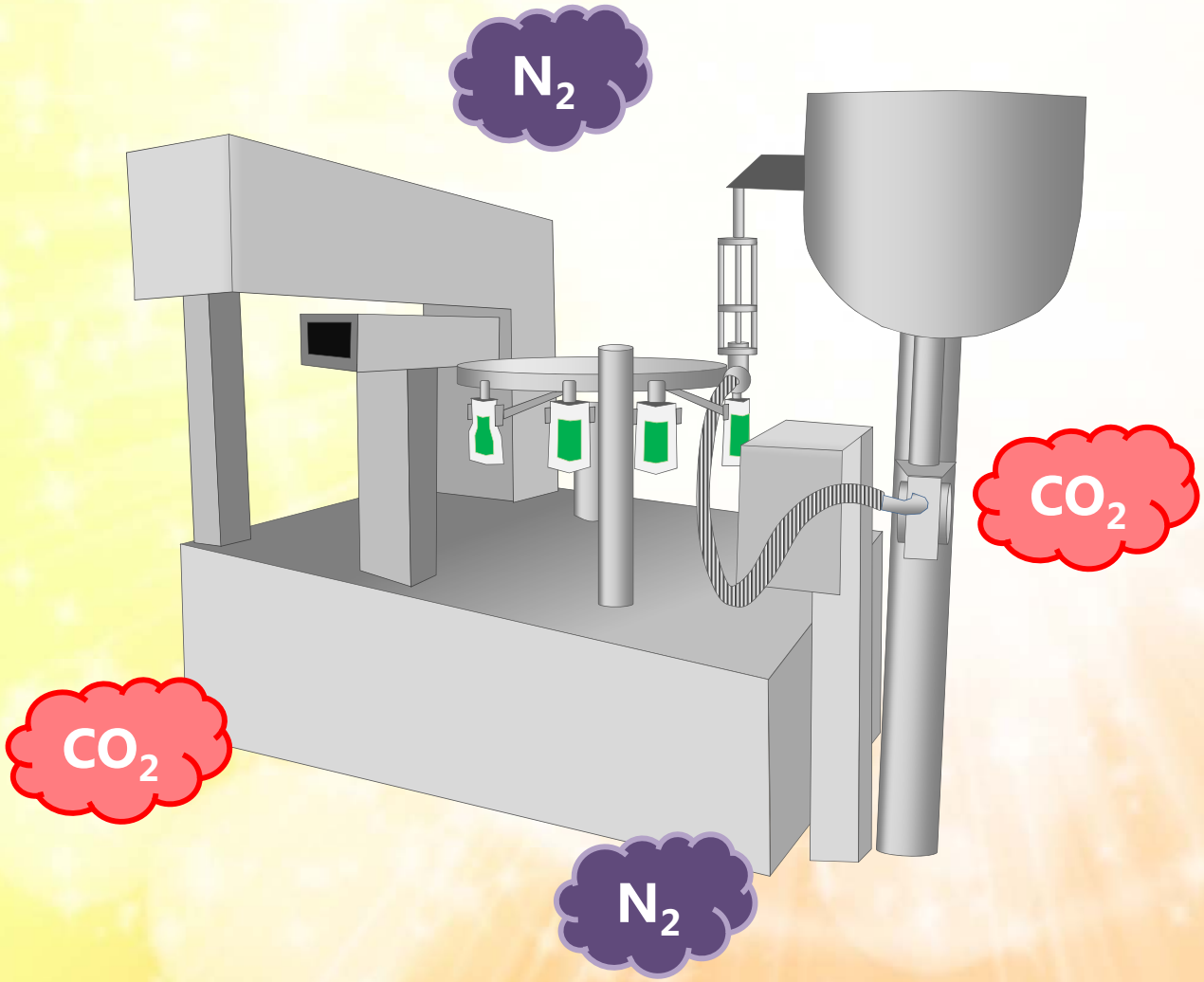
Personal Four Gas Monitor
Model: GX-6000

Four Gas Personal Monitor
Model: GX-2009

2-3: Filling and packaging ①

Description: After the cooked food passes through the metal detector, the filling machine fills the retort pouch with a predetermined amount of food, degases the pouch, and seals the pouch by melting with heat. At the same time, it prints the best-before date.
* Supplementary information: De-aerated ice may be used to maintain freshness even during storage.

Hazardous risks: Nitrogen and carbon dioxide leaks during vacuum sealing may cause oxygen deficiencies. ⇒ **Measuring oxygen concentrations to prevent oxygen deficiencies**



CO_2 Monitor
Model: RI-600

Infrared CO_2 Gas Monitor
Model: RI-215A/D

Indoor Oxygen Monitor
Model: OX-600

Personal Four Gas Monitor
Model: GX-6000

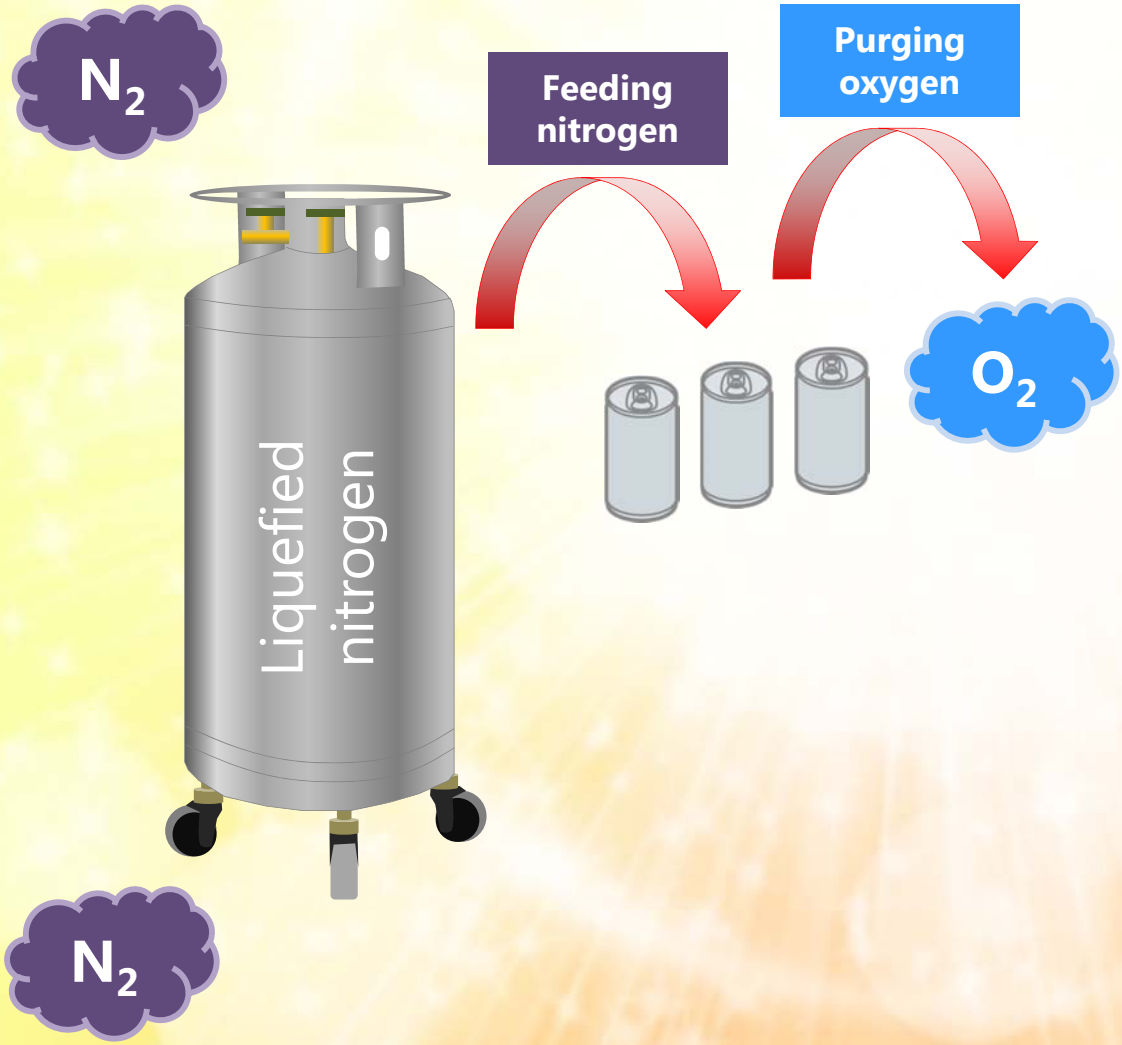
Personal Single Gas Monitor
Model: OX-03

Four Gas Personal Monitor
Model: GX-2009

2-3: Filling and packaging ②

Description: In the filling and packaging process, oxygen is purged by feeding nitrogen to maintain freshness and enable long-term storage. Liquefied nitrogen is used as the source of this nitrogen.

