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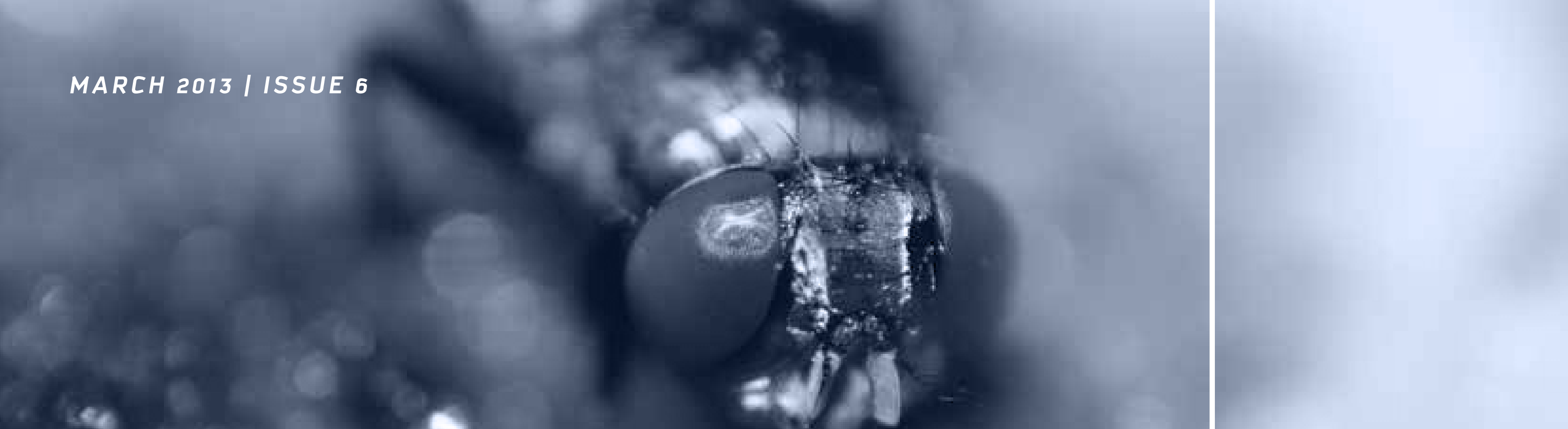


PESTWEST NEWSLETTER

DID YOU KNOW...

Ongoing research is showing that houseflies, Musca domestica, may be important in the transfer of the hospital 'superbug' Clostridium difficile.

Fly eyes have the fastest visual responses in the animal kingdom. A new study shows that their rapid vision may be a result of their photoreceptors -- specialised cells found in the retina -- physically contracting in response to light.

The Asian Rock Pool Mosquito, Aedes japonicus could be the next invasive species to make it to the UK! The nuisance biting reporting scheme, 'Mosquito Watch' will possibly be the first to identify new mosquito biting nuisance issues that could be related to an invasive species.

PestWest®
FLYING INSECT SCIENCE

ELECTRIC FLY KILLERS, THE FACT AND FICTION

With so much conflicting information in the field of UV lamps, selecting which type or make of tube is best for a particular UV fly killer is no longer a straightforward choice.

It has long been known that flying insects are particularly influenced by the presence of UV light. It is thought that this is because when insects first developed on earth, the atmosphere on this planet was very different, with appreciably more UV light than we receive today. It is this principle which forms the basis of all UV light trap systems.

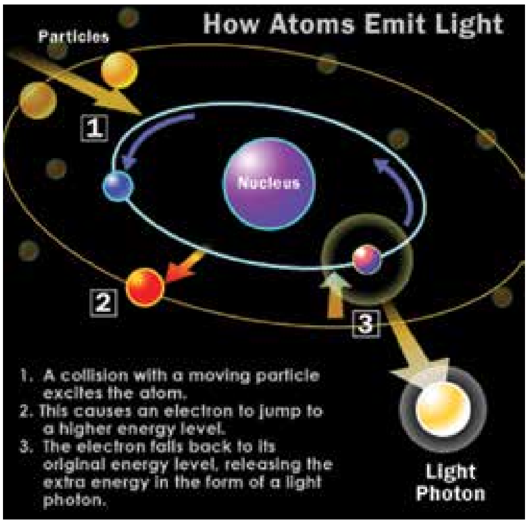
The current method of producing the UV light needed to attract flying insects is to use a device called a fluorescent lamp.

