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Enhancing YOUTH (18-26) Employability in Bakery Sector
2017-1-TR01-KA205-039233

# HYGIENE AND SANITATION HANDBOOK 2018




## TABLE of CONTENTS

## 1. GENERAL DEFINITIONS

### 1.1. CLEANLINESS

Cleanliness is to purify from the visible dirt in the production area by using water, air and various chemical materials in the bakery sector.

### 1.2. HYGIENE

Hygiene is the process of cleaning an environment from all sickness factors which may cause health problem. Hygiene process involves all the precautions to be taken in order to reduce microorganisms.

### 1.3. SANITATION

Sanitation is the creation of a clean and hygienic environment and making it sustainable.

### 1.4. HYGIENE AND SANITATION

Hygiene and sanitation process can't be divided each other in the bakery sector. Hygiene is the purification of the environment from microorganisms causing diseases, the other hand sanitation is the measure taken for cleaning and hygiene.

Sanitation is the purification of foreign substances, microorganisms, drugs, cleaning agents and all visible sources of pollution from the production environment .

## 1.5. THE IMPORTANCE OF HYGIENE AND SANITATION IN FOOD SECTOR

All kinds of food must be purified from any;

- physical pollution such as glass, metal pieces, stone, sand,
- chemical pollution such as liquid fuels, detergents and residual of drug,
- biological pollution sources such as bacteria and mildew to good quality, healthy and safety.

Contaminated food can cause quality problem and the other hand healthy problem can be observed. Hygiene and sanitation should be effectively applied and controlled at every step during manufacturing processes.

If quality control process are not applied effectively during manufacturing, these problems which are listed below can be observed.

- Decreasing number of sales and consumption
- Exposure to legal proceedings
- Loss of prestige
- Production lag
- Lack of motivation in the company
- Food poisoning or nutritional diseases
- Claim for damage

## 2. FOOD SAFETY

Food safety is protection to consumer from risk of food poisoning. Food safety covers all methods for destroying physical, chemical and biological of hazards. Food borne disease can cause a health problem for kids, pregnant and elderly consumers. Food borne disease may ends up with death.

There are 3 sources of contamination in food sector: Physical, Chemical and Biological.

- ➔ Examples of foreign substances, stalks, garbage, plastic, dust, soil, stone and metal contained in food are examples of physical contamination in foodstuffs.

- ➔ Chemical agents are not naturally found in the composition of food, but we can give examples such as substances, detergents, contaminants, disinfectants which are added during manufacturing.


➔ Biological pollution sources are bacteria, fungi, viruses, mildew, mice and insects.

All the pollution factors mentioned above are able to infect food at any step of food during manufacturing. For this reason, it is important to carry out effective control throughout the entire production process. Therefore, the supplier, the manufacturer, the ship unit, the sales unit and also the consumer are responsible for food safety.

Food safety and quality is regulated by applying food safety and quality programs in the bakery sector.

## 2.1. CONTAMINATION

Food contamination refers to the presence in food of harmful chemicals and microorganisms which can cause consumer illness. Contamination can occur directly with chemical, physical and biological agents, or indirectly through cross contamination.

Cross contamination is the indirect transmission of harmful agents to foods. For example, if you use the same knife for cutting a bread and a watermelon, this situation can lead to cross contamination.

## 2.2. STERILIZATION

Sterilization refers to any process that eliminates, removes, kills, or deactivates all forms of life and other biological agents present in a specified region, such as a surface, a volume of fluid, medication, or in a compound such as biological culture media. The purpose of sterilization is effacing all microorganisms.

