

Vacuum Pump Explosion in UPenn Lab



Cabinet damaged by explosion caused by ignition of concentrated ethyl ether vapor from improperly vented vacuum pump exhaust. Ignition source likely electrical switch on motor or fan.

What Happened?

On August 14, 2020, a Chemistry graduate student attempted to evaporate ethyl acetate and hexane using a Buchi Rotavapor (R-200) connected to a Savant VPI00 rotary-vane roughing pump. The vacuum pump was located in a designated pump cabinet in the base of the fume hood. Power to the cabinet was controlled by a toggle switch on the face of the hood. When the pump was turned on, the student reported the **monitor indicated that the pump was not supplying vacuum** and turned the power switch off. When he flipped the switch back on, a **“loud bang”** was heard and the cabinet door **“burst open”**. The vacuum pump was on fire, producing orange flames and black smoke. **The student was uninjured and the fire department extinguished the fire.**

What was the Cause?

Based on the information from witnesses and responders, **the likely cause of the explosion** was the ignition of an explosive concentration of diethyl ether vapor expelled from the pump exhaust. The **source of the ignition** may have been a spark from the pump motor or from the cooling fan inside the cabinet, both are controlled by the same power switch. Diethyl ether, was evaporated using the system earlier that day, which may have been pulled into the vacuum pump and exhausted into the cabinet. The vapor from the exhaust could have ignited when the pump was turned on.



All vacuum exhaust must be properly vented and include sufficient condensing capacity prior to the pump. The exhaust ports of pumps stored in vacuum pump cabinets must be connected directly to the vent port inside the cabinet. The pump may not vent into the cabinet interior.

Example of vacuum pump proper setup.

Note: this photo does not show an oil mist-separator on the vacuum exhaust. Oil mist separators are required for high vacuum pumps.

**Good Science =
Safe Science**

Sept. 21, 2020

Check Your Pump!

Due to this recent event, we are asking every laboratory that utilizes any vacuum pump to complete a thorough assessment of your system.

Ensure sure your lab members are up to date on their training and know how to use, properly set up, and maintain vacuum pump system to prevent potential damage and risk for human injury.

Helpful Links:

- [“Lab Manager Magazine’s Independent Guide to Purchasing a Vacuum Pump.”](#)
- [Fact Sheet: Vacuum Pump Use and Installation](#)

For assistance, questions, and concerns contact DEHS at 852-6670 or email at dehsubm@louisville.edu.