

REC, LLC

RENEWABLE ENERGY CONSULTANTS, LLC

P.O. Box 41 / Beavertown, PA 17813 / 570-765-2020

rec2@ptd.net / <http://renewableenergyconsult.us>

Representatives of BIO-RESPONSE SOLUTIONS

BioLiquidator System

- Amazingly low capital cost
- Simple operation
- Superior digestion
- Can process multiple cycles per day
- Mobile design for ease of use and/or mobile disease response



Benefits of the Process

- Disposal of animal tissue wastes
- Destruction of many harmful chemicals and pathogens
- Operation is cleaner and less costly than incineration
- Creation of a useful byproduct as natural fertilizer



WITH THIS TECHNOLOGY, NUTRIENTS ARE RECYCLED

What is Alkaline Hydrolysis?

Alkaline hydrolysis tissue digestion is a non-burn process which has proven to be a superior alternative to incineration and burial, with a better impact on the environment and lower operating costs.

In this process animal tissues are broken down into their basic building blocks. This naturally-occurring process is *accelerated* in the BioLiquidator system, producing a sterile solution of amino acids, small peptides, sugars, nutrients, and soap, along with the mineral ash of the bones and teeth (calcium phosphate).

Environmentally Superior

Alkaline hydrolysis allows the nutrients to be recycled back to the environment SAFELY. Through the thermochemical process, any pathogens that may be present in the tissues are sterilized. It makes sense to return the nutrients and amino acids to the environment. Here are a few options:

- Land application as a rich natural fertilizer
- Compost additive
- Enrichment of manure slurry
- Disposal in a methane-generating landfill
- Nutrient feedstock for anaerobic digesters

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- Biofuel production through a biomass converter
- Sewer disposal
- Landfill disposal

Who Can Use This Technology?

Meat Processing Plant / Abattoir/ Rendering Facility

- Disposal of Specified Risk Materials (SRM): skulls, brains, spinal columns, and other parts that if infected would be high-titre for prion material, especially if SRM regulations are in place
- Can be used for harvesting tallow

Farms / Co-Ops

- Rapid disposal of animal carcasses for on-site processing to eliminate dependence on renderer services, unattractive disposal operations, costly incineration, and time consuming degradation processes
- Disposal of diseased animal carcasses to prevent further outbreak
- Creation of usable byproduct
- For community use offered by a Co-Op

Universities / Medical Research Institutions / Government Operations and Facilities

- Disposal of necropsy or research animals, sterilization of any chemicals and pathogens
- Operation is less costly than incineration
- Equipment for emergency disease response

Animal Shelters / Veterinary Facilities / Animal Crematory

- Disposal of deceased animals as an alternative to costly incineration
- Process which sterilizes any chemicals/pathogens
- Option of recovering bone ash for pet owners by use of specialized containment bags to ensure the return of the proper remains

Highway Departments / Towns and Municipalities

- Routine disposal of road kill, particularly diseased animals or species prone to carrying disease (for example, rabies and prion diseases)

Bob Rice
REC, LLC

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BIOLIQUIDATOR

4,000 Lb. Capacity Model



**This Carcass Digester enables responsible
Carcass Disposal in the Agricultural Industry**

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AGRICULTURAL DISTRIBUTORS FOR BIO-RESPONSE SOLUTIONS

BIO-LIQUIDATOR

ANIMAL TISSUE / CARCASS DISPOSAL PROCESS SYSTEMS

What is alkaline hydrolysis?

Alkaline hydrolysis is a process by which animal tissues are broken down into their basic building blocks. This naturally-occurring process is accelerated in the Bio-Liquidator System, producing a sterile solution of amino acids, small peptides, sugars, nutrients, and soap, along with the mineral ash of the bones and teeth (calcium phosphate).

Benefits of the process?

- Low energy consumption
- No emissions of harmful greenhouse gasses
- 1/10 the carbon footprint of cremation
- Destruction of chemicals (including euthanasia chemicals)
- Sterilization of pathogens
- Operation is less costly and cleaner than cremation/incineration
- Creation of a useful byproduct as natural fertilizer

Why the Bio-Response system?

- We have over 18 years' experience with alkaline hydrolysis
- Large capacity for processing horses and/or large volumes of pet mortalities
- Affordable, reliable, small footprint, and easy to install
- Available in stationary or mobile configurations

Animal Shelters / Veterinary Facilities / Animal Crematory

- Processing of deceased animals as an alternative to costly cremation/incineration
- Process which sterilizes any chemicals/pathogens
- Option of recovering bone ash for pet owners by use of specialized containment bags to ensure the return of the proper remains

Universities / Medical Research Institutions

- Disposal of necropsy or research animals, sterilization of any chemicals and pathogens
- Operation is less costly than incineration
- Equipment for emergency disease response programs

Meat Processing Plant / Abattoir/ Rendering Facility

- Disposal of on-site Specified Risk Materials (SRM): skulls, brains, spinal columns, and other parts that if infected would be high-titre for prion material
- Creation of a usable fertilizer byproduct

Farms / Co-Ops / Agricultural Applications

- Rapid disposal of animal carcasses for on-site processing to eliminate dependence on renderer services, unattractive disposal operations, costly incineration, and time consuming decomposition processes
- Immediate disposal of diseased animal carcasses to prevent further outbreak
- Creation of a usable fertilizer byproduct

