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July 2012 Safety Topic of the Month

Centrifuge Safety

Centrifuges, which operate at high speed, have great potential for injuring users if not operated properly. Unbalanced centrifuge rotors can result in injury or death. Sample container breakage can release aerosols that are harmful if inhaled. The majority of all centrifuge accidents result from user error. To avoid injury, workers should follow the manufacturer's operating instructions for each make and model of centrifuge that they use.

High-speed centrifuges rely on rotors designed for the particular make and model. These rotors are subject to high mechanical stresses from the forces of the rotation speed. Rotors are rated for a maximum speed and a load of specific weight. Improper loading and balancing can cause the rotors to dislodge while spinning. Failure of the rotors may present a number of hazards; violent movement of the unit itself may cause injury or damage to equipment; flying shrapnel may cause personal injury or facility damage; and some units are susceptible to explosions due to the configuration and materials of construction.

Follow these steps for the safe operation and maintenance of centrifuges:

Operations

- Ensure that centrifuge bowls and tubes are dry and the spindle is clean.
- Use matched sets of tubes, buckets and other equipment.
- Always use safety centrifuge cups to contain potential spills and prevent aerosols.
- Inspect tubes or containers for cracks or flaws before using them.
- Avoid overfilling tubes or other containers.
- Ensure that the rotor is properly seated on the drive shaft.
- Make sure that tubes or containers are properly balanced in the rotor.
- Close the centrifuge lid during operation. The disconnect switch should automatically shut off the equipment when the top is opened.
- Follow the manufacturer's instructions for safe operating speeds. Do not run a rotor beyond its maximum rated speed.
- Do not use the centrifuge for materials that are capable of producing flammable or explosive vapors unless the unit is specifically designed for such use.
- For infectious materials, wait 10 minutes after the rotor stops before opening the lid.
- If a spill occurs, use appropriate decontamination and cleanup procedures for spilled materials. Use tweezers to remove broken glass.

Maintenance

- Keep a usage and maintenance log
- Do not use harsh detergents or abrasive wire brushes to clean rotors, especially aluminum rotors. Use a mild detergent and rinse with deionized water, if possible
- Check O-rings and grease the seals routinely with vacuum grease per manufacturer's instructions.
- Always use the rotor specified by the manufacturer Be sure to follow the manufacturer's guidelines for when to retire a rotor.
- Inspect the components of the centrifuge each time it is used:
    - Look for signs of corrosion of rotors. Metal fatigue will eventually cause any rotor to fail
    - Ensure that the coating on the rotor is not damaged.
    - Check the cone area for cracks, because this area is highly stressed during rotation
    - Look for corrosion or cracks in the tube cavity

Discussion Topics

1) Does the lab have a standard operating procedure for centrifuge operations? Is there a procedure in place for decontamination and cleanup for spilled materials? Are lab personnel trained on proper centrifuge operation?
2) Is there a usage and maintenance log for the centrifuge? Is the manufacturer's operating manual readily available?
3) Verify that the rotor is designed specifically for the particular make and model of the centrifuge and that the rotor has not exceeded the recommended service life (usage and/or age) per the manufacturer's instructions.
4) Consider replacement of older centrifuges that do not meet current safety standards.

References

Occupational Safety and Health Administration (OSHA) Quick Facts – Laboratory Safety – Centrifuges - http://www.osha.gov/Publications/laboratory/OSHAquickfacts-lab-safety-centrifuges.pdf

Prudent Practices - http://www.nap.edu/catalog.php?record_id=12654

Harvard Centrifuge Safety - http://www.uos.harvard.edu/ehs/ih/centrifuge.pdf

Chemical Health and Safety – Safety and the Laboratory Centrifuge - http://www.sciencedirect.com/science/article/pii/S1074909801002635