



ENVIRONMENTAL HEALTH & SAFETY FACT SHEET: CENTRIFUGE SAFETY



There are three general classes of centrifuges in use at the University of Massachusetts at Amherst. Low speed centrifuges which do not exceed 5000 rpm are commonly found on the bench top. High speed centrifuges which do not exceed 25000 rpm are generally floor models. Ultracentrifuges which may exceed 100,000 rpm are often found in core equipment areas and are the most expensive and most dangerous centrifuges on campus. Knowledgeable use, careful procedures, and preventative maintenance are important for all centrifuges but especially for ultracentrifuges.

Over time centrifuge rotors show signs of metal fatigue as a result of the powerful mechanical forces to which they are subjected. Manufacturer guidelines should be followed regarding when to derate (permanently lower the speed) and when to retire centrifuge rotors. Centrifuges are designed to contain the rotor in the event of a failure but there have been documented incidences of rotor failures that were not contained and caused injury to property and personnel. Preventive maintenance for centrifuges should include an inspection of the rotors by trained personnel. Keeping a use log for ultracentrifuges can assist in calculating hours of use which can then be used to determine when a rotor should be derated or retired.

Operators of centrifuges on campus should be trained by supervisors or colleagues in the proper use of centrifuges. User error is the biggest cause of centrifuge malfunction.

Common causes of centrifuge malfunctions include:

- Failure to place the lid on the rotor.
- Failure to properly secure the rotor lid.
- Failure to properly secure the rotor to the drive.
- Overloading the rotor's maximum mass.
- Running swinging bucket rotor with missing buckets.
- Buckets hooked incorrectly and unable to swing freely.
- Improper balancing of centrifuge tubes.
- Utilization of centrifuge tubes that are not rated for the correct speed.

If a centrifuge malfunctions:

- Turn off the centrifuge and do not attempt to open the lid.
- Contact your supervisor or administrative assistant to determine who to call for centrifuge repairs.
- If there is evidence of leakage or tube damage when centrifuging infectious materials, close the lid immediately, allow aerosols to settle, and plan the disinfection procedure.

All centrifugation shall be done using centrifuge safety buckets or sealed centrifuge tubes in sealed rotors. If any spills or leakage are apparent in the centrifuge the rotor should be cleaned

with a mild detergent, rinsed thoroughly with distilled water, and allowed to air dry completely. Do not use abrasive or corrosive materials to clean the rotor as this can cause damage to the rotor.

The following procedures for centrifugation are recommended:

- Examine tubes and bottles for cracks or stress marks before using them.
- Fill and decant all centrifuge tubes and bottles within the biological safety cabinet.
- Wipe outside of tubes with disinfectant before placing in safety cups or rotors.
- Never overfill centrifuge tubes as leakage may occur when tubes are filled to capacity. The maximum capacity for centrifuge tubes is 3/4 full.
- Always cap tubes before spinning. Use screw cap tubes.
- Place all tubes in safety buckets or sealed rotors when centrifuging infectious materials. Inspect the "O" ring seal of the safety bucket and the inside of safety buckets or rotors. Open safety buckets or rotors in a biological safety cabinet.
- Never exceed safe rotor speed.
- Ensure that the load is balanced. A difference of 0.5 grams at 500000 x g is equivalent to a 250 kilogram difference.
- Stop the centrifuge immediately if an unusual condition (noise or vibration) begins.

Centrifuge Safety Online:

- Beckman Coulter Centrifugation Laboratory Resources:
http://www.beckman.com/resourcecenter/labresources/resource_centrif.asp
- Sorvall Centrifuge Information:
<http://www.kendro.com>
- AIHA Laboratory Health and Safety Committee Centrifuge information:
<http://www2.umdj.edu/eohssweb/aiha/accidents/explosion.htm#Centrifuge>
<http://www2.umdj.edu/eohssweb/aiha/technical/labequipment.htm#Centrifuge>