Hazardous risks: **Purging oxygen with liquid nitrogen to seal the aluminum may cause oxygen deficiencies.** ⇒ **Measuring oxygen concentrations to prevent oxygen deficiencies**




Indoor Oxygen Monitor
Model: OX-600


Personal Four Gas Monitor
Model: GX-6000

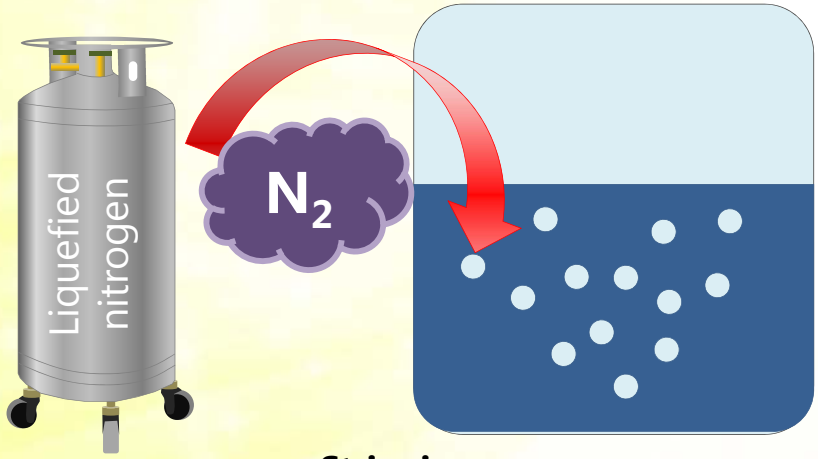

Personal Single Gas Monitor
Model: OX-03


Four Gas Personal Monitor
Model: GX-2009

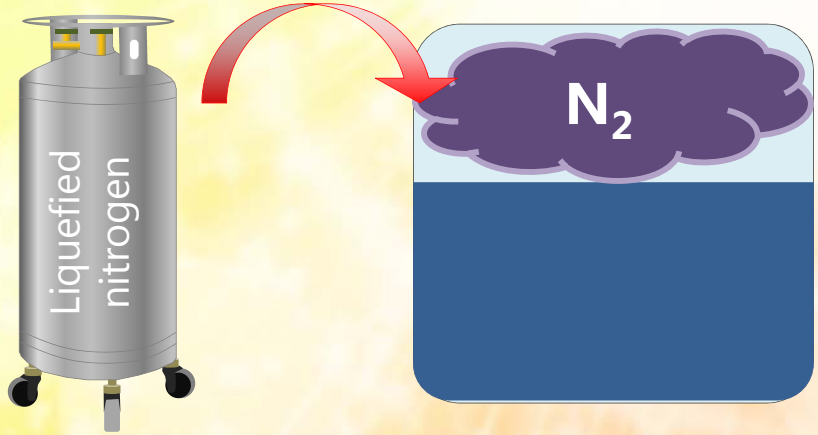
2-3: Filling and packaging ③

Description: To maintain food quality, the oxygen dissolved during processing must be removed. The dissolved oxygen is removed by stripping, which introduces high-purity nitrogen gas into processing water to remove oxygen from the processing water. Nitrogen gas can also be used to prevent the oxidation of oil and other ingredients by blanketing, which isolates the product or raw materials from air to prevent quality deterioration.

Hazardous risks: Nitrogen used in stripping and blanketing may cause oxygen deficiencies. ⇒ **Measuring oxygen concentrations to prevent oxygen deficiencies**



Stripping



Blanketing

Indoor Oxygen Monitor
Model: OX-600

Personal Four Gas Monitor
Model: GX-6000

Personal Single Gas Monitor
Model: OX-03

Four Gas Personal Monitor
Model: GX-2009

2-4: Pressurization, heat sterilization, and cooling ①

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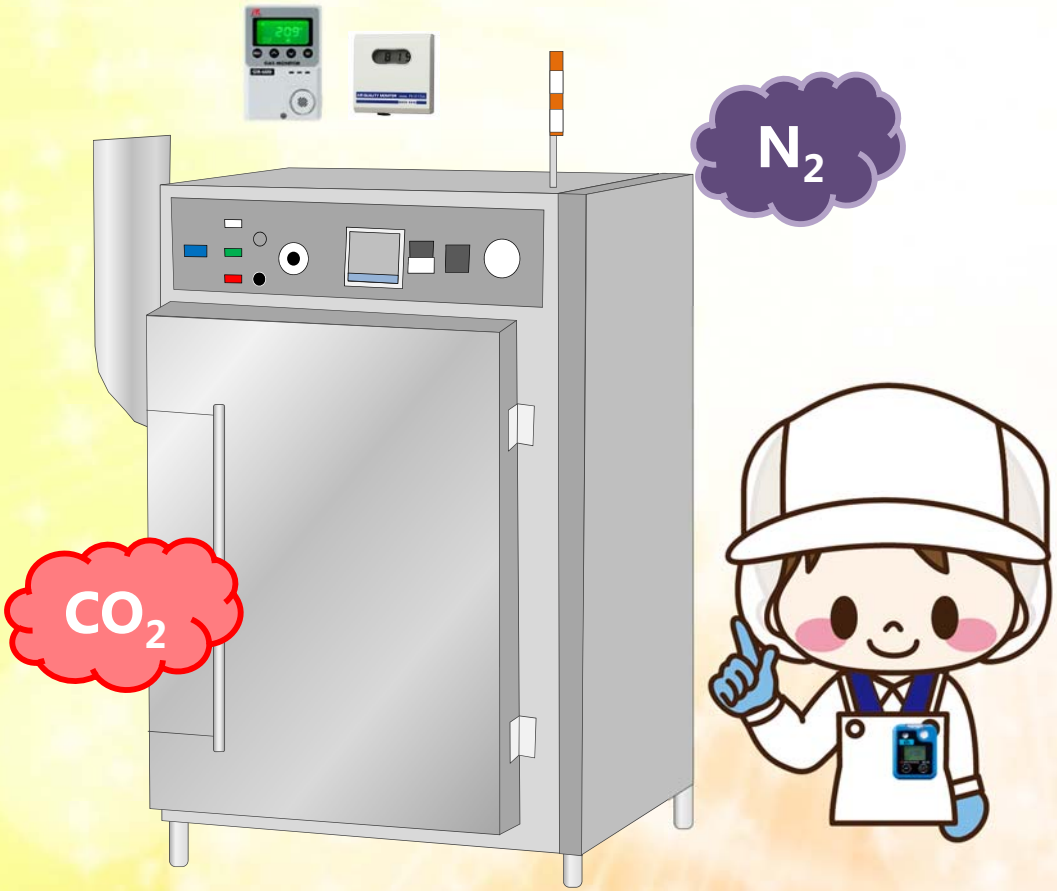
Description: According to the Food Sanitation Act, for retort food whose pH exceeds 4.6 and whose water activity exceeds 0.94, all microorganisms in the product must be killed by heating the central portion at 120°C for 4 minutes or by other equivalent or more effective methods. If the food cannot be heated, it can be sterilized by cooling. These processes render the product preservable at room temperature.

