

MANUFACTURING STANDARDS
GUIDANCE FOR
PEST PREVENTION



**GUIDANCE FOR
PEST PREVENTION**

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Guidance

The foundations of your pest management system should be based on the following principles:

1. Exclusion - Factory management should make every effort to prevent pests from entering their factory. This should be by good structural management of the building fabric, good door control and good control of imported goods.
2. Restriction - Factory management should make every effort to ensure that environmental conditions conducive to infestation within the factory perimeter are prevented.
3. Destruction- should be the last tool used in pest prevention; however, it is necessary if there is evidence of pests that need controlling.
4. Monitoring - systems should be appropriate to the pest species presenting a threat and be capable of controlling intruder species where safe to do so. A good pest prevention and management system is fundamental in the production of safe food and the prevention of any pest incidents. It must also be set up in such a way that it allows factories to immediately act on any internal activity.

The pest prevention system can be managed through an external pest control contractor system or an in-house pest control system.

Factory management must take overall responsibility for preventive pest control. A nominated member of the senior factory management team (e.g. Technical or Operations Manager) must have accountability for pest control matters.

Guidance for the management of a risk based, site specific pest prevention system

Pest Prevention Contract/Internal Specification

To ensure a robust pest prevention and management system is in place, sites should have the following:

- Details of the pests covered by routine inspections, elimination measures and those pests excluded from the contract. The frequency and purpose of all planned visits. Certain pest species, where encountered, may require separate additional treatment outside the scope of the basic contract e.g. booklice, mites, birds, flying insects, exotic species of ants, cats and wildlife.
- Trends should be carried out at least annually or in the event of infestation. Specified limits should be set where activity is measurable and where these limits are exceeded an action plan between pest control contractor and site management should be agreed, documented and implemented.
- Expected time required to carry out routine inspections by the Technician and Biologist
- Call out arrangements and contact telephone numbers including out of hours emergency numbers (N.B. any call made before 18.00 concerning evidence of live pest activity within the factory (or other emergency) should result in a same day visit)

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- Pesticides and other preparations likely to be used to control or monitor pests and a description of products to enable easy identification plus relevant health and safety documentation.
- Any services routinely offered to food factories that have been excluded from the contract at the client's request.
- The contract should include arrangements for the rapid identification of pests or evidence of pests such as droppings, frass and webbing.
- Responsibility for removing old evidence of pests (e.g. droppings).
- A formal, documented review meeting should take place regularly (eg. every 6 months), attended by the senior factory manager responsible for pest control and the contractor's Biologist or Senior Technical Representative. These meetings should be used as an opportunity to discuss service standards and the support given by the factory in achieving the pest prevention objectives.
- Where electronic/paperless systems are in operation, the designated site contact and their nominated deputy must have access to the system and be fully conversant with its use.

Competency for Staff Managing Pest Activity

Any competent pest control contractor operating at a Marks & Spencer food supplier's factory should be a BPCA or NPTA member, provide a 24 hour/7 day emergency call out service, and comply fully with these Guidelines.

Only competent personnel with suitable training and qualifications (e.g. RSPH L2 Certificate in Pest Control or RSPH L2 Award in Pest Management or equivalent), and with experience of pest prevention in a food factory environment should carry out inspections and treatments for pests.

- RSPH Level 2 Award in Safe Use of Rodenticides, allows technicians to use rodenticides.
- RSPH Level 2 Award in Pest Management, is designed to provide an understanding of public health pests and their management.
- RSPH level 2 Certificate in Pest Management has an additional two practical sections on the pest management techniques to the Level 2 Award. **This should be the base level for all pest controllers operating on an M&S site.**
- BPCA Advanced Technician. This is more advanced and covers pest identification, Health and Safety as well as practical and technical aspects of pest management. This would be the preferred level of training for technicians routinely servicing M&S sites.
- Field Biologists should have as a minimum:
 - Level 2 RSPH in Pest Management
 - Advanced Technician in Pest Management
 - RSPH Level 3 in Food Safety
 - One years' experience as a Pest Controller
 - Verified in house training or BPCA certified field biologist qualification

Pesticide Usage

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All pesticides used are approved by the relevant regulatory authority and their use should comply with current national legislation. Compliance with current national health and safety at work legislation (e.g. Current COSHH Regulations in the UK) should be ensured at all times.