## 2.3. DISINFECTION

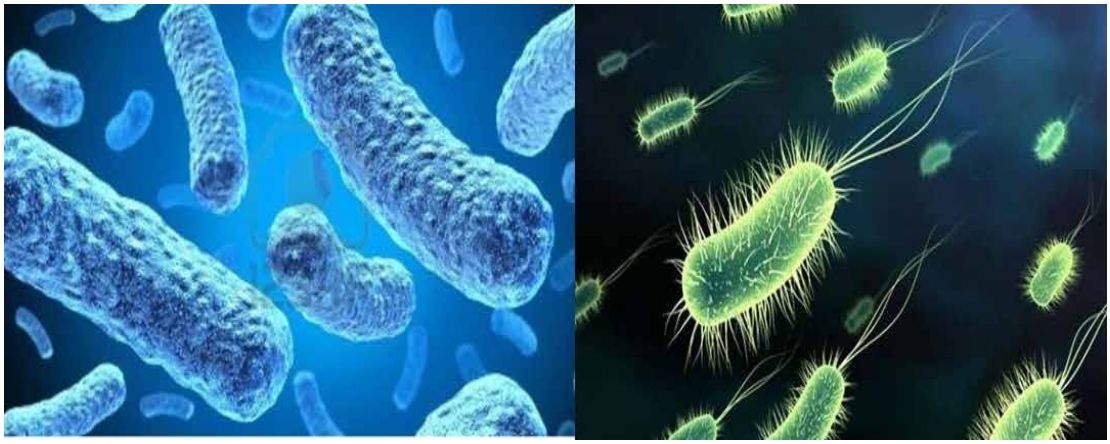
Disinfection is the process of purifying foodstuffs and surfaces that are contacted with foodstuffs from microorganisms except spores that can cause disease by various methods. It is made by chemical substances or heat. The chemicals used for disinfection are called "disinfectants".

## 2.4. FOODBORNE DISEASES

The accumulation of chemical substances, toxins, metals, agricultural and detergent residues in the body, parasites and harmful microorganisms cause food poisoning and foodborne diseases. Microorganisms, which are transmitted to foodstuffs from various sources, multiply rapidly under appropriate conditions. Microorganisms cause lacking qualities of foods and lead to foodborne diseases or poisoning.

High amounts of toxic chemicals are harmful to human health. If chemical agents are passed over the limitation, food poisoning can be observed. Thinner, bleach, salt spirit and other chemical agents sometimes could be toxic. However, mostly reasons of food poisoning are drugs and foods. Poisonous mushrooms, contaminated water with agricultural or industrial chemicals and foods that are not properly prepared can cause poisoning.

Metal containers that are unsuitable for food storage and that give toxic substances into food can also cause food poisoning. Foods should not be stored in untinned copper, aluminum, unsuitable plastic container.



Agricultural medicines can also contaminate food because of unconscious and faulty applications. Medicines, insecticides and rat poisons used against agricultural harms are generally known as pesticides. The reasons of drug poisoning are listed in below;

1. Applying pesticide, without any protection method,
2. Leaving pesticide where people contact by accident especially kids and also if pesticide mix with water or food this situation may causes drug poisoning.

Some food contain naturally elements compounds which are called toxine. Aflatoxin on the dried fruits, some types of poisonous mushrooms and sprouted potatoes can lead to food poisoning and other diseases because they contain natural toxic substances.

Bacteria, viruses and mildew are the main cause of many foodborne diseases. Inappropriate hygienic condition during manufacturing cause bacterial growth therefore

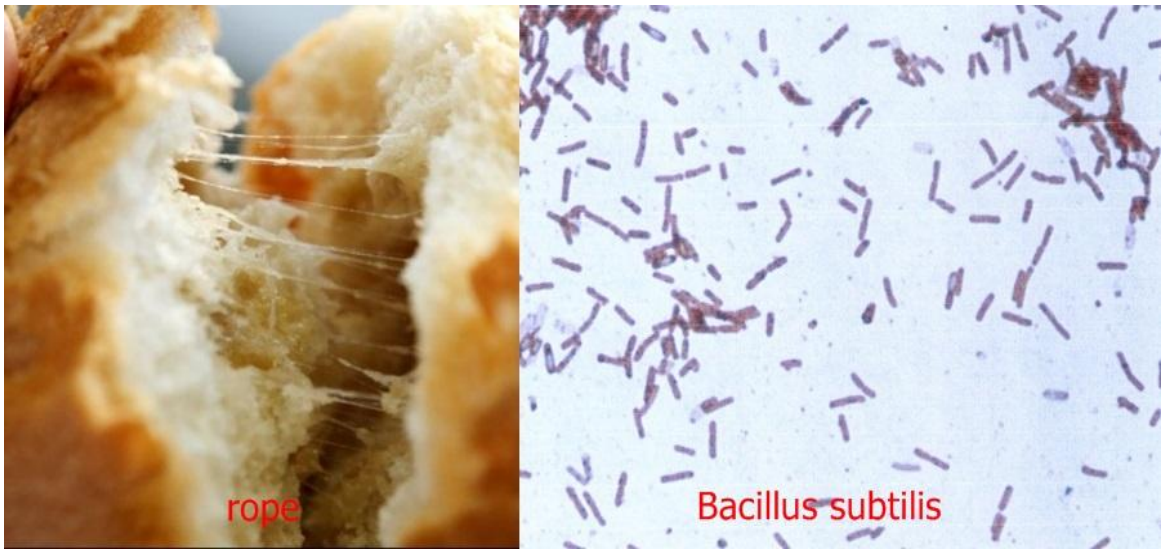
food poisoning can be observed. Such microorganisms may be originated from raw material, water, personnel and ventilation system, also they can be transmitted from the conditions after the food is produced. These microorganisms can cause epidemics such as Hepatitis A, typhoid. In addition, bacteria such as *Staphylococcus aureus*, *E. coli*, *Listeria*, *Salmonella*, and *Shigella* can cause food poisoning.

