Fumigation Service and Supply, Inc. and Insects Limited celebrate their 30th year in business. We want to thank our partners who have helped us along the way.

At Fumigation Service & Supply and Insects Limited, we believe that a pest management strategy should focus on prevention, monitoring, and control.

Monitoring and Prevention
Pheromones have been the center piece for Insects Limited. Insects Limited has been the leader in pheromone technology for 30 years. Pheromones have emerged to be an important tool for pest management in stored products. It wasn’t always that way. David Mueller, FSS/IL founder stated: “In the beginning some people joked about the idea of using sex attractant pheromones. Some people predicted they would never make it.” Insects Limited now synthesizes and supplies quality pheromones to 60 countries worldwide. These sensitive monitoring tools have been an important technology to determine if the population of a pest insect reaches a level to warrant a pesticide treatment or not. It has changed the ‘spray by the calendar’ mentality into a more data driven pest management strategy.

Control
When a pest population warrants a treatment, fumigants are the best tool to penetrate into structures and commodities without leaving a dangerous residue without harming the environment. Most grain based food we produce worldwide has been fumigated. Fumigants can be hazardous and even deadly. Safe use of fumigants takes experience and continuous training. These FSS managers along with experienced and licensed fumigators treat hundreds of commercial structures and grain bins yearly. Safety is of vital importance in every step of the way when preparing and performing fumigation. FSS’s safety record is superior.

Mission Statement
Twenty years ago this mission statement (see right) was written by the FSS/IL employees on a train ride to SC Johnson’s Headquarters in Racine, WI. Every word was carefully crafted by the group. Since written in 1991, we have used this statement as our guiding principles.

In celebration of our 30th year in business, everyone at Insects Limited and Fumigation Service & Supply want to thank you, our customers, partners, and friends, for helping us grow our company.
Insect Resistant Packaging: The Last Line of Defense Part 2

By Alain VanRyckeghem, BCE
Technical Director
InsectHelp@aol.com

There is a multitude of materials that can be used for consumer packaging. They can be graded into five categories according to levels of protection from penetrating insect pests.

Modern packaging incorporates multiple layers and thickness of mixed materials such as those listed in the table below. The purpose of these designs includes better preservation, longer shelf live, enhanced graphics, resealable closures, and user convenience. There are however, many food packages that still have nothing more than dry food product in a single layer Kraft paper box or cellophane wrapper. Why would food manufacturers still do this kind of thing?

Once the food package leaves the warehouse, the food manufacturer has lost a significant degree of control over that product. One cannot accurately gauge the level of sanitation in a distribution center or retail store. The manufacturer cannot foresee a retailer’s improper product rotation or lack of pest control services, or placement next to other infested materials. The manufacturer must however, satisfy the consumer’s expectation of pest free food. That manufacturer has a Branded name product and if a consumer cannot feel confident in that product they will remember that brand as one to avoid rather than one to purchase. To that end, the retail package that a manufacturer uses to proudly sell its product is the Last Line of Defense.

The difference between profit and loss (from recall) can literally be the thickness of the dollar bill (100 microns).

Defence. The difference between profit and loss (from recall) can literally be the thickness of the dollar bill (100 microns).

Why does an insect attack one package over another made of the same material and containing the same food products? The answer is odor; insects live in a world of odors and the escape of food odors from a puncture, loose seal, or badly designed package is the main reason they choose one

(continued on page 6)

<table>
<thead>
<tr>
<th>Level of Protection from Penetrators</th>
<th>Examples of Packaging Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impervious to attack</td>
<td>Vacuum sealed jars and tin cans</td>
</tr>
<tr>
<td>Insect proof</td>
<td>Polycarbonate; Polyethylene terephthalate (PET)</td>
</tr>
<tr>
<td></td>
<td>Polyester; nylon plastics</td>
</tr>
<tr>
<td>Insect resistant</td>
<td>Cellulose Acetate</td>
</tr>
<tr>
<td></td>
<td>Polyamide</td>
</tr>
<tr>
<td></td>
<td>Polyethylene (250 microns = 10 mil)</td>
</tr>
<tr>
<td></td>
<td>Polypropylene</td>
</tr>
<tr>
<td></td>
<td>Polyvinyl chloride</td>
</tr>
<tr>
<td>Susceptible to attack</td>
<td>Acrylonitrile</td>
</tr>
<tr>
<td></td>
<td>Polylactic acid (new biodegradable plastics)</td>
</tr>
<tr>
<td></td>
<td>Polyethylene (125 microns)</td>
</tr>
<tr>
<td>No protection from attack</td>
<td>Ethylene vinyl acetate</td>
</tr>
<tr>
<td></td>
<td>Kraft Paper</td>
</tr>
<tr>
<td></td>
<td>Corrugated paperboard</td>
</tr>
<tr>
<td></td>
<td>Paper/foil/polyethylene</td>
</tr>
<tr>
<td></td>
<td>Polyethylene (25-100 microns =1- 4 mil)</td>
</tr>
<tr>
<td></td>
<td>Polyvinylidene chloride (Saran)</td>
</tr>
</tbody>
</table>