Hazardous risks: Using liquid nitrogen or carbon dioxide gas for instant freezing may cause oxygen deficiencies or cause CO_2 poisoning. ⇒ **Measuring oxygen concentrations to prevent oxygen deficiencies**
Measuring CO_2 concentrations to prevent poisoning



CO_2 Monitor
Model: RI-600

Infrared CO_2 Gas Monitor
Model: RI-215A/D

Indoor Oxygen Monitor
Model: OX-600

Personal Four Gas Monitor
Model: GX-6000

Personal Single Gas Monitor
Model: OX-03

Four Gas Personal Monitor
Model: GX-2009

2-4: Pressurization, heat sterilization, and cooling ②

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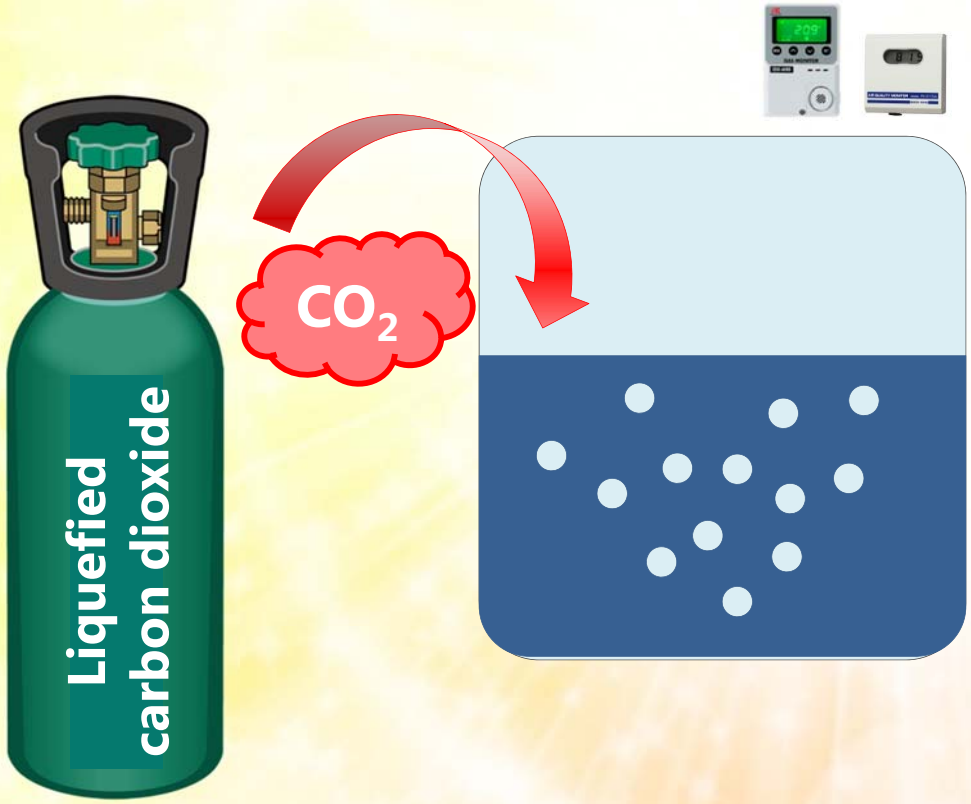
Description: According to the Food Sanitation Act, for retort food whose pH exceeds 4.6 and whose water activity exceeds 0.94, all microorganisms in the product must be killed by heating the central portion at 120°C for 4 minutes or by other equivalent or more effective methods. One method is sterilization/bacteriostasis using liquefied carbon dioxide.

Hazardous risks: Sterilization and bacteriostasis with carbon dioxide may cause oxygen deficiencies or cause CO_2 poisoning.

⇒ **Measuring oxygen concentrations to prevent oxygen deficiencies**
Measuring CO_2 concentrations to prevent poisoning



CO_2 Monitor
Model: RI-600

Infrared CO_2 Gas Monitor
Model: RI-215A/D

Indoor Oxygen Monitor
Model: OX-600

Personal Four Gas Monitor
Model: GX-6000

Personal Single Gas Monitor
Model: OX-03

Four Gas Personal Monitor
Model: GX-2009

2-5: Storage ①

Description: Fluorocarbons and ammonia are sometimes used as coolants for the refrigerated storage of raw materials, prepared materials, and products.

Hazardous risks: Using fluorocarbons and ammonia as coolants for refrigerated storage poses the risk of poisoning. ⇒ **Measuring fluorocarbon and ammonia concentrations to prevent poisoning**

Smart Transmitter/ Gas Detector
Model: SD-1GH

Combustible/Toxic Gas Detector Head
Model: GD-A80V

Smart Transmitter/ Gas Detector
Model: GD-70D

Portable Toxic Gas Monitor
Model: SC-8000

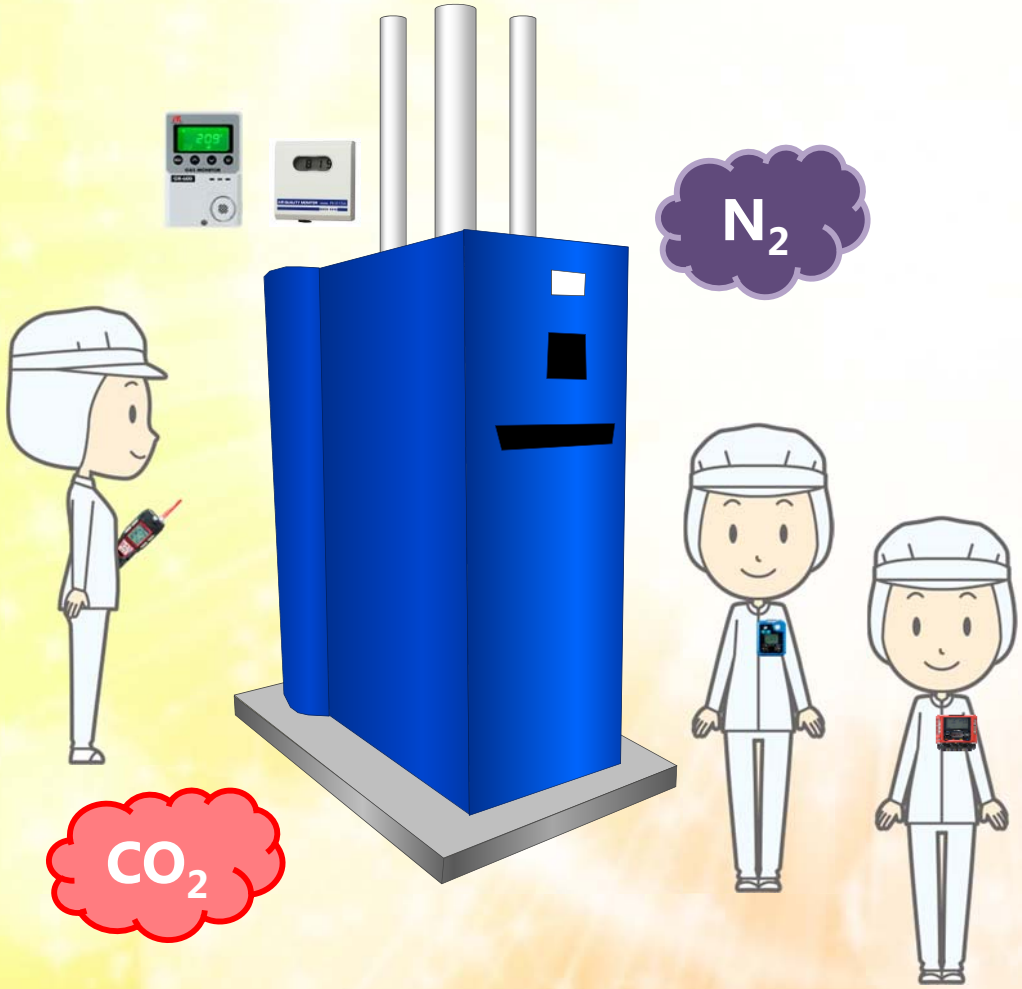
Personal Four Gas Monitor
Model: GX-6000

2-5: Storage ②

Description: Controlled atmosphere (CA) storage adjusts concentrations of atmospheric oxygen, nitrogen, and carbon dioxide (by pressure control) and minimizes breathing of the stored fruits and vegetables to suppress loss of freshness during storage.

