

Honoring the goodbye after a life well loved

I have been practicing as a veterinarian for 17 years, and the last 12 have been in Topsham at Topsham Veterinary Wellness Center; which I own. I have found that the options for pet aftercare (ie. commonly cremation and home burial) are lacking and mostly impersonal. So, I started researching the process of aquamation as an alternative to cremation and how I could build it into the services I already provide to the community at my veterinary office.

My clients are amazing pet owners who suffer great heartache when they lose a pet. When I realized I could help them through this goodbye to the very end, by providing them with the ashes of their pet myself, I began to realize there could be even more support provided.

The "goodbye center" I aim to create would be a combination of 1) by-appointment euthanasias or delivery of a deceased pet in a private setting, 2) an opportunity to memorialize their pet through various mediums and artifacts/urns/memorabilia, and then finally 2) to process their pet's remains through aquamation – a water-based procedure in which bones are isolated and then processed into an ash-like consistency.

With this new facility, Farewell My Friend would be able to provide a quieter final goodbye for a pet and those who love them.

Overview of the Aquamation Process:

AKA “Alkaline hydrolysis” = “breakdown with water in a high pH” In this process, our bodies are returned to their most basic building blocks – water, fat and protein. The inorganic parts of our bone are not reduced, and they remain in their solid mineral form as pure calcium phosphate. In this process, it is actually *water molecules* that do the breakdown, not the chemical. The alkali provides a catalyst to accelerate hydrolysis, and along with heat (200 degrees), water flow, and system engineering, the reactions are thorough and quite rapid –What would take years in nature, is accomplished in a matter of hours using very few resources.

As a science review – the pH scale is 1-14, where below 7 is acidic and above 7 is alkaline. Acid example = lemon, Alkaline example = baking soda. With the aquamation process, pH is manipulated from a normal tap water at 8-8.5 increased up to 11-11.5. After the 22-hour cycle in the machine, only the bones remain. The system then pumps CO2 gas (acidic pH) into the water to decrease the pH to 9-9.5, and the waste water is then safe to go back into the sewer. In truth, this mildly higher pH in much larger quantities is what can buffer the low pH of human waste water.

In short: water goes into a tank, heats up, percolates for 22 hours and then gets drained out.

Water usage: ~200g/day which is what an average two-person household in the US uses.



<u>The following are examples of other industries that use sodium and potassium hydroxide:</u>

• Soap and detergent production, including craft/natural/homemade soap-making

• Cleaning product manufacturers (it is contained in some soaps, detergents, and drain cleaners)

• Beauty product industry (it often listed as an ingredient in shaving creams as well as various other cosmetic products)

• Food industries (it is used to clean and peel fruits and vegetables, and in some baking such as pretzel making, corn syrup production, vegetable oil processing)

Because 143 Lisbon Road is on an Aquifer Overlay, there is additional requirements to be met for this conditional approval for my project:

In summary:

Aquamation Operations/Information for Farewell My Friend

- There will be no floor drains in the aquamation facility
- For winter maintenance, we will use sand or a low-salt mix for the property
- Any chemicals will be stored in closed, labeled, water-tight containers
- Waste disposal, regular - will be done with a hired dumpster from Casella Waste
- Waste disposal, chemical* – if in the event, operations close and the chemical we utilize is no longer needed, it will be returned to our vendor BioResponse Solutions.

  *(There is no by-product chemical waste from the aquamation process itself.)

Farewell My Friend - SPILL PREVENTION AND CONTAINMENT PLAN

I. Emergency Contact Information: (to be posted within the facility)

- Facility Manager: Amy Ruksznis cell: (207) 504-2778
- Lisbon Fire Department - (207) 353-3000, Or 9-1-1
- DEP (Central Region, Augusta) - (207) 287-7688 ***Any spill is reportable in Maine

  (after hours - DPS Comm Center at (207) 624-7076)

- EPA - National Response Center - (800) 424-8802 for EPA reporting of spills
- Technical Process Expert: BioResponse Solutions - (317) 987-9099

II. System engineering

- The PET 550 system (manufacturer Bio-Response Solutions, Inc.) has safeties in place to prevent any spilling of process water.
- The system has an uninterruptable power supply to allow all valves and components to fail safe in the event of a power outage.
- The system also has EWON remote internet connectivity to alert the company and building personnel of any system errors during the process should one occur. This also allows emergency remote diagnostics from the manufacturer.

III. Generation and discharge of hazardous materials

- This facility/system/process does not generate or discharge any hazardous materials.