Table 2. Common packaging materials and the level of protection they provide from insect penetrators.
How does it feel to be cold blooded? How do you find a crack to crawl into during the hottest part of the day when the surface reaches over 110 degrees? What does it feel like to have a breeze blowing on your fragile wings that causes you to find shelter until it subsides? What does it feel like to see a light at night and be programmed to fly to a tiny opening into a food processing plant from which the light comes from? What does it smell like when a wisp of pheromone crosses an antennae? What does it feel like to lay 100 eggs a day in locations where there is a food source and protection from predators and parasites? What does it feel like to know how to survive like your ancestors have done for millions of years? 

Humans are warm blooded animals who seek conditioned air in all we do and in all seasons year round. We get into our cars and immediate turn on our air conditioning. We place screens, fans, air conditioning, and tinted window to keep the warm temperatures under control in the hot summer months. We insulate our homes, wear thick wool clothing, and turn up the thermostat in the winter months. We survive in places like Alaska, Antarctica, Minnesota, and even at 35,000 ft. because we create livable conditions. 

Pest Management Tip
Superior pest management should include the use of outdoor and indoor temperatures to predict insect outbreaks. It is basic biology but we often overlook how important temperature is to the development of insect populations.

In this chart below, the 12 year average mean temperature in a Midwestern city is denoted by the blue line (1998-2009). The average mean temperature for 2010 at this location is designated by the red line. Notice that the temperatures in 2010 were 2-3 degrees higher than the previous 12 year average meant high temperature. When you compare the two lines, it shows that 2010 was an extremely hot summer. The months of March, April, and May allowed for the insects to emerge early and reach the second generation fast. Remember that insect development is directly dependent on temperature. Most insects can stay active if the temperatures are above 60-65° F (18-20° C). If the temperatures stay above 65 degrees at night, the insects can then stay active 24 hours a day. The night time active insects will accelerate their population growth and the pest problems in stored products begins to reach a critical mass.

Stay look at the number of insects circling a light pole in on a hot night. That activity is directly proportional to their life cycle. 

Reproductive potential: If a female Indian meal moth can lay 400 eggs per female. The normal time it takes these 400 eggs to hatch in one week, larvae two weeks, pupae one week and emerge as a reproductive adult moth in as short as one month. If you get three generations in an average year, that number can grow exponentially, 400 x 400 x 400. Mathematically this is about 64 million biologically active offspring. In 2010 we had six months where the average mean temperature was 2-3 degrees warmer than the average of the previous 12 years (see chart). If you add the fourth generation, like we did in the Midwestern region of the United States in 2010, you theoretically could reach 27 billion moths in one summer. 

Finally, I hope you are starting to ‘feel’ like a cold blooded insect. Understanding indoor and outdoor temperatures can offer data driven predictions that leads to a reduction of customer complaints.

Where to start? Go to www.weather-warehouse.com and start with your hometown in 2011.
Comparison Phosphine Pellets

By Pete Swords
Pheromone Chemist
p.swords@insectslimited.com

Recent studies conducted at our facilities were aimed at investigating the integrity and longevity of phosphine pellets produced by three different major manufacturers. The purpose of this being to determine which pellet has the most stability and at the same time capable of releasing phosphine gas at standard concentrations for an efficient amount of time. The three top manufacturers which were included in the testing were the following: Drexel Drex-PH3 Phosphine Pellets™, Weevil-cide Phosphine Pellets™, and Degesch Phostoxin Phosphine Pellets™.

In order to determine the integrity of the pellets, four canisters of pellets for each manufacturer where randomly chosen from different cases that were shipped at separate times. Each canister was emptied into sifters where they were shaken so that the residual dust could fall through and be collected to be weighed. Total weights of the pellets from each canister where recorded along with each respective dust total. The following data table shows the results obtained from four separate trials for each manufacturer. Drexel and Degesch both claim to provide 1kg of pellets, while Weevil-cide provides 1.5kg.