Hazardous risks: **Leaks of nitrogen and carbon gas used during the CA storage may cause oxygen deficiencies or poisoning.**

⇒ **Measuring oxygen concentrations to prevent oxygen deficiencies**
Measuring CO_2 concentrations to prevent poisoning



CO_2 Monitor
Model: RI-600

Infrared CO_2 Gas Monitor
Model: RI-215A/D

Indoor Oxygen Monitor
Model: OX-600

Personal Four Gas Monitor
Model: GX-6000

Personal Single Gas Monitor
Model: OX-03

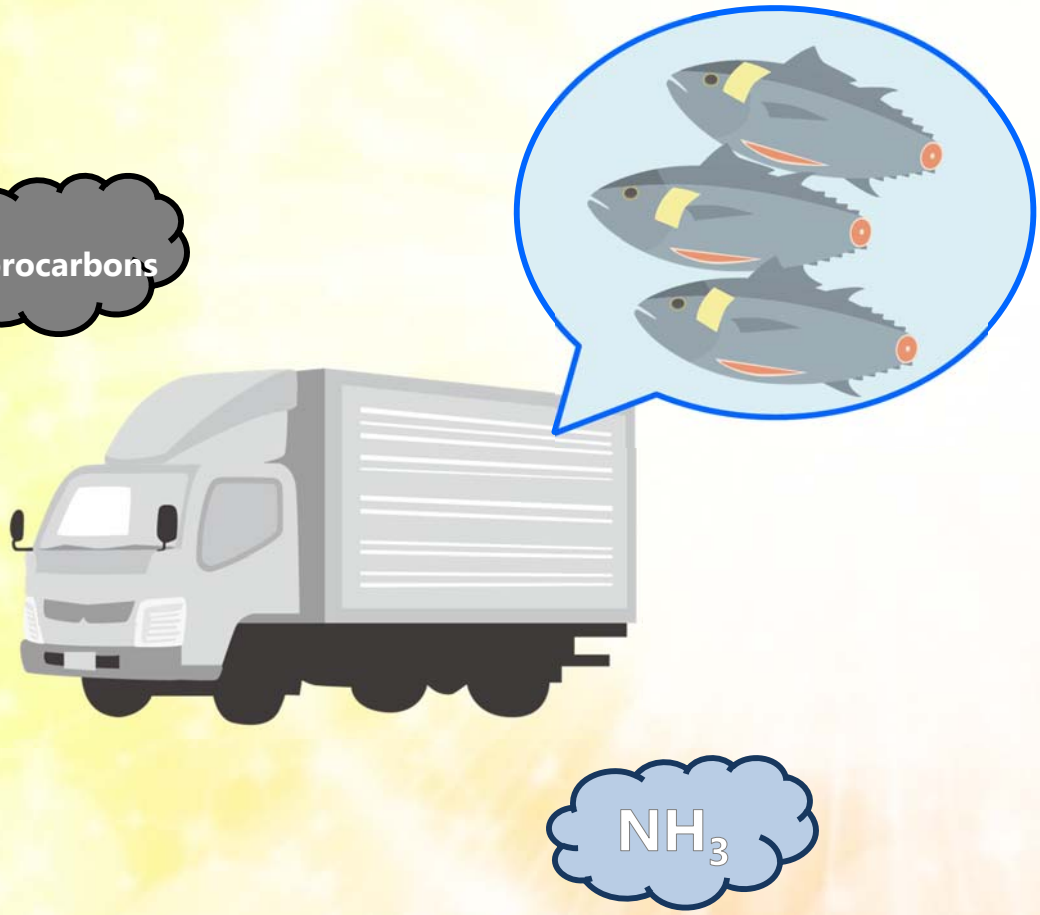
Four Gas Personal Monitor
Model: GX-2009

2-6: Transportation ①

Description: Fluorocarbons and ammonia are the most popular coolants for the refrigerators and freezers used in truck transportation.

Hazardous risks: The gases generated from the fluorocarbons and ammonia used as coolant in truck transportation may result in cases of poisoning or oxygen deficiencies.

⇒ **Measuring fluorocarbon and ammonia concentrations to prevent poisoning**
Measuring oxygen concentrations to prevent oxygen deficiencies



Smart Transmitter/ Gas Detector
Model: SD-1GH

Combustible/Toxic Gas Detector Head
Model: GD-A80V

Smart Transmitter/ Gas Detector
Model: GD-70D

Portable Toxic Gas Monitor
Model: SC-8000

Personal Four Gas Monitor
Model: GX-6000

Indoor Oxygen Monitor
Model: OX-600

Personal Single Gas Monitors
Model: 03 series

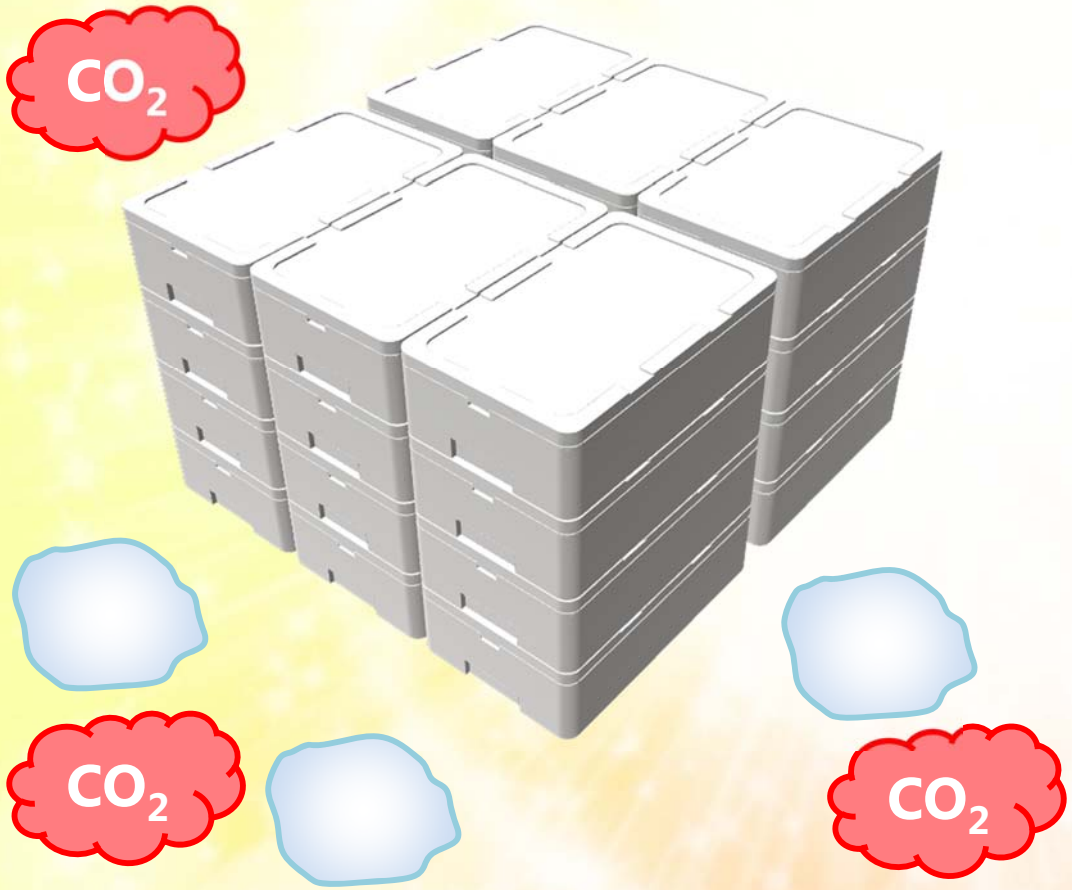
Four Gas Personal Monitor
Model: GX-2009

2-6: Transportation ②

Description: Dry ice is the most popular refrigerating agent used during transportation.

