

STANDARD OPERATING PROCEDURES
DIVISION OF COMPARATIVE MEDICINE
UNIVERSITY OF SOUTH FLORIDA

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TITLE:	Bioquell Z-2 Hydrogen Peroxide Vapor Generator System
SCOPE:	Animal Care Personnel
RESPONSIBILITY:	Facility Manager and Technical Staff
PURPOSE:	To Outline the Proper Procedures for Use and Maintenance of a Hydrogen Peroxide Vapor (VHP) Generator System

I. PURPOSE

1. This procedure outlines the use and maintenance of the Bioquell Z-2 VHP Generator System used for decontamination of animal housing rooms and common procedural areas within the animal facilities.

II. RESPONSIBILITY

1. The Facility Manager ensures that equipment is appropriately cleaned, maintained in good working order, and available for use.
2. The Facility Manager ensures that all technical staff using this equipment are adequately trained and experienced in the use of the Bioquell Z-2 system.
3. It is the responsibility of the technical staff using this equipment to read, understand and follow the procedures outlined below.
4. It is the responsibility of the technical staff using this equipment to read, understand and follow the instruction contained in the *Bioquell Z-2 Hydrogen Peroxide Vapor Generator System* and the *Bioquell R-30 Aeration Unit User Manuals*.

III. EQUIPMENT USE

BACKGROUND and SET UP

1. For instructions regarding room decontamination see **SOP #1016** entitled ***Hydrogen Peroxide Vapor Decontamination***.
2. The Bioquell Z-2 is designed to carry out a complete bio-decontamination cycle and is capable of controlling and monitoring the process.
3. The Bioquell VHP Generator System is composed of the VHP generator, which includes a detachable lectern to remotely control the unit, and a Bioquell R-30 aeration unit.

4. Place the Z-2 generator in the center of the room, or other position, for even VHP distribution to any alcoves or side rooms connected to the main room. Positioning the front of unit facing the door allows the HP level in the reservoir to be viewed from outside the room. Apply the brakes on the two front wheels by pushing the down on the foot pedal. Always push the Bioquell Z-2 from the back side (i.e., lectern side).
5. **Separate the lectern from the main unit of the Z-2** by lifting the handle and pulling away from the main unit. **Place the lectern outside of room.** The lectern contains:
 - a. Distance meter for measuring room area
 - b. HP concentration monitor
 - c. Cable for powering the main unit
 - d. Cable for connecting lectern to main unit
 - e. Eye protection disposable gloves
 - f. Sealing tape and spare printer paper
6. **Remove the control cable reel** from the main unit and attach the socket to the main unit and secure with cable retention clips.
7. **Unwind the cable from the reel and connect to the lectern** by plugging the lectern cable (located in the lectern) into the cable winder and secure with cable retention clips.
8. **Plug power cable into the main unit** and secure with cable retention clip. Plug the main unit into power source and turn on green switch to illuminate. It is recommended to use a power outlet that is not shared with other large equipment to ensure adequate amperage to the unit.
9. **When the R-30 is used for aeration only**, place the unit in the room so that air can flow, unimpeded, into all six filters. **When using the R-30 to aid in the distribution of VHP**, position the front of the unit so the VHP distribution fans are directed toward the alcoves or side rooms. Engage the brakes located on the rear wheels
10. **Connect the power cable to the R-30 and to the power supply** (use the retaining clip to secure the cable to the unit). **Ensure that the power source is on a different circuit than the Z-2.**
11. **Connect the communication cable to the R-30** input control signal connector (← arrow pointing to the connector) and to the **Z-2 VHP Generator**.
12. **Turn the R-30 on** at the green ON/OFF power switch. The self-decontamination fan within the unit will operate automatically during the aeration cycle.
13. **If required for distribution of VHP** (e.g., when room is large or has side rooms/alcoves), depress the VHP distribution fan ON/Off switch to operate VHP distribution fans. When depressed a green light around the switch will illuminate and the distribution fans will begin operating.
14. **Ensure the Manual Aeration switch is OFF** (the amber light around the switch should not be illuminated).

