

Liquefied Gas Cylinder Failure

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Intact cylinder and remains of a ruptured cylinder

A liquid nitrogen (Dewar) cylinder in a university chemistry laboratory catastrophically failed due to overpressurization. The incident occurred at 3 AM, when the building was not occupied, so there were no personal injuries; however, the damage sustained by the laboratory was extensive. Overpressurization blew out the bottom of the cylinder and propelled the cylinder upwards. The cylinder's pressure-relief devices, namely the pressure-relief valve and rupture disc, had been replaced at some point in the past by two brass plugs. But [before the incident], the cylinder may have been leaking through an old gasket, providing sufficient release of gas to prevent overpressure.

Approximately 12 hours before the explosion, the leaking gasket had been replaced, and the cylinder was refilled with liquid nitrogen. With the new gasket, the cylinder was completely sealed, and pressure could have been building up inside of it. The cylinder ruptured when its internal

pressure rose above 1,000 psi (69 bar). The catastrophic failure of the nitrogen cylinder was a result of the removal of the pressure-relief devices.



Laboratory damage

Did you know?

- ▶ Liquefied and pressurized gas cylinders are commonly used in laboratories and in manufacturing plants. In this incident, the force released by the cylinder was estimated at 250,000 lb (~113,000 kg-force).
- ▶ Cryogenic storage must either be refrigerated to maintain low temperature and pressure, or slowly bled off as vapor to maintain pressure and cool the remaining inventory.
- ▶ An incident this powerful can release other hazardous materials in nearby containers, vessels and piping, causing an even more severe incident.

What can you do?

- ▶ Never modify any equipment containing hazardous materials or energy without a qualified engineering evaluation, and always conduct a management of change review.
- ▶ If you observe a high-pressure or liquefied-gas cylinder that appears to have been modified, or is corroded or otherwise damaged, report it to supervision immediately so it can be removed from service.
- ▶ Ensure that cylinders are properly maintained and periodically inspected, including the pressure-relief devices.
- ▶ If you use pressurized-gas cylinders, make sure you are properly trained in the safe handling of high-pressure cylinders.
- ▶ Share this incident with your colleagues in the laboratory who may use pressurized-gas cylinders.
- ▶ Read the Texas State Fire Marshall's Alert on this incident at <http://www.tdi.state.tx.us/fire/documents/fmred022206.pdf>.

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Don't let a gas cylinder become a rocket!

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