

CENTRIFUGE SAFETY

(For assistance, please contact EHS at (402) 472-4925, or visit our web site at <http://ehs.unl.edu/>)

Rotors on high-speed centrifuge and ultracentrifuge units are subject to mechanical stress that can result in rotor failure. In addition, improper loading and balancing of rotors can cause the rotors to break loose while spinning. For these reasons, centrifuges must be properly used and maintained.

Training and Repair

- Before using any centrifuge, review the owner's manual. If a manual is not available, obtain a copy from the manufacturer. Do not operate a centrifuge before reading the owner's manual or before being trained in the safe use of the centrifuge by an experienced operator.
- Be familiar with unsafe situations or equipment operating conditions before beginning operations using centrifuges.
- Centrifuges should be repaired only by the manufacturer or authorized dealer representative. Do not attempt repairs. Centrifuges in need of repair should be tagged and locked-out while awaiting service.

Rotor Care and Use

- Rotors and other exposed parts of centrifuges should always be kept clean free of chemicals and chemical residues. Metal rotors in contact with moisture for extended periods of time may result in corrosion and equipment damage. It is important that the rotor is left clean and dry after use. (Wash with mild detergent and warm water using a nylon bottle brush, if necessary). Dry the rotor thoroughly. In some cases the manufacturer may recommend storing rotors upside down with the cover and tubes removed to prevent water from pooling inside of equipment.
- Do not autoclave rotors at temperatures above 100°C.
- To avoid corrosion, do not expose aluminum rotor components to strong acids or bases, alkaline lab detergents, or salts (chlorides) of heavy metals (e.g., cesium, lead, silver or mercury).
- Check that the centrifuge chamber, drive spindle, and tapered mounting surface of the rotor are clean and free of scratches or burrs.
- Damaged rotors must not be used.
- Wipe drive surfaces prior to installing the rotor.

- Make sure rotor, tubes, and spindle are dry and that the rotor is properly seated and secured to the drive hub. Do not operate the centrifuge without the appropriate rotor cover securely fitted with seals in place.
- If the temperature of the chamber is below room temperature, pre-cool the rotor to the lower temperature before securing the rotor (this will minimize the chance of it seizing to the tapered spindle).
- Always complete the machine log book since the number of hours of operation determines the life of the rotor.
- High-speed rotor heads are prone to metal fatigue. Each rotor should be accompanied by its own logbook indicating the number of hours operated at top or de-rated speeds. Do not exceed the design mass for the maximum speed of the rotor. Failure to observe this precaution can result in dangerous and expensive rotor disintegration.
- Never exceed the manufacturer's stated maximum speed for any rotor.
- At times it may be necessary to de-rate rotor speed, which is defined as reducing the maximum safe speed at which a manufacturer states a rotor should be used. De-rate the rotor speed whenever: a) the rotor speed, temperature, or a combination of the speed and temperature during operation exceeds the solubility of the gradient material and causes it to precipitate, or; b) the compartment load exceeds the maximum specified by the manufacturer, or; c) when a manufacturer recommends based upon the amount of use the rotor has received, limiting the maximum speed at which the rotor is used to some level below the maximum speed listed for the rotor when it was new. This requires that operators maintain a comprehensive use log for each rotor. Failure to reduce rotor speed under these conditions can cause rotor failure.
- Balance the rotor to within the limits specified (take care that materials of similar densities are in opposite positions of the rotor).

Tube Care

- Before use, tubes should be checked for cracks. The inside of cups should be inspected for rough walls caused by corrosion and adhering matter should be removed. Metal or plastic tubes (other than nitrocellulose) should be used whenever possible.
- Make sure each tube compartment is clean and corrosion free.
- Tubes must be properly balanced in the rotor ($\frac{1}{2}$ gram at 1 G is roughly equivalent to 250 Kg @ 500,000 G's).
- Check compatibility of the tube material to the solvent medium (some solvents may cause the tubes to swell or crack in the rotor).
- Never fill centrifuge tubes above the maximum recommended by the manufacturer.
- Use only correctly fitting tubes.
- Use sealed rotors, sealed buckets, or a guard bowl cover complete with gasket as well as safety centrifuge tubes (tube or bottle carrier with sealable cap or "O" ring cap).

Miscellaneous

- Once a run is complete, make sure the rotor has **COMPLETELY STOPPED** before opening the centrifuge lid. Never attempt to open the lid of a centrifuge or slow the rotor by hand while the rotor is in motion. Serious injury may result.
- If a tube breaks, the centrifuge should be turned off and allowed to stand undisturbed for an appropriate amount of time before opening to allow aerosols to settle. Thirty (30) minutes is a commonly recommended waiting period. Clean and disinfect the rotor. If infectious material was placed in the centrifuge, implement protocols for safe decontamination and cleanup of equipment. Cleaning and disinfection of tubes, rotors, and other components requires considerable care. No single method is suitable for all items, and the various manufacturers' recommendations must be followed to avoid rotor fatigue, distortion, and corrosion.
- After use, tubes, rotors, and centrifuge interiors should be cleaned and/or disinfected.
- Clean up spills immediately, using appropriate spill response procedures.

Infectious Substances

- Use a HEPA-filtered safety centrifuge cabinet.
- Always use safety centrifuge cups and check the integrity of the "O" rings before every use.

References: Information contained in this SOP was gathered from the following sources: University of California-Berkeley, University of Bristol UK, and University of California-San Diego.