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PEST CONTROL IN THE ASPECT OF THE REQUIREMENTS OF SELECTED FOOD SAFETY MANAGEMENT STANDARDS

Justyna GÓRNA[1*], Adam BRZECHWA[2], Anna KOWALCZYK[3]

[1] Poznań University of Economics and Business; justyna.gorna@ue.poznan.pl, ORCID: 0000-0002-2763-5810
[2] Bureau Veritas Polska Sp. z o. o.; adam.brzechwa@bureauveritas.com
[3] Unilever Poznań Sp. z o.o.; a_kowalczyk@onet.eu
* Correspondence author

Purpose: The aim of this article is to present the method of pest control in the aspect of ensuring food safety and the requirements of selected standards in this area.
Design/ methodology / approach: An analysis of the functioning of pest control principles in selected food chain enterprises was carried out in the context of meeting the requirements of applicable standards and generating recommendations for other enterprises.
Findings: Based on the standardization guidelines, the most important requirements for the prevention of pests in enterprises operating in the food chain were identified. Basic guidelines for enterprises were formulated, based on which it will be possible to design an effective pest control system.
Originality/value: The article indicates the most common non-conformities that occur in the area of pest control and monitoring. The article can help companies operating in the food chain to improve this area of their activities and thus reduce the risk of non-conformities during certification audits, and most importantly, ensure a reduction in the risk of threats to the production process.
Keywords: pest control, non-compliance, food chain, standards.
Category of the paper: Case study.

1. Introduction

An indispensable attribute of food quality is its safety throughout the food chain. The food chain consists of operators within primary production (plant cultivation, animal breeding), food processors, wholesale and retail trade operators and food services, as well as producers/suppliers/service providers cooperating with the above-mentioned operators (Górna, Kaźmierczak, Zapłata, 2021). All entities participating in the so-called "food chain are obliged to apply good manufacturing practices (GMP) and good hygiene practices (GHP). In accordance with the definition according to art. 3 point 9 of the Act on Food and Nutrition

Safety, good manufacturing practice (GMP) - in relation to food production means actions that must be taken and conditions that must be met in order for food production to take place in a manner that ensures food safety, in accordance with its intended purpose (Act of August 25, 2006). On the other hand, in accordance with the definition according to art. 3 point 8 of the Act on Food and Nutrition Safety, good hygiene practice (GHP) means actions that must be taken and hygiene conditions that must be met and controlled at all stages of production or trade to ensure food safety (Act of 25 August 2006).

GMP/GHP requirements concern (Berdowski, Turlejska, 2003; Kołożyn-Krajewska, Sikora, 2010):

- ensuring hygienic environmental conditions,
- preventing insects, birds and other animals from entering the plant from outside,
- appropriate storage conditions for food products and auxiliary materials,
- ensuring adequate space for the deployment of production and storage equipment,
- proper ventilation of the plant,
- maintaining infrastructure in good technical condition,
- lighting efficiency,
- water and sewage management,
- washing and disinfection procedures,
- employee control related to preventing food contamination.

The principles of supervising the use of raw materials and their handling are defined by legal requirements. This is primarily aimed at preventing, minimizing or eliminating the occurrence of microbiological, chemical and physical hazards. The extent to which an enterprise implements legal requirements and ensures proper handling of raw materials, finished products or the manufacturing process depends on the management system adopted for use in the organization and its culture. A very important link in ensuring the safety of manufactured products are, among others, suppliers, including service and product providers. The role of service providers in the DDD area (Pest Control/Disinfection) consists, among others, in providing services mainly to food processing, feed, packaging or cosmetic companies.

The above-mentioned industries are interconnected, the activities of each industry are regulated by mandatory requirements, but also voluntary (management standards) (Górna, 2019). In the food industry, companies can implement standards such as ISO 22000:2018 Food safety management systems – Requirements for any organization in the food chain, FSSC 22000 Food Safety System Certification, BRC Global Standard Food Safety, IFS Food Standard, GLOBALG.AP The Worldwide Standard for Good Agricultural Practices, QS Quality scheme for safe food, The AiB International Consolidated Standards for Inspection Prerequisite and Food Safety Programs. In the industry of production of packaging materials and products dedicated to food and other hygienically sensitive products, the following are implemented: BRC Packaging Materials, IFS PACsecure. In the production of cosmetic

products, standards such as ISO 22716 Good Manufacturing Practices for Cosmetics (GMP), BRC CP Global Standard Consumer Products, IFS HPC Household and Personal Care Standard are implemented. All of these standards specify requirements for ensuring proper pest control.

