

DEVICES FOR ELECTROCUTION OF FLYING INSECTS

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DISCLAIMER

Descriptions of devices for electrocuting flying insects contained herein are necessary to adequately discuss their use. The Armed Forces Pest Management Board does not recommend specific brands of these devices. The descriptions of acceptable devices found herein represent a consensus from unbiased technical literature and are intended to be generic in nature.

FOREWORD

Devices for Electrocutation of Flying Insects

There are literally dozens of names and variations in the technical literature, DoD files, and trade sources for devices that electrocute flying insects. Some common examples include electrocutor traps, insect light traps, electrocution devices, electric flying insect control units, indoor grid-electrocution light traps, and insect electrocuting light traps. These names are interchangeable when they describe devices which use ultraviolet light (radiation) to attract flying insects to an electrocuting grid. The resulting high voltage, low amperage electric arc electrocutes the insects, which then fall into a removable tray. In the interest of federal agency standardization, DoD will share terminology used in the Food and Drug Administration Retail Food Protection Program Information Manual, Part 6, Chapter 1, Number 6-701 of 3 September 1987, which refers to "Devices for Electrocuting Flying Insects." In the interest of brevity, the acronym DEFLI is used herein when describing a device for electrocuting flying insects.

INTRODUCTION

Purpose

It is the policy of the Department of Defense (DoD) to implement safe, effective, economical, environmentally sound integrated pest management (IPM) programs to ensure that living organisms do not interfere with military operations, destroy property/material, or adversely affect health, safety and morale. The purpose of this Technical Information Memorandum (TIM) is to provide guidance on the selection, procurement, placement, use, and maintenance of **indoor** devices for electrocuting flying insects (DEFLIs) as part of IPM programs to control house flies and certain other flying insects in food service facilities, commissaries, hospitals, and other sensitive sites. **DoD does not approve the use of DEFLIs outdoors.** DEFLIs by themselves generally will not provide control of flying insects. They can, however, contribute to IPM programs when properly used in conjunction with other technologies such as sanitation, exclusion and chemical control.

This guidance is directed to all DoD Components, including CONUS and overseas installations, Reserve and National Guard units, appropriated and non-appropriated fund activities and contractor operations. This TIM is intended to educate and inform readers rather than to encourage or discourage the use of DEFLIs.

Untrained personnel should not attempt to select, utilize or maintain DEFLIs. Assistance should be requested from the pest management professional responsible for reviewing the pest management plan for the requesting installation. If DEFLIs are used at an installation, this TIM and site-specific information should be included in the installation pest management plan.

History in Federal Agencies

Although the first DEFLIs did not appear until 1927, the first patent approval for the mechanical fly trap goes back to 1851. During WWII, the military used electrified screens to control houseflies. In 1968 the U.S. Department of Agriculture accepted the use of DEFLIs in meat and poultry plants under federal inspection. Also in 1968, the Food and Drug Administration (FDA) recognized them in their retail Food Protection Program Information Manual as "...supplemental to good sanitation practices..." Later in the same year, the Veterans Administration published guidance for the use of DEFLIs in their health care facilities.

Current Acceptance and Use outside DoD

It is estimated that over 10,000 industrial type indoor DEFLIs are produced in the U.S. annually. These are purchased primarily by food processors, supermarket chains, restaurant chains, pharmaceutical firms, and hospitals.

Terms and Definitions

Electric arc - A discharge of electricity through a gas.

Electromagnetic - Pertaining to the phenomena in which electricity and magnetism are related.

Mercury vapor lamp - A lamp in which light is produced by an electric arc in an iodized mercury vapor atmosphere, producing a bluish light rich in ultraviolet radiation.

Phosphor - A luminescent coating inside a lamp that converts part of the absorbed primary energy into emitted luminescent radiation.

Sodium vapor lamp - A lamp containing sodium vapor, used chiefly for outdoor illumination, producing a yellow-orange light.

Ultrasonic - Pertaining to signals, equipment, or phenomena involving frequencies above the range of human hearing.

Ultraviolet (UV) light - Electromagnetic radiation in the wavelength range 4-400 nanometers.

BACKGROUND

Three major categories of non-pesticidal electric-powered insect control devices have been marketed in recent years: electromagnetic repellers, ultrasonic repellers and DEFLIs.

Electromagnetic repellers have been discredited by legitimate researchers in the U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency (EPA). EPA enforcement actions have been taken against some manufacturers for misrepresenting their products.

Ultrasonic repelling devices have been shown ineffective against insects. Although there may be some limited potential for control of vertebrate pests with ultrasonic devices, the DoD does not approve of them for any use.

