

Food Manufacturing, Processing and Storage

Overview of Managing Pest Problems in Food Related Facilities

Management of pests in food processing facilities requires a high degree of professional knowledge combined with experience. Pest management includes many items in addition to pesticides. A good definition for pest management: IPM is the integration of chemical, physical, cultural and biological controls into a system that minimizes health, economic and environmental hazards. Some have stated pesticides are to be used as the last resort or as a method to correct a serious problem.

One of the first steps in managing pests in food plants is a well-constructed building. Preventive design and maintenance is an extremely valuable tool and first step in pest control. When preventive design/construction is not possible, then steps must be taken to apply preventive measures to existing facilities to decrease pest problems.

Food plants must employ daily, ongoing pest management programs including record keeping to monitor both effectiveness and legality of pest management.

The pest management program must be directed against the threat of pests not only in the facility but also from surrounding areas. Pests may be introduced to the facilities via incoming ingredients, materials and transportation vehicles. Pest management must be directed at preventing favorable environments for the pest to develop.

The first step in pest management for a food processing facility is design and construction to eliminate pest entry and harborage. Without this step, the pesticide applicator is working from a deficit situation in which the applicator is on a continuous treadmill of trying to catch up with the problem.

The applicator must also be very aware of federal and state regulations regarding the use of pesticides in a food processing facility. This can include the Food and Drug Administration (FDA), United States Department of

Agriculture's Food Safety Inspection Service (USDA-FSIS), Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA) and Department of Transportation (DOT). There may be more than one state agency that will be inspecting the food plant also. In Arkansas, the Arkansas State Plant Board, the Arkansas Department of Health (ADH) and the Arkansas Department of Environmental Quality (ADEQ) will either be inspecting the plant or affecting pesticide selection and/or application.

Many food plants also have strict guidelines for which pesticides can be used in the plant and where the pesticide(s) can be used. In addition, the food plant's contractors may have further restrictions on pesticide use regarding the processing of the contractor's product. The applicator must be aware and follow all of these requirements.

Building Design

Through the engineering design of the building, pest prevention will be made easier. The design includes not only the building, walls and interior but also the exterior landscaping, drainage and where usable materials will be stored and, very importantly, where unusable (trash) materials will be stored outside. The location of property lines can be very important if a food plant's neighbor does not practice sanitation or is a business which will provide harborage for pests.

Short grass, neatly trimmed shrubs, paved access ways and proper drainage are some of the environmental management strategies that help reduce or eliminate shelter areas for most pests. Rodents are further discouraged by surrounding the building foundation with an 18- to 24-inch strip of 1-inch gravel in a trench six (6) inches deep. This also makes an excellent area for traps and bait stations. If the bottom of the trench is lined with roofing paper, weed growth is reduced. A soil sterilant may be used as a surface treatment.

Building design or remodeling for pest prevention involves building framing, construction materials and building services. It is important to keep framing four inches or

more away from walls so that inaccessible voids are not designed into the building. Where voids cannot be prevented, the voids should be filled with polyurethane foams coated with epoxy filler or similar materials. Steel column floor junctions should be grouped and sloped 60° to facilitate cleaning. Reinforced concrete framing should not leave ledges for dust, should be free of pits, crack and crevices and sealed and painted where necessary.

Concrete is suitable for floors, but if not properly poured, concrete will crack and hold dust. Coating the floor will help aid in sanitation. The concrete must be cured and the surface must be sandblasted, ground or acid-etched and primed with the recommended bonding material before the coating is applied. The type of service needed will determine the coating required.

Wet processing areas require acid-proof or brick floors for easy cleaning and resistance to erosion. If the floor will be exposed to large quantities of running water or harsh chemicals, the concrete substrate should be protected from erosion with an asphalt membrane over which the tile cement is applied before laying tiles and grouting. Good epoxy or acid-proof grouts must be carefully and smoothly applied to the joints, which should be no more than 1/4 inch wide to reduce water penetration and pest shelter.

Nonproduction zones of food plants may be covered with asphalt or straight vinyl tiles. However, these tiles may have cracks or void areas due to incomplete bonding, which will harbor insects, so they should not be used in areas where there is a high potential for insect infestation. Tiles may also be discolored by pesticides. Old wood floors offer many pest harborages. Store the new flooring materials for several days in the same area where it is to be used. This preconditioning reduces shrinkage and cracks that can develop later.

