Iwatani Safety Information

Iwatani Group

Common annual version

This Safety Information is intended to provide various information on the safety management of gas and gas facilities. Please utilize the information for accident prevention and safe operation.

Instructions for gas facility management during long holidays

- The pace of work and life tends to get out of rhythm before and after long holidays, causing checking mistakes and erroneous operations more often than usual. Because the entire plant and other workplaces stop and start operations at the same time, the amount of non-routine work increases, causing more human errors.
- Aiming to prevent the occurrence of accidents and disasters, please keep concerned parties informed about the following before the holidays: 1) The need to confirm the procedures for stopping and restarting operations and emergency contact system and 2) the need to inspect the gas facilities during the holidays.

Instructions for gas storage and use

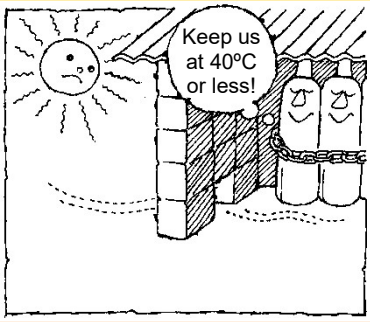
(1) Please pay attention to the following matters when storing gas in containers.

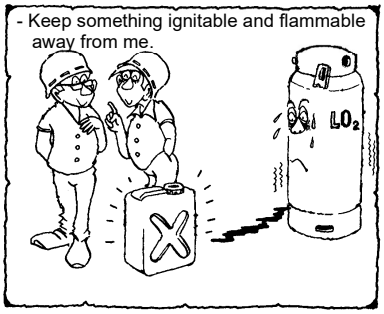
- Keep gas containers in a well-ventilated place away from direct sunlight so that the temperature of the containers will not exceed 40ºC.
- Prevent gas containers from falling using chains and fences. Mount a cap on each gas container to protect the valve from damage.
- Do not use fire or put something ignitable or flammable within a two-meter radius of a gas container.
- After using a gas container, be sure to completely shut the container valve so that moisture and foreign substances will not enter the container.

(2) Please pay attention to the following matters when using gas.

- Do not use fire or put something ignitable or flammable within a five-meter radius of the place where you are using gas.
- Fix each hose connection point with a hose band and check the absence of gas leaks using soapy water.
- Be sure to inspect and replace hoses regularly. Failure to follow this instruction might lead to gas leaks due to a cracked or worn hose.
- Never use oxygen gas for "petroleum, fats and oils, and other combustibles."
- When using flammable gas and oxygen gas, keep a fire extinguisher nearby.

Please inspect your gas facilities for any gas leaks at the starting and closing times, plus at least once a day. If there are abnormalities, take necessary measures.





Before long holidays begin ...

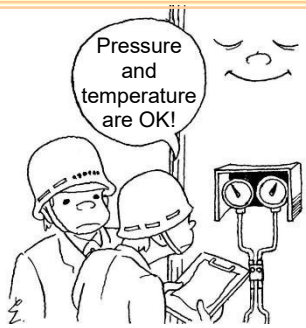
(1) Make sure the internal pressure of gas storage tanks and containers will not rise.

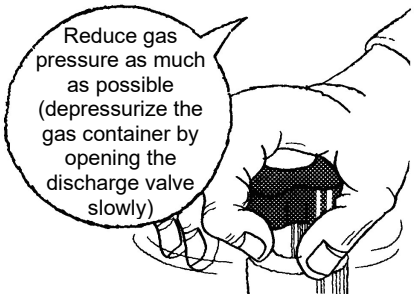
(2) Make sure the latest emergency contact system is available. Please conduct walk-around inspections during the holidays.

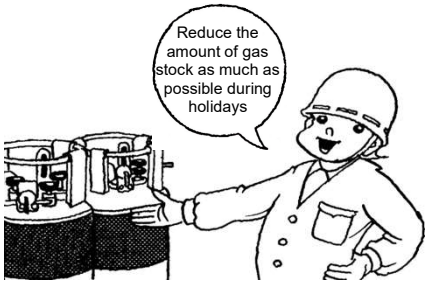
(3) If no one stays in your plant during long holidays, reduce the amount of gas storage as much as possible. Do not keep unnecessary gas containers in the plant.

(4) Reduce the internal pressure of gas tanks and LGC (portable ultra-low temperature containers) as much as possible.
Open the discharge valve "slowly" to release gas and depressurize the tank so that the gas will not exceed its maximum working pressure during the holidays.
Examples: CE at 0.9MPa (CO2 at 2.3MPa) LGC at 1.3MPa (CO2 at 2.4MPa)

As a rough indication, the rate of gas pressure increase per day is in the range of 0.05MPa to 0.2MPa, though that depends heavily on the type of gas, the quantity of gas filled, and the characteristics of the gas storage tank.