Rodenticide used should be so sited as to prevent either accidental food contamination or ingestion by humans or non-target animals.

Pesticides should be used in such a way as to ensure there is no risk of contamination of foodstuffs, food packaging materials, food contact surfaces or personnel. Only fully trained and qualified personnel should be permitted to apply pesticide preparations. Where pesticide is applied, records of its use including type, location, and quantities used should be kept.

The use of insecticides in food factories should be kept to the absolute minimum necessary to treat active infestations. There should be no routine precautionary insecticidal spraying, dusting, or fogging.

Documentation

To ensure the pest contactor knows those responsible for pest prevention, the site should supply the contractor with the names of all personnel at the factory with specific management responsibilities for pest control. This should include the senior member of the factory management team with overall responsibility for the preventive pest control system.

Pest Prevention File

The pest prevention file or electronic reporting system must contain the following: -

- The contract specification and a letter from the contractor confirming that the specification complies fully with the M&S Food Safety Manufacturing Standard.
- All baits used as part of a permanent baiting and monitoring points programme should be marked on an up to date (and dated) site plan. A key should be used to distinguish the different types of baits and monitoring devices. This includes external and internal parts of the factory using either rodenticide or non-rodenticide preparations.
- A checklist detailing all areas covered by the contract (including inspection only areas) and identifying the number and type of monitoring points in each area. The presence or absence of any evidence of pests should be clearly recorded on the checklist at the time of each programmed inspection by the contractor, including Field Biologist's inspections.
- The contractor's representative and a member of the factory management team should sign the checklist on each occasion.
- Detailed inspection reports identifying the precise nature and extent of any pest activity found, scientific names of the species concerned (not necessary for rats and mice), and any action to be taken by the client or contractor regarding:
 - Elimination of pests
 - Proofing
 - Cleaning

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- Housekeeping
- Any other recommendations to improve pest prevention standards
- Inspection reports should be available at the factory at the time of the visit and should be agreed between the pest contractor and the site. All action points should be signed off on completion. For typed reports a hand-written summary should be left on site at the time of the inspection and the final version arrive no later than 5 working days after the completion of the inspection
- A planned programme setting out the week-commencing dates for all contracted visits.
- Material safety data sheets for all pesticide preparations likely to be used and records of actual usage during each visit.
- The supplier must be able to demonstrate a sound working knowledge of the reporting system, all associated records and if available any on-line system and all associated records.
- All pest prevention file reports should be sequentially numbered.
- The contents of the pest control file should be regularly reviewed and kept up to date by the senior manager responsible for pest control.

Routine Inspections

- The frequency of visits to the site should be risk assessed on the basis of the manufacturing environment and the pest species presenting the threat. To maintain a robust pest prevention system, it is recommended that these should be carried out by the pest contractor at least 8 times per year at evenly spaced intervals (i.e. every 5 to 7 weeks). All visits should be planned in advance with factory management.
- An inspection of the entire site for evidence of pests should be carried out during each routine visit. This should include the perimeter, all ancillary buildings including service and other non-production areas, and high and low levels in each part of the factory. Safe access should be provided.
- As part of these routine visits, all bait and monitoring stations and devices, including insect pads, pheromone lures, should be inspected, dated internally, replenished as necessary and left in good palatable condition.
- Any evidence of pests found should be recorded and if it is suspected this is recent, a control strategy implemented to kill the pest as quickly as possible. If the pest species is not covered by the contract, a quotation and plan for control should be implemented as soon as practicable.
- Areas between the monitoring stations should be checked for signs of infestation as pests might not necessarily find their way into the monitoring stations.
- All external perimeters and external doors should be checked for proofing faults and door disciplines to ensure pests cannot walk or fly in. Any faults found should be recorded.
- All conditions conducive to infestation such as poor cleaning, persistent leaks and spills, poor stock management should be recorded.
- A factory representative with pest control responsibility should accompany the Technician and field biologist for at least part of each inspection.
- The Technician and a factory representative should sign routine inspection report documentation, and agree any action points or recommendations before the

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contractor has left the site. All action points raised should be signed off on completion either on the paperwork or on the on-line electronic system in real time.

