OPERATION & MAINTENANCE OF THE BECKMAN GPK CENTRIFUGE

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1.0 SCOPE AND APPLICATION

1.1 This standard operating procedure (SOP) describes the operation and maintenance of a Beckman GOP series centrifuge, specifically the GPK centrifuge.

1.2 The Beckman GPK centrifuge may be used to rapidly sediment, precipitate, and separate substances of differing densities by centrifugal force, from a fluid.

2.0 METHOD SUMMARY

2.1 Load the centrifuge tubes with the to-be-centrifuged material, being certain that opposing tubes are balanced by mass. It is extremely important that the centrifuge tubes are able to sustain the rotation speed, that the tubes are compatible with the fluids used, that the tubes are size compatible with the rotor, and that the mass of the opposing tubes to be centrifuged are balanced. Install the rotor into the centrifuge cavity. Close the instrument's lid/door, adjust the rotor's rotation speed to the desired revolutions per minute (rpm), select the appropriate braking option, then turn the timer dial to the desired duration. When operation is complete and the rotor has stopped, open the lid/door and remove the centrifuged materials.

3.0 INTERFERENCES AND POTENTIAL PROBLEMS

3.1 Because of the high rotation speeds involved during this instrument's operation, safety precautions must be observed at all times. Unbalanced rotors can cause personal injury, centrifuge and rotor damage. During the operation of the centrifuge, the door must be securely fastened and in the locked position.

4.0 EQUIPMENT AND APPARATUS

4.1 Centrifuge, rotor, and compatible centrifuge tubes, which are suitable for use at the intended rotation, speed. Operating procedures include installing the rotor, loading the rotor, determining the relative centrifugal force (RCF), setting the controls, performing the run cycle, and removing the rotor.

5.0 PROCEDURE

5.1 Connect the power cord and press the POWER switch to ON.

5.2 Open the centrifuge's lid/door by pressing the OPEN switch on the control panel, and lifting it up (this will lock the lid/door in the open position).

5.3 Select an appropriate rotor for the experiment. Inspect the rotor and centrifuge tubes' condition. If any damage is observed, do not use the rotor or the centrifuge tubes. Load the rotor with the centrifuge tubes; the opposing centrifuge tubes must be equally weighted. Be certain that the grooves under the rotor body are seated on the pin in the drive shaft of the centrifuge. If a swinging bucket rotor is used, all four buckets must be installed and filled during the run. Opposing loads should balance to within 5 grams (see the Rotors Manual for complete information).

5.4 Close the instrument door.

5.5 Set the SPEED dials to the desired positions.

5.6 Select the HIGH, LOW or OFF (coast) brake options.

5.7 Turn the timer to the desired setting and the centrifuge will start.

5.7.1 As the run begins, programmed acceleration control protects delicate gradients. When the rotor speed reaches about 200 revolutions per minute (rpm), full acceleration to the final set speed occurs. The digital display for RPM will indicate the rotor speed, and the countdown timer will show the time remaining in the run.

5.7.2 To interrupt and stop a run in progress, turn the Timer knob to the OFF position. The door interlock system will keep the lid/door latched until the rotor has virtually stopped spinning (less than 40 rpm).

5.7.3 After the rotor has completely stopped spinning, open the lid/door by pressing the OPEN switch on the control panel, and lift it up. Always remove the rotor and unload the chambers following a run. The rotor may be stored in the centrifuge, though good operating practice is to store the rotor outside of the centrifuge, in a clean, controlled temperature environment. Always clean the rotor with a non-abrasive, mild detergent following a run.

It is important to note that all centrifuges have a critical speed at which vibration occurs. As the speed of the rotor increases past this critical speed, the vibration will cease. An imbalanced load intensifies the critical frequency. DO NOT OPERATE THE CENTRIFUGE AT THE OBSERVED CRITICAL FREQUENCY. If the vibration does not cease, stop the run and re-balance the load. Safety features of the GPK centrifuge include an imbalance detector that will cause automatic shutdown of the centrifuge if rotor loads are severely out of

balance, a safety latch mechanism which disallows centrifuge operation unless the door is securely latched, and an interlock which does not allow the door to be opened until the rotor has virtually stopped rotating.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

6.1 During a run, the digital display indicates the rotor speed to the nearest 10 rpm increments. Periodically, the speed of the rotor's rotation must be verified, and if necessary, calibrated. To perform this calibration, administer the following procedure:

6.1.1 Place a strip of reflective tape on the rotor, install the rotor, shut the door, and set the desired speed value. Place the brake in the HIGH position. Set the timer knob to the HOLD position and the instrument will start. When the rotor reaches its set speed, use the strobe to verify the rotor's speed with the display. Should there be a discrepancy, check the calibration of your strobe.

6.2 If the set speed and the determined speed are not in agreement, the rotation speed knob may need to be adjusted. Calibrate the speed control knob to the actual speed (measured speed) as follows:

1) Install a balanced rotor in the centrifuge cavity and close the lid/door.

2) Set the speed control knob to 3,000 rpm, and set the TIMER to the hold position, thus starting the centrifuge. When the rotor speed stabilizes, adjust the speed control knob until the strobe measured speed is 3,000 rpm.

3) Loosen the set screw on the speed control knob, and move the knob around the shaft until it indicates the 3,000 rpm setting. Tighten the screw.

4) Terminate the centrifuge's operation by turning the Timer knob to the OFF position.

7.0 HEALTH AND SAFETY

7.1 Do not place the centrifuge near areas containing flammable reagents or combustible fluids. Vapors from these materials could enter the instrument's air system and be ignited by the operation of the centrifuge.

7.2 Be certain the power outlet used is compatible with the voltage needed to operate the centrifuge.

7.3 Operator error or tube failure may generate aerosols. Toxic, pathogenic, or radioactive materials should not be placed in the centrifuge.

7.4 Inspect the rotor for defects before and following each run. The rotor should be inspected for major and hairline cracks, deep scratches, severe dents, and corrosion. Liqui-Nox (Alconox, Inc.), ActioNox (Scientific Products), Haemo-Sol (Meinecke & Co.), or 70% ethanol or isopropanol can be used to clean and disinfect the rotor.

7.5 The parts of the centrifuge should be maintained in a clean, uncluttered environment, to insure satisfactory operation and increased service life. ALWAYS UNPLUG THE POWER CORD DURING CLEANING AND MAINTENANCE. Unlatch the door and remove the rotor. Clean the interior of the centrifuge of broken and ground glass, spillage and dust. This must be done in order to insure the centrifuge's motor life, to prevent abrasion of the inside surfaces, and to prevent sample contamination. Following cleaning and disinfection, thoroughly rinse the rotor with clean water. Dry the rotor before re-installation.

8.0 REFERENCES

Beckman GPK Centrifuge Operating Manual