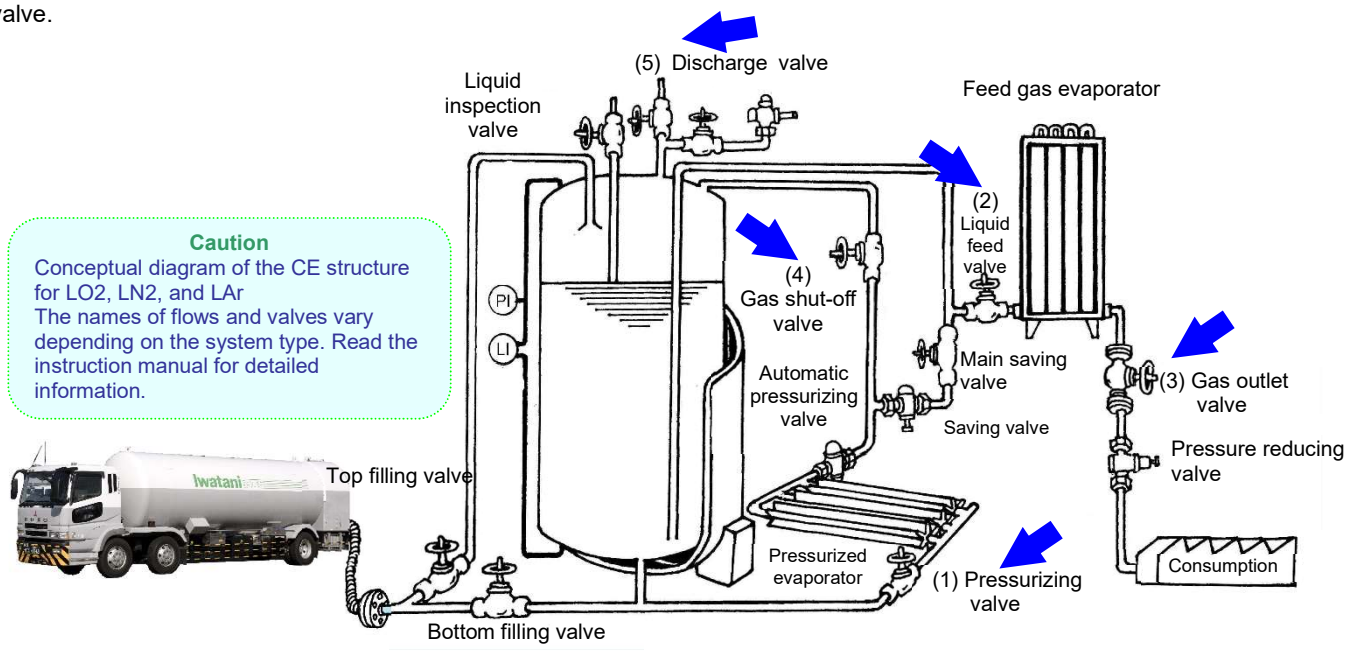


Valve operation when the CE stops for an extended period (three days or more)

When the CE stops for an extended period (three days or more), close the pressurizing valve (1) and the liquid feed valve (2). After confirming that liquefied gas inside the feed gas evaporator and the pressurized evaporator has vaporized, close the gas outlet valve (3) and gas shut-off valve (4).

If there is the risk of gas pressure rising while the CE stops, reduce the pressure of the gas tank as much as possible using the discharge valve (5).

Discharge gas slowly so as not to reduce the pressure sharply. Make sure that the pressure is stable after closing the discharge valve.



- Control the system so that the pressure will not exceed the maximum working pressure while the CE stops. The rate of gas pressure increase per day varies depending on the liquid quantity and the type of the tank. As a rough indication, the rate ranges between 0.05MPa and 0.2MPa.
- Even while the CE stops, inspect the pressure in the gas tank at least once a day.
- If the pressure has risen close to the maximum working pressure, open the discharge valve "slowly" and depressurize the tank.
- Make sure that the pressure is stable after closing the discharge valve.

When the CE stops for one or two days, close the gas outlet valve (3). After confirming the absence of frost formation in the feed gas evaporator, close the liquid feed valve (2). When the CE stops for a few hours, no valve operation is required because there is a built-in mechanism to stabilize the pressure at a specific level automatically.

Caution

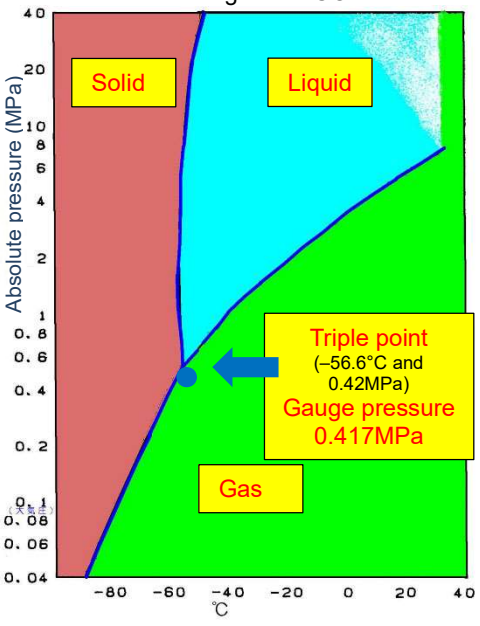
Aiming to prevent the pressure from exceeding its maximum working pressure when storing each of LO2, LN2, and LAr in the CE, you not only need to inspect the internal pressure of the tank while the CE stops, but you also need to reduce the pressure of the gas tank in the CE system before holidays.

In the case of the liquefied carbon dioxide (LCO2) CE system, however, be careful not to reduce the pressure to the pressure levels of the LO2, LN2, and LAr CE systems.

Q: What is the reason the pressure of the LCO2 CE system must not be reduced to a lower level?

A: **Liquefied carbon dioxide changes to a solid (dry ice) at a pressure of 0.42MPa or less (please see the right graph).** Carbon dioxide has a triple point at which the three states of solid, liquid, and gas exist at the same time (−56.6°C and 0.42MPa). When the pressure goes below 0.42MPa, carbon dioxide changes to a solid (dry ice), which clogs the inside of the pipeline. This situation may reduce CO2 supply pressure and cause supply disruption in the worst case.

Phase diagram of CO2



For this reason, the pressure of the LCO2 CE tank must be kept at a pressure of 0.6MPa or more.

Please contact our sales representative for any questions about this information.