For each manufacturer, it is important to look at the weight to dust ratio. As the data above shows, Drexel has the best weight to dust ratio of 437:1 (0.23%) which means that there is only 1 gram of dust for every 437 grams of pellets. Weevil-cide was second in weight to dust ratios having 1 gram of dust for every 162 grams of pellets. Weevil-cide was third at 1 gram of dust for every 117 grams of pellets (0.85%). Drexel Drex-PH3 Phosphine Pellets showed to have the best integrity out of all three as well as provided at or more than the claimed value provided at 1kg. Weevil-cide also provided more than the claimed 1.5kg for each trial while Degesch Phostoxin provided less than 1kg for each trial completed.

Phosphine Pellet Comparison

Methods/Materials  Each pellet brand had four pellets from separate flasks taken randomly and placed in 200mL glass containers 2 feet apart. Each flask was monitored approximately every half hour with a Dräger PAC 3000. The PAC 3000 was held directly above the glass containers.

<table>
<thead>
<tr>
<th>Pellet Brand</th>
<th>Trial</th>
<th>Wt. of Pellets (g)</th>
<th>Wt. of Dust (g)</th>
<th>Wt. of Pellets (g)</th>
<th>Wt. of Dust (g)</th>
<th>Wt. of Pellets (g)</th>
<th>Wt. of Dust (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drexel Drex-PH3 Phosphine Pellets</strong></td>
<td>1</td>
<td>1011.7</td>
<td>1.1</td>
<td>1</td>
<td>1508.2</td>
<td>6.4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>995.6</td>
<td>5.0</td>
<td>2</td>
<td>1507.7</td>
<td>13.8</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1002.7</td>
<td>2.1</td>
<td>3</td>
<td>1507.2</td>
<td>8.6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1006.1</td>
<td>1.0</td>
<td>4</td>
<td>1503.9</td>
<td>8.4</td>
<td>4</td>
</tr>
<tr>
<td>Average</td>
<td>1004.025</td>
<td>2.3</td>
<td>Average</td>
<td>1506.75</td>
<td>9.3</td>
<td>Average</td>
<td>996.28</td>
</tr>
<tr>
<td>Weight to Dust Ratio</td>
<td>437 : 1</td>
<td>Weight to Dust Ratio</td>
<td>162 : 1</td>
<td>Weight to Dust Ratio</td>
<td>117 : 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1  Dust Comparison of 3 major phosphine pellet manufacturers.
containing the pellets. The temperatures were 54-57°F and the relative humidity was 55% Rh.

**Results** Data was recorded for 3 days. Breakdown trending could be seen with a higher concentration of phosphine for the first four hours and then the gradual tailing off for 2 days (See Figure 1 below).

**Conclusion** All three major phosphine pellet brands had the same trending of phosphine release over an extended period of time. Each manufacturer had an average phosphine release ranging from 1.8-2.0 days. From this study, there has no significant difference in pellet longevity between the three phosphine pellet brands used.

![Phosphine Pellet Time Release Comparison](image)

*Figure 1 Pellet time release of all three major manufacturers under similar conditions.*

**Top Ten Retailers in USA**
1. WalMart
2. Kroger
3. Costco
4. Home Depot
5. Target
6. Walgreens
7. CVS Caremark
8. Lowe’s
9. Sears Holdings
10. Best Buy

**Quotable Quotes**

“Any child can tell you that the sole purpose of a middle name is so he can tell when he’s really in trouble.”
— Dennis Fakes

“If you watch a game, it’s fun. If you play it, it’s recreation. If you work at it, it’s golf.”
— Bob Hope
Insect Resistant Packaging
(continued from page 2)

package over another. The majority of consumer complaints come from products that have been invaded by a food pest; much fewer cases are from active penetration of insects through packages. It is a rare occurrence that food products are actually manufactured or packaged with active and viable insects. The risk of infestations come post production and packaging. This is why the packaging material is critical; it is the last line of defense to keep the food pest free.

A food manufacturer must have good stewardship for its brand; it must protect the product beyond its own walls. The manufacturer should envision long storage, poor sanitation, rough handling, and even invasions from the “evil insect hoards.” Great food in great packaging develops a great reputation which can only lead to great profits.

New Commercial Pest Control Changes

1 All rodenticide products that you receive from the manufacturer must be sold in specific sizes and must carry new required label changes. Existing products can be used until it runs out. If you have old and newly labeled products, follow the label on the container you are using.