Selecting an appropriate pest control strategy requires estimating all risks for the company, not only those related to the business profile, but also those resulting from the type of pest control methods selected (Kloosterman, Mager, 2014).

Companies that decide to use the services of an external supplier in the field of pest control and monitoring can, when qualifying such a service provider, be guided by whether they are certified for compliance with the European standard PN-EN 16636:2015-03 Pest control services. Requirements and competences. By using the services of a certified supplier, the company ordering the supervision is sure that the contractors of these services (PN-EN 16636:2015-03):

- are competent to sell and perform the services they offer, maintaining minimum standards of knowledge, skills and practical competence,
- offer the best advice available on preventing pest problems in a client's environment,
- offer an effective and efficient service that will eliminate the root cause of the identified problem,
- will provide safe services that minimise risk to customers and society as a whole, while minimising possible negative impacts on the environment and animal welfare.

2. Requirements of selected pest control standards

According to the requirements of the BRC Global Standard Food Safety version 9, the company must have an effective pest control program in place to eliminate the risk of contamination of raw materials, packaging and finished products. The standard requires that the company outsource pest control to a qualified entity or rely on qualified employees. In the case of the latter option, employees involved in pest control must meet legal requirements for training (such as are required when using professional plant protection products). Most rodenticides are PBT substances (P – Persistant, B - Bio-Accumulative, T - Toxic) and pose a significant risk to our environment. These substances are controlled by the ECHA (European Chemicals Agency), and all rodenticide treatments must include risk mitigation measures to avoid secondary poisoning of non-target animals in the environment (IFS Pest Control, 2022). If the company uses the services of an external company, then the scope of work must be precisely defined, namely the responsibilities of the company's management and the service provider must be defined. Most often, the scope of services is specified in the DDD agreement and program. The documentation and records maintained should include (BRC GS Food Safety, 2022):

- a risk assessment, which must be reviewed whenever changes are made to the buildings or production process that may affect the pest control programme, or whenever a significant pest problem occurs,
- an up-to-date plan of the entire facility, indicating where pest control equipment is located,
- identification of rodent control stations and/or monitoring equipment at the plant,
- detailed information on pest control measures used, including instructions on their proper use and procedures to follow in the event of an emergency,
- record of all observed pest activity,
- details of actions taken to control pests.

Bait stations or other devices used for monitoring or controlling rodents must be positioned and maintained so as to avoid the risk of product contamination. If a bait station is lost, this must be recorded and the cause of the loss established. Toxic rodent baits must not be used in production or storage areas where open product is present, except for the purpose of pest control. In such cases, toxic baits may be introduced for use inside buildings, but the entire process must be carefully supervised and monitored.

Insect killers, pheromone traps and/or other insect monitoring devices must be in good working order and in the appropriate location. If there is a risk of insects being thrown from the insect killer and thus contaminating the product, other systems and equipment must be used. If pests or signs of pest activity are present, immediate action must be taken to identify the products at risk and to minimize the risk of product contamination. All potentially contaminated products must be subjected to the non-conforming product procedure.

All inspections must be recorded, including information on any pest control measures implemented, hygiene recommendations, and actions to be taken to prevent pests.

The company is responsible for ensuring that all appropriate recommendations made by the service provider or specialists employed at the facility are implemented in a timely manner.

To verify the effectiveness of pest control measures used on the site, a thorough and documented review of pest control measures must be conducted by an expert at a risk-based frequency, but no less than once per year.

The review should:

- include a thorough inspection of the facility for pests,
- include an overview of the pest control measures used and any recommendations for changes.

The results of pest control inspections must be regularly evaluated and analyzed for trends, at least annually or whenever pest infestations occur. The analysis must include monitoring results from traps and monitoring devices to identify problem areas. Above all, the analysis must provide a basis for improving pest control procedures.

The standard also requires that employees be able to recognize signs of pest activity and know that they should report such situations to their superiors. For this purpose, training is carried out in plants, the implementation of which is most often outsourced to a company providing pest control services (BRC GS Food Safety, 2022).

The IFS standard requires that the production company has a pest control system that complies with legal requirements and that when establishing such a system it takes into account at least: the environment of the plant (potential pests); a plan of the plant with the location of traps (trap map); marking of traps on the premises; responsible persons, from among the staff; products/means used and instructions for their use and safety; frequency of inspections. The pest control system must be based on a hazard analysis and an assessment of the associated risks. The company should have qualified and trained staff and/or hire a competent external company. In the case of hiring an external company, all necessary activities to be carried out on the plant should be recorded in the contract. Pest control inspections and actions resulting from these inspections must be documented and the implementation of the activities should be monitored and recorded. Baits, rodent traps and insect traps must be in adequate numbers and must be placed in an appropriate position. They must be made and placed so as not to cause a risk of contamination. The effectiveness of pest control should be monitored through regular trend analyses (IFS Food, 2023).

