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The Benefits of Dry Heat Sterilization to the Lab Animal Science Industy

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TABLE OF CONTENTS

In recent years dry heat used for the sterilization of laboratory animal caging has been making its mark in the Lab Animal Sciences market. Although dry heat sterilization has been utilized for many years in the pharmaceutical and medical industries, the ability for this to be a viable technology in the LAS market is relatively new. So what has changed to allow this technology to be more pertinent today?

Sterilization is a time/temperature function, as we elevate the temperature the time needed to achieve sterilization is lessened.

As the common caging materials have shifted from polycarbonate to polysulfone, so did the ability to sterilize at higher temperatures. Polysulfone caging permits a higher sterilization temperature setpoint comfortably within the material's temperature tolerance. Since sterilization is a time versus temperature relationship, the higher operating temperatures in a dry heat sterilizer used for polysulfone plastics have allowed for more meaningful and shorter overall cycle times than previously available.

It is essential with the dry heat systems that the cages receive good airflow over their surface area in order to achieve optimum results thus minimizing the cycle time. The specialized airflow characteristics utilized in the modern dry heat sterilizers are designed and developed for this purpose. This method of cage sterilization provides the industry with a viable alternative to bulk autoclaves and a number of advantages in comparing the two technologies.

These benefits include:

- Less complex technology resulting in considerably less maintenance requirements.
- Lower initial project cost to deploy.
- Lower operational costs.
- Lower infrastructure costs. Just an electrical supply and exhaust duct required.
- No pit, steam, condensate return or water requirements.
- Panelized or modular build construction resulting in more ease to rig into place.

STERILIZATION OF NUTRITIONAL DIET

In a recent study conducted in conjunction with a major nutritional diet manufacturer, samples of both autoclavable and non-autoclavable diets were sterilized utilizing dry heat sterilization. Each diet was housed in caging and the typical sterilization cycle was operated. At the completion of sterilization the diet samples were sent to a 3rd party test lab for evaluation.

Findings

Post-sterilization vitamin levels were similar to the pre-sterilized levels in the food, so the dry heat sterilization process caused little degradation of the food. Moreover, in the dry heat sterilizer, the food does not become wet, clumped or crusty.

	Food Type 1			Feed Type 2		
	Theoretical	Non-Sterilized	Dry Heat Sterilized	Theoretical	Non-Sterilized	Dry Heat Sterilized
Thiamin, mg/kg	17	19.2	20.6	117	139	128
Vitamin A, IU/g	15	11.6	11	30	27.2	24.9
Vitamin E, IU/kg	110	71	100	135	114	126

INSTALLATION ADVANTAGE

Bulk sterilizers with intact pressure vessels often need to be located in areas that are prohibitive to moving such heavy, cumbersome equipment into position. Dry heat sterilizers are constructed in modules, the sizes of which are designed to fit through any architectural restrictions without the need for construction or elaborate rigging plans. A dry heat sterilizer is roughly 70% lighter than an equivalent steam system, eliminating the need to reinforce the building structure to hold its weight. The dry heat sterilizer does not require a pit. Instead, a stainless steel plate floor in the sterilizer allows the load of animal cages to be rolled in directly from the facility floor.

The dry heat sterilizer requires no water, no drain, no steam and no condensate return. Rejected heat, that is heat given off of the dry heat sterilizer, is roughly 70-80% lower than a steam sterilizer for a more comfortable and efficient space. As a result of these design features, the cost savings to the entire project are immense.

Flexible Installation Options

Finding space for a sterilizer in an existing facility can be difficult. Dry heat sterilizers typically take up less than half the space required by a steam sterilizer.

Throughput to Meet Any Demand

Whether you need a sterilizer to sterilize 20 cages or 2,000 cages per day (or more), we have the equipment and experience for you.

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COST OF OWNERSHIP

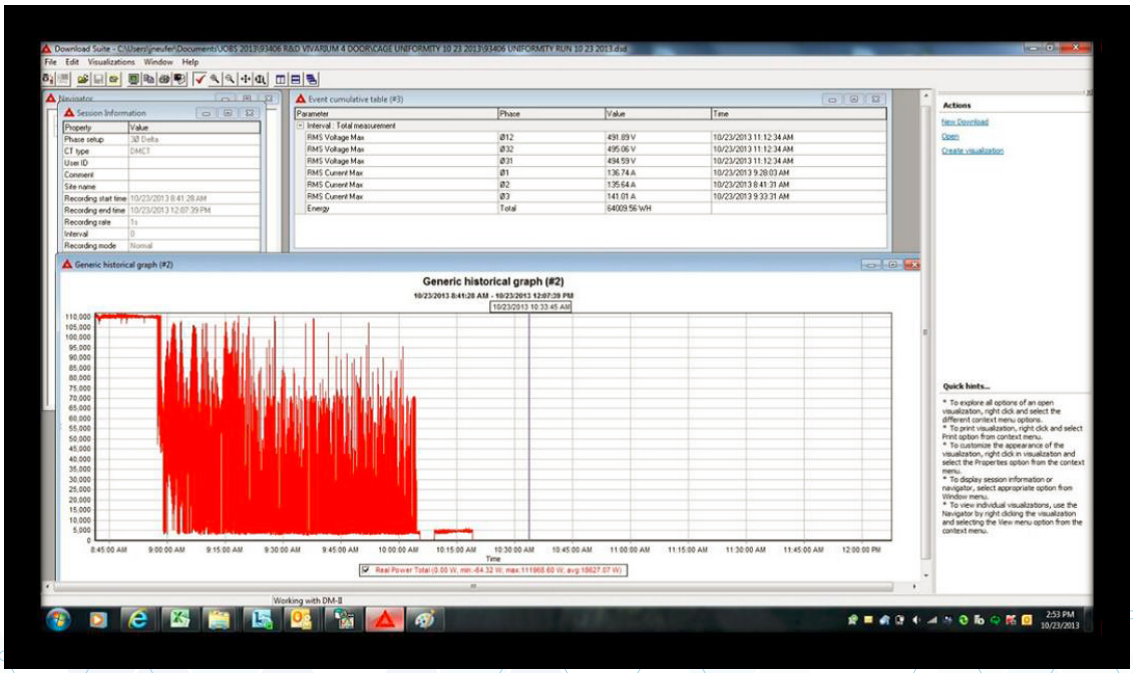
A fundamental factor in deploying any technology is cost, including dry heat sterilization systems. How much will it cost me today, next week, and next year to maintain and operate?
Dry heat systems cost less to implement, operate, and maintain. In one direct comparison the life cycle costs of a bulk 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 a dry heat sterilizer project is significantly lower than equivalent sized steam autoclaves. Because the infrastructure and installation requirements are far less complex and costly than a steam sterilizer, the project cost savings is hundreds of thousands to millions of dollars, depending on project size.

