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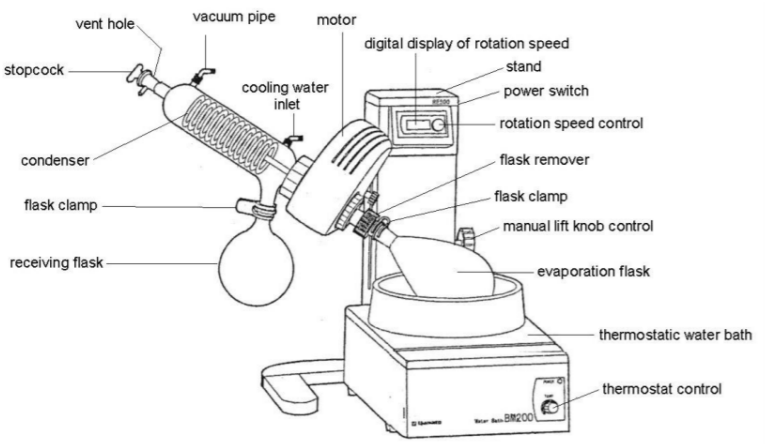
# Rotary Evaporator Fact Sheet

**What are Rotary Evaporators?**

A rotary evaporator (also called as "rotavap" or "rotovap") is a device used in labs for the efficient and gentle removal of solvents from samples by evaporation. The picture on the right shows what a typical rotary evaporator includes.




Source: http://www.chem.ucalgary.ca/courses/351/laboratory/rotavap.pdf

**What are Potential Hazards?**

- Burn hazard from heating water bath (usually range from 25 – 95 °C) or cryogens used for cooling.
- Implosion hazard from vacuum system.
- Ignition hazard if flammable liquid vapors escape the apparatus or accumulate in the pump.
- Inhalation hazard if toxic chemical vapors escape the apparatus.
- Pinch point hazard from the motor unit and manual quick-action jack.
- Entanglement with spinning parts.
- Electrocution/shock hazard from the outlet.
- Cut hazard from broken flasks.

**How to Work Safely with Rotary Evaporators?**

1. Wear lab coats, eye protection (safety glasses or goggles), closed-toes shoes, and appropriate gloves while operating the equipment.
2. Tie back long hair and do not wear loose items to avoid entanglement.
3. Ensure that the apparatus is maintained in a good working order. Seals should be checked periodically and replaced as necessary. Decrease in vacuum and leaking are generally indications that seals should be replaced.
4. Use a vacuum source that is appropriate for the level of vacuum needed. Diaphragm pumps are appropriate for most applications. Belt pumps and rotary vane pumps provide high levels of vacuum that can cause excessive bumping (i.e., flash boiling of

solvent) and clog traps. Water aspirators should not be used as these can allow solvent vapors to enter drains and waste large volumes of water.

5. Check all glassware for visible chips, cracks or scratches before using. Handle glassware with care at all times.
6. Always use a cold trap in between the rotovap and the pump. Never use a liquid nitrogen to cool the trap as this can cause condensation of liquid oxygen. Empty the trap after each use. If a trap becomes clogged, immediately shut off the vacuum, disconnect the trap and ensure it is open to atmosphere to prevent explosion. Allow the trap to thaw in a fume hood to empty.


*A bump bulb*

7. Cool the receiving flask in a cold bath (typically ice water) and ensure that fluid used to cool the condenser is at a temperature appropriate for the solvent being removed. This will promote efficient collection of solvent and avoid overloading cold traps. Use chilled recirculators, or similar types of items, for supplying cooling fluid to the condenser to avoid wasting water.
8. Use a bump bulb (see picture) placed between your sample and the condenser to prevent contamination of the condenser area (and your sample) in the event of bumping. Remove and clean the bump bulb from the rotovap immediately after use to ensure ground glass joint connections do not stick together and to prevent contamination of future samples that will be rotovaped.
9. Always ensure that flasks, bump bulbs, and ground glass joint connections are secured to the unit with clamps or Keck clips, as appropriate.
10. Always keep organic solvents and residues away from the water baths and the electrical components. Change contaminated baths immediately.
11. Know the risks and properties of the chemicals you are working with. SDS sheets can be found through CEMS: https://cems.unh.edu/umass/CEMS/. Rotovaping of toxic items should only occur with appropriate local exhaust (i.e., in a fume hood, or in some cases, with a snorkel exhaust). Please contact EH&S if you have questions about the safety of your rotovap configuration for your application.
12. Rotovaps cannot be used for air and water-sensitive materials. Highly reactive materials should also not be rotovaped to prevent damage to seals. Distillation is a more appropriate choice for solvent removal for these items.
13. The water bath temperature should not exceed the boiling point of the solvent. Increase the temperature of the bath slowly to avoid bumping. Since a vacuum is

usually applied to the setup, the boiling points of the solvents are going to be significantly lower than at ambient pressure (examples in the table below):

| Solvent | b.p. (760 torr) | b.p. (40 torr) |
|---|---|---|
| acetonitrile | 81.8 °C | 7.7 °C |
| diethyl ether | 34.6 °C | -27.7°C |
| ethanol | 78.4 °C | 19 °C |
| ethyl acetate | 77.1 °C | 9.1 °C |
| hexane | 68.7 °C | -2.3 °C |
| heptane | 98.4 °C | 22.3 °C |
| methanol | 64.7 °C | 5.0 °C |

14. Set the motor to start spinning slowly prior to applying vacuum to avoid bumping. Adjust the spinning speed once the vacuum is engaged to maximize surface area and prevent bumping.
15. Adjust the pressure to the minimum level needed to allow for efficient removal of solvent. Some units are equipped with devices to automatically control the pressure to a defined set point. For other units, pressure must be adjusted manually by using the vent stopcock located at the top of the condenser. For both types of units, the pressure should be monitored and adjusted, if necessary, throughout the process to avoid bumping.
16. Always empty the solvent collection flask of the unit immediately after use to prevent accidentally mixing of incompatible materials or unidentified waste.

References: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