3. Good practices in pest control in terms of meeting the requirements of standards

A professional service provider should (PN-EN 16636:2015-03):

- document the type of service that should be provided to the customer and retain the documentation for a minimum of one year or longer as required by customer and legal requirements,
- record evidence of actions performed and results achieved, to include the date of intervention, type of pest, infestation, techniques and pesticides used and any other relevant information,
- provide information on the specific risk-based pest management plan necessary to establish agreed control processes, including the responsibilities, rights and obligations of each party to the agreement,
- formally review and evaluate the results, including making any further recommendations to the client.

Table 1 shows an example of a pest risk assessment for storage facilities.

Table 1.
Pest Risk Assessment – Example

Location	Threat/ Group pests	Rate threats			Activities preventive	Activities Corrective	Methods Combating
		AND	B	AxB			
Rooms warehouse	Rodents	3	2	6	Regular trimming of greenery, designation of three zones A, B, C	Installation of feeders in the plant area	Catchers live
	Insects flying	2	1	2	Compliance with general principles of GMP, GHP	Application preparations insecticides	Insect killer lamps, attractant lamps - sticky ones
	Insects running	3	1	3	Compliance with general principles of GMP, GHP	Application of preparations on flat surfaces	Mechanical sticky traps with attractant
	Pests warehouse	3	3	9	Observance FIFO, FEFO rules	Application of preparations on flat surfaces	Insect killer lamps, mechanical pheromone traps - sticky

Source: Documentation of pest control of a food production enterprise, 2024.

In the above example (Table 1), a methodology was used to assess the probability of pest occurrence (A) using a three-point scale, where 1 means a low probability of occurrence, 2 - possible, 3 - high probability of occurrence, and to assess the effects related to the occurrence of pests (B), where 1 - means the effects are difficult to estimate, 2 - significant, 3 - very high effects of pest occurrence. Based on the risk assessment, the procedures should be determined preventive, for the implementation of which are the responsibility of employees providing DDD services and/or/and internally, employees of the company where the business is conducted. In order to be able to respond appropriately to changes in pest population activity trends, the effectiveness of previous activities and treatments should be monitored based on cyclical measurements and observations. This is usually done on the basis of determining the collection of attractant, catches, feeding traces. Monthly monitoring is a good practice, which will allow for immediate observation of an increase or decrease in pest population activity and timely implementation of appropriate corrective, corrective, preventive actions, e.g.:

- increasing the amount of safety equipment (insect lamps, traps),
- sealing the building (mosquito net, door sealing rubber),
- spraying with a chemical agent.

Observations should be supplemented with important information that will help find the cause of the increase or decrease in pest activity, i.e. average monthly temperature, amount of rainfall, important internal factors (e.g. renovation works), or changes in the building's surroundings, e.g. harvest season, changes in neighbouring buildings (Table 2):

Table 2.
Example of monitoring a monthly trend of pest activity

	June	July	August	September	October	November	December
Activity [%]	36.6	36.6	46.2				
Temperature [˚C]	19.9	20.2	23.2				
Precipitation [mm]	63.4	22.7	22.5				
Internal factors (e.g. renovation works, services, etc.)	Works renovation	Works renovation	Works renovation				
Environment (field work, farmers' activity, mowing)	lack (growth corn)	lack (growth corn)	lack (growth corn)				
Additional pest control treatments (additional/intervention)	2 sprays	1 spray 2 lamps blatant	Exchange glue in lamps				
Additional Recommendations DDD companies	-	-	-				
Comment	Lack	Replacing 2 sticky insect killer lamps with bright ones	Lack				

Source: Documentation of pest control of a food production enterprise, 2024.

The DDD program and all observations, measurements, implemented actions should be documented. In addition, companies should implement a procedure in the event of a pest infestation and determine their activity thresholds, which result in the implementation of actions corresponding to the identified scale of the threat / problem. Usually, companies set three levels of response: low (pest population activity up to 25%), medium (pest population activity from 25% to 50%) and high (pest population activity above 50%). The indicated threat levels should be identified in three zones: internal and two external (around the building and around the perimeter fence), which limit the possibility of pest invasion into the building. Therefore, companies are required to have a map of the building and its surroundings with the location of equipment (the map legend identifies the type of equipment). An important element of the DDD system assessment is to conduct a biologist audit at least once a year. This is part of the assessment of the quality of work performed by the pest control technician. The audit should include a detailed inspection of hard-to-reach areas such as voids, cable runs, mezzanines. The auditor will also determine the current level of pest activity on the premises and propose alternative approaches to resolving the problems (BRCGS Guidance document, 2020).

