



Dry Heat Success Story

Dr. Robert Harris, D.V.M, Director of Laboratory Animal Services, Rutgers, the State University of New Jersey needed to increase cage processing capability within his existing facility. However, the quote to run steam to the proposed sterilizer location proved to be cost prohibitive for Dr. Harris, and nearly killed his sterilizer upgrade plan.

“A dry heat sterilizer has proved to be the perfect solution to our need for increased cage processing capability in an existing facility. Upon receiving an astronomical quote to just get steam to the proposed sterilizer location we had all but given up on being able to afford a new sterilizer. Without much of a track record for this technology in the lab animal field, we knew we were taking some risk and exploring new ground. It turned out to be an excellent decision. I initially assumed that dry heat from electricity could not be cost effective. I also had a preconceived notion that dry heat sterilization could not be as effective as steam sterilization. I changed my mind on both accounts. In the end we were able to site and afford a sterilizer twice the size of the steam autoclave we had first considered.”

Robert Harris, D.V.M., Director of Laboratory Animal Services, Rutgers, the State University of New Jersey

Gruenberg is a leader in dry heat sterilization technology. Compared to steam; dry heat sterilizers provide many cost-effective benefits to laboratories. The technology is greener eliminating the need for water/steam; it provides flexibility for installation in locations within the facility, costs less to operate and rodent cages last longer. Also; custom design services, installation assistance, and after sale support and maintenance are provided.

Gruenberg's dry heat sterilizers offer several benefits when compared to the typical steam sterilizer used in animal lab applications:

- green operation with lower total energy consumption
- lower total cost of ownership
- flexible installation options
- quiet operation for use around sound sensitive animals
- remotely placed controllers
- validated cycles.

Gruenberg sterilizers incorporate a flexibility of design that allows customization to suit every application. The sterilizers are built to ensure a smooth and quiet operation, beneficial when working with noise-sensitive animals.

Greener

The newer steam autoclaves in general are designed to be more efficient with water usage but the required amount of water used in a typical cycle is considerable. The water needs to be heated to generate steam for sterilization, and then it must be cooled for disposal. Conversely a dry heat sterilizer uses one utility, electricity.

The dry heat sterilization systems are providing a high degree of thermal efficiency and present very low skin temperatures. This, combined with the fact that there is no steam present to infiltrate the work environment when the door is opened, provides for a much more comfortable environment.

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Cycle Time and Capacity Considerations

Modern dry heat sterilization systems using the new patent pending **PrecisionFlo™** focused forced air convection technology are consistently decreasing the cycle time. Depending on the load configuration, sterilization is typically achieved in less than two hours, with proper cage orientation. Although the cycle may be slightly lengthier than an autoclave, the dry heat system design allows for considerably larger product load to be processed in the same overall machine footprint: with standard models offering nested cage capacities of 340, 680, or 1360.

The sterilization cycle consists of three segments: heat up, soak, and cool down. During the heat up segment, the oven and its load of cages are raised to the pre-set sterilization temperature of 300°F. The cages soak for a pre-determined time period in order to facilitate complete sterilization, after which a forced cool down segment rapidly brings the oven and product down to a manageable temperature.

Flexible Installation Options

A critical logistical point to consider when installing a bulk sterilizer is the task of getting a large piece of equipment into the building and placed in the desired position. For labs interested in replacing their old equipment: navigating bulky equipment through an existing building layout may prove difficult, expensive, or impossible.

Modular design Dry heat systems can be designed allowing the individual modules to be fitted through most corridors, service elevators, and doors. The modules can be reassembled at the location of use.

Cost of Ownership

A fundamental factor in deploying any technology is cost, including dry heat sterilization systems.

- How much will it cost me today, next week, and next year to maintain and operate?

Dry heat systems cost less to implement, operate, and maintain. In one direct comparison the life cycle costs of a bulk autoclave are **five to ten times greater** than a dry heat sterilizer over an average 20 year asset life. The order of magnitude may vary depending on the specific requirements and location, but the cost differential is substantial. Some of the factors:

Initial Cost. The initial cost of available dry heat systems is about 60% of equivalent sized steam autoclaves. But that is only the beginning of the financial benefits. Rigging, installation, operation, and maintenance all provide large cost benefits with dry heat sterilizers.