In every gram of wheat berry or farina could have microorganism spores about a million. Most of microorganism spores die during baking bread. However, while some disease-causing bacterial spores, which are very durable, remain alive, often afterwards they contaminate to the bread. Red stain disease caused by a bacterium that is transmitted later on the bread, and chalk disease that causes white stains on the bread are the diseases seen in the bread. In red spot disease, red stains appear on the bread, whereas in chalk disease, white stains occur. Both diseases can be prevented by providing the necessary hygienic conditions. The most common problem in the bakery sector is the disruption caused by Rope disease.

## 2.5. ROPE DISEASE

Rope is a bread disease caused by bacteria called Bacillus mesentericus and Bacillus subtilis. This bacterium makes resistant sports to high temperatures. The bacteria spores, which are activated after the dough has been made, remain intact when the temperature of the bread is not 100 degrees. These live spores multiply rapidly in the bread and begin to show bacterial effects. The enzymes that secreted by the bacteria decompose parts of the starch and protein in the bread. People smell musty from the inside of the bread on the first days. As the disease progresses, stickiness and odor increase in the bread. The starch becomes liquid and forms which are similar to long

strands when the bread is cut. Depending on the severity of the disease, symptoms occur within 1-3 days. In case of consumption of diseased products, it can also cause food poisoning cases such as nausea, vomiting, diarrhea and headache.




The disease usually seen in spring and summer months when the temperature and moisture increase.

- Slow cooling of cooked bread or crating without cooling,
- The pH value of the dough is at a suitable value (5 over) for the growth of the bacterium,
- If necessary precautions are not taken after the emergence of the disease, it causes the problem to grow.

The operations that need to be done are, firstly,

- All fields where the dough is found in the production area where the disease is infected are cleared with vinegar, alcohol or a suitable disinfectant,
- Reduction of the pH value of the flour by vinegar,
- Good cooking and quick chilling of the manufactured product,
- The use of preservatives to prevent bacterial growth,
- Making attention to the storage conditions of your plant in hot weather,
- It should not be stored in a bag in hot and humid environment.

## 2.6. MOLDINESS

One of the most common forms of deterioration in bakery products is mildew infestation. The temperature during the baking, destroys the entire microorganisms which will cause mildew in the pod and on the surface. Mildew can contaminate with breads in any area. These contaminated mildew begin to develop on the surface in humid weather. Especially during the summer months, the mildew coming from the breads stored in the bag is rapidly multiplied by the condensation in the bag. After a few days, white, green,

black round mildew colonies begin to appear on the bread. As time goes by, the mildew covers the bread surface in different colors from green to red.