Rigging ft Installation: The dry heat sterilizer is designed and built in modules based on the project and facility requirements and is reassembled in place, eliminating the need for extensive construction.

MINIMIZED UTILITY COSTS

The dry heat sterilizer uses just one utility, electricity. In comparison to other sterilization methods the cycle operational cost can be considerably less. The graph below depicts a Gen II SteriDry system model# VST40H349. 3PTSS, 350cuft of process area, loaded with two load trucks and 504 nested mouse cages plus bedding. The cycle is validated to prove 100% spore kill. The total electrical usage is 64.009KWH. Obviously electrical costs vary but based on a $0.10 per KWH this translates to $6.40 per cycle or $0.0127 per cage. When compared to a steam sterilizer of a similar size, the utility usage of the dry heat sterilizer is 50-70% lower.



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CYCLE TIME & CAPACITY CONSIDERATIONS

Modern dry heat sterilization systems using the new patent pending PrecisionFlo™ focused forced air convection technology are consistently decreasing the cycle time. The dry heat system design allows for considerably larger product loads to be processed in the same overall machine footprint: with standard models offering nested cage capacities of 340, 680, and even 1360 mouse cages. Custom designed units have been built to sterilize even larger loads.

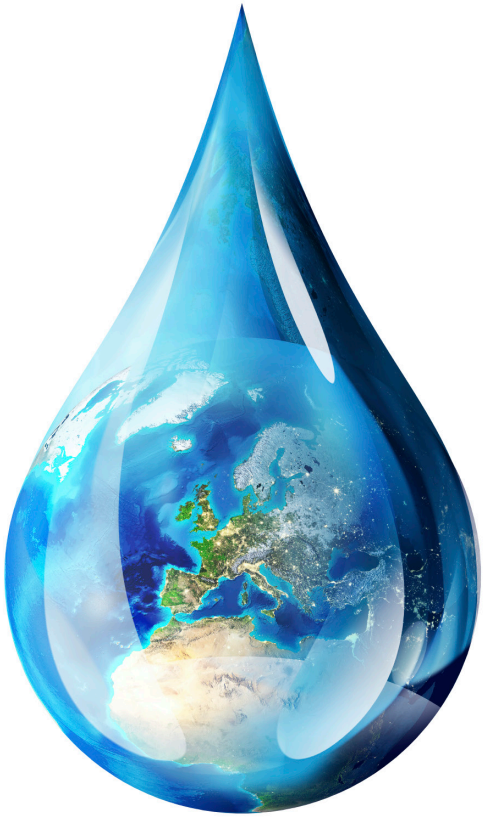
The sterilization cycle consists of three segments: heat up, soak, and cool down. During the heat up segment, the oven and its load of cages are raised to the pre-set sterilization temperature. The cages soak for a pre-determined time period for complete sterilization, after which a forced cool down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

"Cages? IVC Racks? Food? Bedding? Enrichment? Big or Small? Single Door or Passthrough? With Gruenberg Steri-Dry dry heat sterilizers, we have you covered."

SUSTAINABILITY

Sustainability is an increasingly important consideration.

"Water is an issue of particular concern. The world's water problems and the looming water-security crisis were ranked high by the World Economic Forum (WEF) 2013 Global Risk Survey. 'In every sector, the demand for water is expected to increase, and analysis suggests that the world will face a 40% global shortfall between forecast demand and available supply by 2030,' WEF concluded."



76% of respondents named "water" as the resource most at risk, above oil, metals, minerals, others.

Source: Ernst ft Young - 2013 Six Growing Trends in Corporate Sustainability: Based on a survey of executives at organizations with over $1 billion annual revenue, in 17 industry groups.

The industry has recently seen a demand for greener technologies that require less energy, less water, and less maintenance. This puts the pressure on equipment engineers to develop innovative ways to approach sterilization. While traditional steam autoclaves use water, dry heat sterilization provides an alternative to steam that uses no water, less energy and requires less maintenance.