In-depth Inspections

- The contractor’s suitably qualified Field Biologist or equivalent should carry out in-depth inspections at least 4 times per year at evenly spaced intervals. To ensure independence, this person should not carry out any of the routine inspections at the factory. If the pest prevention company only employs field biologists for the services, then 8 Biologist visits a year is a minimum. If pest problems persist it is good practice to employ another company to carry out an independent audit or to use them to carry out 1 or 2 of the annual Field Biologist visits.
- The Field Biologist should arrange the dates for all quarterly inspections in advance with the senior factory manager responsible for pest control to ensure that he/she will be present. The inspections should not coincide with routine visits by the Technician.
- The Biologist should allow sufficient time to carry out a detailed inspection of all areas of the site. This should include all ancillary buildings including service and other non-production areas, and high and low levels in each part of the factory. Safe access should be provided.
- A reasonable proportion of internal and external baits and monitoring points should be inspected and recorded but to provide the value of the Field Biologist Inspection time should be directed to environmental issues and areas not routinely inspected. If Field Biologists do not carry appropriate preparations then instruction should be given to Technicians to recharge baits or carry out any pest control procedures required. If recent pest activity is detected, a means of control must be implemented to remove or kill the pest as quickly as possible.
- In-depth inspections should be carried out in conjunction with factory personnel to ensure full access to all areas and a clear understanding of the issues raised.
- Areas between the monitoring stations should be checked for signs of infestation as pests might not necessarily find their way into the monitoring stations.
- All production lines should be inspected externally for signs of infestation and any hygiene issues on visible internal ledges, around footings and on any accessible overheads should be reported.
- All external perimeters and external doors should be checked for proofing faults and door disciplines to ensure pests cannot walk or fly in. Any faults found should be recorded.
- The Field Biologist should:
 - look for and report signs of any pest infestation, these may take the form of: live or dead pests, parts of pests (e.g. wings, legs, egg cases), damage caused by pests, tracks, runs, harbourages, faecal pellets, smears or droppings.
 - look for and report conditions conducive to pest infestation e.g. food spillages, rubbish or debris that might be used as nesting material, shortfalls in the standards of tidiness, hygiene and maintenance.
 - look for and report structural issues that would allow pest access from outside and if present the most practical solution to the problem.
 - consider engineering controls to remove access points, dirt traps, leaks and other conditions that allow food material to escape the process flow

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- assess and report accessibility to all wall floor junctions to ensure proper cleaning and inspection is possible and if not what needs to be done to rectify the situation.
- reassess the health and safety risk assessment with regard to the safety of any baiting system and the safety of the contractors and client's staff.
- look for any other matters that will help prevent pest activity and contamination.
- At the end of the inspection a review meeting should take place attended by the senior manager responsible for pest control during which the findings are discussed and actions agreed.
- The Field Biologist should submit a written report within 7 days of the inspection to the factory detailing the findings and agreed actions. It is good practice to use photos to clearly identify where improvements can be made. Any unresolved points from previous reports should be clearly identified.

Inspections by Factory Management

Although the pest management system will have planned documented visits by the pest contractor, factories should also carry out the following inspections with the aim of being proactive:

- Routine internal hygiene audits and inspections should include pest prevention matters (e.g. evidence of pests, pest proofing).
- Where raw materials, which can be infested such as flour, dried fruit, nuts or chocolate, are stored and handled, these commodities and storage areas should be regularly inspected by a competent person from the factory trained to recognise evidence of relevant pests. The results of these inspections should be recorded together with any necessary corrective action taken.
- The pest control contractor should be immediately called to visit the site if any new evidence of pests is found.