On the bread to prevent mildew;

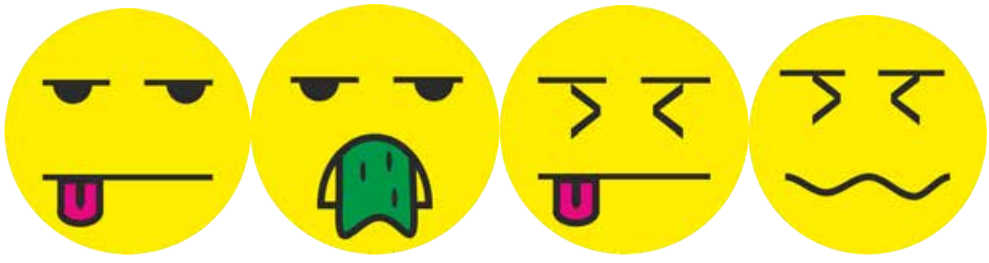
- Keep it as clean as possible,
- Quickly cooled,
- If the bread will not to be consumed, it hides in the fridge,
- Use of preservative substances,
- Disinfect the storage areas,
- The bread should not be stored in the bag.

## 2.7. FOOD POISONING SYMPTOMS

Inappropriate manufacture and storage condition can cause food poisoning. In some cases of poisoning, symptoms occur within 1 hour, whereas most symptoms of food poisoning occur within 12-48 hours and sometimes the period of time is 1 week. Poisoning usually takes 1-3 days, but in some cases it can last up to 1 week. Many people recover completely within a week.

The most common symptoms are vomiting, abdominal pain and diarrhea. The appearance of a few of the following symptoms suggests the suspicion of food poisoning.

- Nausea and vomiting and abdominal pain
- Headache
- Diarrhea can be bloody from time to time.
- Chills and fever
- Pain and fatigue



## 2.8. WHAT ARE SOURCES OF FOOD CONTAMINATION ?

Sources of food contamination; raw materials, transport, processing, storing and all kinds of physical, chemical and biological unwanted contamination, including food.

Pollution sources that cause undesirable deterioration in food:

- Soil-borne contamination passes through the raw material.
- Water. if contaminated water used
- Incompatible tools and surface contamination
- Negative information, attitudes and behaviors of producers and consumers about hygiene
- Pesticides and chemical contamination
- Contamination from microorganisms
- Inadequate personnel hygiene contamination caused by foodborne patient and carrier subjects
- Contamination due to inadequate production, processing and storage areas
- Use of common tools
- Contamination from sources such as instruments, equipment, packaging and ventilation systems used

## 3. HYGIENE AND SANITATION PRACTICES IN FOOD OPERATING

There are a number of precautions to destroy physical, chemical and biological damages in foodstuffs, when must be taken before production, during production and at the end of production. These precautions must be carry out during manufacturing, otherwise hygienic product can't be achievement.

## 3.1. HYGIENE AND SANITATION BEFORE PRODUCTION

There is a need for a structure which is free from physical, chemical and biological pollution sources, provided hygienic production conditions and has a suitable technological infrastructure in order to produce reliable and quality food. Before the manufacturing process get started, all stuff which are used for manufacturing process and manufacturing yard must be cleaned periodically. For this purpose, the check list which is about what the staff has to do before manufacture process starts has to prepared. The check list must announced and posted with staff. These forms must be filled by the person concerned and checked by senior supervisors. A sample form is shown below.

| | PRODUCTION START-UP CONTROL FORM | | | | | | | DATE | |
|---|---|---|---|---|---|---|---|---|---|
| | LINES | 1 | 2 | 3 | 4 | 5 | ALL LINES | EXPLANATION | COMPLETED OPERATION |
| | | INAPPROPRIATE | INAPPROPRIATE | INAPPROPRIATE | INAPPROPRIATE | INAPPROPRIATE | APPROPRIATE | | |
| MAKE-UP | Mixer Bowl | | | | | | | | |
| | Mixer | | | | | | | | |
| | Weighing Silo | | | | | | | | |
| | Salt Shelf | | | | | | | | |
| | Bowl Covers | | | | | | | | |
| DIVIDER | Hopper Covers | | | | | | | | |
| | Measuring Chambers | | | | | | | | |
| | Transfer Belts & Sealings | | | | | | | | |
| | Top & Bottom Hoppers | | | | | | | | |
| | Conical Rounder Teflon Coating | | | | | | | | |
| | Flour Tray | | | | | | | | |
| | PRE-PROOFER | | | | | | | | |
| FORMING | Cleaning of Dough Shaping Mould | | | | | | | | |
| | Cleaning of Dough Extruding Rollers & Belt Cylinders | | | | | | | | |
| SORTING | Cleaning of Belt Cylinders | | | | | | | | |
| | Cleaning of Chassis & Sections | | | | | | | | |
| PROOFER | Cleaning of Belt End Tray | | | | | | | | |
| | General Cleaning | | | | | | | | |
| | Cleaning of Belt | | | | | | | | |
| OVEN FEEDING CONVEYOR | Cleaning of Belt Tray and Floor | | | | | | | | |
| | Cleaning of Belt Edge | | | | | | | | |
| The Cleaning Control Form shall be filled in by Technical Personnel in line with the job description. Non-conforming situation shall be marked such that it will indicate the line, machine or equipment. If there are no non-conformities, the last box will be marked. Non-conformities shall be noted down in the Explanation part. Approver shall take a note for the correction of non-conformities and necessary actions. | | | | | | | | | |
| CONTROL | | | | | | | | APPROVAL | |
| TECHNICAL STAFF | | | | | | | | | |

