

TISSUE DIGESTION VS INCINERATION

Tissue Digestion:

In Tissue Digestion (using Alkaline Hydrolysis), all tissues and carcasses are placed in a pressure vessel and the vessel is sealed before the process begins. Tissue Digestors are loaded from the top through an opening that is equal to the diameter of digestion vessel or into a large hatch door in a horizontal vessel design. Small- and medium-sized digestors, are available from 30 lb load capacity to 1000 lb. For large-sized vessels up to 20,000 lb + load, suitable for multiple equine or bovine carcasses, whole carcasses are lowered with an overhand hoist into the vessel from an overhead crane (customer or Hydrol-Pro provided). Thus, tissue digestors are easy to load.

For the digestion process, the tissue/carcass load is weighed automatically by load cells on which the vessel is mounted, alkali and water are added in precise proportion to the weight of tissue, and the system is heated to a specified operating temperature with a circulating oil system and held there for a specified time. Agitation in the BioMEER system, necessary for appropriate exposure of all material to the alkali solution, is achieved by a unique paddle assembly intermittently at first then continuously later in the cycle.

The carcasses are solubilized (liquefied) within the first 60 minutes of the digestion cycle and hydrolysis of proteins, fats, and nucleic acids begins immediately on the solubilized material. Alkaline hydrolysis at a temperature >150 deg C for recommended periods of > 6 hours destroys all known pathogens. It is one of the two only processes demonstrated to destroy the infectivity of tissues contaminated with the agents causing Transmissible Spongiform Encephalopathy's (Mad Cow disease, CJD, etc.). The other

is high temperature (>850 deg C) incineration. Both are recommended by EU, CFIA and USDA.

.Alkaline hydrolysis is a true batch process. The Digester is sealed during operation. At the end of the process, the liquid effluent is a sterile, EPA neutral solution of amino acids, small peptides, sugars and soaps that may be released to a sanitary sewer OR Hydrol-Pro Technologies now offers a dry output system where the output is an extirpated aggregate suitable for landfill, composting or a energy source. The dry output system has a much lower BOD of liquid that goes down the sanitary sewer, since the solids are carted away and the liquid that goes to sewer, is the evaporated sterile liquid. If KOH is used as the alkali, the liquid effluent or dry aggregate is an excellent fertilizer that may be land or crop applied.

After processing, both the effluent and all internal parts of the digestion system are sterile. All wetted parts of the Digester system are 316L stainless steel or Teflon. The vessel is insulated for greater efficiency and operator safety. The shell of the digester is also stainless steel and all exposed electrical parts are NEMA 4 compliant, facilitating external cleanup and making the whole system hose-able, if necessary.

Materials that may enter the system with the carcasses, such as gloves, catheters, and instruments, are also sterilized and may be treated as ordinary waste.

In a Tissue Digester, most toxins associated with the carcasses are destroyed, no new toxins (such as dioxins from incompletely oxidized plastics) are produced, and heavy metals are not concentrated; rather, they are diluted by the release of the nearly 75% of the animal that is water.

The Tissue Digester automatically cools the fluid in the vessel to a temperature at which it is safe to release it to a sanitary sewer and also cools the extirpated aggregate of the dry system so it still 'flows' into a dumpster under the digester. The operator is not exposed to hot materials.

A Tissue Digester operates at between \$0.03 to \$0.06 per pound of tissue processed, a fraction of the cost of operating an incinerator. A Tissue Digester is designed to last much longer than an incinerator, with less maintenance.

There is no smokestack, there are no air emissions, and there are no applicable EPA air quality regulations.

A trivia note: Digester is the noun and digester is the verb, so these words are used interchangeably in many documents.

Incineration:

Incinerators come in many forms. Pathological incinerators, with secondary gas retention chambers of 2 seconds retention time (no scrubbers currently required) are discussed here.

The basic pathological incinerator is a "stuff and burn" system, with a side fed door. This type of system is difficult to feed, particularly if large animals are to be processed.

Carcasses have to be dissected or butchered to provide pieces small enough to fit through the feed door and these pieces may be heavy, difficult, and potentially dangerous to handle. Pathologic incinerators are available with a top load, large door but this adds considerably to the cost and is usually still not adequately sized for whole equine, bovine, or porcine carcasses. Some units are available with a top-fed ram that

loads tissues into the side door of the burn chamber. Again, however, large animals must be quartered or further cut up before loading into the hopper of the ram.

An incinerator is not a true batch system because air goes in and air flows out constantly during the processing cycle. In addition, most incinerators must be operated by adding more tissue as the burn progresses in order to meet the throughput requirements of the institution.

Ram feed systems become contaminated and remain that way, they are not easily cleanable.

Incineration also achieves significant volume reduction, up to 97%, but toxins and heavy metals are concentrated in the incinerator ash, yielding a residue that is usually classified as toxic waste. Toxins, including dioxins, halogenated hydrocarbons, and mercury vapor are produced by the combustion process and are released through the stack into the atmosphere.

Destruction of pathogens by incineration is only as good as the least burned material remaining in the bottom of the combustion chamber. Unburned "meat" is often found in the ashes as they are raked out and must be returned to the chamber, putting the operator at risk. It has been shown that TSE agents are NOT destroyed by conventional incineration nor by heating to as much as 600°C under controlled conditions. The need for a reliable, simple method for destruction of TSE agents is imperative as more contaminated wildlife, ungulates, and zoo animals are turning up in the US.

Cost of operating a pathologic incinerator ranges from \$0.25 to \$0.75 per pound, depending on the age of the unit, natural gas costs, and the frequent repair and maintenance needed on these systems.

Operators are exposed to dust, heat, and toxic gases while running an incinerator.

There is a smokestack with visible output, toxic emissions are produced, and incinerators are subject to increasing stringent clean air regulations.

SUMMARY

While installation of a Tissue Digester might be somewhat more expensive than purchase of a basic pathologic incinerator of comparable capacity, it is much less costly to own and operate in the long run. A digester system is complete on installation. No preprocessing or post processing equipment must be added for convenience of operation or to meet clean air regulations.

A Digester is safer, environmentally responsible, economical, and more efficient than an incinerator. [To Top](#)

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