In-House Systems of Pest Control

- When in-house pest control systems are chosen, these should comply in full with all relevant sections of the M&S Manufacturing Standard.
- Quarterly in-depth inspections are performed by a company pest control advisor or an independent consultant.

Control of Rodents

The use of toxic rodenticides should be considered for intruder rodent control and be considered in areas such as raw material and finished goods warehouses, where food products are totally enclosed. In these cases, adequate controls must be in place such as using the most appropriate formulation to maximise the speed of control. Ideally toxic bait should be of non-spill formulation contained within tamper resistant stations, secured in place in locations where boxes are not going to get damaged or spoiled. As rodents will often favour wall cavities, consider baiting these areas as well.

There should be no use of rodenticides in food preparation, production or packing areas unless an active infestation is being treated. There may be exceptional

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circumstances for its use in enclosed areas e.g. cavity walls or warehouse areas where external doors are regularly used. In these circumstances, there should be a written risk assessment carried out by the pest control company and factory management, and held in the pest prevention file.

Bait boxes should be robust (plastic or metal), tamper resistant and designed to prevent any accidental poisoning or injury to non-target species and contamination of products. They should be numbered and secured in position. Keys to all bait boxes should be held on site by the responsible senior factory manager.

All bait preparations should be retained within bait boxes unless in exceptional circumstances (e.g. box shy mice) where the control programme should be approved by the M&S technologist before implementation. Loose grain bait should not be used internally unless in secure wall cavities or voids where it is appropriate and safe to do so. Non-spill formulations should always be the first consideration.

Electronic Rodent Monitoring systems can be used to monitor when a rodent enters a bait box, however it does not reduce or eliminate physical inspections carried out by a pest controller to monitor the site.

Rodent activity around the factory perimeter should be closely monitored by inspection and appropriate devices actively treated when a rat problem is detected to ensure that there is no risk of infestation to internal areas.

If at any time, there is evidence of rodents nesting in the building structure, an intensive eradication plan should be implemented. This may require additional access panels to be created in the building fabric.

Reference should be made to the requirements of the Second Generation Anti-coagulant Rodenticide Stewardship Scheme for use of rodenticides outside and the BPCA Code of Practice for Operational Procedures - Humane Use of Rodent Boards, for internal areas.

Reaction to Presence of Rodents

The site should have a zero-tolerance attitude to all pest activity and when rodent activity is detected appropriate techniques must be used to eradicate the activity (e.g. traps, proofing, environmental management) however, rodent glue boards must only be used as a last resort. Live capture traps and sticky boards must be frequently inspected following BPCA guidelines. Use of these and any other alternative methods must be supervised by a member of the pest contractor management and a member of the factory management team. The site and pest contractor should identify the root cause of the activity and together put a plan in place for eradication.

In the event of the presence of rodents for example a rodent sighting, damage or droppings being discovered by site staff, a bait being eaten or a dead rodent in a trap, the following actions will be taken:

- Inspect the area where the rodent was found/seen,
- Check all the monitor boxes in the area.

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- Install additional monitoring and/or control devices to maximise the chances of a foraging rodent being detected and killed as quickly as possible. This should include the replacement of all non-toxic bait monitoring points with a lethal system (traps or toxic baits) in the room/rooms where the evidence was found and adjacent to those if felt necessary.
- Follow ups must be carried out after the initial visit and should continue at an appropriate frequency over a period of 3 weeks. The frequency should be determined by risk assessment depending on the location and threat to product. If live infestation is still detected after 7 days this would be considered as a breach in Prerequisite that could impact the customer or brand, therefore the M&S technologist must be notified and a riddance programme implemented.

Control of Stored Product Insects

The aim of any SPI control programme should be to eliminate the infestation. The principles of control should be based on good engineering and leak management and thorough and frequent cleaning of the building and manufacturing equipment. The key factors in successfully preventing infestation by S.P.I. are excellent standards of cleaning, removal of harbourage areas, proofing, thorough inspections and control over incoming raw materials. Cleaning frequencies should be determined by risk assessment that should include the life cycle of the pest species presenting the threat.

Where there are foodstuffs that are attractive to stored product insects (S.P.I.), monitoring, inspections and treatments for these must be specifically included in the pest control contract. This should include a schedule for in depth inspections of processing and production equipment, cable trunking and any other equipment or location where food residues may accumulate and encourage infestation. All health and safety aspects must be considered when gaining access to these areas. To be most effective, these inspections for SPI's will need to take place during non-production hours.

The inspections should be planned in advance so that factory engineering and hygiene personnel are available to strip and clean equipment. Inspection frequencies will vary but should be determined by an assessment of the risk of infestation. Where infestations exist, detailed inspections are required to identify where insects may be surviving between cleans.

Monitoring devices (e.g. sticky traps with attractants, pheromone moth pots) should be used as a method of indicating the presence of stored product insects. Dates of inspection and renewal of attractants should be clearly marked on each monitoring device, or a clearly defined system of colour coding used.

The use of insecticides should be kept to the absolute minimum necessary to treat active infestations. Other non-toxic lethal options should be considered e.g. heat treatment. Insecticides should not be used in any way that puts food products or raw materials at risk of contamination. This requirement is due to the potential hazard of dead insects falling into and contaminating food or packaging. Thorough cleaning of processing and production equipment is required before the application of an

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insecticide, to achieve an effective kill. Cleaning is also required afterwards to remove insecticide residues and dead insects.

There should be no precautionary spraying, dusting or fogging. Where insecticidal fogging is deemed necessary by the site they must get written approval by the M&S Hygiene Technologist.

Control of Cockroaches

Sticky traps with attractants should be used where there is a history or risk of cockroach activity. These should be checked during all routine in-house and contractor inspections and replaced in accordance with the manufacturer's recommendations.

Treatment against cockroaches will vary depending on the species involved and the nature and extent of the infestation. The ability of cockroaches to climb, deposit egg capsules and their preferred habitat vary according to species and should be taken into account as part of the eradication plan.

An intensive eradication plan should be implemented to deal with any infestation. This should include a programme of cleaning, inspections (including night inspections) and insecticidal treatment. Inspections should take place at least every 2 weeks until clear for 1 month but should be supported by the installation of as many cockroach monitors as is necessary to ensure proper monitoring. The number of adult and nymph cockroaches found on detectors at the time of each inspection should be recorded in order to monitor progress with eradicating the infestation.

Follow up inspections should take place after the last signs of cockroaches to ensure that no nymphs have hatched from egg capsules. The first follow up inspection should take place after 2 clear weeks for German cockroaches and 6 clear weeks for Oriental cockroaches and continue for at least 4 months. Follow up inspections of the infested area should be done during the routine inspections over these 4 months and specifically documented. As a precaution, sticky traps should continue to be used in previously infested locations.

Once eradicated it is advisable to increase the number permanent monitors which should also cover canteens and locker rooms, because it is possible for employees, unknowingly, to transport the pests in their bags.

Control of Flying Insects

Proofing and building maintenance programmes should take into account the risk of flying insect entry. There should be no unscreened openings from the exterior in preparation, production, packing, storage, staff amenity or engineering areas. External fire exit doors should be provided with audible alarms which will sound when the door is opened.

It is good practice to reduce to the minimum all external doors which open directly into the factory and progressively install lobby system with integral EFKs and separately activated doors into factory goods entry, storage areas etc. All new premises should incorporate these arrangements. In addition, lights erected to supply perimeter

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illuminations should not be sited on buildings where they will attract night-flying insects but on the perimeter in such a way as to illuminate the necessary areas.

Any spillage of food or food waste materials should be controlled and frequently cleaned to avoid attracting flying insects. This applies to internal and external locations.

Electronic fly killing units (EFKs) should be positioned in all production and storage areas. The pest control contractor should advise on appropriate locations. The positioning and choice of unit type should ensure that dead or dying insects do not cause any contamination of food. Insects in EFK catch trays or on sticky films should be removed, counted (by insect type), recorded and analysed regularly to monitor trends. This should be carried out at least every three months or more frequently in the summer if a risk assessment dictates. The findings and in particular any unexpected increases should be investigated to identify the source. Analysis should be made in written form and provide conclusions and recommendations based on the EFK catch count.

Tubes in the EFKs should be replaced at least annually shortly before the main flying insect season begins; however, EFKs that have UV emitting LEDs need replacing at the frequency of the manufacturers recommendation.

The first steps in treating a flying insect infestation should be thorough cleaning and proofing. The use of an insecticide may also be required but should be adequately controlled to avoid any risk to food, raw materials or personnel. UV fly killers should be installed in sufficient numbers and locations to adequately monitor flying insect activity.

Where appropriate, baiting and traps should be used to control wasps together with any preventative measures e.g. Proofing and removal of food sources, especially outside.

Control of Birds

Steps should be taken to prevent birds being attracted to, roosting on or entering factory buildings. All external doors should be kept closed when not in use and holes in the external structure proofed against bird entry. There are a number of proprietary systems available to stop birds from roosting. Systems utilising sprung wires, spikes or netting can be effective; alternatively, the netting of canopies could be considered.

Good hygiene standards around the factory perimeter (e.g. keeping all waste skips covered) should be maintained to help reduce attraction.

Where there is a local problem with birds (e.g. coastal locations or near a landfill site) the advice of the pest control contractor or the local authority should be obtained and implemented to control birds on the site as far as practicable.

In the U.K., there are legal restrictions on the capture and destruction of wild birds. Non-lethal methods should always be given first consideration. Trapping and shooting

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may be used in addition to the measures described above, subject to the relevant licences being held or obtained by the food supplier or the pest control company.

Bird nests can be infested by some species of stored product insect (e.g. Australian Spider Beetle). Any unoccupied nests in or on factory buildings should be removed to prevent any SPI infestation spreading. When young birds are present in the nest and the bird species is not listed under relevant Licences issued by National organisations e.g. WML – GLO5 issued by Natural England, as one of those species which may be taken for means of protecting human health and safety, a specific license may be applied for from the relevant countries authority (England, Scotland, Wales or Northern Ireland) to remove the nest.

Case Study 1: Internal Rodent Activity

The Dry Goods store and the roof void to the side had rodent activity highlighted. This resulted in an extended period of activity in both areas which proved to be a challenge for the site.

Initially additional break back traps and rodent bait were placed along with the existing rodent bait boxes. These were quickly followed by electronic bait boxes & tracking and UV dust. Rodenticide foam was placed in the roof void (where safe to use). Site plans for each level of the factory were also overlaid to see if there was a link between the activities or whether there was a route used by the rodents from the roof void to the stores or whether the infestations were two separate issues.

The M&S technologist was kept informed of the work being carried out. An extensive proofing appraisal and rodent activity inspection was carried out in the roof void and dry stores area. Racking was emptied along one side and wall cladding along the side of the store (which had previously been an external wall) was professionally repaired and new flashing applied where necessary. Floor expansion joints were repaired as required. These all had an impact, however the problem persisted. The biologist added a second alternative, soft wax bait which proved more palatable however signs were still evident. The last treatment undertaken was a large scale glue board treatment (with 2 visits per day) which resolved the issue. Boards were placed round the edges of the store and up the aisles and in the location in the roof void. Daily checks were carried out on food stuffs within the stores on the ground level but it was noted that no damage was found. It was thought that the rodents may have been feeding elsewhere. Daily floor cleaning took place to ensure any fresh droppings could be easily identified. M&S were notified throughout due to the follow up requirements and the time taken to eradicate the issue.

Brick work was cut from the far side of the stores wall and a panel placed over it. This was used to check for wall cavity activity which is now used as a monitoring point. A hatch was also cut in the cladded wall panel on the other side of the repaired cladded wall to be used for monitoring and continues to be used in this way. M&S were also contacted to seek approval to use a grain based rodenticide within the panels cut from the store/chill walls. Permission was granted but it was later decided that it was not needed.

