

Alkaline Hydrolysis Disposition Frequently Asked Questions



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I. PROCESS Q&A

How does alkaline hydrolysis work?

Alkaline hydrolysis is essentially an accelerated version of what takes place in natural decomposition. A combination of gentle water flow, temperature, and alkalinity is used to accelerate the natural course of tissue hydrolysis. At the end of the process the body has been returned to its natural form, dissolved in the water. Remember - our bodies are 65% water to begin with! Similar to cremation, the only solid remains are the mineral ash of the bones.

Is the final product sterile, and why?

Yes. The system sterilizes via three mechanisms. The first is heat, for an extended period of time. The secondary and tertiary mechanisms for pathogen and chemical destruction are by way of an alkaline environment, and liberated amines. Pathogens and chemicals are either heat, alkaline, or amine-labile, or a combination of the three. It is important to keep in mind that alkaline hydrolysis is the favored technology for pathogen and chemical destruction in high-risk biocontainment applications.

Are the bone remains safe to handle?

Yes. The bone remains (calcium phosphate) are 100% safe, pathogen and disease free. The Bio-Response system rinses and cools the bones as part of the automated process. They are safe to handle with bare hands immediately after the process. The bones do not require a cooling time prior to handling, but since this is a water process they will require a drying time before they can be processed for return to the family.

Is there an ash to return to the family as there is with cremation?

Yes. "Ash" is returned to the family in the same manner it is with cremation, but it is in the form of pure calcium phosphate. The ash is lighter in color because it is clean and without carbon discoloration.

Can the bone remains be processed in a standard cremains processor?

Yes. Standard funeral industry cremulators are used for processing the bone remains into a returnable ash.

Is the liquid byproduct corrosive or harmful to pipes?

No. The system automatically cools the effluent well below required discharge regulations. The effluent actually has a preservative and beneficial effect on iron and steel pipes, and is not harmful to plastic pipes. A standard feature on the Bio-Response system is an automated pH neutralization feature. The effluent is an excellent micronutrient package that can benefit wastewater treatment plants.



What devices must be removed from the body?

Medical devices and implants will not create any adverse effects in this system. Items such as titanium implants and pacemakers can be recovered for recycling at the conclusion of the process.

II. SYSTEM Q&A

Do you have any systems in operation?

Yes. To schedule a site visit, please [contact us](#).

At what temperature does the system operate?

Bio-Response offers both low and high temperature systems. The low temperature system is not pressurized, and operates well-below boiling temperature, <199 degrees Fahrenheit. The high temperature system operates at 300 degrees Fahrenheit.

Is the system pressurized?

The low temperature system is not pressurized. The high temperature system requires a pressurized system for operation.

Does the system automatically ensure that the proper temperature and pH are achieved before draining?

Yes, automatic temperature and pH control are standard inclusions for the systems.

What is the noise level of the system when in operation?

The system is extremely quiet in operation (<75 dbA)

What is the water in the system used for?

The water is used for hydrolysis, and rinse cycles at the conclusion of the process. Because of our patent pending tip technology and our much lower operating temperature, this system consumes a fraction of the water when compared to traditional horizontal high temperature systems.



What is the capacity of the system?

Bio-Response offers three system sizes to accommodate bodies of all sizes, up to 700 pounds. Please [contact us](#) for further details.

Can one person operate the system?

Yes, the system can be easily operated by one person.

Does the system require supervision while in operation?

No. Once the user has initiated the cycle from the touch screen, the system will run and complete the entire cycle automatically. The user may return at a convenient time to collect the rinsed bone remains.

Are automatic weight calculation and chemical injection available?

Yes.

III. LOW VS. HIGH TEMPERATURE

At what temperatures does alkaline hydrolysis work?

Alkaline Hydrolysis can occur at any temperature, however at room temperature the process could take up to 6 weeks or so to complete. This is impractical. The process approximately follows the rule established by Arrhenius that for every 10 degrees C increase in temperature the process time is cut approximately in half. The process in our low temperature systems (<210 degrees F) performs the same process and yields the exact same end product as the process in our high temperature systems (>212 degrees F).

What type of systems do you offer?

We offer both low and temperature systems.

There are two basic types of alkaline hydrolysis systems: those that operate at no pressure and up to 210 degrees F, and those that operate at pressure over 212 degrees F. All systems must be loaded, heat up, cycle at temperature, cool down, discharge, rinse, and then be unloaded. Then the next body loaded. The time for all of this is called "turn-around time". The temperature at which a system operates is going to affect the total turn-around time of the process. There are also other factors associated with operating temperature. Please read the next questions for more details.



How many dispositions per day can be performed in a low temperature system?

The low temperature Bio-Response system yields two dispositions per day. It should be noted that the benefits of selecting a low temperature system are substantial. Please see the other factors to consider below.

How many dispositions per day can be performed in a high temperature system?

The process of alkaline hydrolysis is accelerated even further with an increase in temperature. If the process is heated up to 250 degrees F, then the process time can be reduced to approximately an 8 hour turn-around, or three dispositions per day in a pressurized system. The system would operate at approximately 25 pounds per square inch vessel pressure.

At 300 degrees F the pressure is approximately 65 pounds per square inch, the process can be reduced to approximately a 6 hour turn around, or 4 dispositions per day. The standard Bio-Response high temperature system can process at the user-selected temperature of 199-300 degrees F.

At 350 degrees F or greater, the pressure is over 100 psi and the process can conceivably be reduced to 4 hours turn around or up to 6 dispositions per day, but this remains to be proven in actual use.

What are other factors to consider when choosing between a low and high temperature system?

The benefits of choosing a low temperature (<210F) system are substantial. The lower operating temperature allows the system to remain a non-pressurized process. Required utilities are standard, a steam generator is not required, and the system is less costly. Maintenance items are decreased.

High temperature systems accelerate the process to yield more cycles per day, however these systems require a pressurized system for operation. Higher temperature systems use more energy to heat, and more water or energy to cool than do low temperature systems. For example, if water is used to cool a 199 degree F system it will require approximately the same amount of water for cooling as was added for the actual process. In contrast, to cool a 300 degree F system will require almost 3x's the amount of cooling water (or cooling energy) as was added for the actual process. There are however methods to cool which use less resources such as a dry cooler or cooling tower, but this requires additional apparatus and complexity. High temperature systems are more complex, more costly, and require more maintenance items.

What are the benefits of Bio-Response's patent pending tip technology?

There are other issues that come into play in an alkaline hydrolysis system such as geometry, water to body ratio, water circulation, etc. Bio-Response's tip technology addresses all of these items, and allows for an optimized process. This is a key design feature, especially in our low temperature systems. [Contact us](#) for a more detailed explanation. Our technical monograph is available as a resource and covers all of these topics in detail.



IV. OWNERSHIP Q&A

What utilities are required?

The low temperature system requires only standard utilities. Please see [technical information](#) for further details.

Are there any long term maintenance items?

Unlike a retort, this system can be used for many years without any major maintenance items.

How long does installation take?

If the utilities are in place, installation will take less than one day.

Is there a site preparation guide?

Yes, we provide a site preparation guide prior to purchase. An installation guide is provided with delivery of a system. Please [contact us](#) for information on site preparation.

Where is the system manufactured?

Danville, Indiana USA

Is this system available for purchase outside of the United States?

Yes. We are able to configure the control system and utilities for any country in the world.

Will Bio-Response assist with the funeral directors' marketing efforts?

Yes, Bio-Response will provide marketing guidance based on our experience with other funeral directors offering the AH option.

For further information or to submit a new question for the FAQ section, please email info@bioresponsesolutions.com, or call 317-386-3500.

