

Lessons Learned

Vacuum Chamber Over-pressurization

What Happened?

A vacuum chamber over-pressurized while a researcher was returning the vacuum to atmosphere by venting with nitrogen from a gas cylinder. The chamber was left to fill while the researcher worked on other tasks. By the time the researcher returned, the chamber had over-pressurized and the view window shattered.

The researcher sustained multiple cuts to the face, three of which required stitches on their forehead. Their injuries could have been worse if it weren't for an aluminum panel that deflected pieces of glass. Visible dents in the panel were noted after the incident.

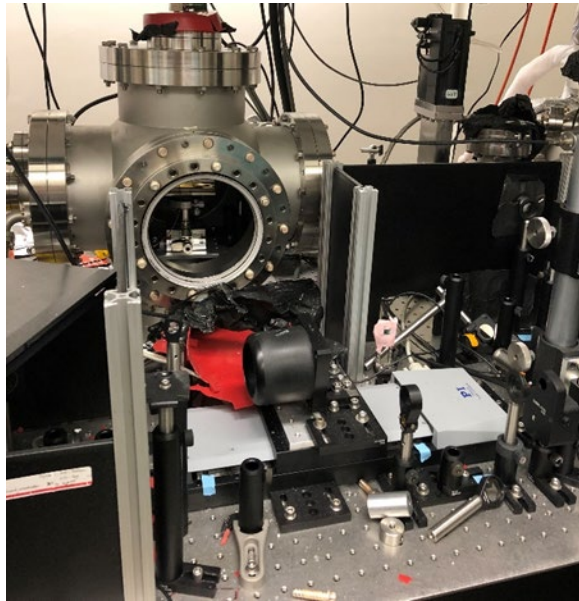


Photo 1 – Chamber with broken view window

What went right?

- The researcher went into the hall for help and 911 was called.
- Safety glasses (impact resistant, polycarbonate, laser safety eyewear) were being worn at the time of the incident.

What should have been done differently?

- The vacuum and air cylinder system should have included a pressure regulator and pressure relief valves.
- A hazard analysis should have been performed to identify the over-pressurization risk.
- A standard operating procedure (SOP) should have been written for the vacuum chamber system prior to use by the lab.

What corrective actions will be taken?

- Pressure relief valves will be placed on the inlet gas line and possibly the vacuum chamber.
- Pressure relief valves will be placed on the forelines of the pumps as well as solenoid valves on all gas lines in case of a power failure.
- A vacuum regulator will be used so a minimum pressure can be set.
- Vacuum chambers will be brought to atmosphere with air (a drying tube may be used if the sample is sensitive to moisture) and compressed gases will only be used when necessary for operations that are extremely air sensitive.
- A SOP will be written to cover this process.
- In addition to safety glasses, researchers will be required to wear a lab coat and face shield when performing hazardous operations such as filling a vacuum chamber from a gas cylinder.
- The Laboratory Operations & Safety Committee (LO&SC) will discuss any additional required training for campus.

Lessons Learned

Pressurized systems hold a great deal of energy. Over-pressurizing a chamber can cause adverse effects such as the view window rupturing. Care should be taken when returning these to atmosphere.

To prevent similar incidents, follow the recommended guidelines below:

- Pressure relief valves and additional personal protective equipment (PPE) can be important safety measures in the event of a system failure.
- A SOP should be written for hazardous processes based on a hazard analysis.

For additional assistance, contact EH&S at ehs@berkeley.edu or (510) 642-3073, Lessons Learned date: 10.2019