Hazardous risks: **CO_2 generated from the dry ice used as the refrigerating agent during transportation may result in cases of poisoning or oxygen deficiencies.**

⇒ **Measuring CO_2 concentrations to prevent poisoning**
Measuring oxygen concentrations to prevent oxygen deficiencies



Smart Transmitter/
Gas Detector
Model: GD-70D

CO_2 Monitor
Model: RI-600

Infrared CO_2
Gas Monitor
Model: RI-215A/D

Indoor Oxygen
Monitor
Model: OX-600

Personal Four Gas
Monitor
Model: GX-6000

Personal Single Gas
Monitor
Model: 03 series

Four Gas Personal
Monitor
Model: GX-2009

2-7: Other processes ① Bread baking

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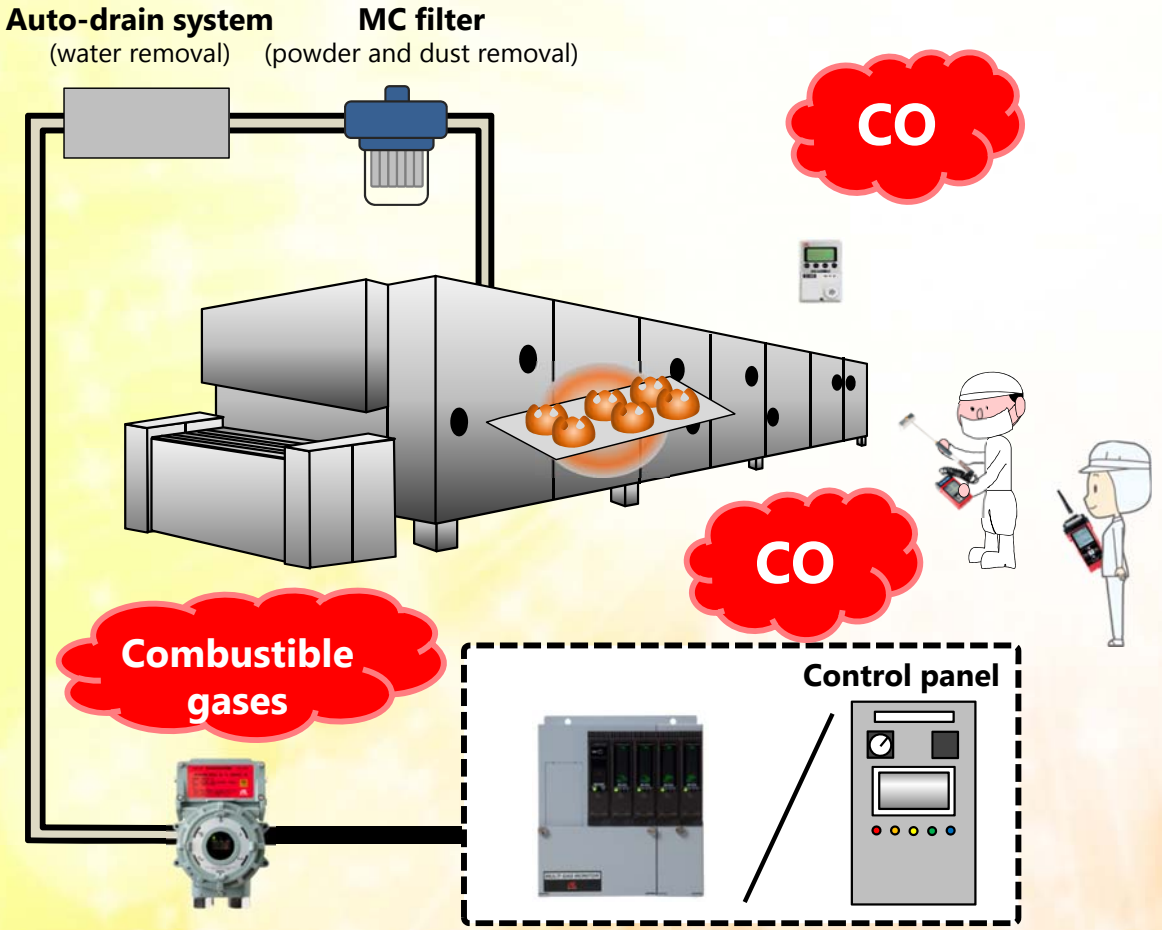
Description: Baking in a bread factory requires fuel.

Hazardous risks:

- **Fuel for the baking machine may leak.** ⇒ **Preventing explosions involving combustible gases**
- **Baking may cause fire.** ⇒ **Detecting fire to prevent the spread of fire**
- **The carbon monoxide (CO) generated by incomplete combustion during baking may result in cases of poisoning.** ⇒ **Detecting CO to prevent poisoning**



Flame-proof Suction Type Gas Detector
Model: SD-D58

Indoor Carbon Monoxide Monitor
Model: EC-600

Multi-channel Gas Monitoring System
Model: RM-5000

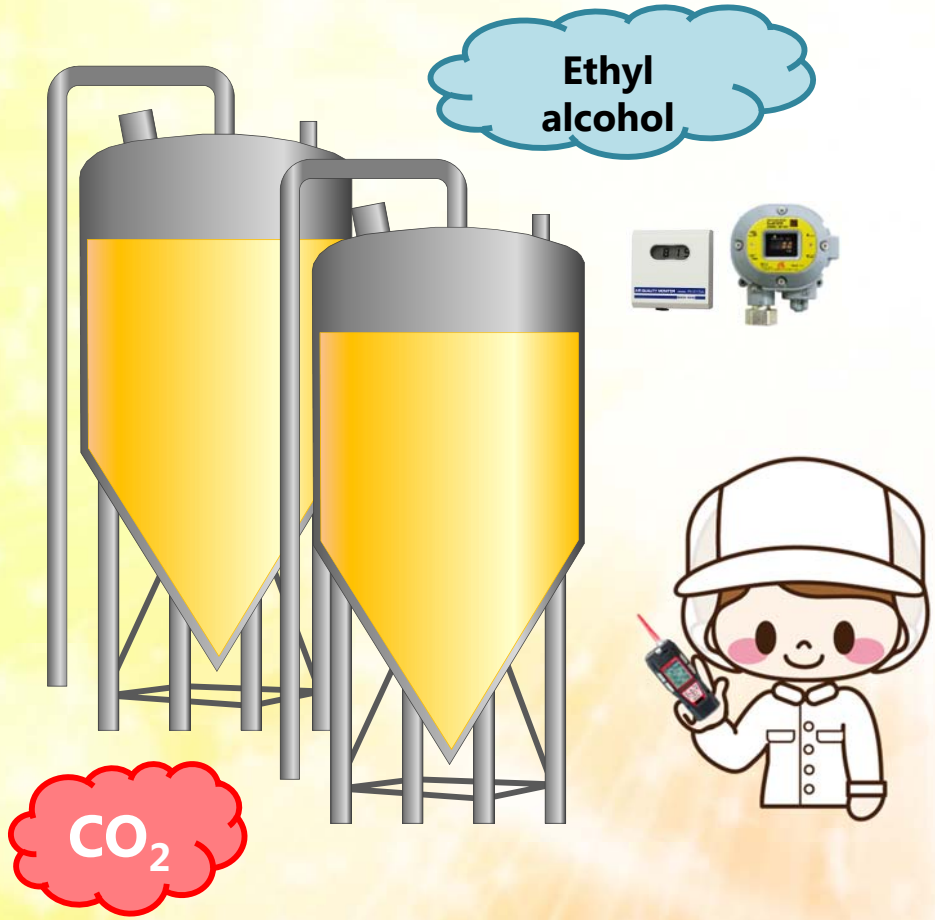
Personal Four Gas Monitor
Model: GX-2012GT

Carbon Monoxide Monitor
Model: CO-FL1

2-7: Other processes ② Beer production

Description: During the beer fermentation process, yeast coverts most of the sugar in the wort into alcohol (ethyl alcohol) and carbon dioxide.