Let There Be Light

To understand fluorescent lamps, it helps to know a little about light itself. Light is a form of energy that can be released by an atom. It is made up of many small particle-like packets that have energy and momentum but no mass. These particles, called **photons**, are the most basic systems of light. Atoms release photons when their **electrons** become excited. Electrons are the negatively charged particles that move around an atom's nucleus (which has a net positive charge).

The **wavelength** of the emitted light depends on how much energy is released, which depends on the particular position of the electron. Consequently, different sorts of atoms will release different sorts of photons. In other words, the **color** of the light is determined by what kind of atom is excited. This is the mechanism at work in nearly all light sources. Fluorescent lamps have one of the most elaborate systems for exciting atoms.

This diagram explains the process:

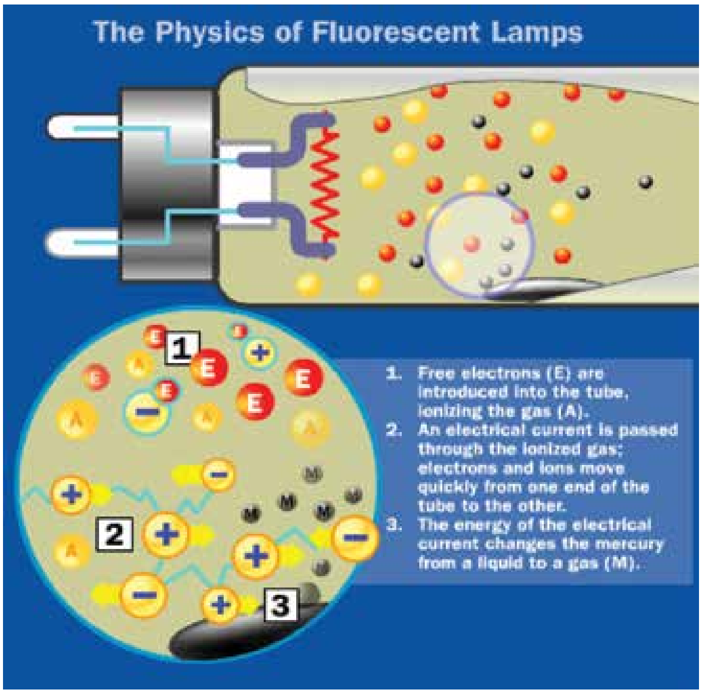


Lamp construction

To appreciate the significance of this process in a modern fluorescent lamp it helps to understand a little bit about the way lamps are made and how they function.

The central element in a fluorescent lamp is a **sealed glass tube**. The tube contains a small amount of **mercury** and an inert gas, typically **argon**, kept under very low pressure. The tube also contains a **phosphor powder** coated along the inside of the glass. The tube has two **electrodes**, one at each end, which are wired to an electrical circuit.

When the lamp is turned on, electrons and charged atoms move through the tube, some of which **collide** with gaseous mercury atoms. These collisions excite the atoms, bumping electrons up to higher energy levels. When the electrons return to their original energy level, they release photons. The details of this process are explained below.



How do the lamps work?

The vast majority of the released light is at the characteristic frequencies of mercury, which is of a very short wavelength and invisible to human beings.

By coating the inside of the glass tube with different formulations of certain rare earth chemicals, called phosphors, it is possible to use this very short wavelength light to react with the phosphor coating and produce different wavelengths of light from within the ultra violet band right up to the red end of the visible light spectrum. So by choosing the correct phosphor or phosphor mix it is possible to produce fluorescent lamps suitable for a wide range of different applications.