There should be a floor drain every 400 square feet of floor in a wet processing area. Floors should be sloped toward the drain at 3/16 inch per foot into a four (4) inch or larger sanitary line which should be equipped with check valves to prevent the entrance of insects and rodents.

Wall materials include precast or poured concrete, concrete block, brick, tile and metal curtain. Whatever the material, it should be sealed or repainted and sealed so that it will be easy to clean and so that pores, cracks and joints will not offer insect shelter. Be sure that when purchasing hollow, sandwich panel-type metal curtain walls, they are well sealed. Do not drill

or punch holes in these walls because holes provide access to the interior of the wall, which makes excellent insect quarters.

Roofs should be smooth, built-up paper and pitch type and free of spills and standing water. Pitch and gravel roofs are difficult to clean, and corrugated metal roofs can support insect life in the voids.

It is desirable to have as few windows as possible in a food production zone. Windows are hard to clean and allow many pests to enter when left open. Transparent glass block windows should be considered when outside light is necessary.

Doors should be made of metal and have tight-fitting seams. Use of air curtains on delivery doors or other large entries could also prevent certain pest entry. Any night-lights should be located 30 feet or more away from exterior doors so insects will be attracted away from the doors. Train shed doors are particularly difficult to rodent proof, but by use of a channel threshold and proper locations of the track splice, an acceptable seal can be obtained.

Good lighting with dust-tight fixtures leads to easy inspection, better housekeeping and improved pest management. Wall-suspended lockers, urinals and shower partitions and ceiling-suspended toilet partitions allow wet cleaning of floors. Likewise, water fountains should be wall mounted.

Electrical and plumbing services should be installed so there is adequate access for cleaning behind and through the wall. Pipe insulation should be dense, tough and well sealed and electrical control panels should be either sealed to or held away from the wall. All such panels should be insect proof.

Equipment layout and design should be roomy, easily accessible for cleaning and should not have rolled edges, ledges, dead ends or pockets in which insect-attracting dirt, dust or waste products can accumulate. Equipment should either be raised at least six (6) inches off the floor or sealed to the floor with a pliable material that will resist vibration.

There are five distinct general areas of activity in food plants in which various pests must be managed. In addition to understanding the life cycles and habits of pests, you should consider management in three successive steps:

1. Preventive maintenance
2. Other non-chemical management options
3. Pesticide management options

The following are procedural guides for each area of activity.

Grounds

1. Preventive Maintenance

- Eliminate improperly stored equipment, litter, waste, refuse and uncut weeds or grass within the immediate vicinity of buildings or structures to reduce pest harborage.
- Eliminate excessively dusty roads, yards or parking lots. Pave where necessary and establish well-maintained lawns. This reduces the possibility of food contamination from dirt, microbes and other airborne particles that may drift into the plant.
- Properly slope and adequately drain the grounds to avoid contamination of food products through seepage of foot-borne filth. Poor drainage also provides a breeding place for insects, micro-organisms and water source for rodents.
- Position outside lighting away from buildings and focus the lights toward buildings to attract night-flying insects away from doors and windows. Low sodium lights attract fewer insects and should be used when possible.
- Reduce potential bird harborage by screening off harborage areas. Reduce any waste food product or raw product spillage outside to reduce food potential for birds, insects or rodents.
- Eliminate food that may accumulate near dust collection or exhaust systems.

2. Nonchemical Management

- Consider various types of rodent, insect and bird traps.
- Maintain adequate housekeeping programs.
- Implement pest monitoring programs including pheromone(s) and sticky traps.

3. Pesticide Management

(Rodents)

- Maintain and inspect bait stations. Install bait stations at adequate intervals and inspect often for signs of activity. Be aware of rodent migration seasons or nearby construction that may cause rodent migration. Rodenticides must be kept fresh. Consider solid baits

in wet weather and liquid baits in dry weather.

(Insects)

- Install solid insecticidal baits in and around breeding sites that cannot be removed.
- Treat as needed with approved insecticides, especially near potential insect breeding sites.