There are two major types of DEFLIs available: outdoor and indoor models. The outdoor devices are consumer-oriented products targeted for backyard use against biting and nuisance Indoor DEFLIs typically are heavy-duty industrial devices which are more expensive than outdoor DEFLIs and which are generally designed with the behavior of the intended target

insects. Research indicates that although substantial numbers of insects may be killed by such devices, the number of pest insects is not significantly reduced when their source cannot be controlled. Evidence also suggests that the outdoor devices may attract more insects into a backyard environment than they kill. The net result may be an increase in the insect population. Although UV light is attractive to face flies and biting flies, DEFLIs also do not normally provide effective control around stables. Since the fly breeding habitat is usually nearby and exclusion is not feasible, the reproductive potential of the insect overwhelms the control efforts. Even house flies in a caged environment could not be controlled by DEFLIs in one experiment when the breeding medium was placed in the cages.

Outdoor DEFLIs are typically installed by the customer with little regard for the bionomics of the intended target species. Maintenance is often marginal, and early failure is common. The U.S. Consumer Product Safety Commission recalled at least one brand after it started several fires. As might be expected, shock hazards have also been documented.

Such outdoor devices were grouped with commercially available electromagnetic and ultrasonic devices, and in fact were so considered in a 1982 Armed Forces Pest Management Board (AFPMB) policy statement. At that time the AFPMB did not have adequate efficacy data to distinguish outdoor and indoor DEFLIs. Data now exist which differentiate DEFLIs and which support effective use of indoor devices.

species, usually the house fly, in mind. They are tailored for and installed in food processing, food service, medical, pharmaceutical, manufacturing and similar sites. Although no such device or

group of devices represents a pest management panacea, the better ones, when professionally integrated into a well-conceived and implemented pest management program, are worthwhile surveillance and control tools which may be recommended by DoD pest management professionals.

DoD POLICY AND APPROPRIATE USES

It is the policy of the DoD that:

Electromagnetic exclusion or control devices, ultrasonic repellent or control devices, and outdoors devices for electrocuting flying insects will not be used on DoD installations.

This policy **does not** apply to:

Indoor use only of selected devices for electrocuting flying insects when carried out in accordance with the guidance provided by this TIM.

Pest surveillance traps and monitoring equipment, such as non-electrocuting mosquito light traps, used by trained personnel.

DEFLIs may be considered as part of IPM programs to control house flies in food service facilities, commissaries, non-patient areas of hospitals, animal holding rooms, and possibly some “clean areas” involving communications or computers (where even small numbers of flying insects could be detrimental to operations). DEFLIs are not recommended for the control of most stored products pests.

PROS AND CONS

Integration with Other Methods of Fly Control

DEFLIs alone will not solve serious fly control problems. Some important measures necessary for minimizing fly problems around DoD facilities are listed below:

- ◆ If possible, locate food handling facilities away from natural breeding sites.
- ◆ Locate garbage containers as far from buildings as practical.
- ◆ Steam clean garbage containers weekly during warm weather.
- ◆ Maintain excellent sanitation, especially in potential breeding sites (loading, storage and service areas).
- ◆ Whenever feasible, identify and eliminate breeding sites (may require weed control and general cleanup).
- ◆ Ensure that screens, air curtains and self-closing doors are frequently inspected and properly maintained.
- ◆ When selecting outside lighting, consider the use of mercury vapor lamps on poles away from buildings to attract and hold night-flying insects.
- ◆ Consider the use of sodium vapor lamps for lighting at (but not over) entrance ways to minimize fly attraction to buildings.
- ◆ Utilize pesticides (including baits), residual materials, and ultra-low-volume space treatments.

- ◆ May be useful for surveillance as well as control of many flying insects, thereby facilitating ongoing evaluation of total IPM efforts by trained professionals.
- ◆ Occupants do not have to vacate areas that are treated.
- ◆ Reduces complaints by reducing insect levels and/or providing ongoing evidence that flying insects are being destroyed.
- ◆ Lessens possible environmental damage and offers long-term savings by decreasing the amount of pesticide used.
- ◆ Eliminates the risk of chemical contamination (may be critical in sensitive areas such as animal holding rooms in research facilities).
- ◆ Provides continuous control.

Disadvantages

- ◆ Does not provide control in most environments, unless used in conjunction with other IPM measures such as exclusion (screens, self-closing doors, and air curtains), sanitation and pesticides. Education of the public is necessary so that other parts of IPM programs are not diminished when DEFLIs are installed.
- ◆ Requires substantial initial expense.
- ◆ Requires servicing (cleaning and fly removal) at least weekly and lamp replacement at least annually.
- ◆ Requires training for servicing personnel if used for surveillance as well as control.

Advantages

- ◆ Attracts flies only from a short distance away and will usually not compete with odors.
- ◆ Attracts only some species of flying insect pests.
- ◆ Creates potential hazards to workers and other personnel from airborne particles which are potential allergens; aesthetic problems and potential for vandalism if improperly located.