According to this program, The hygienic control must carry out periodically and also saved. All "food contact surface areas" including the floor in the environment where foodstuffs are processed, the processing channels, the walls, all kinds of tools, machinery and equipment that come into contact with foodstuffs must be thoroughly cleaned regularly before starting daily work to protect food from contamination. The cleanliness of the ambient air should also be controlled in the workplace where microbiological contamination is important. The surfaces used for the production and storage of foods with low moisture content should always be dry and hygienic during use. When wet cleaning is required, these surfaces must be sanitized and must be thoroughly dried to use. The entire food contact surface in wet applications must be cleaned and sanitized absolutely before use or at the risk of any contamination . Those with portable properties should be stored in places where they will not cause any contamination risk to the food when not in use.

Equipment that does not have a contact surface with food should also be cleaned periodically. Raw and baked products must be prepared in separate rooms or on benches. The staff should be provided with a hygienic environment in all production areas.

Potentially hazardous foods should be processed shortly. Disposable gloves should be preferred when working with these foods, after which they should not be

touched before the hands are thoroughly washed. The person working in the food processing area must take care of personal hygiene while in working, the nails should be cut short, the handler should be kept clean and not open wound. Appropriate protective clothes including headgear, gloves and footwear should be worn during work. These garments should be easy to clean and kept clean. Pre-treatments should be done to prevent contamination (washing, sorting, stalking and cutting, peeling, shaping etc.) and should be protected from any physical pollutions (glass breakage, dropping of ceiling plaster, dripping from pipes) from outside. If boiling is necessary, it should be at optimum temperature and time and chilled quickly. The cell loses selective permeability during boiling and becomes unprotected against microorganisms. Water must be safe and hygienic for washing boiled product. Dough, sauce, coating products should be protected specifically against the risk of transmission. Therefore, uncontaminated inputs and additives should be used. Required heat treatments must be applied correctly for this purpose temperature and time controls should be done frequently.

### 3.2. PRECAUTIONS TO BE TAKEN DURING THE PRODUCTION

If foodstuffs are not processed in the appropriate methods and techniques, the following situations arise:

- Taste, color, consistency and appearance cause unwanted properties.
- The nutritional value loses.
- The hygiene quality is lost. It is a condition that can cause health problems and food poisoning.
- It causes the producer to lose market and reputation.

For these reasons, in particular, there are rules that must be applied during processing to ensure food hygiene. These rules can generally be summarized as follows:

- Do not eat anything, use tobacco, chew gum, spit and sneeze towards food, nor cough during production.
- Personnel items and clothing should not be kept in the areas where foodstuffs are processed, and no jewelry should be worn during production.
- The staff working in the processing of the food should change all protective clothing, wash their hands and, if necessary, disinfect them in the risk of infecting the end product.

Preventive actions should be identified for critical production steps that will not cause any contamination in the final product. Where there is a risk of contamination, the presence or level of contamination with appropriate chemical, microbial, physical analysis should be measured by the responsible person and should be applied. A documentation system should be established for all these steps, including records and applied transactions. All food production processes must be carried out under conditions and under the necessary controls to reduce the risk of microorganism contamination and development. For this, temperature, time, humidity, water activity, pH, physical parameters and freezing, drying, heat treatment, acidification and cooling should be monitored continuously. Raw materials, additives and rejected materials should not be stored in the loading and transport areas of the final product in order to prevent recontamination of the finished products by contact with raw materials and additives.

