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# The Application of Integrated Pest Control Management in Raw Materials for the Animal Feed Industry at PT. XYZ Unit Buduran

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## ABSTRACT

Integrated Pest Control Management (IPCM) is a crucial strategy for companies to mitigate pest attacks on raw materials, thereby preventing financial losses. This study was conducted at PT. XYZ, Unit Buduran, Sidoarjo District, an animal feed production company, to identify effective pest control strategies. Using a descriptive analysis method, primary and secondary data were collected to evaluate existing practices. The findings revealed that PT. XYZ employs various pest control strategies, including spraying, fogging, glue traps, yellow traps, ultrasonic sound technology, and temperature and humidity monitoring. These integrated strategies reflect the company's commitment to minimizing pest-related risks and maintaining raw material quality. The study highlights the importance of combining traditional and innovative methods for effective pest management in the animal feed industry.

### Contribution to Sustainable Development Goals (SDGs):

SDG 2: Zero Hunger

SDG 12: Responsible Consumption and Production

Goal 15: Life on Land

## 1. INTRODUCTION

### 1.1. Research Background

Animal feed is a type of industry engaged in agribusiness by utilizing raw materials derived from agricultural activities in a wide range. Feed quality has an important role because animal feed is a source of energy and brings potential hazards to food products for animals [1]. Raw materials are inputs that are used to produce finished products (output). Every manufacturing company needs raw materials to carry out the production process. Raw materials need to be prepared before production is carried out. High-grade products are produced from high-grade raw materials as well. Care is necessary to maintain the quality of the raw materials. Raw material treatment can be in the form of pest control. PT XYZ conducts pest control on raw materials stored in

the warehouse. Pest control is useful to prevent raw materials from contamination and damage [2].

PT XYZ is one of the Company's companies engaged in the manufacture of animal feed located in Buduran District, Sidoarjo Regency, East Java. The quality of animal feed produced by PT XYZ is highly dependent on the quality of the raw materials used. Contamination of raw materials by pests can significantly affect the quality and quantity of animal feed produced. Pests in animal feed raw materials such as fleas, rats, fungi, birds, and flies, in addition to causing loss of quantity and quality, can also cause financial and operational losses to the company. Fleas are one of the pests that are difficult to control because fleas can die while their eggs are difficult to destroy [3]. Therefore, effective control of these pests requires the implementation of strict sanitation strategies to prevent contamination and exclusion of pests from the storage warehouse environment, as well as regular pest



monitoring is also an important step in detecting the presence of pests early and taking preventive measures quickly.

Integrated Pest Management in the animal feed industry is designed to protect the quality of raw materials from potentially damaging pests. With integrated pest control management, companies carry out careful planning to identify risks and develop appropriate control strategies. Furthermore, organizing human resources, and technology, and carrying out preventive measures such as maintaining cleanliness and routine monitoring of pest populations. Control also involves periodic evaluation of the strategies implemented, with this approach not only supporting the production of safe and quality feed but also minimizing risks to livestock health and maintaining the sustainability of the company's operations in the long term [4].

This study discusses how to effectively and efficiently control pests in PT XYZ Buduran unit, Sidoarjo Regency, East Java. The application of the POAC management function as an assessment indicator in this study which with good management, will produce a good strategy so that it can make the implementation of the pest control strategy appropriate and get satisfactory results [5].

### 1.2. The objective of the Research

The objective of this research is to evaluate the effectiveness of integrated pest control management strategies implemented at PT XYZ, an animal feed manufacturing company located in Buduran District, Sidoarjo Regency, East Java. Specifically, the study aims to provide recommendations for optimizing pest control measures to ensure the sustainability of raw material quality and the operational efficiency of the company.

## 2. MATERIALS AND METHODS

This study discusses how to effectively and efficiently control pests in PT XYZ Buduran unit, Sidoarjo Regency, East Java. The application of the POAC management function as an assessment indicator in this study which with good management, will produce a good strategy so that it can make the implementation of the pest control strategy appropriate and get satisfactory results [5].

## 3. RESULT AND DISCUSSION

Pest control management is an action to reduce and control pests in an integrated manner. Pest control management is needed so that the number of pests can be controlled so that it does not cause financial losses. Pest control management is carried out in an organized manner so that the pest control implemented can be carried out in the long term. The implementation of pest control management needs to identify the types of pests to be eradicated and make effective plans to control the growth of these pests. Special teams are needed to carry out pest control management. Team performance and the effectiveness of control methods also need to be evaluated to assess their strengths and weaknesses.

### 3.1. Pest Control Planning

Pest control in industrial raw materials is needed to maintain the quality and physical quality of raw materials. Raw material control needs to be planned before pests in raw materials are carried out with the determination of a schedule. Planning is the

activity of preparing actions to achieve goals. Planning can provide direction in making decisions so planning needs to be carried out so that activities can be carried out smoothly [6]. Based on this description, it can be concluded that planning for pest control needs to be carried out so that pest control activities are more orderly and the goals of pest control can be achieved. Types of pests that attack the raw materials of PT. XYZ is pests of ticks, fungi, birds, rats, and flies. The control of flea pests is carried out by the control team with regular scheduling, including:

**Table 1.** Maintenance Schedule for Spraying/Fogging Raw Material Warehouses, Corn Silos, and Animal Feed:

Monday	WH. Merlin A, WH. I, II, III, IV, VIII, IX (PT), Silos Yard 1-19, Corn trading if any, WH. Breeder.
Tuesday	WH. I, II, III, VIII, IX (PT), X, XI, Corn trading if any.
Wednesday	WH. Merlin A, I, II, III, IV, VII, VIII, IX (PT), Silos Yard 1-19, Corn trading if any, WH. Breeder.
Thursday	WH. I, II, III, VIII, IX (PT), X, XI, Corn trading if any.
Friday	WH. Merlin A, I, II, III, IV, VIII, IX (PT), Silos Yard 1-19, Corn trading if any.
Saturday	WH. Merlin A, I, II, III, IV, XI, VIII, IX, IX (PT), X, Corn trading if any, WH. Breeder.
Sunday	WH. I, II, III, IV, VII, X, XI, VIII, IX (PT).

Table 1 displays warehouse maintenance schedules by Spraying/Fogging. Spraying is a pest control technique by spraying drugs on the part that is infested with pests. Spraying drugs using a tool called a Sprayer. Fogging is a pest control technique with a method of spraying air in the form of smoke which is useful for killing pests. Spraying and Fogging are carried out every 17.00 hours by the Fumigan Team. Spraying and Fogging are carried out to eradicate flea pests.

Table 2. shows the maintenance of pest warehouses against rat and bird pests regularly. Rat and bird pest control is carried out by the PCO Team (Pestindo Central Optima). The PCO team checked each rat trap spread in each warehouse. Checks are carried out daily to avoid rat carcasses that can cause disease. Rat and bird pest control is carried out by regular scheduling every day throughout the company's environment.

**Table 2.** Routine Maintenance Schedule for Rat and Bird Pest Warehouse

Monday	WH. Merlin A, WH. I, II, III, and IV
Tuesday	WH. V, WH. Sack, Multipurpose Building, Breeder Tower
Wednesday	Buhler Tower, House Tower, Pet Food, Quality Control Laboratorium, dan WH. Teknik
Thursday	WH. VI, VII, VIII, and IX
Friday	WH. X, XI, WH. Intake, Silos and Silos Panels.
Saturday	Man Office dan Cooperative Warehouse

### 3.2. Organizing

Organizing is the second stage in management. The division of tasks and explanations of work techniques is carried out at the organizing stage. The organizing stage determines the procedures that must be carried out when carrying out the planning that has been prepared [9][7]. Organizing was also carried out in pest control activities at PT. XYZ Buduran Unit. Organizing is carried out to divide tasks into several teams so that they do not overlap with each other. Pest control at PT. XYZ Buduran Unit is carried out by several control teams according to the type of pest, namely:

#### 3.2.1. Fumigation Team

The Fumigation Team is a team that is tasked with controlling fleas and fungi by administering fumigant solutions. In addition, the fumigant team is also tasked with providing effective ways to control pests both in terms of monitoring and control every day. Before fumigation, the fumigator will conduct a risk assessment by calculating the time that must be available to carry out fumigation activities properly and following standards, the area must be ensured to be safe and not disturb the environment following the predetermined conditions, and calculate the concentration of fumigant that must be used according to the volume of raw materials to be fumigated.

