FREQUENTLY ASKED QUESTIONS: INSECT REARING

What temperature and humidity conditions are ideal for my insects?

Each species has slightly different needs. Most flying insects, however, flourish between 18 and 28°C, and at a Relative Humidity (RH) between 50 and 80%. Select a chamber that is capable of reliably maintaining temperature within this range. Typically, for most building ambients (20-25°C) and given the fact that all chambers have components that generate heat, some form of cooling or refrigeration system will be required.

Depending on the rearing environment, additive humidification may or may not be required. The ambient humidity level recommended for lab spaces (50%) is within the range of most insects, but airflow throughout the chamber can cause evaporation and desiccation in smaller or drier working volumes. Depending on your experimental conditions, you may need to specify a humidity control system. A system capable of controlling the chamber RH at a pre-set level is recommended, since simple uncontrolled evaporative systems can produce chamber humidity levels in excess of 95%, creating condensation and resulting in mold and fungal growth.

Why is airflow important in a large reach-in chamber?

Big chambers have big air volumes, which are usually conditioned using heat and refrigeration (if applicable) elements in a single location within the chamber. Small incubators, by comparison, typically have heated walls, and very small working volumes. Since air has farther to go in a reach-in, these larger units are more dependent on forced-air convection (moving air around mechanically) than is the case for their smaller counterparts, which typically use either gravity convection (warm air rising and spreading out), or a mix of the two technologies.

In addition, insect rearing reach-in's are often used to incubate large trays, which can cover shelves and obstruct vertical airflow. Reach-ins need directed airflow though pressurized ducts or air gaps that can't be obstructed. Otherwise, a single heavily loaded shelf can completely stop airflow to the area above or below the blockage, disrupting chamber temperature uniformity and creating "cold spots/regions" within the box.

Directed airflow is, however, more expensive to manufacture than non-directed, requiring more metalwork and higher capacity blower systems. Non-directed airflow units often show up in the insect rearing market, due to suppliers selling lightly-adapted commercial/ foodservice units. These converted food/flower cases come from an application where a temperature variation of several degrees is acceptable. These suppliers often use wire shelves to increase airflow from the top to the bottom of the chamber, and produce artificially attractive unloaded uniformity specifications. Standard wire shelves are a giveaway of this lower-end unit origin and are predictive of resulting airflow problems when used fully loaded.

Is there a real difference between the traditional phenolic cooling coil coating process and this new electrostatic technology?

Flies excrete both uric acid and ammonia as metabolic waste products. Both of these compounds react severely with copper alloys, converting solid metal into green or blue-green corrosion scale. This can rapidly degrade refrigeration components, resulting in holes in refrigerant lines and fittings, refrigerant loss, and eventually total system failure. Phenolics are a class of polymer coatings commonly used to protect brass and copper parts from damage due to hostile environments, such as exposed marine locations. Most phenolics are applied using a manual spray or dip process, which while effective under ideal circumstances, can result in incomplete coverage under less than perfect conditions. Electrostatic coating techniques, by comparison, create an electrical attraction between the surfaces of charged component and an applied epoxy polymer. The custom epoxy, formulated for uniform flow and flexibility, is applied in a computer-controlled process. The coated part is then baked, creating a uniformly chemical-resistant surface that conforms to ASTM and DIN salt spray and accelerated corrosion tests. This process is highly repeatable, with little chance of coating variation, making it the ideal choice for this demanding application.

How can I select a chamber that's easy to keep clean?

Big chambers have lots of surface area, which can hide dead insects, spilled media, and condensation from view. That said, certain design features can make chambers easier or more difficult to clean than comparable units. Interior surfaces made of stainless steel will resist corrosion better than painted or coated steel or aluminum. Corrosion is a physical process that pits and roughens materials, making a unit nearly impossible to wipe down. Interior components such as duct sheets, fan shrouds, or reinforced shelves that are attached to the chamber with screws or bolts are extremely time-consuming to remove, clean, and reassemble. Look for a chamber that requires few or no tools to disassemble for cleaning. It should take no more than 5 minutes to remove all chamber components.

If using an additive water system to boost chamber relative humidity, it's important to carefully evaluate the humidification source. Simple evaporative water pans, while inexpensive to buy, tend to collect dead insects, and serve as a chamber-wide source for mold contamination. Select a humidification system with an external water source; it will be naturally easier to keep clean, and more contamination resistant.

Can I run a cycle to automatically kill mites and eliminate mold and fungus in my large reach-in?

While certain types of incubators/chambers (namely cell culture CO_2 incubators) often feature some kind of periodic contamination elimination cycle, few large chambers have this functionality. While heat-based “mite” cycles have been available from several insect chamber manufacturers, these units are only effective against mites, having no proven efficacy versus mold, fungi, or bacteria. Caron’s 7340 series reach-ins now offer an optional validatable two-hour hydrogen peroxide (H_2O_2) sterilization cycle. This process provides a statistically significant kill (10^{12} reduction) of all organisms and microorganisms in the chamber, and can be proven to work through the use of biological indicators, the same methodology used to validate autoclave (steam sterilizer) cycles.

Why are there two parts to Caron’s reach-In sterilization system? What is the “prep” portion all about?

Not all reach-in customers want or need a sterilization cycle, which requires special operational components. Rather than force customers to buy parts they don’t want or need, we’ve broken them out into a special “prep” kit just for sterilization-ready units. The “prep” consists of an electromechanical door lock, which prevents chamber access during the cycle, a power/data connector cable to the sterilization module, and unique programming to run it.

You show a narrow spectrum “orange” or “fly” lighting option in your literature. What’s that all about?

Recent research (Hori, M., Shibuya, K., Sato, M. & Saito, Y. *Lethal effects of short-wavelength visible light on insects*. Sci. Rep. 4, 7383; DOI:10.1038/srep07383 (2014)) shows that many species of flying insect, including Drosophilia melanogaster (common fruit fly), Culex pipiens molestus (London Underground mosquito), and Tribolium confusum (confused flour beetle) are highly susceptible to lethal effects from blue-light irradiation. Exposure during the study to light between 404 and 508 nanometers killed substantial proportions of both fly pupae and hatchlings. Speculation is that these species have evolved to reproduce in dark habitats, in which shorter blue-light wavelengths have been naturally filtered out by the atmosphere and long-wavelength spectra comprise the majority of visible light.

By providing an optional 500-700 nanometer narrow-spectrum light source, Caron can tailor its insect rearing chambers to the unique needs of flying insects, reducing the previously unknown risk created by a conventional wide-spectrum light source.

CARON PRODUCTS & SERVICES, INC. PO Box 715 / Marietta OH 45750 / **PHONE** 740 373 6809 / 800 648 3042 / **FAX** 740 374 3760