Hazardous risks: Alcohol and carbon dioxide (CO_2) generated during beer fermentation may cause poisoning. ⇒ **Measuring concentrations of ethyl alcohol and CO_2 to prevent poisoning**



Smart Transmitter/ Gas Detector
Model: SD-1GH

Combustible/Toxic Gas Detector Head
Model: GD-A80V

CO_2 Monitor
Model: RI-600

Infrared CO_2 Gas Monitor
Model: RI-215A/D

Smart Transmitter/ Gas Detector
Model: GD-70D

Personal Four Gas Monitor
Model: GX-6000

2-7: Other processes ③

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① Leaks of carbon dioxide (CO_2) used for supercritical extraction (concentration and extraction of cooked constituents) may cause CO_2 poisoning.

② The production of food hardened by adding hydrogen to oil or fat (such as margarine) may generate hydrogen and pose explosion risks.

③ In the after-ripening (maturation process of fruit, such as bananas and kiwifruit, promoted by ethylene gas and suppressed by CO_2), the ethylene gas and CO_2 used may cause explosions, oxygen deficiencies, or poisoning.

④ When a restaurant prepares mousse-like food such as whipped cream, nitrous oxide (N_2O) used as the propellant may result in cases of poisoning.

⑤ In a plant factory, the CO_2 used to promote plant growth and LPG used to control the temperature may cause explosions.

⑥ The carbon dioxide used to control spider mites that parasitize strawberry seedlings may cause oxygen deficiencies and poisoning.

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Major Examples of Accidents

Prepared by extracting and processing materials from the Safety at Work Site (Ministry of Health, Labour and Welfare: http://anzeninfo.mhlw.go.jp/index.html)

Ammonia coolant leaked from the freezer entered the meat processing factory and caused ammonia poisoning.

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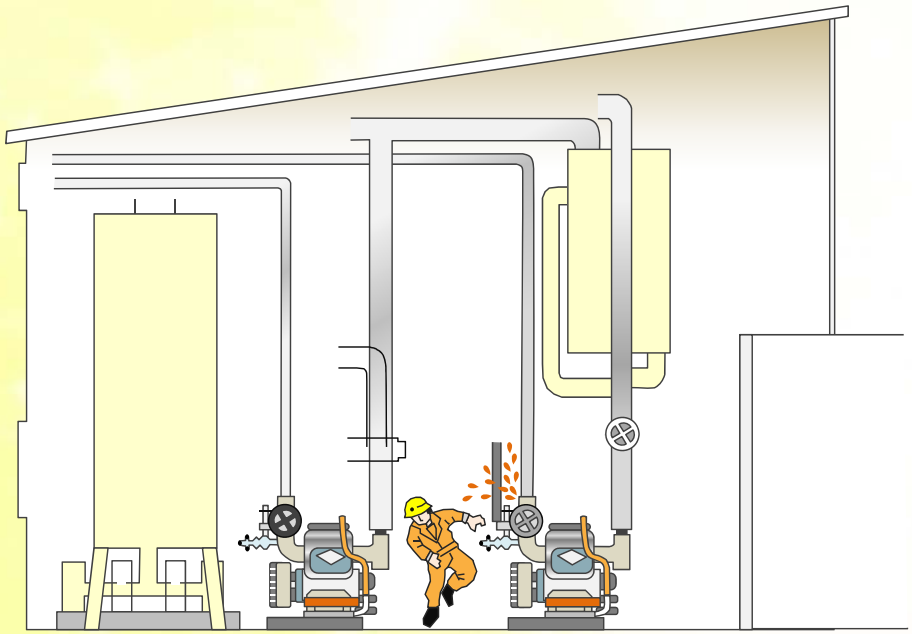


[Location of accident]

Freezer in the machine room of a meat factory

[Cause of accident]

The electromagnetic valve of the cooling system used in the meat processing process failed to operate, damaging the compressor in the freezer. Ammonia gas entered and seeped throughout the factory. After evacuation and ventilation of ammonia gas, the workers returned and resumed work. However, due to insufficient removal of ammonia gas, the workers sustained injuries as secondary damage.

[Damage/injuries]

After resuming work, the workers suffered ammonia poisoning as secondary damage. Additionally, an engineering section staff member who came into contact with a low-temperature object when closing the valve of the freezer was frostbitten on the toes.

Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.

Incomplete combustion of gas oven caused carbon monoxide poisoning.

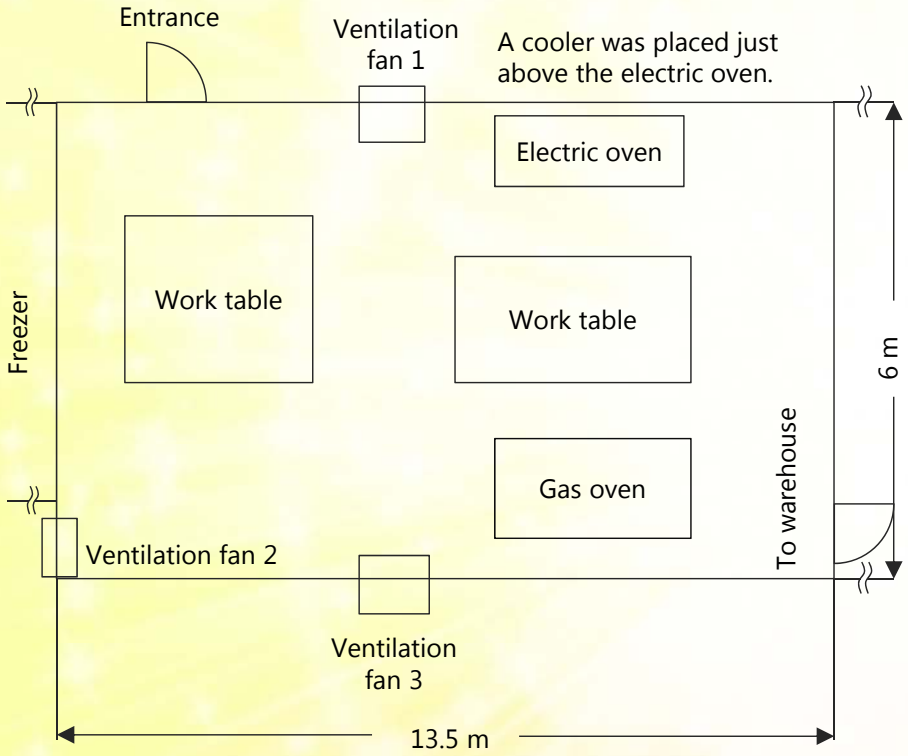


Figure: Work area

[Location of accident]

Work area with gas oven in Japanese confectionary manufacturing factory

[Cause of accident]