IV. Chemicals

a. Types of chemicals used and concentrations

- Anhydrous Potassium Hydroxide (KOH), 50 or 55lb bags flake, 90%
- Anhydrous Sodium Hydroxide (NaOH), 50 or 55 lb bags pellets, 99%

b. Quantity used

Machine can perform a maximum of one cycle per 24 hours; system can perform a half or a full cycle

- Average use per cycle: 3 lb KOH; 6 lb NaOH
- Maximum use per cycle: 11 lb KOH; 22 lb NaOH

c. Quantity stored

- Typical: quarter or half pallet total (10 bags or 20 bags, respectively)
- Maximum: full pallet total (40 bags, respectively) if proper permission is obtained by the state
- Total bag quantity will consist of 2/3 NaOH bags and 1/3 KOH bags on the same pallet
- Facility will ensure safe storage of alkali (see addendum for more info on container)

d. Disposal

· There will be no disposal of alkali at this site; the operation will not have an issue of disposal for expired chemical. The chemical has a very long shelf life, and is ordered in appropriate quantities for the facility's use.

· Alkali is consumed in the process.

· If the business ceases to do business, the removal of the alkali from the site will be facilitated by the chemical supplier. This may involve transferring to another facility, or using a proper service for removal.

V. Employee Training

· Employees are trained by the manufacturer (Bio-Response Solutions) of the system upon start-up.

· Future employees will undergo a training program by the appointed training expert for this business and will include a reviewing a copy of: **"Alkali Storage and Handling Best Practices Handbook for Employers"** created by BioResponse Solutions. This handbook outlines recommended methods for storing, handling, and using potassium hydroxide and sodium hydroxide. It also includes information on safety considerations for facility design and employee training for the safe operation of Bio-Response equipment and processes.

· Proper handling is regularly observed and strictly enforced; a disciplinary program is in place.

· Re-training occurs annually at minimum.

Chemical Handling Procedure during typical Aquamation Run

1. The weight of the bodies are measured and recorded

2. The bodies are respectfully placed in the basket cradles, each pet in their own individual compartment if the families wish to have remains returned.

3. The operator consults the manufacturer-provided Alkali Chart to determine the amount of chemical that will be added to the machine, and records this on their cycle log sheet. The Alkali Chart includes photos of the chemicals, states the mass of each chemical that is to be weighed out, and the total mass of the two chemicals combined.

4. The operator takes a moment to ensure they are ready for the chemical step. They wash and completely dry their hands.

5. The operator puts on proper PPE, located by the chemical storage area. PPE consists of wearing proper shop attire (closed-toe shoes long pants) and using fog-free safety eye-goggles, a pair of proper length alkali-resistant gloves, and a dust mask or respirator.

6. The operator places the Transfer Container on the scale and press TARE to zero the mass of the bucket. The Storage Container for the first chemical is opened, chemical is scooped, and gently placed into the container until the proper mass is reached. That Storage Container is closed. The Storage Container for the second chemical is opened, chemical is scooped, and gently placed into the bucket until the total mass is reached. That Storage Container is closed. The scoop is placed in a special sealed receptacle, and the container closed. If any chemical spills onto the floor, the operator follows the Spill Plan. This typically recommends using a designated broom and dustpan to immediately place it in the Storage Container (only if completely dry) or Alkali Transfer Container.

7. The operator carefully transfers the contents of the Transfer Container into the machine. In a pet system, the alkali is evenly distributed across the entire length of the basket cradles PRIOR to placing the lid on the basket.

9. The Transfer Container is taken back to the storage area and stored upside down on a disposable absorbent mat.

10. The operator returns to the machine to place and secure basket lid onto the cradle basket using the latch mechanisms. The door/external lid of the machine is closed and securely latched.

11. The Storage Containers are returned to their proper storage places. All areas are inspected for hygiene prior to PPE Removal. If the area is clean, PPE is removed per best practices and replaced on the hooks.

12. With prompt action, residue wiping and hand washing follow PPE removal. Any items that came in contact with residue are wiped down at this time with disposable wipes (broom and dustpan, goggles, respirator, etc.). The operator wipes the door of the machine with a clean disposable wet wipe. The operator thoroughly washes their hands at the hand sink.