An important characteristic is how the light output produced by the phosphor decreases over time. This is due to a number of factors beyond the scope of this article, suffice to say that phosphors used to produce the shorter wavelengths e.g; in the UV band, tend to lose performance more rapidly than longer visible wavelength phosphors.

The BL350 UV tube

For over 50 years the BL350 phosphor was the workhorse for flying insect management throughout the world. The name refers to the fact that it produces its peak output of light at a wavelength of 350 nanometres (nm), although the actual band of output spreads from around 300nm up to 400nm. This upper end is actually in the visible band for a large percentage of the human population.

In the past, all lamps in the market place used only one type of phosphor, the BL350.

One of the most noticeable characteristics of this phosphor is that in order to work efficiently it needs the element lead to be introduced into the phosphor mix. This is one of the substances restricted by the Restriction of Hazardous Substances Directive (RoHS).

As a result of pressure from interested parties, production of fluorescent lamps incorporating this phosphor was banned in Europe from January 2011.

Additionally the BL350 phosphor had another shortcoming. The UV light output dropped off quickly, typically losing up to 30 % output within the first 500 hours of operation (that's only 3 weeks). This degradation is not linear however, see figure adjacent.

It is worth noting at this juncture that not all manufacturers' lamps are of the same quality. Tests performed by PestWest found a wide variation among the performance from different manufacturers' lamps of similar rating, both in terms of initial UV output and rate of degradation of UV output against time. For this reason alone it pays to select lamps from quality manufacturers able to supply supportive data for their products rather than buying solely on price.

Because of the fall in output of the BL350 lamp against time, it has become standard practice, within the responsible pest control industry, to replace UV lamps when the output has fallen to less than 50 % of the initial value.

With good quality lamps this equates to around 7-8 months operation. For regions North and South of the tropics assuming lamp change is effected at the start of the flying insect season in the spring, maximum attraction to insects coincides with the insect activity cycle. Within the tropics, however, insects are present all year round and it is common practice to change lamps every 6 months.

In the late 1990's Pestwest collaborated on a 3 year research program at the University of Birmingham, UK. A wealth of very interesting and informative data was generated during this research. Of particular note was the revelation that urban flying insect pests were specifically attracted to the waveband 340 – 380 nm.

From this and other data generated during the research, Pestwest initiated a project in conjunction with their lamp supplier to develop a UV lamp which concentrated the maximum amount of its output within this band, rather than spread over the whole UVA band of 315 to 400 nm produced by the BL 350 lamp. The aim of this was to ensure more of the electrical energy put into the lamp resulted in effective attraction rather than wasting power where it would have minimal benefit.

This work resulted in the introduction of a new type of flying insect attracting lamp, which was branded Quantum. Not only did this lamp produce over twice its peak output in the important 340-380 nm band an added benefit was a dramatic increase in the effective performance of the lamp.

The phosphor used in this tube (strontium borate), is now known as the BL 368 phosphor.

Since the EU ruling on the cessation of production of the BL 350 tube, many manufacturers have been forced to use this phosphor if they wished to be part of the flying insect control supply chain. This has resulted in many tube vendors sourcing their supplies from other low cost manufacturers. Many of these lamps are produced with little regard to UV output efficiency and doubtful "Maintenance" (UV output against time).

In an effort to promote their own products a number of manufacturers have seized on the improved life performance characteristics of the BL368 phosphor to make somewhat exaggerated claims, such as “super-efficient” etc., without any data to support their claims. More responsible lamp manufacturers have, on the other hand, applied their considerable knowledge to not only improve the performance of the lamps further but also adopt manufacturing processes with less environmental impact.

Let’s examine each of these in detail.