Rigging. A dry heat sterilizer is two to three times lighter than an equivalent steam system. Because the dry heat sterilizer can be rigged in place as modules, there are considerably less rigging challenges and costs.

Installation. The dry heat sterilizer does not need to be pit mounted. Instead, a steel plate floor in the sterilizer allows the load of animal cages to be rolled into the oven from plant grade.

Operations. A recent study at Rutgers University showed that their 139cuft bulk dry heat sterilizer loaded with 180 pre-assembled cages plus bedding has a cycle utility cost, (preheat, sterilize, cool down) of \$4.71 based on electricity costs of \$0.13kw/hr. Water and wastewater utility costs are eliminated entirely.

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Maintenance. Dry heat systems operate at ambient pressure eliminating the myriad of maintenance considerations, and the mandate for costly certified pressure vessel technicians or contractors. As with all technologies, issues may still arise with a dry heat sterilizer, but the simpler technology means these can be addressed with more ease and less expense.

Extended cage life. In life cycle simulations, cages showed zero visible cage defects after simulating six years of usage with weekly dry heat sterilization cycles.

Cycle Validation

The cycle validation process for a dry heat sterilizer is similar to a typical steam autoclave. Once your dry heat sterilizer is installed, the sterilization process should be validated using Biological Indicators (BI). Generally, the manufacturer will validate the system in the following manner:

1. Thermally map an empty chamber and tune pressure ducts to achieve the correct chamber temperature uniformity.
2. Load the chamber with animal cages.
3. Thermally map the cages to determine the slowest point to reach temperature.
4. Place the BI's in selected cages and operate the sterilizer cycle.
5. Incubate the BI's for any signs of growth.

A temperature mapping should be included with periodic preventative maintenance procedures performed by the manufacturer's technical services.

Controls

New sterilizers provide control options using a programmable logic controller (PLC) and human machine interface (HMI) based control systems. These controls are simple to use and allow the technician to configure and record the temperature of the sterilization cycle. Technicians can control

various processes, such as start/stop, fault indicators, temperature displays, timers, and alarms in a secure manner preventing accidental changes to stored sterilization programs.

Evolution of control technology has eliminated the need for technicians to be in the same room as the sterilizer. Remote control ability makes it possible for the technician to operate, monitor, and diagnose problems from other locations using a computer or other device with web access.

Design Options

Dry heat sterilizers come in two basic design options each providing a selection of sizes and configurations.

The first design utilizes a closed, hermetically sealed container to house the rodent cages. The container is docked into the circulation system of the oven, heated air is forced up through the cages to achieve sterilization. Once the cycle is complete, the container of sterilized cages can be removed from the oven and moved to the point of usage whilst maintaining the sterility and cleanliness of the product load.

The second design loads rodent cages via a standard open truck which may currently be in use in your facility. A typical loading truck size is 24.5"W x 60"L X 70"H. Oven designs can accommodate 1, 2, 4 or 6 such trucks.

Both design configurations employ a unique focused forced air convection airflow design **PrecisionFlo™** which has been developed to **minimize cycle time while maximizing the product throughput** capability.

Work Environment and Safety

Eliminating steam and high humidity from the cage sterilization area creates a healthier working environment. Eliminating pressure vessel risks increases safety and lowers insurance premiums.

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Sole manufacturers

As of this time to the best of our knowledge, TPS is the sole manufacturer to have made the significant investments into designing a dry heat sterilizer specific to the LAS needs and requirements. The product that we now present to the market is the

result of a number of years of design optimization of this sterilizer including the patent pending **PrecisionFlo™** airflow design to meet the demanding challenge presented by the load of plastic cages and introducing a disruptive technology into this market place.

Our products comply with all applicable norms and regulations and are constructed with the best materials.

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