2 Products that use the word ‘only’ for certain species like Norway Rat, roof rat, and house mouse, cannot be used against rodent pests not on the label. (ie. deer mice).

3 Any treatment site like a fence line or dumpster more than 50 feet from the structure can no longer be baited.

There are several minor changes in the commercial and consumer rodenticides. Always read the label to be in compliance of federal pesticide laws. If you have questions, contact the manufacturer or your distributor.

Drugstore beetle

Notice the difference in their antennae.

Cigarette beetle

Even though these two pantry pests look similar, they are attracted to different pheromones. Insects Limited provides quality pheromones for these two beetles and many more.

The Leader in Pheromone Technology Since 1982

www.insectslimited.com

800.992.1991
Flies, Flies and More Flies

By Patrick Kelley, ACE
p.kelley@insectslimited.com

The earliest warming days of spring through the hot summer and into the chilling autumn, flies continue to plague commercial businesses, homes, and museums alike. Of the more than 110,000 species of flies on this planet, most are not considered pests and some are quite beneficial. A few, though, can cause emotional and economic stress as well as propagate disease. Each different type has its own unique environment in which it will thrive. In order to eliminate the flies, we need to remove the source of their existence. Once we have identified the pest, our job to eliminate it becomes much easier as we can then know what environment this particular fly comes from. There are several species that I come across quite frequently in museum settings. Here are the top 5 with some tips on identification and elimination.

House Fly, Musca domestica: This is likely the most common fly worldwide. House fly adults have 4 dark stripes on the thorax and are 7 mm in length. They commonly infest the places where people live and spend time. They can be found breeding in anything from spoiled food to manure. The key to control is sanitation and exclusion. (See article: “The Exclusion Conclusion” in Fumigants and Pheromone Issue 94)

Fungus Gnat, Sciaridae: These slender flies can look a little like a miniature mosquito at 2 - 6 mm in length. They are commonly found in office spaces and anywhere else where live plants are kept. These flies live and breed in soil where they feed upon the fungus and moist organic matter. They will thrive under certain soil conditions if the plants are being over-watered and the soil is constantly wet. Control is possible if the plants are removed or if the soil is allowed to completely dry and treated with diatomaceous earth.

Cluster Fly, Pollenia rudis: This fly is medium in size (7-9 mm) and can come into structures in large numbers during the months of August and September. Yellow hairs on their upper thorax help identify them from other flies. Eggs are laid singly in the soil outdoors and the emerging larvae will locate an earthworm and bore into it. This parasite will feed on the worm for 3 weeks before pupating. They look for man-made structures to over-winter. The best control method is preventing them from being able to enter your building. If they do get inside, light traps can be very effective.

Our philosophy:
“Start with the Insect First”

Moth Fly, Psychodidae: This distinct looking and relatively small (3 mm) fly has the appearance of a moth because its entire body and wings are covered with hairs. Moth flies primarily breed in drains or sewer pits, feeding on gelatinous organic material. The key to control is to eliminate their food sources in the drains by thorough cleaning and an application of microbial foam that breaks down the bio-gel.

Common Fruit Fly, Drosophila melanogaster: Restaurants and food sales in museums are very commonplace, as the revenue and enjoyment that the visitor’s experience is essential. Unfortunately, fruit flies commonly come into the building closely behind the food. They will feed on spoiled fruit and vegetation as well as the sugary drinks at the soda fountain. Removal of their food sources and rotation of produce is essential.

Call Insects Limited with your questions on flies.


VISIT US AT: www.fumigationzone.com
MEETING CALENDAR:

May 16-18, 2012
“Pest Management Around the World”

May 16-18, 2012
10th Fumigants & Pheromones
Conference and Workshop
“Pest Management Around the World”
Indianapolis, IN USA

See You There!
*we will attend, **we will speak,
***we will organize this meeting

Indy 2012
Keynote Speaker

Dr. Gebisa Ejeta,
World Food Prize laureate, helped
to develop at Purdue sorghum
that is reducing hunger around
the world, primarily in his native
country of Ethiopia.

Other speakers:
Paul Fields, Ph.D., Canada
David Mueller, BCE, USA
Keith Delport, Zimbabwe
Darka Hammel, Ph.D., Croatia
Michael Doyle, Ph.D., USA
Kim Kemp, USA
Bobby Corrigan, Ph.D.
Dieudonne Baributsa, Ph.D.,
Nigeria
Alain VanRyckeghem, BCE,
Canada
David Liszka, Poland
Pawel Swietoslawski, Poland
Agustin Barrutia, Argentina

More speakers to be announced.