15. Return to the lectern and **press the Bioquell logo**. If the relative humidity (RH) or temperature of the room is out of range to run a cycle an alarm will appear.
16. The next screen is the **main menu**. A password (i.e., “super”) is required to proceed further. Menu choices include: “**aeration test**”, “**stored cycles**”, “**new cycle**”, “**admin menu**”, or “**aeration only**”.
17. If the R-30 aeration unit is connected, **press the “TEST” button**. This will start the aeration unit. Press “**OK**” to turn unit off once it is confirmed to be working.
18. At the main menu screen press “**Stored Cycle**” to select a cycle previously entered. If a “**New Cycle**” is required, please see the Programming a Cycle section below.
19. Next choose “**Parametric Cycles**”. Parametric cycles use the Bioquell Z-2’s own calculation while timed cycles are a fixed timed cycle that has been previously validated. “**Timed cycles**” require development and validation, and will rarely be used, if at all.
20. From the “**Stored Cycle Name**” pull down key, all the stored cycles will be displayed. Using the scroll bar, scroll down and to and **select the stored cycle name to be run**.
21. **Cycles are named** using the first letter of the facility abbreviation, followed by the room number, and whether it is a normal room (N) or is heavily loaded room (L) (e.g. SRB room 292 loaded will be designated **S292L**).
22. Once the selected cycle is chosen the minimum amount of HP required for the decontamination cycle will be displayed in a yellow box. **Ensure an adequate amount of HP is present** in the 5L bottle located in the Z-2 unit. Replace bottle if necessary. **PPE required** when handling HP includes at least suitable gloves, sleeves and eye protection.
23. **Check the area again for people/animals, and** that all openings are shut, and ventilation is shut down or blocked off.
24. **Carefully shut door ensuring flat cable to lectern is not damaged and seal door with tape.**

RUNNING A CYCLE

1. Start the cycle by pressing “**Confirm Cycle**”, then “**I Agree**”, then “**Start Cycle**”, **enter password**, and press “**Start Cycle**” again. The timer screen will then be displayed. While the unit is running the ring of orange lights around the neck of the unit will flash.
2. The unit will start a **conditioning phase**. This phase allows the unit to equilibrate and lasts a minimum of 10 minutes, but may go longer if the vaporizer has not reached temperature.

3. The timer **screen will highlight in red the phase of the cycle the unit is in**. With the parametric cycle the gassing time is predicted, then will count up. In the dwell cycle the actual time completed will be displayed (i.e., 20 minutes).
4. At any time during the cycle the **cycle can be aborted by pressing the abort button** on the screen. When pressed a confirmation is required. Once aborted, the cycle will return to the main menu. An **“Aeration Only Cycle”** will need to be run prior to entering the room if vapor is present in the room.

AERATION

1. At the beginning of aeration, the display on the lectern informs the operator that any additional aeration procedures can be performed at this time (e.g., enabling the area's ventilation system, starting BSCs remotely by breaker, etc.) to reduce the time of aeration.
2. Caution must be taken when using the ventilation system to aerate the area to ensure:
 - a. The vapor is not exhausted to other areas
 - b. The area is not positively pressurized causing sealing tape to leak
 - c. The discharge is away from people
3. Both the Bioquell Z-2 unit and the R-30 unit provide catalytic conversion of VHP to oxygen and water vapor.
4. At the end of aeration the display will read **“Aeration Target Achieved Check concentration <1ppm Before Ending Cycle”** to prompt the operator to independently check the room HP concentration is < 1ppm using the low level HP sensor. **Remove tape** from the door and **place the sensor inside the door**. After a few minutes, retrieve the device and **if the displayed level is <1ppm it is safe to end the cycle and enter the area**. When VHP is confirmed <1ppm, stop the cycle by pressing the **“End Cycle”** button on the display. The operator's password is required. When entering the area check the HP concentration in all areas of the room.
5. The hand held sensor will give both an audible and visual alarm **if levels are > 1ppm. Do not enter the room** if the HP level is >1ppm. If the levels are >1ppm let the Z-2 continue to aerate and test again later.
6. A report is printed at the beginning of every cycle with the details of the Z-2 unit and cycle details. During the cycle the details of each phase are printed.
7. After completion of the aeration cycle turn power to unit off unit, disconnect cables, return ancillary equipment to its designated storage area, and replace lectern. Remove the HP bottle from the main unit and store in dark place.