Contaminated product, raw material and other additives should be destroyed immediately for the safety of other products. However, if the contaminant is suitable for reprocessing, it must be processed with an effective method and the condition must be re-analyzed to determine that contamination has been eliminated without interfering with other products.

Processes such as filling, packing and collecting should be done in a way to protect the products against contamination, all food contact surfaces and containers should be thoroughly cleaned and sanitized.

Foods with low water activity, such as snacks, powder products, dry, moderately moist foods, dried products, should be processed at optimum moisture content specific to that product. In addition, moisture should not be allowed to exceed the safety limits. It should be checked that the pH value is 4.6 or lower in the acidified foods. For this, it is necessary to check the raw material, the intermediate product in the production process and the pH value of the final product, the amount of acid added to the low acidic food should be checked. No products intended for different consumption purposes (animal feeds, etc.) should be produced in production areas and lines of food produced for human consumption.

Preventive measures should be taken to prevent contamination of foodstuffs in the food processing area. For this purpose, protective clothing should be provided and kept for the visitors to obey all rules stated for the employees.

An example of a form for routine cleaning in food businesses is given below.

# CONTROL FORM OF CLEANING

| CLEANING AREAS / DATE | Cleaning of Control Panel | Cleaning of Fermentation Area | Cleaning of Production Office | Cleaning of Glasses | Cleaning of Belt Conveyor | Cleaning of Oven Surfaces |
|---|---|---|---|---|---|---|
| 01/08/18 | | | | | | |
| 02/08/18 | | | | | | |
| 03/08/18 | | | | | | |
| 04/08/18 | | | | | | |
| 06/08/18 | | | | | | |
| 07/08/18 | | | | | | |
| 08/08/18 | | | | | | |
| 09/08/18 | | | | | | |
| 10/08/18 | | | | | | |
| 11/08/18 | | | | | | |
| 13/08/18 | | | | | | |
| 14/08/18 | | | | | | |
| 15/08/18 | | | | | | |
| 16/08/18 | | | | | | |
| 17/08/18 | | | | | | |
| 18/08/18 | | | | | | |
| 20/08/18 | | | | | | |
| 25/08/18 | | | | | | |
| 27/08/18 | | | | | | |
| 28/08/18 | | | | | | |
| 29/08/18 | | | | | | |
| 30/08/18 | | | | | | |
| 31/08/18 | | | | | | |

### 3.3. PRECAUTIONS TO BE TAKEN AFTER THE PRODUCTION

The environment and employees must be clean and healthy for quality and healthy production, as well as effective and periodic cleaning and disinfection to be carried out in the operation. The role of cleaning and disinfection is great in preventing contamination (spreading) of microorganisms and preventing their negative effects.

Cleaning is the prevention of tools, equipment and various surface dirt and food debris that come into contact with food and turn them into growth area for microorganisms. Cleaning is the reduction of visible dirt and debris as well as all of the invisible microorganisms to the point where they are not killed or harmful.

All materials which had been used during manufacturing process must be cleaned and disinfected in periodically to make sure there is no any particular nor microorganism from the last process for purifying new product from the source of dirtiness. For this purpose, a control chart containing should be prepared at the end of the work in the field of production, these prepared schedules and forms should be filled in by the relevant persons and checked by top supervisors. A sample form is given below.