13. The operator returns to the machine to operate the touch screen and start the cycle.

Safety Measures in place for working with KOH and NaOH:

I. Proper PPE (Personal Protective Equipment)

A. Farewell My Friend will provide the following items, available in proper sizes for all trained employees:

1. Goggles – fog-free, close fitting

2. Gloves – compatible material, extend at least to wrist

3. Respirator/dust mask – for dust particles only, there is no vapor

4. Apron or smock

B. Any employee handling alkali will need to be dressed in proper attire. This includes long sleeves and closed- toe shoes. Employees have the right to request a set of PVC boots to be stored with other PPE.

C. Only trained employees may access the alkali area and/or handle alkali. Training is valid only if provided and documented by our organization's designated training member. Any employee who does not wear full PPE will undergo disciplinary review and re-training. Repeated offenses may result in termination of employment.

II. Proper Safety Equipment

A. Safety shower and eyewash station

1. Station will be an ANSI Standard Z358. 1 compliant unit (compliant with CCOHS guidelines). A copy of this standard is maintained in the Hazard Communications (HAZCOM) binder located in the Main Office.

2. Access to the station will be unobstructed and clearly marked

3. Routine inspection and activation will be performed and documented

4. A site risk assessment statement stating the safety reasons for locating the safety shower eyewash station greater than 10 feet from the alkali storage area is maintained in the HAZCOM binder located in the Main Office.

III. Safe Storage Area

For dry alkali, our organization's requirements include:

1. Dry Accessible Storage

A. Located at proper height for easy access (not overhead)

B. Covered with a tarp or inside a storage bin

C. Stored on the skid, riser, or other method to prevent contact of any floor water with bags

D. Any opened bags must be closed, or transferred into a properly sealed storage container to prevent moisture contact. All packaging and storage containers will be properly marked.

2. Away from common traffic areas

A. Away from any walkways

B. Away from fork lift traffic to prevent puncture of bags

3. Properly Marked

A. All bags must be individually labeled (this is done by the manufacturer)

B. Any alkali transferred to a different container must contain a corrosives label

4. Though not legally required, our organization will locate the alkali storage where it is accessible to trained employees only. This may include a locked storage bin, closet, or a larger area with restricted employee-only access

5. Located with proper access to the safety shower eyewash station, but far enough away such that activation of the safety shower eyewash station will not wet the bags

IV. Notes on Quantity Stored On-Site

A. KOH and NaOH are not on the federal list of EHS (extremely hazardous substances), therefore the federal EPA does not require reporting for our quantities which are less than 10,000 lb (source: http://www2.epa.gov/epcra/epcra-sections-311-312#facilities%20required):

a. We may store the amounts we work with without a requirement for extra paperwork, monitoring, or reporting.
b. Our organization will not store greater than 10,000 lb of alkali. (We will store 500-1000 lb; max 2200 lb).

c. Regardless of quantity, we will notify the local fire department of our chemical type, quantity, and storage location and accommodation.

1. The local fire department will be invited to visit our site. This is for their safety (and ours, and our neighbors') should they have to respond to a call from our facility.

2. The fire department will ensure the storage area doesn't block exits, and will record location and details of the chemical for their pre-fire planning documents.

B. Spill Reporting

a. Dry alkali is does not pose a serious spill hazard, as it is easily contained and placed into a receptacle for later use. Employees will be properly trained to contain any spills on dry chemical and re-use the chemical in the neutralizing process. Employees will be properly trained to prevent any exit of chemical through the drains (sewer) or trash.

b. Our organization is aware of the proper reporting procedures.

(Please Note Underlined Information:)

Hazardous Matter SPCC Plans (https://www.maine.gov/dep/waste/spcc/hazmatspcc.html)

The term SPCC Plan, as used in state statutes governing hazardous matter, stands for a slightly different term-"Spill Prevention Control and Clean-up Plan. "Hazardous matter" refers to substances that have been identified by the Board of Environment Protection as posing a danger to people or the environment when spilled. Over 400 substances have been identified as hazardous matter by the board under Chapter 800 of the DEP's rules. Oil does not appear on this list and is not subject to the laws governing hazardous matter.