PROGRAMMING A CYCLE

1. At the initial menu screen choose the **“New Cycle”** button, and enter password. Supervisor level access is required to program a cycle.

2. Choose either the **“Room Dimensions”** or **“Room Volume”** button and enter the appropriate values using the keypad which appears. Room dimensions/volumes can be determined using the electronic distance meter found in the lectern.
3. Set the remote **Start/Stop to OFF** (default is off). Remote Start/Stop is only used when an external source (e.g., building management system) is used to control the unit.
4. Set **Injection in dwell to ON** (default is on). When “on” is selected the injection rate can be set between 10g/min to 4g/min. 10g/min is used for all rooms > 50m³. Lower gassing rates are advisable when rooms are < 50m³.
5. Set Load to **“Normal”** or **“Loaded”**
 - a. **Normal** - is for rooms that are a simple shape, and is empty, or near empty of equipment.
 - b. **Loaded** – is a room that is L-shaped, or made up of two rooms, or has a fair amount of equipment present.
6. **Cycle Identification:** Cycles are named using the first letter of the facility abbreviation, followed by the room number, and whether it is a normal room (N) or is heavily loaded room (L) (e.g. SRB room 292 loaded will be designated **S292L**).
7. Press “OK”.
8. **Parametric cycles** use the information from instruments and an algorithm to determine the length of the gassing phase and the amount of HP liquid used automatically.
9. **Timed cycles** will run the gassing and dwell phases to a programmed time. Timed cycle will not be routinely used. Refer to the user manual for information on timed cycles.

IV. MAINTENANCE

1. Change printer paper as needed.
2. Clean unit when unit is off. Using a mild detergent solution, wipe unit with a damp cloth, taking care not to wet the control panel, printer, connections, and black pre-filters. Dry the surfaces using a lint-free cloth.
3. The Bioquell R-30 prefilters can be cleaned as needed to prevent dust buildup and debris from reaching the catalyst filters. Remove the filters from the unit with a screwdriver and either vacuum or wash with tap water. Allow filters to dry completely before reinstalling.
4. Service by trained Bioquell agents is recommended annually (see Item #5). This service includes changing internal filters and checking sensor calibrations.
5. Increased length of times for aeration may be an indication the internal filters should be changed

6. Any additional maintenance/service should be performed by authorized personnel.

V. SAFETY

1. Hydrogen peroxide (HP) is a strong oxidizer and is irritating to the eyes, skin, and mucous membranes. It is imperative that all personnel using HP wear the appropriate personal protection equipment.
 - a. Protective eyewear (e.g., goggles or face shield) must be worn when performing procedures that could result in HP coming in contact with the eyes.
 - b. Protective eyewear, impervious sleeves and gloves (e.g., neoprene or vinyl) are required when handling concentrated HP solutions (i.e., changing or filling bottles).
 - c. Wash hands after handling HP.
 - d. Flush skin/eyes with water if come in contact with HP.
 - e. HP spills should be cleaned-up with water.
 - f. If you must enter an area briefly during or immediately after fogging with HP, Tyvek coverall with hood and boots (or long sleeves, long pants, hair cover and shoe covers), gloves, snug-fitting goggles, and half-face respirator with organic vapor filters and a particulate filter (e.g., 3M 6000 half face-piece respirator assembly with 3M 6001 Organic Vapor cartridges and a 5n11 or 5P71 particulate filter) are required.

VI. REFERENCES

1. *Bioquell Z-2 Hydrogen Peroxide Vapor Generator System User Manual.*
2. *Bioquell R-30 Aeration Unit User Manual.*
3. *Bioquell Hydrogen Peroxide SDS.*
4. For additional information contact Bioquell Technical Support at (215) 682-0225

Approved:

Date: