



Vacuum Pump Safety

Description

This standard operating procedure outlines the handling and use of vacuum pumps. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when working with vacuum pumps.

Vacuum pumps are commonly used in a variety of experimental setups to remove air and other vapors from a vessel or system. Applications that use vacuum pumps include rotary evaporators, vacuum ovens, drying manifolds, freeze-dryers, aspirators, desiccators, and filtration equipment. Many vacuum pumps use oil which can be easily contaminated and result in pump damage and hazards.

Potential Hazards

Vacuum pumps can pose chemical, mechanical, electrical, and fire hazards. Chemical exposure can occur from improper installing, trapping, and exhausting or from off gassing of contaminated pump oil. Mechanical hazards can occur from the moving parts of the vacuum pump. Fire can result if the pump malfunctions or overheats and ignites nearby combustible materials. Electrocutation can occur from faulty or defective switches and wiring.

Engineering Controls

Vacuum pumps used to evacuate systems containing toxic, volatile, or corrosive substances must be vented to the building exhaust ventilation system. Whenever possible locate pump in vacuum pump cabinet or a ventilated cabinet. Ensure that pumps have belt guards. Traps such as a cold trap should be used in line with high vapor loads to minimize the amount of volatile chemicals being evacuated and reaching the pump oil. Ensure the cold trap is appropriate for situation and follows all manufacturer and safety guidelines.

Work Practice Controls

General:

- Place pump on spill tray to contain oil spills if the equipment fails.
- Shield any glassware under vacuum.

Physical:

- Ensure all vacuum pump belt systems are guarded.
- Electrical cords and switches must be free from defects.
- Avoid placing pumps in an unventilated and enclosed receptacle.
- Do not operate pumps near combustible materials.
- Use correct vacuum tubing and replace old tubing.

Chemical:

- Use engineering controls to avoid exposure.

- Ensure pump oil is compatible with vapors that will pass through the pump (i.e. avoid hydrocarbon pump oil and oxidizing gases/vapors).
- Close valve between vessel and pump before turning off pump to avoid introducing oil into system.
- Ensure gases or vapors will not damage the pump.
- If cold traps are used, check for blockage.
- Check oil levels and change oil when necessary. Change oil when it begins to turn a dark brown color.
- An oil mist separator can be used to prevent oil loss.

Personal Protective Equipment (PPE)

Wear safety glasses, lab coat, long pants, close-toed shoes and gloves when performing all vacuum operations.

Transportation and Storage

Vacuum pumps must be stored on spill trays to prevent oil spills. Vacuum pump areas may be insulated for noise, if necessary.

Waste Disposal

All used vacuum pump oils must be disposed of through EH&S.

Do not dispose of chemical wastes by dumping them down a sink, flushing in a toilet or discarding in regular trash containers. Contact EH&S at (509)-963-2338 or at EHS@cwu.edu for waste containers, labels, waste collection and for any questions regarding proper waste disposal. Also refer to EH&S's Hazardous Waste webpage for more information (<http://www.cwu.edu/ehs/hazardous-materials-hazardous-waste>).

Exposures/Unintended Contact

If the employee is in need of emergency medical attention, call 911 immediately. Report all work related accidents, injuries, illnesses or exposures to Labor & Industries (L&I) within 24 hours by contacting 800-423-7233.

Contact EH&S for advice on symptoms of chemical exposure, or assistance in performing an exposure assessment.

Complete the EH&S Online Accident Reporting Form (<http://www.cwu.edu/~web/cwu-accident-report/>) or Report an Unsafe Condition or Hazard Report form (<http://www.cwu.edu/~web/report-hazardous-condition/>).

Spill Procedure

A minor (small) chemical spill is one that the laboratory staff is capable of handling safely without the assistance of safety and emergency personnel, i.e., less than 1 Gallon or 3.5 Liters. A major/large chemical spill requires active assistance from emergency personnel.

For small oil spills, treat the oil as a hazardous chemical spill. Use appropriate absorbent and dispose of as hazardous waste. For large oil spills contact EH&S at (509) 963-2338.

- When a spill occurs, personal safety should always come first.

- Alert and clear everyone in the immediate area where the spill occurred.

Additional Spill Response Steps:

MINOR CHEMICAL SPILL

- Alert people in immediate area of spill.
- If spilled material is flammable, turn off ignition and heat sources. Don't light Bunsen burners or turn on other switches.
- Open outside windows, if possible.
- Wear protective equipment, including safety goggles, gloves and long-sleeve lab coat.
- Avoid breathing vapors from spill.
- Confine spill to as small an area as possible.
- Do not wash spill down the drain.
- Use appropriate spill kits/sorbents to absorb spill. Collect contaminated materials and residues and place in container. Contact EH&S (509) 963-2338 for proper disposal.
- Clean spill area with water.

MAJOR CHEMICAL SPILL

- Attend to injured or contaminated persons and remove them from exposure.
- Alert people in the laboratory to evacuate.
- If spilled material is flammable, turn off ignition and heat sources. Don't light Bunsen burners or turn on other switches.
- Call Central Washington University's Public Safety at 911 immediately for assistance.
- Close doors to affected area.
- Post warnings to keep people from entering the area.
- Have person available that has knowledge of incident and laboratory to assist emergency personnel.

Certification

I have read and understand the above SOP. I agree to contact my Supervisor or Principal Investigator (PI) if I plan to modify this procedure.

| Name | Signature | CWU ID # | Date |
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Principal Investigator _____ Date _____