The Fumigation Team at XYZ Company consists of 10 people with 6 permanent workers and 4 outsources. The fumigation team is divided into 3 shifts/day with shift 1 entering at 07.00-14.00, shift 2 entering at 10.00-17.00, and shift 3 entering at 14.00-22.00. The fumigation team is on duty and coordinates with the warehouse team in spraying, fogging, and gassing work.

#### 3.2.2. PCO Team (PT. Pestindo Central Optima)

The PCO team is a professional Pest Control Officer trained to identify, prevent, manage, and control pests, insects, and other nuisance organisms. PCO works to protect the factory environment from health threats and damage that may be caused by these organisms, especially in raw materials to maintain the quality of the product. The PCO team is a collaboration of another company, namely PT. Pestindo Central Optima which is in charge of controlling insect and reptile pests such as birds, rats, and flies.

In company XYZ, the PCO Team consists of 3 people with the same and scheduled tasks. Every Monday, Tuesday, Thursday, and Friday 2 people work for monitoring while for Wednesday and Saturday, 3 people are in charge of monitoring. PCO officers have the task of controlling and monitoring the existence of insect and reptile pests at every point of the company where these pests often appear and interfere with production activities and affect the quality of animal feed products in the company.

#### 3.2.3. Raw Material Warehouse Team

The Warehouse Team is a team that is in charge of controlling each warehouse, both raw material warehouses, intake warehouses, premix warehouses, and feed warehouses. Each warehouse has different tasks so it has a different team. The warehouse team has a task in every place such as in the raw material warehouse, the raw material warehouse team will always monitor the quality of the type of raw material feed with several indicators, namely color, smell, and pests. Meanwhile, in the feed warehouse, the warehouse team will have the task of controlling

income, expenses, layout of finished materials, and quality of finished materials with indicators of age, color, odor, and the presence of pests such as fleas that are often found.

These three teams must have good coordination with each other. If there are problems with each team, they will immediately contact the relevant parties. For example, when the feed warehouse is attacked by pests, the feed warehouse team will submit a pest control request to the fumigant team for spraying and fogging. When there are pests of birds, rats, cats, and flies that are annoying, the warehouse team will contact the PCO team for immediate follow-up action.

### 3.3. Actuating

Actuating is a briefing activity to achieve a planned goal. Briefings can be in the form of work techniques that have been designed to be done properly. Briefings are carried out so that the implementation of activities can run effectively and efficiently following planning and organization [1][8]. The pest control process at PT. XYZ is carried out in various ways according to the type of pest faced, namely:

#### 3.3.1. Spraying and Fogging

Spraying and fogging is a type of chemical pest control carried out by fumigation, namely by using chemical pesticides, fungicides, and other chemical substances. Spraying is a treatment by spraying chemical liquids made from liquid pesticides + water. Spraying is carried out indoors, such as raw material warehouses, animal feed warehouses, indoor silos, and outside silo areas. Meanwhile, fogging is a treatment by fumigant and wet oil-based fumigant. Fogging is carried out every day at 17.00 according to the schedule indoors, such as warehouses and silo areas. In addition, spraying is also carried out in the process of corn raw materials entering the silo. Corn that is in the process of going to the silo will be sprayed with antimold, namely fungicides with the aim that corn is not attacked by fungi when in the silo.



Figure 1. Spraying and fogging equipment storage (2024)

Fumigation officers spray fogging periodically every day. Fumigation activities are carried out starting with checking and preparing fogging spraying tools in storage as shown in Figure 1. Spraying and fogging are carried out simultaneously by spraying (spraying) then followed by fogging (fumigation) in each place in the company according to a predetermined schedule. This spraying and fogging is carried out by the fumigation team every

day at 17.00 by 3 people with the division of 1 person spraying then followed by 2 fogging people.

