



LEAFLET 21

CRYOGENIC INSTALLATIONS - MANAGING ICE BUILD-UP

Storage (as well as transportation) of certain gases as cryogenic liquids allows a large quantity of product to be stored within a significantly smaller volume. For example, the volume ratio of gaseous oxygen to liquid is 840:1 and is stored at an extremely low temperature of -183°C .

A typical installation includes a cryogenic storage tank, a vaporiser and a pressure control system.

- storage tanks come in a wide range of sizes and they are equipped with various safety devices to store the cryogenic liquid safely. To maintain the cryogenic temperature, the tank has very efficient vacuum thermal insulation;
- the vaporiser evaporates the cryogenic liquid into a gas using heat from the surrounding air and warms it to close to ambient temperature for use;
- the pressure control system manages the gas pressure into the downstream distribution system.



Under normal use, a small amount of frosting and ice may develop around pipes, valves, controls and vaporisers, especially where the cryogenic liquid enters the vaporiser.



All cryogenic installations require routine safety checks, refer to BCGA Leaflet 11, *Safety checks for cryogenic tanks*, and to your equipment operating instructions. Safety checks, including the monitoring of ice build-up and any necessary de-icing activity, is a customer / site operator responsibility.

The quantity of ice should be routinely monitored, but small quantities should cause no concern.

If ice continues to build-up, routine de-icing shall take place to prevent the ice build-up becoming excessive.

During periods of extended use or high demand, and / or in cold weather, ice can build up and may form layers, especially on uninsulated pipework and on vaporiser fins. This may be increased where high levels of humidity are present or where installations are shaded from sunlight.

Excessive quantities of ice are hazardous to both people and the installation, for example, the weight of ice may damage pipework and the ice may impair or prevent the normal operation of safety devices, valves, vents, or gauges. Excessive ice build-up on vaporisers will impede their operation, for example, by reducing the gaseous exit temperature and may allow very cold gas to enter the downstream system or, in extreme cases, cryogenic liquid. If fitted, a low temperature thermal protection device will operate (dependent on the model, this may reduce the gaseous output or close and stop the flow).



Action is required to remove the ice before it becomes excessive.



If frequent de-icing interventions are required consult your gas supplier / equipment owner to discuss possible solutions.

Removing ice build-up

Safety controls:

- carry out a suitable and sufficient risk assessment to identify the hazards associated with removing ice, for example, falling ice, freezing of run-off water, damage to pipework, extreme cold temperatures, destabilising the equipment, etc. Then put in place appropriate controls;
- ensure personnel are competent to undertake the required tasks, use the de-icing equipment, are aware of the hazards associated with cryogenic gases and are authorised to access the installation;
- manage the run-off water. Ensure there is adequate drainage or temporary provisions;
- manage any trip hazards, for example, from the use of hoses.

Do:

- where it can be safely generated, deployed and handled, use steam, which is the preferred medium. Where it is not safe to use steam, then use water;
- de-ice over the entire ice surface, in line with the risk assessment, ensuring that the ice does not become top heavy. This is the most efficient method, it helps to prevent damage to equipment due to asymmetric loading and prevents ice blocks, water and steam falling on persons and equipment below;

Do NOT:

- spray steam or water into components, for example, safety device, vent openings, etc. Water ingress may impede their operation;

NOTE: A pressure washer should not be used as this may lead to the above and could cause mechanical damage.

- use naked flames or equipment which is a source of ignition, unless this is a specific element of the vaporiser design;
- use substances such as de-icing chemicals or salt. These may be incompatible and can cause accelerated corrosion;

NOTE: These substances should not be used to manage the hazard of ice on the ground within the installation area as they can too easily pass onto the equipment.

- use tools which could cause thermal or mechanical damage to the installation, including its pipes. For example, hot air guns, spades, hammers, ice-picks, chisels, clubs, metal bars, etc.;
- remove ice from the bottom of the vaporiser, or other equipment, until the ice above it is cleared.

For more information

British Compressed Gases Association (BCGA)

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