USE OF DEFLIs

Selection, Procurement and Placement

General - There is no “cookbook” explanation of how to determine the optimum density, unit size, or exact locations for placement of DEFLIs. Generalizations are impractical due to variations in building locations, construction features, local practices, and acceptable levels of control. Manufacturers generally provide consultation to pest management personnel upon request. Some “rules of thumb,” however, are provided here to assist pest management professionals.

Models - DEFLIs are available primarily as rectangular units of varying sizes and shapes suitable for mounting (vertically or horizontally) on walls, in corners or from ceilings. The most common units are designed for two four-foot 40 watt lamps, or two two-foot 20 watt lamps. Several other configurations are also available. Ceiling or overhead units should only be specified when there are no suitable sites closer to the floor and

should never be installed near food preparation areas.

Height - For optimum capture of house flies and closely related filth flies, units should be mounted approximately 2' above the floor. When this is impractical and/or would interfere with operations, units can be raised, but placement should not exceed approximately 5' above the floor.

Competition with Other Light Sources

- Units should be placed to minimize competition from natural and artificial light sources and to ensure that insects are not attracted from outside sources. DEFLIs should be run continuously since 24 hour operation will result in the trapping of night-flying insects.

Sanitation - Units should not be placed within 5' of exposed food or food preparation surfaces. No ceiling units should be placed near sensitive areas. This is to ensure that dead insects do not fall onto food, food preparation surfaces or utensils.

Natural Odors - Units should be placed near natural food attractants such as garbage areas.

Planning a Layout - Units should be located along insect pathways leading to sensitive areas. The first unit encountered by flies entering a building should be near an entry point where the temperature is over 50°F.

Density - As a compromise between optimum attraction and cost-effectiveness, 50' spacing (of units with two 40 watt lamps) may be used as a baseline for determining density. Smaller

units should be placed in small rooms. Density will vary, however, based on local conditions.

Electrical Safety - To safeguard against electrical shock, units should be accepted, certified and labeled by Underwriters Laboratories, Inc. Such units are designed with safety features such as 3-wire grounded power cords. Placement should not be in high traffic areas, especially where forklifts are used, and should preclude access by children, pets, unauthorized personnel, and unstable personnel (i.e. near psychiatric wards). Units should not be placed where clean-up is accomplished by hosing. DEFLIs are regulated by Occupational Safety and Health Administration (OSHA) electrical standards. Title 29, Code of Federal Regulations (CFR), 1910.303, 1910.304 and 1910.399 apply.

Fire Safety - Units should not be placed near combustible materials, where oxygen is used, or where a gas or dust explosion could be triggered by a spark.

Worker Exposure - It is important that replacement lamps be identical to those supplied by the manufacturer. A variety of UV lamps are used for detecting oil leaks in aircraft engines, inspecting fabric for flaws, and killing bacteria. A germicidal lamp placed in a DEFLI could be hazardous to personnel. Long-term chronic effects of UV exposure are unknown. Common sense dictates that DEFLIs be located where employees are not required to work continuously with UV lamps at or near eye level.

Maintenance

Cleaning - For purposes of general sanitation, to prevent hatching of insect eggs and to prevent attraction of scavengers, dead insects should be removed as needed or at least weekly. This can be done manually or with a vacuum cleaner. Trays should be cleaned with soap and water and germicide at a frequency consistent with the capture rate. Only units with quick-access service plates and deactivating electrical switches should be selected. Insect debris should also be removed from electrical grids and surfaces at regular intervals. DEFLIs placed near food handling areas for surveillance should be cleaned daily. Metal surfaces should be cleaned as necessary to retain reflectivity. Heavy accumulations of dust should be removed from lamps as necessary to prevent blockage of UV light emissions.

Lamp Replacement - Lamps should be replaced as least annually, preferably in the spring. This is because phosphor breakdown eliminates most UV light emissions within 10 months.

Maintenance Plan - A written maintenance plan should include:

- ◆ Responsibilities and frequencies for emptying, cleaning, and sanitizing insect collection trays, cleaning grids and reflective surface,; and cleaning/replacing lamps.
- ◆ A format for a maintenance log (may include stick-on labels for equipment).
- ◆ Source information on replacement lamps and other parts.

- ◆ A file containing manufacturer's user guide and literature.

FUTURE RESEARCH

The existing literature on DEFLIs, although substantial, provides limited scientific evaluations of indoor industrial-type units under field conditions. Much of what is available comes from trade magazines and proprietary material. The AFPMB is particularly interested in evaluations of the operational efficacy of available indoor industrial-type units for control of flies. Information from controlled studies is especially needed on how well and how quickly commercial devices provide economic levels of pest management when environments, traps/locations and insect density are manipulated. The AFPMB continues to seek opportunities to expand its base of information on practical aspects of the use of DEFLIs in DoD IPM programs.

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* Only the most pertinent references are included in this TIM. A more comprehensive bibliography is available from the Defense Pest Management Information Analysis Center of the Armed Forces Pest Management Board.