(Birds)

- Use chemical bird repellents where possible on bird harborage and nesting sites.
- Avicides may be selectively used in many ways.

Buildings

Effective grounds management is beneficial in preventing pest entry, but it cannot stop all pests or prevent pest entry from incoming ingredients and/or materials.

Some general preventive maintenance and non-chemical control guidelines that apply to all areas of operations within the buildings are:

1. Preventive Maintenance

- Rodent proof all doors, walls, windows and roofs.
- Screen all windows that can be opened.
- Eliminate cracks, crevices, recesses and ledges for ease of cleaning and elimination of potential pest harborage.
- Eliminate access to ledges and roofing areas for birds.
- Locate equipment off the floor and away from walls or seal equipment to walls and floors.

2. Nonchemical Management

- Housekeeping – Keep all areas free of loose materials such as cardboard, rags, processing waste and equipment.
- Clean structure frequently with brooms and vacuum, paying particular attention to out-of-the-way places.
- Clean both the interior and exterior of all equipment (electrical and mechanical) often.
- Inside buildings, utilize electrified grids for attracting insects. However, outside buildings electrified grids may do more harm than good.

Incoming Ingredients and Material Storage Warehouse

1. Preventive Maintenance

- Inspection of all incoming vehicles as well as ingredients and materials is essential to determine that pests are not brought into storage areas.

2. Nonchemical Controls

- Store ingredients and materials away from walls far enough to permit access for inspection and sanitation.

(Rodents)

- Place rodent traps (windup and snap) at or near all doors and at intervals along walls and maintain a map of trap locations. Record catches for each trap.

(Insects)

- Utilize air curtains at dock and pedestrian doors

(Birds)

- Selectively use revolving bird lights. Add wires, prongs or other deterrents to rooftops or roosting sites. Note: all mechanical and electrical units require frequent inspection to ensure proper functioning.

3. Pesticide Management

- Use rodent bait stations containing anticoagulants to supplement rodent traps (where company policy permits).
- Space treatment with nonresiduals.
- Crack and crevice treatment with residual insecticides.
- Spot treat with residual insecticides.
- Fumigate raw bulk commodities when infested during receiving and, if possible, before entering the processing plant.

Frequent inspections are necessary to determine that all controls are functioning correctly.

Processing Area

1. Preventive Maintenance

- Detailed monitoring program
- Total facility IPM program

2. Nonchemical Management

- Place rodent traps near doors if situation warrants and monitor for activity.

- Ensure proper sanitation and elimination of harborages.

3. Pesticide Management

- Space treatment with non-residuals.
- Spot treatment with nonresiduals.
- Crack and crevice treatment with residuals.
- Contact treatment with nonresiduals.

Frequent inspections of all programs are necessary.

Packaging Areas

This is the most critical area of the entire facility since foods are most likely to be exposed in their finished form. Contamination resulting from human contact can also be a significant problem in this area. Packaging materials must be considered as a source of and home for pests.

Records for chain of custody can be very important for packaging material to document proper care and protection from pests.

Preventive maintenance, nonchemical management and pesticide management are the same here as stated earlier.

Finished Products Warehouse

The probability that rodents, insects and birds might gain entry into the finished product warehouse is just as great as with receiving materials and storage. The management requirements are similar. However, the possibility of rodents and insects being introduced into warehouses via carriers is less likely unless all operations are housed together and there are lapses in the pest management program.

Vehicles

The need for an effective vehicle inspection program cannot be overemphasized. If pest-free finished products are placed on a pest-contaminated carrier, the pest control manager has not fulfilled their obligations. Carrier inspection of boxcars and trucks with false walls is difficult at best since it is impossible to closely examine behind walls. Vehicles must be clean and free of infestation prior to loading final product.

(Vehicles before loading)

- Space treatment.
- Crack and crevice treatment.

Creation of In-Plant Sanitation Program

For in-plant sanitation programs to be successful, the program must be supported and followed by all plant personnel including upper management. Inspections of any facility consume a considerable quantity of executive and supervisory time. Therefore, it is important that inspections are organized and efficient, and provisions made to utilize the information gained. Inspections should be given the same careful attention as any other production maintenance activity. Keeping this in mind, the following comments are aimed primarily at the establishment of an in-plant sanitation inspection program.

The procedure in setting up an inspection program can be broken down into five basic steps. These are:

1. Organization
2. Goal
3. Inspection
4. Utilization
5. Follow-up

Organization

The need for in-plant inspections for any food plant operation is quite obvious. In nearly all instances, the motivation to operate a clean, orderly, complaint-free plant surpasses the fear of enforcement activity. Protection of the consumer and maintenance of a respected trade name are strong motives for proper sanitation pest management programs. In this interest, it is obvious that a complete review of the sanitation effort is needed on a periodic and scheduled basis.

As there will be many decisions to make as the program progresses, in matters of finance, policy and personnel, it is best to have the highest company official fully support the program. When the group meets, the highest company official present should act as chairman of the committee. In addition to the chairman, all department heads should be involved, plus an office manager, a safety officer, a personnel director and similar department heads as applicable. The reason for this large group is pest management affects all departments and all departments affect the plant's pest management program. Also, the more persons looking, the more apt the committee is to see and correct any problems.

Goal

The main goal of in-plant sanitation is to review existing activities. After seeing what is being neglected or performed improperly, it is the prime duty of the committee to compile a list of these deficiencies by category. A suggested routine is to precede each item recorded, possibly on a sample inspection sheet, with the categorical classification of the item.

Generally, all defects will fall under five main headings:

1. Pest Control
2. Operational Methods
3. Personnel Practices
4. Maintenance for Sanitation
5. Cleaning Practices

Preceding each deficient item, single or multiple notations of PC, OM, PP, M or C will serve to categorize the problem.

The reason for identification categorically of deficiencies observed by the committee is the violation becomes more obvious when a critical situation starts to appear within a given category. If 50% of the items concern maintenance, it can be assured the plant manager will have some answers from the maintenance department. It could also be the plant superintendent does not like the engineer and is loading the report. In which case, another problem area has been brought to the committee's attention.

The true goal of the in-plant sanitation committee is to recognize weaknesses in the program, to find missed areas in all phases of the effort if these exist and to solve sanitation problems beyond the scope or authority of the individual in charge of the in-plant sanitation program or individual departments.

Inspection

A poorly equipped sanitation committee will do a poor job. Rank-and-file employees know where problems exist and how corrections can best be made. The inspection committee should utilize this information source. The inspection committee should start with clean, spotless outer clothing; a white or green smock would be minimum. A suitable and identifiable uniform is better. A white uniform with a jacket identified as Sanitation Inspection Team, or other such marking, is suggested.

Often when equipment is poorly cleaned, faulty lighting is to blame. The same applies to

inspections. See to it that each member of the inspection carries a halogen flashlight. Some members may prefer having halogen flashlights attached to their bump caps in order to allow free use of their hands. A scraper or spatula is often helpful.

Generally, the engineer will carry a screwdriver and pliers that will be needed tools. The recorder should bring a suitable note pad and pencil and use them.

The committee should assemble on time at a selected site. Determine at this time where an inspection will be made. Proceed to the selected area and begin with the inspection. Try not to look into all the places you examined on the previous inspection unless that location has a history of pest problems. It is a fallacy of inspectors that if an insect was found at a specific location, that person tends to return to and look at the same location.

Discussions during the course of the inspection should be brief and confined to matters within the scope of observations in that specific area. If a unit appears to need cleaning, question the cleaning cycle and when the unit was and is to be cleaned. If the same unit is soiled every time it is viewed, it is likely that the cleaning cycle should be changed unless the inspection is occurring during the "dirty" phase of the day for that unit.

Be constructive, but watch details. Note missing electrical box covers and knockouts. Open boxes present possible insect harborage. Surplus lubricant and chipped paint over or in the vicinity of a product zone is a product hazard and should be noted. It is far better to have too many items on the list than to miss even one item that is critical.

Recording of defects is important because this information will be a work list and must be treated as such. The record sheet should carry the date, area or area number and names of persons participating in the inspection. Consecutive numbering is suggested, starting with item 1 and continuing on to the final item at the end of the series of inspections that comprise one complete in-plant inspection cycle.

Be complete when identifying and describing recorded deficiencies, but be as specific as possible and brief. Get the meaning down on paper so recall on a given item is simple and appropriate measures can be taken to correct the deficiency.

At the conclusion of each inspection, the recorder should comply and distribute inspection notes to each department head so im-

mediate action can be taken on items that can be corrected readily.

As the routine of inspections is established, there may be temptation to consider making up a sanitation checklist or form. This may be helpful as a rough guide. A checklist becomes a problem if it becomes routine, and constructive "digging" is forgotten.

There will be times when it is necessary to look for and to catalog specific things. Surplus lubricant conditions, chipped or peeling paint on structures or equipment and similar product hazard defects are to be considered here. The emphasis of enforcement inspections is shifting to conditions whereby a product may become violative. This means if a condition exists where condensate is dripping off a pipe into a product zone, a violation already exists.

These are of initial and primary concern and should be given priority over all else. Rodent evidence in a warehouse should not be tolerated and could bring about undesirable comment or serious action from enforcement personnel.

Utilization

Each department should be given a clear, written copy of the inspection notes within a day after the inspection. Correction of defects that are within the scope of activities of a department head should be carried out at once. Depending on the seriousness of the condition, a decision must be made by the committee on the action to be taken. When such a condition is observed by the sanitation committee or reported to the sanitation committee, immediate action should be taken. If product contamination or a potential product contamination situation is involved, immediate steps must be taken.

Usually, the sanitation committee will identify items of a less significant nature that can be handled as a matter of routine. At the end of an inspection cycle, when the entire operation including inspection of the roof and grounds has been completed, the sanitation committee should hold a meeting and review the notes compiled during the survey.

Uncorrected items left over from previous inspections should be addressed first. To address repeat situations, the committee head should go down the list, item by item, to determine if a correction has been made. If a correction has not been made, the department head responsible for the condition should give a realistic correction date.

Not infrequently an item will continue to reappear on the inspection notes in spite of

having been marked as corrected. For example, it is a violation of the current Good Manufacturing Practices to have personal clothing lying about in a food production area. In a mill packing area in very hot or very cold weather, personal clothing is often where it does not belong. The packing superintendent's comment may be about having told someone something. This is not correction, however. Providing a site to place clothing, even just a specific peg on a specific post, and enforcing its use is correction.

Both the inspection and meeting should be conducted in a businesslike format, allowing discussion and problem solving.

There is one facet of this type of inspection and meeting that must be carefully watched, and that is to avoid criticism of each other or departments. Finger pointing leads to distraction from the original purpose and does not meet the goal of providing a safe plant to work or to produce a quality product.

Follow-up

Sanitation responsibility does not rest with just the plant sanitarian, the plant manager or any other single plant person. Responsibility for the sanitation program rests on everyone in the plant including plant administrators.

Inspection Observation Routine

The first detailed look should start with obscure places, such as areas where pipes pass through the wall. Usually, if insect trails are present on a pipe, even ten or more feet off the floor, they become quite obvious as a flashlight beam is played slowly along the pipe. When such a situation is found, have the inspection team confirm it. This not only gets a second opinion, but also, quite often, is an educational moment for those of the inspection team who are not familiar with the situation.

Pay particular attention to any highly dust-coated surface, especially on a fairly flat piece of structure. By holding a flashlight at a flat angle to the surface, minor disruptions of the dust coating are elongated and become more obvious. Insect trails or mouse footprints usually stand out well in such situations. Light colored dust on a dark surface is best for this type of observation. Such trails, as those made by mites, are almost microscopic, but readily stand out on

such a surface because the mite trails are generally disproportionately large in comparison to the mite itself.

Individual insects, such as the flat grain beetle, are often difficult to see in stock of the same color as the insect. One method of observation is to lay a handful of suspect stock on a flat surface and smooth it out with a spatula. By holding the flashlight at about a 20 or 30-degree angle to the surface carefully for a minute or two, movement can be noted if there is live infestation. Cereal-type insects will usually come to the surface of the stock and can be seen. Mites will start to move, and although the mite itself may not be viewed, mites will move flakes of stock, such as bran or chaff, and this movement can be observed. Insects such as the saw-toothed grain beetle will sometimes remain motionless for up to a minute or so, and only then is movement detected. Again, this is a lesson in seeing, not haste.