The pest control program should be in line with the requirements of the standard for which the company for which the DDD company provides services is certified. The requirements of the standards are more or less detailed, but each company operating on the DDD services market should develop its own code of good practice. Fulfilling the following requirements for the pest control program and information recorded as a result of inspections will satisfy most companies

using the services of DDD companies, regardless of the standard in the given company (Table 3).

Table 3.
Example of the contents of a pest control program and monitoring reports

PEST CONTROL PROGRAM	PERIODIC MONITORING REPORTS
• pest control program provider details • contact details of people to be called in emergency situations (pest invasion)	• any observations of pests and their activity
• indicating the persons responsible in the plant for supervising DDD activities	• recommendations for the plant regarding actions to be taken, including hygiene and security measures, as well as any outstanding recommendations from previous inspections
• pest control program provider training certificates	• information on chemicals used (type, quantity and location)
• description of raw materials/finished products present in the plant in terms of their impact on the existence of pests, • pest risk assessment, • description of pests covered by the program (description/photos)	• reports on access issues and lost baits
• frequency and type of inspections (based on documented risk assessment) • frequency of replacing fluorescent lamps from insect killers	• signature of designated manager or deputy
• pest control methods and procedures and equipment used	• updated analysis trends
• site plan identifying program area and pest monitoring points (e.g. toxic/non-toxic baits)	
• follow-up inspection procedures after a pest infestation has been detected,	
• Material Safety Data Sheets for all chemicals used	
• DDD documentation and records supervision procedure	

Source: Own research.

Based on many years of auditing experience of the authors of this article, the most common non-compliances in the area of pest control in enterprises have been identified:

- failure to include all pests in the control program, e.g. insects, storage pests, wild animals, pets (cats, dogs), birds,
- differences between the plan for the deployment of rodent or live traps and reality (numerical/location discrepancy/lack of numbering on the device),
- lack of safety data sheets (this happens when there is a change in legal measures or requirements and the company providing DDD services does not update the documentation),
- outdated DDD program – should be reviewed and approved with a date and signature once a year,
- live traps not attached to the floor,
- dirty, uncleaned insect killer lamps,
- set rodent control traps,
- no traps for crawling insects, e.g. in staff canteens or changing rooms,

- lack of compliance with the scope of services defined in the contract with the DDD company in comparison to the DDD program or vice versa – a wider scope in the contract and no reflection in the activities,
- rodent control traps not permanently closed,
- unsealed/unprotected buildings against pests,
- open gates/doors,
- lack of activities/procedures for analyzing the trend of pest movement. There are no defined threshold values that initiate corrective actions,
- no evidence of replacing fluorescent tubes in insect killer lamps,
- failure to include newly constructed facilities on the company's premises in the DDD protection program, e.g. a new tent warehouse.

It is worth paying attention to the above-mentioned inconsistencies in terms of improving the service provider's procedures in the field of pest control and the company's activities, because some of these inconsistencies, e.g. related to the lack of tightness of the plant, are the fault of the company's employees.

4. Conclusions

Improvement activities are an essential element of management systems, which is why DDD companies must consider that the requirements of the standards will evolve. Each standard is subject to update at least every 3 to 5 years. The update of the requirements is based, among other things, on new threats that will be observed on the market and the results of certification audits. Effective pest control is one of the elements of the food safety management system. Activities in this area are most often outsourced to specialist companies, because a production company usually does not have staff with the appropriate qualifications to use pesticides in pest control and staff with the appropriate skills in this area. In turn, companies specializing in providing DDD services to companies operating in the food chain must be aware of the standardization requirements that apply to their customers. Effective communication between the DDD company and the company ordering the DDD service is key in this aspect. A company purchasing a DDD service should inform the DDD company about its requirements, the standard it is certified for and the processes it performs. In turn, the DDD company should be aware of the requirements of the applicable standard and provide its service in a professional manner. In addition, the DDD company should periodically review the pest control program in terms of its relevance and respond to any comments/non-compliances in this area. Only reliable cooperation between both entities can ensure effective pest control and reduce the risk of non-compliance, which will contribute to reducing the risk of loss of safety of manufactured products.

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