| | PRODUCTION COMPLETION CLEANING CONTROL FORM | | | | | | | DATE: | |
|---|---|---|---|---|---|---|---|---|---|
| | LINES | 1 | 2 | 3 | 4 | 5 | ALL LINES | EXPLANATION | ACTION TAKEN |
| | | INAPPROPRIATE | INAPPROPRIATE | INAPPROPRIATE | INAPPROPRIATE | INAPPROPRIATE | APPROPRIATE | | |
| MAKE UP | Mixer Bowl | | | | | | | | |
| | Mixer | | | | | | | | |
| | Weighing Silo | | | | | | | | |
| | Salt Shelf | | | | | | | | |
| | Bowl Cover | | | | | | | | |
| DIVIDER | Hopper Covers | | | | | | | | |
| | Measuring Chambers | | | | | | | | |
| | Transfer Belts & Sealings | | | | | | | | |
| | Top & Bottom Hoppers | | | | | | | | |
| | Conical Rounder Teflon Coating | | | | | | | | |
| | Flour Tray | | | | | | | | |
| PRE-PROOFER | | | | | | | | | |
| FORMING | Cleaning of Dough Shaping Mould | | | | | | | | |
| | Cleaning of Dough Extruding Rollers & Belt Cylinders | | | | | | | | |
| SORTING | Cleaning of Belt Cylinders | | | | | | | | |
| | Cleaning of Chassis & Sections | | | | | | | | |
| PROOFER | Cleaning of Belt End Tray | | | | | | | | |
| | General Cleaning | | | | | | | | |
| | Cleaning of Belt | | | | | | | | |
| OVEN FEEDING CONVEYOR | Cleaning of Belt Tray and Floor | | | | | | | | |
| | Cleaning of Belt Edge | | | | | | | | |
| The Cleaning Control Form shall be filled in by Technical Personnel in line with the job description. Non-conforming situation shall be marked such that it will indicate the line, machine or equipment. If there are no non-conformities, the last box will be marked. Non-conformities shall be noted down in the Explanation part. Approver shall take a note for the correction of non-conformities and necessary actions. | | | | | | | | | |
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| TECHNICAL STAFF | | | | | | | | | |

Some of the microorganisms that are taken from the places where they are cleaned and released are spread more with the water and they reproduce in this new environment and have negative effects on the next production. For this reason, the cleaning to be done in the organizations must follow an appropriate disinfection process.

For this;

Disinfecting products must be used in the cleaning process or a disinfection process must be performed after the cleaning process.

All kinds of places, surfaces and equipment in contact with food must be disinfected in terms of food safety.

In cleaning and disinfection of surfaces and equipment in contact with food;

- Detachable parts are removed, cleaned, rinsed and disinfected and allowed to dry.
- Residues and coarse dirts are removed.
- A suitable and effective detergent solution is prepared.
- The surface and equipment are cleaned and rinsed with the prepared detergent solution
- All surfaces and equipment are wiped with prepared disinfectant solution.
- It is wiped with disinfectant solution.
- It is held for 5 minutes, rinsed and dried.
- Heavy oil and dirt cleaning; general cleaning products and processes require cleaning products that can not be cleaned, that are sticky, burned, gelled, or stronger when cleaning dirt.
- Oven, stove, grill, fryer, hood, filter, heavy soiled surface and soils are included in this group. For such dirt on detachable parts, pressing can also be done if necessary. The products used to clean heavy dirt and oils are highly alkaline products.
- During the application of these products;
- Products should not touch the skin.
- Gloves, glasses, masks, bones, etc. protective materials must be used.
- Products should not be sprayed on very hot surfaces to avoid exposure to alkaline vapors.

### 3.4. PEST CONTROL OF FOOD INDUSTRY

Taking a series of precautions starting from raw material to reaching the consumer in food production is of great importance in terms of food hygiene. One of these measures is an effective struggle against foodstuffs that damage food and food in various ways. It is called any kind of harmful animal pest that infects the disease agents of your body in various ways. Many pest species cause the disease to spread to humans in a variety of ways, leading to the emergence of important diseases and also to the loss and degradation of economic values of food. The company should struggle with pestles for this reason.

Pests are usually collected under 3 groups. These are:

#### 3.4.1. Insects

Ants, cockroaches, flies, bears, spiders …

In this group of creatures, microorganisms that they carry are transmitted to production and products by means of both other food and equipment, leading to the formation of epidemic diseases, the products being more rapidly deteriorated and economic values being lost.

It is known that the most important lossy sundae (eurygaster spp) and pestilence (aeilla spp) are caused by the baking sector. It is known that the enzymes left in wheat during the two pest development periods lead to serious problems in bread production. The physical structure of the dough made from the flour obtained by the breakage of the wheat which has suffered the destruction is deteriorated, the gas holding ability is decreased, the dough becomes sticky, the melted dough is formed and consequently the broken breads are formed. In the growing period of wheat, it is possible to eliminate the damages caused by such an effective struggle.

