# Gruenberg Steri-Dry™ dry heat sterilizers provide a sustainable alternative to steam autoclaves for a fraction of the price

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Professionals in the lab animal science field have historically used autoclaves that employ steam, vacuum, and pressure to sterilize their tools and animal cages. In recent years, the industry has seen an increased demand for lower-cost, more-sustainable technologies that consume fewer resources. Dry heat sterilizers are a viable green alternative to the steam autoclaves that have traditionally been used. Compared to steam, dry heat sterilizers provide many cost-effective benefits to laboratories. The systems provide a high degree of thermal efficiency and present very low skin temperatures, resulting in lower energy costs to operate. The technology is greener because it completely eliminates the need for water that is used to generate steam, and it minimizes damage to plastic cages, resulting in a longer overall cage life. Dry heat sterilizers typically take up half of the footprint of an equivalent-size autoclave, which allows for more flexibility when choosing an installation location within a facility.

**FIGURE 1** | Model VSTP40H74.67SS. Two systems shown, each with a load capacity of 252 nested cages.

## Water conservation minimizes environmental impact

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.

Dry heat sterilization systems (**Fig. 1**) eliminate the use of water, and this is critical to conservation efforts during dry seasons and droughts. The thermal efficiency and very low skin temperatures of dry heat sterilizers minimize the energy used to maintain temperature and cool the work area from heat loss. 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.

## Increased product loads maximize efficiency

Modern dry heat sterilization systems using focused forced-air convection technology are consistently decreasing the cycle time. Depending on the load configuration and cool down requirements, the typical cycle lasts 3 hours. Although this is a more lengthy cycle than an autoclave, the design of the dry heat system allows for a considerably larger product load to be processed in the same overall machine footprint.

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 a pre-set sterilization temperature. The cages soak for a predetermined 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.

## Smaller equipment footprint provides 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 can prove difficult, expensive, or impossible. Dry heat systems can be designed in a modular fashion allowing the individual modules to be fitted through most corridors, service elevators, and doors. The modules are then reassembled at the location of use. Space-saving cabinet models are also available (**Fig. 2**).

## Lower cost of ownership

A fundamental factor in deploying any technology is cost, and this includes dry heat sterilization systems. How much will it cost today, next week, and next year to maintain and operate? Dry heat systems cost less to implement, operate, and maintain.

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. With respect to rigging, a dry heat sterilizer is two to three times lighter than an equivalent steam system. Because the dry heat sterilizer can be rigged

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**FIGURE 2** | Model VSC35VU15.8SS cabinet sterilizer with a load capacity of 64 nested cages.

**FIGURE 3** | Model VST40H314.3PTSS4D, with a load capacity of 680 nested cages or two IVC racks.

in place as modules, there are considerably less rigging challenges and costs. For 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. Furthermore, dry heat systems operate at ambient pressure, eliminating the myriad maintenance considerations that are attributed to high pressure steam sterilization units. As with all technologies, issues may still arise with a dry heat sterilizer, but the simpler technology means that issues can be addressed with more ease and less expense. Additionally, in life cycle simulations, cages showed zero visible cage defects after simulating six years of usage with weekly dry heat sterilization cycles.

### Gruenberg Steri-Dry™

Gruenberg, a division of TPS, LLC, is a leader in dry heat sterilization technology. Gruenberg sterilizers incorporate a flexibility of design options that allows customization to suit every application. The sterilizers are built to ensure a smooth and quiet operation, which is beneficial when working with noise-sensitive animals.

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 animal cages. The container is docked into the circulation system of the oven and 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 (**Fig. 3**), loads cages via a standard open truck which is commonly used at animal facilities. A typical loading truck size is 24.5”W x 60”L X 70”H. Designs can accommodate 1, 2, 4 or 6 such trucks (**Fig. 1** and **3**). Both design configurations employ a unique focused, forced-air convection airflow design which has been developed to minimize cycle time while maximizing the product throughput capability. The patent-pending PrecisionFlo™ airflow design meets the demanding challenge presented by the load of plastic cages and introduces a disruptive technology into this market place. As well as being used for sterilization of clean cages, the systems can also be used to decontaminate dirty caging (**Fig. 4**).

**FIGURE 4** | BSL2 sterilization chamber, incorporating Ionized Hydrogen Peroxide ability.

### Company profile

Gruenberg, a division of Thermal Product Solutions, is a leader in dry heat sterilization technology with an advanced line of sterilizers that eliminate harmful pathogens on animal habitat cages. In addition to the dry heat sterilizer technology, they offer a full line of standard and custom industrial ovens that accommodate temperatures up to 1200 °F and are available in a variety of configurations, including cabinet, truck-in, and top-loading models. They also offer a comprehensive line of custom pharmaceutical ovens, Class-100 sterilizers, and continuous-process and explosion-proof dryers.

Thermal Product Solutions designs and manufactures industrial ovens, furnaces, and environmental temperature cycling and stability test chambers. Product brands include Baker Furnace, Blue M, Gruenberg, Lindberg/MPH, Lunaire, Tenney, and Wisconsin Oven. TPS is headquartered in New Columbia, Pennsylvania, Baker Furnace is located in Yorba Linda, CA, Lindberg/MPH is located in Riverside, Michigan, and Wisconsin Oven is located in East Troy, Wisconsin.

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