UV tube phosphors

Whilst knowledge of the basic chemicals to make a phosphor is commonplace, ensuring the quality and purity to create the optimum physical properties of the mix requires years of experience. Over the last few years the supplies of the rare earths that are incorporated in the manufacture of these phosphors have increased significantly in price. Processing of the raw materials to achieve the desired level of performance has further added to phosphor costs with the net effect of some tube manufacturers taking “shortcuts” either to reduce costs or because of the lack of knowledge to produce top quality phosphors.

Application of the phosphor coating to the inside of the tube

The original method to apply the phosphor coating on the tube was to mix the phosphor powders with an organic solvent to form “paint”. These organic solvents resulted in high levels of airborne pollution.

By the end of the last century, European tube manufacturers had perfected phosphor application systems which dispensed with the need to use polluting solvents and now use only water-based phosphor application systems, further reducing the environmental impact of tube production.

Mercury

A fluorescent tube has to contain mercury for it to operate. Within Europe there are directives aimed at minimising the amount of mercury (a substance covered by RoHS) that is permitted to be added to a UV lamp. Over the years, technical advances have allowed reliable lamps to be produced which contain a reduced amount of mercury. Nowadays limits are typically below 5 milligrams per lamp. The production of fluorescent lamps dosed with such tiny amounts of mercury requires advanced equipment to control accurately the amount used on a production line producing 1,000’s of lamps an hour.

Examples of lamps from outside Europe have been found to contain 6-10 times this amount of mercury, and with it a potential hazard to those charged with disposing of same. The biological impact of manufacturing fluorescent lamps containing these levels of mercury cannot be ignored.

Having explained the general construction and the way in which a UV fluorescent lamp operates, there are number of different manufacturing techniques that have been developed to reduce the environmental impact of such lamps.

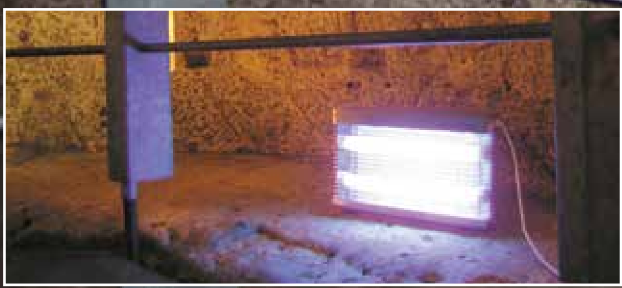
Remember humans cannot see UV so without actually measuring the output from the lamps, customers will have no way of knowing what they are getting. So, it can be easy to be misled by claims. However, PestWest can be trusted to separate the fact from fiction of fly trap UV lamps and expel the myths of fly vision. Always take an evidence-based approach regarding the UV lamps available for flying insect control and make an informed choice.

ROYSTON CAVE PRESERVATION AND PESTWEST

PestWest units not only protect the present but also the past as a Chameleon unit was installed to protect the precious interior of Royston Cave, Hertfordshire.

Dating from the 14th Century, Royston Cave features an extensive range of wall carvings representing the crucifixion, the holy family and several saints, among them St Katherine, St Laurence and St Christopher.

Local historians have said the wall carvings suggest the Grade I-listed site may have been used by the Knights Templar.



PestWest®
FLYING INSECT SCIENCE

Why choose PestWest Quantum UV-tubes for your fly control units?

UV tubes are at the heart of a fly killer. Their quality dictates the attractiveness of the unit to flying insects and therefore its effectiveness.

Since the manufacture of BL 350 tubes was banned in Europe for environmental reasons, PestWest Quantum tubes have become the choice of professionals in the food industry.

Why?

PestWest Quantum tubes are -

- Manufactured to the highest quality
- 100% lead-free construction
- Based on the lowest mercury levels consistent with optimum performance
- Shatterproofed with the most effective FEP coating

By using only proven water-based phosphor technology, they give maximum output and minimum reduction in UVA light output over two years. PestWest believe that we owe it to our customers to supply them with the best. **WOULDN'T YOU AGREE?**

www.pestwest.com