### 3.3.2. Gassing

Gassing is controlled using drugs in the form of tablets. The tablet is placed in a room or part affected by pests, then the part must be covered by a tarp to make it airtight. The closure with a tarpaulin is carried out so that warehouse workers are not exposed to toxins from gassing. Gassing tablets will sublimate and spread the drug in the tarpaulin so that pests in animal feed die and cannot reproduce.



**Figure 2.** Gassing Fumigation Against Raw Materials and Finished Feed Machines

Gassing is a treatment of fumigation by isolating a room of raw materials exposed to air until it is airtight with a basic material in the form of tablets/capsules as shown in Figure 2. Gassing is usually done in silos if there are silos that are infested with tick pests. Gassing is carried out by inserting fumigant drugs in the form of capsules and then isolated until airtight for 7-10 days then opened. If the gassing activity fails, then re-gassing fumigation is carried out. Gassing drugs that are often used are metal morphine, methyl bromide, mg. morphine in the form of capsules and sulfur in the form of liquid gas. The use of gassing drugs in the form of capsules has a dose of 3 tablets/ton with the use as stated on the package. In the gassing process, there is also the help of UV light which is useful for sterilizing surfaces and air from microorganisms, namely fleas, and preventing the spread of flea breeding.

### 3.3.3. Glue Trap

Sticky traps or glue are used to monitor crawling insects such as rats. Glue traps for insects are made of thick paper or cardboard coated with sticky, non-repellent glue. Insects walking on the trap will stick to the glue.



**Figure 3.** Rat Glue Trap and Rat Catch Results

Figure 3 shows a rat trap placed in a shed. These glue traps are placed at several points on each warehouse according to the layout sketch of the warehouse and the determination of the amount of glue from the PCO team to keep the raw materials from rat pests and more effective. To trap rats, glue is generally given as bait. To prevent dust from covering the glue, usually, these traps are placed in a hollow place that allows pests to enter.

According to the data on the catch of rat pests for the last 5 months, which are as follows:

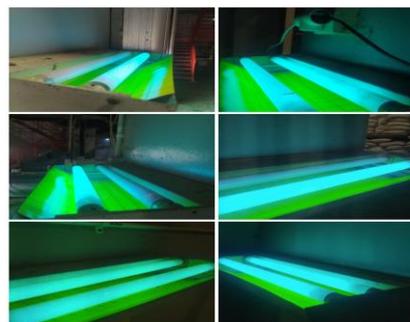
**Table 3.** Total Rat Capture Results for 5 Months

Month	Total Rat Catch
January	229
February	232
March	234
April	228
May	275

It is known that the average number of rat pests obtained during one month is around 200 heads. This pest is obtained so as not to cause damage to the raw material process (Table 3). With pest control like this, it will help make it easier to control the existence of pests and minimize losses caused by rat pests in raw materials.

### 3.3.4. Fly Catcher Installation

Fly Catcher is a pest control tool used to catch insect pests. Flycatcher is a tool consisting of ultraviolet lights and given a Yellow Trap (Yellow Trap) which is a trap in the form of yellow adhesive paper to trap flies. The checking tool is called a flycatcher. Pest control using this tool is considered more environmentally friendly because it does not use chemicals.



**Figure 4.** Installation of the Fly Catcher Tool

The flycatcher in Figure 4 is useful for attracting pest attention and monitoring the presence of pests around the location where the raw materials are stored. The Yellow Trap can control several insects such as flies, leafhoppers, and fleas. Yellow Traps are spread around fish feed production sites because there are many flies in these locations that can contaminate raw materials. The Yellow Trap needs to be replaced after 15 days of installation as most of the trap surfaces have been filled with pests.

### 3.3.5. Ultrasonic and Laser Devices

Animals that often eat corn in silos are birds. Birds can enter the silo through the gaps in the silo holes such as blowers and air vents. Corn enters silos in search of food. This causes corn to be eaten by birds and even has the potential to increase the reproduction of flea eggs due to feces brought by birds from the outside environment.