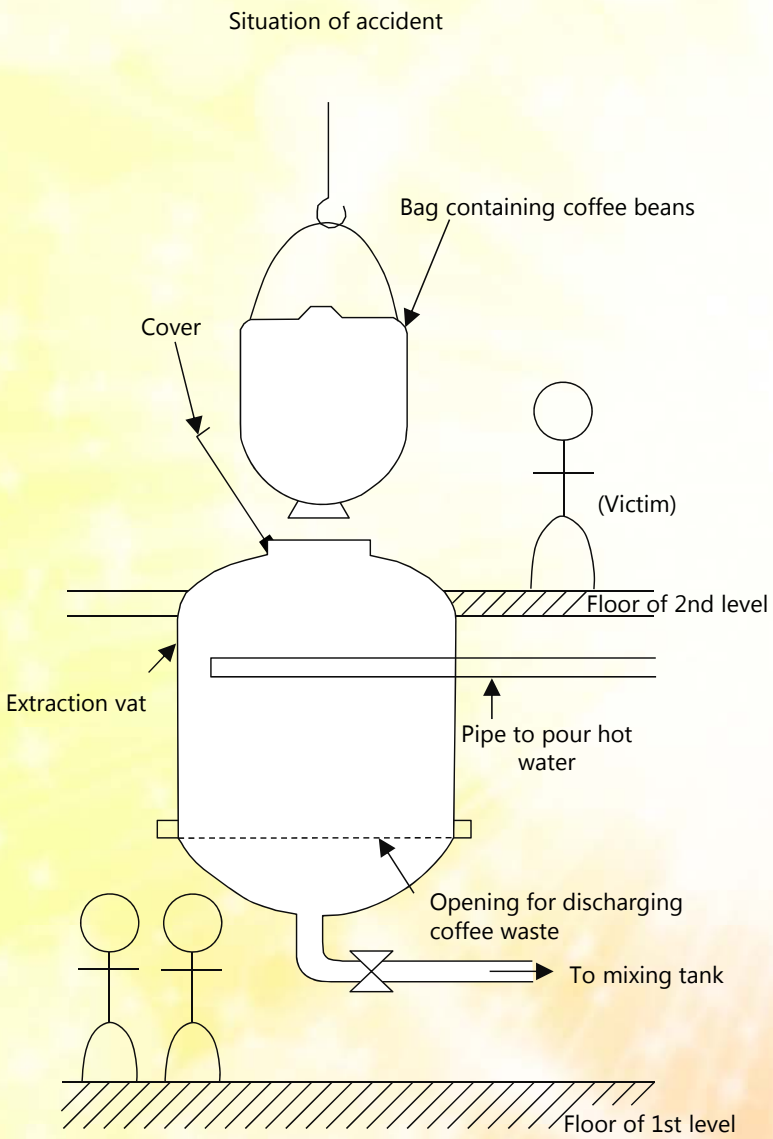
The gas oven used lacked a duct for discharging the combustion gas (LP gas) after combustion. The workers worked in the room without turning on the ventilation fan and with the windows and entrance closed, except when entering/leaving the work area, and were exposed to carbon monoxide generated from the gas oven.

[Damage/injuries]

The workers complained of various physical disorders, including headaches and nausea. They were hurried to the hospital and diagnosed with carbon monoxide poisoning. Workers with severe symptoms took sick leave for a day.

Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.

Carbon monoxide generated from coffee beans caused poisoning.



[Location of accident]

Inside a vat used to extract a coffee concentrate solution installed on the production line for canned coffee in a plant producing canned beverages and other products

[Cause of accident]

When the coffee concentrate solution was extracted by pouring hot water into the extraction vat holding roasted coffee beans, carbon monoxide adsorbed to the roasted coffee beans was desorbed all at once and began accumulating in the closed extraction vat. The accident occurred after extraction when the victim attempted to pick up a rod used to level the coffee beans dropped inside the vat.

[Damage/injuries]

The victims was poisoned when discharging the residual coffee bean waste. The victim fell inside the vat and was found unconscious when rescued. The victim was diagnosed with carbon monoxide poisoning at the hospital and died approximately one month later.

Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.

Chlorine gas was generated during cleaning work in vegetable washing room.

RIKEN KEIKI

[Location of accident]

Sterilizing water generating system in a vegetable washing room

[Cause of accident]

Sodium hypochlorite was removed from a container in the sterilizing water generating system and used to remove mold from the wall of the washing room and equipment. As it was returned to the container, the remaining sodium hypochlorite was accidentally poured into the adjacent container of hydrochloric acid, generating chlorine gas.

[Damage/injuries]

While no workers reported feeling ill during evacuation due to the chlorine gas generated or while the gas was being treated, a worker began to feel unwell after returning home and was transported to the hospital by ambulance.

Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.

During the test operation of a methane gas generator using wastewater, the flame of a cigarette lighter ignited the methane gas, resulting in burn injuries.

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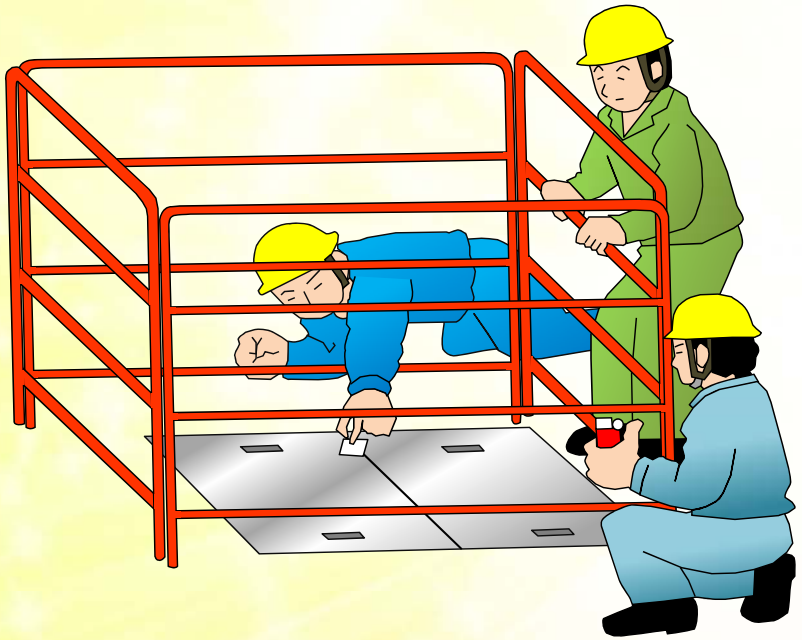

[Location of accident]

Equipment to generate methane gas from brewery wastewater for use as fuel for the boiler

[Cause of accident]

To generate and collect methane gas from the wastewater of a brewery, the facility switched from aerobic treatment to anaerobic treatment. A hand-over test operation of the facility was performed. To reduce hydrogen sulfide from the deodorizing equipment exceeding atmospheric release standards for hydrogen sulfide, negative pressure was applied to the PH adjusting layer connected to the deodorizing equipment. The flame of a cigarette lighter brought close to the inspection port to confirm negative pressure ignited the methane gas and hydrogen sulfide generated in the PH adjustment layer, generating a flame spout from the inspection port.

[Damage/injuries]

A worker near the inspection port sustained burns.

Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.