A hazardous matter SPCC plan shares the same acronym and has the same pollution prevention goal as an oil SPCC plan, but there are significant differences. *Most notably, the preparation of a hazardous matter SPCC plan is optional for facilities storing hazardous matter.*

Contact: Daniel.J.Wehr@Maine.gov

Addendum: Spill report form

HAZARDOUS WASTE & HAZARDOUS MATERIAL SPILL OR DISCHARGE REPORT FORM

All spills should be reported to the Department of Public Safety (State Police) immediately at 800-452-4664. Additionally, hazardous waste spills must be reported in writing to the DEP within 15 days. Hazardous material spills must be reported in writing to the DEP within 30 days. This form should be filled out by the spillor and returned to the DEP at the following address: Maine DEP, BRWM, 17 State House Station, Augusta, ME 04333

DATE & TIME OF CHEMICAL RELEASED: _____

NAME & ADDRESS OF COMPANY: _____
_____ _____

EXACT LOCATION OF SPILL: _____
_____
_____

CHEMICAL SPILLED: _____
AMOUNT:_____
CIRCUMSTANCES CAUSING RELEASE:_____
_____
_____
_____
_____

AMOUNT OF CHEMICAL RECOVERED: _____

METHOD OF RECOVERY:_____

METHOD & LOCATION OF DISPOSAL: _____
_____

WERE THERE ANY PERSONAL INJURIES, HOSPITALIZATIONS OR DEATHS?
_____
_____
_____

ACTIONS TAKEN TO PREVENT SIMILAR INCIDENT FROM RECURRING: _____
_____
_____
_____

WAS THIS INCIDENT REPORTED IMMEDIATELY?

DATE: _____ TIME:_____ CONTACT'S NAME:_____
PHONE#_____

REPORT PREPARED BY:_____ DATE: _____

Addendum: Water Usage Scenarios

Water Balance Calculations for PET-550 System

1. PET-550 Machine Discharge • Equipment is self-limiting

• Full cycle at maximum capacity operated as frequently as possible (1 cycle per 24 hour period) = 400 gal/day

• This is very unlikely for users of PET-550 systems. The busiest locations in the US do not run the machine 7 days per week

• Full cycle, 5 days per week (400*5)/7= 285.7 gal/day

• Scenario 1: Full cycles at maximum capacity operated 5 times *every* 14 days

• Scenario 2: Half cycles Operated 8 times every 14 days

• Scenario 3: 2 full cycles and 5 half cycles operated every 14 days [(1 * 400)+(2.5 *260))/7 = avg 150.0 gal/day

Maximum possible use:

Max 400 gal/day

Projected use by Month 36 (full operational capacity, 5 days per week):

Future: 286 gal/day

Projected use by Month 24 of operation (months 1-24 will be less use):

(2.5 full cycles/week x 400 gal/ full cycle)/7 days/wk= avg 142.8 gal/day

(4 half cycles/week x 260 gal/ half cycle)/7 days/wk= avg 148.6 gal/day

Recorded: Avg 150 gal/day

Plant washing water

A. Misc. facility washing: max 5gpd

B. Automated Equipment Rinse PET-550

• Volumes Used: Full cycle: 200 gallons

Half cycle: 130 gallons

• Maximum possible use = 200 gpd

Expected use @24 months = [(200*2.5)/7] = 71.4 gpd Recorded: Avg 76.4 gal/day

2. Sanitary wastewater

Maximum:

• 2 office employees (OE) * 13gpd = 26 gpd Expected: • same Recorded: 26 gal/day

Addendum: Water Effluent Characteristics

Parameter	Average (mg/l)
Fluoride	Same as feed water
Hardness (as $CaCO_3$)	Same as feed water
Iron (total)	ND
Lead	ND
Manganese	<0.01
Mercury*	ND
Oil and Grease (hexane solubles or equivalents)	0 - all oils and grease are saponified by hydrolysis of the ester bonds
Organic Nitrogen (as N)	250
pH	Unmodified: 11.3 Adjusted prior to discharge: pH 8.7-10.5* *pH is automatically modified to below required limits by CO_2 injection prior to discharge if requested/required by local wastewater authorities.
Phenols	0
Phosphorous (as P)	50
Radioactivity	0
Selenium	ND
Silver	ND
Sulphate	25
Suspended Solids	125
Zinc	0.02
Ammonia Nitrogen	125
Arsenic	ND
Barium	ND
Boron	ND
BOD_5	11,250
COD	16,875
Cadmium	ND
Chloride	100
Chromium (total hexavalent)	ND
Chromium (total trivalent)	Not possible at pH
Copper[a]	<.01[a]
Cyanide (total)	ND
Cyanide (readily released @ 150 F & pH 4.5)	ND
Fecal Coliform	0-Sterile

a: Copper comes from pipes, supply water (from summer water supplies contaminated with copper sulphate, etc.), and r mercury can come from some predatory animals (such as Coyotes). Alkaline Hydrolysis does not contribute to copper or content. Any measured copper is insoluble at the pH of the process.

BOD: biochemical oxygen demand

COD: chemical oxygen demand