Highway Departments / Towns and Municipalities

- Routine disposal of road kill, particularly diseased animals or species prone to carrying disease (for example, rabies and prion diseases)
- As an integral part of a disease prevention and response plan

BIO-LIQUIDATOR EFFLUENT

The Bio-Liquidator system uses alkaline hydrolysis to dissolve tissue and convert the tissue and water into a sterile, aqueous solution. This solution is suitable for land application as a natural fertilizer when potassium hydroxide (KOH) is used as the alkali. Sodium hydroxide (NaOH) can also be used as the alkali in this process, but may limit the selection of plants for application due to the high sodium content. A mix of the two alkalis, in appropriate amounts, may also be used to decrease the concern for the salinity of the effluent. The effluent is a coffee-colored true solution of small peptides, amino acids, sugars, and soaps, with a pH in the range of 10.5-11.5 (dependent upon digestion time and amount of alkali used). The effluent has a very high carbon value which enhances soil performance as a growth medium, and absorbs carbon dioxide which benefits our atmosphere and the plants which use it.

SUMMARY OF EFFLUENT QUALITIES

- Sterile: Safe for any fertilizing use, even for human food plants
- Recycled: Nutrients are returned to the environment as nature intended
- Complete: Larger complement of nutrients
- Soil-Building: Maintains organic matter in the soil and encourages microbial complexity
- Long-Lasting Residual Effects: Slow nutrient release, and therefore increased plant utilization
- Reduced Leaching Risk: Lower quantities of leaching-risks, phosphate harbored in solid form (bone ash)

DIRECT APPLICATION The method in which you directly apply the effluent fertilizer is entirely dependent upon the tools you already have, or those which you plan to purchase. We are more than happy to brainstorm with you to find the best method.

What concentration should be used? What should the applied-pH level be? What is the best method for application? These are all questions that will depend on your environmental surroundings, soil chemistry, and use of the land. Optimal ranges for these parameters that have been determined in the lab setting can help provide a starting point. The truth is, if all fertilizer was applied how it should be, a soil analysis would be conducted before one drop ever touched the soil. Here in the US, a soil sample can be taken to a local extension agency for a free or minimal-cost analysis. Unless there is a reason your terrain may differ from nearby terrain, it is probably likely that the areas surrounding your property are similar (farmers already know that what they grow and how they grow it affects their soil chemistry, but I'm pretty sure my neighbor's lawn is pretty similar to mine, as is the lawn down the street). It would be impossible for me to tell you exactly how much effluent to apply, and at what pH, but it is inexpensive and fairly simple to find out on a case-by-case basis. A little bit of experimentation will take place, but you'll have it tweaked just right after a couple applications. If NaOH is used as alkali, it would be best to dilute the effluent appropriately depending on the application site. Some crops and many highway grasses are salt-tolerant and would be better candidates as recipients for the effluent. Some salt-tolerant plants include asparagus, squash (zucchini and other types), beets, barley, cotton, sugar cane, and dates. In fact, salt is used in regular practice for growing asparagus, as it controls the weeds and decreases the occurrence of crown and root rot. For less salt-tolerant plants, other factors should be considered. Rainfall helps wash away the highly soluble salt, while leaving behind the other nutrients contained in

the effluent. If the area to receive the more saline effluent has sufficient water movement, the salt effects would be minimized.

MANURE ADDITIVE With access to manure that is recycled as fertilizer for waste-management, it makes sense to enrich the liquid or solid with effluent. The equipment to spread the manure is already available and in use, so adding some additional nutrients would serve as an added benefit.

As a courtesy to neighbors and to decrease the loss of nutrients to volatilization, many farming operations choose to “knife in” or “inject” the manure into the ground. Not only does this reduce the odor, but it is a more controlled method for application. Please see above photos.

COMPOST ADDITIVE Composting is a labor-intensive process, however very beneficial for the environment in terms of managing waste and recycling nutrients. Effluent can be added to different types of compost as enrichment. In fact, a formal university study has been conducted on composting tissue digester effluent with yard waste. Recommended concentrations and procedures for managing leachate are available through this study.

SEWAGE “DISPOSAL” The presented recycling techniques can all effectively (and beneficially) repurpose the byproducts of the Bio-Liquidator process. We wish to not refer to effluent removal as “disposal” because in reality it is recycled. One option that is considered a disposal technique for the effluent is sewer disposal. This is an option, which many facilities choose to use for purpose of simplicity. This method however does not go without benefit somewhere. If the facility has access to a larger treatment plant, the effluent does not pose a problem. The liquid serves as a feedstock to the aerobes which digest waste, and can become especially important when implemented during slower times (night time, when less waste is passed through the plant) in order to maintain a healthy concentration of aerobes. In fact, an imbalanced plant could benefit greatly from introducing the micronutrient-rich effluent to the inflow to the plant. Some treatment plants have an anaerobic digester as well, and could benefit from the energy produced. In a smaller treatment plant, the high BOD could pose a problem. Recycling the effluent in other ways is especially important in areas which lack proper waste disposal methods or facilities. It is important to note that a sewer plant may apply a surcharge for their service in managing the waste.

KEEP AN OPEN MIND

Biotechnology is still an emerging science. There may be other applications for alkaline hydrolysis effluent that have yet to be uncovered. Keep in mind that the alkaline hydrolysis technology became affordable for industries with recycling interests just recently. We are constantly discovering more about the recycling potential, and hope the agricultural community will continue to share ideas and learn from each other for forward p

We look forward to working with you,

Bob Rice