**Figure 5.** Ultrasonic Devices Inside Raw Material Warehouse

Birds have the biggest fear, which is being preyed upon by predators, so the company overcomes this by installing an ultrasonic sound in the form of an eagle's voice. Figure 5 shows an ultrasonic device suspended on a pole. The device functions to produce the sound of birds of prey that can scare small birds. Some lasers work to repel small birds. This pest control is carried out by the PCO (external in collaboration with the company). The presence of electronic sounds makes birds afraid and does not approach the corn silo to minimize the presence of bird pests and reduce the breeding of flea eggs. This is done to maintain the quality of corn raw materials so that they remain very good.

### 3.3.6. Temperature and Humidity Monitoring

Temperature and humidity are some of the factors that cause the appearance of pests. Inappropriate temperatures will cause flea pests and fungi to multiply faster. Therefore, temperature monitoring is needed with a temperature sensor in the corn silo where corn raw materials are stored. In addition, there is also a humidity sensor that is used to find out the type of humidity. Temperature monitoring is checked every day at 08.00-10.00 am because it is a suitable time to check for pests.



**Figure 6.** Temperature Sensor and Humidity Check Activity

Figure 6. showing the temperature sensor and humidity check carried out on the raw material. Temperature sensor devices help workers monitor the temperature of raw materials in large quantities. Humidity checks are done using a thermometer. The function of checking humidity is to monitor raw materials to

avoid flea and fungal pest attacks because inappropriate humidity can trigger the emergence and reproduction of pests.

### 3.3.7. Maintenance

Maintenance can be done using sanitation, inspection, and routine maintenance. Sanitation is an effort made to prevent pest attacks and pest breeding. Sanitation is usually carried out in all raw material places such as silos and warehouses, raw materials are carried out routinely by applying chemicals by spraying and fogging.



**Figure 7.** PCO Officers Conduct Routine Inspections

Figure 7 shows the inspection activities carried out by the PCO Team. Routine inspections are activities that are carried out periodically to monitor conditions in the workplace. Routine inspections are carried out by inspecting parts in silos and raw material warehouses that are often detected to have problems such as transportation, chains, dryers, equipment, and machine parts that have a risk of experiencing problems. This routine inspection is usually carried out within 2 months. And routine maintenance is carried out by routine cleaning both in silos and raw material warehouses which is carried out every 2 months. As in the silo, it is done in such a way that if there is an empty silo, then before the corn is filled again, it will be cleaned first with the bottom cleaned manually until spraying and fogging are carried out in the silo.

### 3.4. Controlling

Controlling is a supervisory activity on the plan that has been implemented. Supervision is carried out to ensure that the plan that has been prepared has been implemented properly [9]. Supervision of the performance of the PCO, Fumigan, and Warehouse Teams is carried out every day at 17.00. The PCO and Fumigan teams provide reports to the Warehouse Team regarding the results of the work according to the planned schedule. This report serves to monitor whether the work that has been scheduled has been done well or not. If the work is not done properly, advice and warnings will be given. In the commemoration, there are 3 levels, namely WL (Warning Letter) level 1, level II, and level III in 6 months, if you make repeated mistakes, you will increase the WL level.

After the report, it will be evaluated on the suitability and effectiveness of the performance. This evaluation is carried out to provide input on pest control, namely:

1. The program runs according to plan or not.
2. Identify improvements to more effective pest control methods.
3. Identify and assess employee performance outcomes.
4. Assessing the benefits of the program in the long term.

The results of the evaluation assessed whether the pest attack was reduced or increased. The results of the evaluation also need to assess the possibility of new pest attacks due to the influence of environmental changes around the factory as well as corrective actions in dealing with pests that need to be carried out and others.

#### 4. CONCLUSION

PT. XYZ made a pest control management planning schedule and various control techniques, namely sanitation (spraying, fogging, gassing) for flea pest control, glue/adhesive traps for rat pests, yellow traps for fly pests, ultrasonic devices for bird pests, and temperature and humidity monitoring for fungal pests. Evaluations are carried out daily related to employee performance and the effectiveness of pest control methods to get maximum results.

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