RIKEN KEIKI

Product Information

RIKEN KEIKI

Portable
Multi Gas Detector

Model:
GX-6000

Features

- A single unit can simultaneously display up to six types of gases, including VOCs. This is the first product of its kind from a Japanese manufacturer.
- The PID sensor enables measurements of more than 200 types of chemical substances subject to regulation.
- Ideal for checking the risks and hazards of chemical substances as required under the Industrial Safety and Health Act
- Support for multilingual display (Japanese, English, French, Spanish, etc.)
- Equipped with convenient new functions, including panic alarm and LED flashlight

RIKEN KEIKI

GX-2012

GX-2012GT

Personal
Four Gas Monitors

Model:
GX-2012 series

Features

- First hydrogen sulfide alarm in Japan with the alarm setting at 1 ppm supported (ACGIH TWA 1 ppm compatible)
- Intrinsically safe explosion-proof enclosure and Group II C explosion-proof rating allow use even in hydrogen and acetylene atmospheres.
- Protection rating equivalent to IP 67 ensures safe use for outdoor work.
- Three-direction alarm lamps and two-direction alarm buzzers to alert both the carrier and those in surrounding areas
- Buzzer volume of 95 dB (A) or more can be clearly heard even in noisy factory environments.
- Allows use of either dry batteries or lithium ion battery unit (available separately).
- GX-2012GT leak check function detects leaks of both town gas and LP gas.

RIKEN KEIKI

Four Gas Personal Monitor

Model: GX-2009

Features

- Suitable for use as an explosion-proof product, even in a hydrogen/acetylene atmosphere
- IP 67 equivalent protection for safe use in outdoor work
- Three-direction alarm lamps and two-direction alarm buzzers to alert both the carrier and those in surrounding areas
- Buzzer volume of 95 dB or more can be clearly heard in noisy factory environments.
- Simultaneous display of gas concentrations of four components on large LCD screen
- Also equipped with clock display and data logger functions
- GX-2009 allows suction type operation with RP-2009 pump suction unit (optional).

RIKEN KEIKI

GP-03 (For combustible gases)
OX-03 (For oxygen)
HS-03 (For hydrogen sulfide)
CO-03 (For carbon monoxide)

Features

- Models for use with rechargeable batteries have been added to the product line.
- Standard protective covers protect the main unit from scratches, dirt, and shock.
- Compact, lightweight design doesn't interfere with work.
- Inherently safe and explosion-proof enclosure is ideal for use in hazardous locations.

Personal Single Gas Monitors

Model: 03 series

RIKEN KEIKI

Features

- Intrinsically safe explosion-proof enclosure
- Product line supporting diverse gases
- Dustproof, waterproof enclosure for use in any environment
- Adjustable buzzer volume
- Two types of easy to read displays (digital/analog)
- Allows switching of target gas.

Portable Toxic
Gas Monitor

Model: SC-8000

RIKEN KEIKI

Carbon Monoxide Monitor

Model: CO-FL1

Features

- Seven types of measurement modes are selectable.
  (Supports criteria recommended by the High Pressure Gas Safety Institute of Japan.)
- A single unit provides a range of measurement suitable for commercial kitchen equipment.
- Three types of gas introduction pipes are included as standard equipment. Allows measurement by extending the pipe or bending the tip. The device is suitable for use in various work environments.
- The cartridge type drain trap facilitates filter replacement.
- The large LCD screen and blue, orange, and red three-color lamps clearly display judgment results.

RIKEN KEIKI

SD-1
SD-1RI
(For combustible gases)

SD-1GH
(For combustible/ toxic gases)

SD-1EC
(For carbon monoxide/ hydrogen sulfide)

SD-1OX
(For oxygen)

Features

- Suitable for use as an explosion-proof product, even in a hydrogen/acetylene atmosphere
- Waterproof/dustproof enclosure (IP 65 equivalent) allows deployment in severe environments.
- Supports HART Communication Protocol, allowing transmission of more information over legacy analog 4-20 mA connection.
  * Excluding SD-1 (TYPE NC)
- SD-1RI, SD-1EC, and SD-1OX are SIL 2 certified in all parts of the functional safety standard, marking a first for Japanese manufacturers.
- Using the suction cap for the SD-1 series and connecting the detector to a suction pump or an aspirator unit enables suction type operation.

Smart Transmitter/
Gas Detectors

Model: SD-1 series

RIKEN KEIKI

Flame-proof
Suction Type
Gas Detectors

Model:

SD-D58 series

Features

- Suitable for use to safeguard against explosions even in hydrogen atmospheres
- Equipped with automatic flow rate abnormality detection function
- Integrated replacement parts improves maintainability.
- Dustproof/waterproof enclosure (IP 67 equivalent)
- Allows one-person maintenance.

RIKEN KEIKI

GD-A80
(For combustible gases)

GD-A80V
(For flammable gases/
toxic gases)

Features

- Explosion-proof rating Exd II CT4 allows use in hydrogen and acetylene atmospheres.
- Suction type and aspirator suction type operations are supported.
  (* A pump unit and a power supply [available separately] are required.)
- The GD-A80-70 is also provided as a combustible gas detector head for use in high-temperature environments up to 70°C (normally 53°C).

Combustible/Toxic Gas Detector Heads

Model:
GD-A80 series

RIKEN KEIKI

Features

- Excellent selectivity for resistance to interference from other gases
- Rapid detection of slight environmental changes (Detectable at ppb level)
- Cassette insertion method for easy tape replacement (Using microcassette)

Highly Sensitive
Toxic Gas Monitor

Model: FP-300

RIKEN KEIKI

Features

- Adopts universal design independent of detection principle to allow shared use of the main unit.
- Reusable parts
- Allows recycling of constituent materials to reduce environmental impact.
- Design complies with various international regulations.
- Complies with CE requirements under RoHS Directive.
- Supports a range of communication methods.

DC method using analog 4 mA to 20 mA general instrumentation signal
(Detector head used: GD-70D)

DC power line carrier method using the same line for power supply and communication
(Detector head used: GD-70D-NT)

Ethernet method using PoE HUB
(Detector head used: GD-70D-EA)

Smart Transmitter/Gas Detector

Model: GD-70D

RIKEN KEIKI

Features

- Select from five CO_2 detection ranges: 0 to 2,000 ppm; 5,000 ppm; 10,000 ppm; 0 to 2% vol; and 5% vol.
- Compact and lightweight, easy operation
- For CO_2 measurements required under the Act on Maintenance of Sanitation in Buildings and Ordinance on Health Standards in the Office
- For monitoring carbon dioxide concentration in plant cultivation factories and facilities

CO_2 Monitor

Model: RI-600

RIKEN KEIKI

RI-215A
(Diffusion type)

RI-215D
(Suction type)

Features

- Compact, lightweight, easy to install
- External output (4-20 mA) with control contact output

Infrared CO_2 Gas Monitor

Model:

RI-215A/D

RIKEN KEIKI

Features

- The high visibility LCD screen illuminates in green, orange, or red, depending on the operational state.
- Allows selection of one of three power supply types based on the usage environment: AC power, DC power, and dry battery specifications
- Allows remote measurement of up to 20 m with optional remote sensor.

Indoor Carbon Monoxide Monitor

Model: EC-600

RIKEN KEIKI

Indoor Oxygen Monitor

Model: OX-600

Features

- Large, easy-to-read three-color LCD screen display

First alarm (orange)

Second alarm (red)

- Equipped with pressure correction function to prevent fluctuating readings due to atmospheric pressure
- The product line offers three types of power supply specifications (AC power supply, DC power supply, and dry battery) to suit the power supply available at the installation location.
- Continuous operation for approximately one year on two AA alkaline batteries
  * No alarm; backlight switched off
- Remote measurement at distances of up to 20 m with the remote sensor (sold separately)

RIKEN KEIKI

Multiple casing

Single casing

Features

- Many types of gas detector heads available
- Gas concentrations are displayed in two ways: bar meter and digital display
- High-contrast three-color LCD improves visibility of detected state.
- Equipped with RS-485 communication function (optional)

Multi-channel Gas Monitoring Systems

Model: RM-5000 series

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International Agents

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Europe | Middle East | Africa

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Europe	Germany	Greece	THE NETHERLANDS	Norway	Turkey
	U.K.				
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Africa	South Africa				
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