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Ongoing, additional baits were added to the existing site plan in the stores and the roof void. This was for monitoring purposes and to provide a 3 dimensional baiting plan instead of the original 2 dimensional plan.

Treatments used, proofing works and rodent activity were continuously reviewed with the technician, biologist and hygiene manager to ensure sufficient action was being taken to eradicate the issue. Adjustments to the plan were made as required.

We now have an independent annual pest control audit carried out which examines at the pest control systems and the factory.

The areas continue to be pest free but are closely monitored.

Case Study 2: The control and elimination of Cocoa Moth (*Ephestia elutella*).

The site that was infested with Cocoa Moth is a large, reasonably complex, Victorian industrial building that has made confectionary for many decades, and had been infested with Cocoa moth for the last fifty years. It has had professional pest controllers managing the site in all that time using residual insecticides and methyl bromide fumigation periodically when it was permitted. Unfortunately, the moth infestation persisted and a change in direction was required. The decision was made to bring in new contractors.

Their first step was to conduct a thorough inspection of the whole site including most of the equipment. This took many days for a pair of Biologists; the site being divided into structural fabric, manufacturing equipment and storage areas. The idea being to triage the infestation to identify the areas posing the greatest risk and most immediate threat to product. As one might expect, this turned out primarily to be the manufacturing equipment. It may be surprising that most of the equipment was inspected on this initial occasion from the outside looking in as the production equipment could not be stopped at this particular time. With skill and careful examination much can be gained simply by looking under, around and into manufacturing equipment without it having to be stopped, certainly enough to demonstrate it is infested, where it requires better cleaning and where most of the cleaning needed to be directed. More detailed strip down inspections were necessary for a few specific items of equipment and again more conducted later once the bulk of the infestation had been removed, but these were more easily managed within the manufacturing schedules. It was not necessary to conduct routine inspections of the equipment during shut down periods except in particular circumstances, where need dictated but all the manufacturing equipment was inspected externally on each routine inspection.

Having identified where the bulk of the problems were located and having developed an understanding of the root causes of the infestation, a control project was formulated and a detailed presentation made to the senior factory management. The project was to last at least three years as some of the changes required were structural as well as cultural and would require investment in training, cleaning equipment and engineering modification to reduce spillage and dirt traps.

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There was moth monitoring in place but this was of limited value as the moth levels were so obvious and much of the evidence was provided through staff observations and detailed inspection from the contractor (here staff pest sightings records were useful). Later, once the bulk of the infestation had been reduced the monitoring levels were increased and refined to better represent a biological sampling tool to monitor distribution and absolute levels. This was essential so that the remaining pockets of infestation could be pinpointed and resources directed at more thorough and effective cleaning of the equipment concerned.

During the progress of the project it was clear that to succeed it was essential that there was a good understanding of the nature of the problems and a commitment to success by the factory management. Without senior management commitment the pest control project would not have succeeded.

The project required the use of minimal levels of insecticide and was based on rigorous environmental management. In total, over the eventual five-year period of the project to the point where the moths were eliminated, about 20 litres of residual insecticide were used in a very targeted manner. Fumigation was not an option as methyl bromide had been withdrawn and phosphine was not practical. The bulk of the control was achieved by site staff under direction of the pest control specialists and consisted of:

- 1) Moving away from air blowers to clean and using vacuum cleaners.
- 2) Refining the Cleaning SOP's to include all guards and covers (many had been missed off)
- 3) Increasing the cleaning frequency where necessary.
- 4) Through training of cleaning and supervisory staff to improve the attention to detail in the clean.
- 5) Making Engineering modifications to reduce spillage and remove dirt traps (this included removal of redundant equipment).
- 6) Frequent technical support and drive from the pest control contractor with refinement of the plan as necessary.

The site remains clear of moth infestation with the exception of one incident when a consignment of infested raw material was imported in. The procedures were in place to ensure this was swiftly and robustly dealt with and quickly eliminated.

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