In looking for insect or rodent activity, inspect areas most likely to produce results.

It is general opinion of enforcement agencies that a plant will be clean and free of contaminants regardless of what must be done to prevent them. No system is permitted to be insect infested, even a raw grain handling system. While a court case may not evolve from such an infestation, this will appear on an "I Observe" form (Form FDA 483, Inspectional Observations) for which the operation can be held accountable.

Concepts in the amount of allowable filth in any food operation have changed drastically in the past few years. This had diminished from a shovelful to a teaspoonful, and now even a potential contaminated situation must be looked upon with alarm.

Grease and paint should be of prime concern in the inspection along with insects, rodents or any other potential source of contamination. However, it is infrequent that these situations are obvious. Pests are observable in hoppers, under equipment and inside of equipment framework, and it is the task of the inspection team to get in, under and behind such areas to make the necessary observations. This is another reason to carry a good light. Places missed in cleaning are generally dark and inaccessible or else they would not have been missed.

A lesson in equipment framework examination is to determine from which side a piece of equipment is cleaned. The problem, if

one exists, will usually be on the reverse side of the framework, or the one nearer the person cleaning but on the interior.

A void, for the purpose of inspection routine, is any space that cannot be accounted for or access gained for routine check. These are potential danger spots. More often than not, a single insect trail on the floor will point the way to an adverse condition. Remember, suspect everything that cannot be accounted for in false spaces in equipment and structure.

Know what previous inspections reports have stated. If no mice have been reported on the plant trapping record, and hair is observed on a snaptrap, something is wrong. Perhaps this is just a failure to clean the trap, perhaps not.

A portion of each inspection should be devoted to watching employee actions and in-plant practices in general. This observation should be done in a manner as to see the operation, as it would normally be done – not as it may be done with plant supervisors present.

A routine daily inspection of each area is the responsibility of that area's supervisor. These daily inspections should be included in the plant inspection reports.

Good sanitation should be rewarded and recognition should be made to the area and personnel working in that area. This is an important part of total plant cooperation.

Often a periodic inspection by an outside firm will provide insight into the plant's operations. An outside inspection can help identify strengths and weaknesses in a sanitation program.

Specialized Plant Inspections

Persons responsible for sanitation inspections for specific areas of the plant need to be given the authority to implement and enforce sanitation programs.

Warehouse: The person in charge of sanitation needs to be able to require leaving an 18-inch space between pallets and walls and 14-inch space between double rows of pallets. This extra space allows for inspection of the warehouse for insects and rodents. The 18-inch space between the wall and pallets is not attractive for rodents.

Raw Product Receiving: The law (FD&C Act, Title 21, Code of Federal Regulations)

requires inspection of raw product received at a food processing plant; however, this often is not done. Each plant needs a written inspection procedure for receiving and inspecting incoming raw product. Not only is the raw product vital for processing, but often either the product or the receiving area is the source of most pest problems. These problems can be eliminated or greatly reduced by a good inspection and sanitation program at receiving.

Items to include for a receiving procedure include:

1. Guidelines for acceptance level of rail cars and trucks as per insects (live or dead), odors, rodent contamination and physical condition of the car. Insects may be either in the raw product or the transportation vehicle.
2. Guidelines for checks and visual examinations of both bagged and bulk products. Included in this are methods to be used and the number of samples and how to take samples for inspection of insects or for quality control analysis.
3. A recording form that is used to provide direct and quick communication when a problem is detected.
4. Set housekeeping standards for receiving area.
5. A pallet-cleaning program coupled with a cleaning code and frequent checks.
6. Specifications as to height, storage and location of stocks in relation to each other. One purpose is to isolate slow-moving stock away from dusty areas or raw product.
7. A reliable method of ensuring stock rotation.

A very critical item at the receiving area is the quick removal of spilled raw commodity, broken packaging and other garbage type material. Removal means not only getting the material into a trash receptacle but having the trash removed frequently and the trash container kept clean.

A pest manager must know which pests cause product damage and those that occur due to some management situation but do not damage the final product. The pest manager must know why a pest occurs, that is, what conditions must be present for the pests to survive and how to remove those conditions. The pest manager must also be aware of the federal and state regulations relating to his/her plant.