### 3.4.2. Rodents

Mouse, rat...

Mouse type rodents, especially seen in food deposits, are at the forefront of pests that need to be struggled against due to damage to raw materials and, if necessary, disease-causing microorganisms.

### 3.4.3. Birds, Domestic Animals and Wild Animals

In general, the following measures must be taken in the fight against pestles.

- All doors and openings to the outside need to be closed to prevent entry of harmful substances.
- Mechanically or adhesive mouse traps should be placed at appropriate intervals in the production area, traps should be checked regularly.
- Effective struggle must be carried out to prepare a pest control program.
- Drugs used against harmful should be stored in separate spaces so that they do not contact with foodstuffs.
- It should be periodically spraying or supported by a sprayer.
- If the spraying is to be done by the workplace, the necessary training should be taken in this regard.
- Drug formulation should be recorded.
- Medicines used in the fight against pests must be approved by the relevant legal authorities.
- Necessary preventive measures must be taken against the animals and pests that cause contamination.
- Domestic animals must not enter where the food is prepared or treated.
- Products that have been exposed to pests must be destroyed.

## 4. PERSONNEL HYGIENE

The most important factor in ensuring sanitation in a food operation is the hygienic condition of the personnel involved. Because one of the most important contamination sources in food enterprises is the person working in production. Personnel can carry a number and variety of microorganisms that can directly infect food during preparation, processing, packaging and transport phases. Staff's breathing, saliva, and wounds can be the source of the infection in addition to many external factors such as hands, clothes, hair, mustache, accessories. It is stated that the staff can release between 10,000 and 100,000 microorganisms per a minute. For this reason, personnel hygiene and education are important. In general, humans are the first source of contamination for foods. Personnel have very important responsibilities in terms of human health. The most important role of the factors that may cause the disease in the food contamination is the staff. From the acceptance of the raw material to the transportation, the staff is responsible for all stages of the production as well as cleaning, disinfection, control, conservation and own health. The employer has to inform the staff with the appropriate training programs for the responsibilities that the staff must bear. These responsibilities include:

### 4.1. RULES FOR THE PERSONNEL

1. The personnel should pay careful attention to cleanliness, protect their health and take care to maintain this situation by taking nourishment adequately.
2. The personnel should make efforts to avoid respiratory infections, gastrointestinal disturbances and physical illnesses in particular.
3. All kinds of wounds such as cuts, burns, boils and skin rashes must be reported to the employer.
4. Personnel should strive to comply with hygienic rules and make it a habit.
5. If personnel get an illness such as colds or bronchitis, Personnel should notify the managers about the their situations.
6. Personnel should obey the hygienic rules;
    a. Take a shower each day
    b. Wash their hair at least twice a week
    c. Change their underwear every day
    d. Pay attention nail cleanliness
    e. Dress work clothes up before starting work every day
    f. Use hat and bones during work
    g. Not wear jewelers or rings that could fall into the food, or containers.
7. If the soaps and towels in the toilets have been exhausted, the employer must notify the manager for reinforcement.
8. If there are habits such as scratching the head and other parts of the body, mixing the nose, they should abandon these habits.
9. The mouth must be covered during coughing and sneezing.

10. Normally, a worker working in production must wash his hands at least once in each two hours.

Additionally, in the workplace;

- When personnel go to the toilet,
- When personnel touch the garbage or the contaminated materials,
- When personnel touch the money,
- When personnel touch the unheated food,
- After the break time,
- After smoking,
- After coughing and sneezing,
- After using the tissue,

The staff must wash their hands with a disinfectant soap.

11. Staff should not touch raw food with bare hands
12. Bans on smoking, chewing gum must be strictly observed
13. Access to non-authorized persons should be prevented.

14.Staff should work with  hygienic clothes and equipment.

## 4.2. EMPLOYER RESPONSIBILITIES

The employer's responsibilities start in the staff recruitment process. The staff should be sure that they have passed the health check and are not infectious. It should be regularly checked by health inspectors and patient personnel should not be allowed to work. The examinations should be strengthened by x-ray, blood analysis, parasite and tuberculin tests. Personnel should be supervised during operation and provided compliance with hygiene regulations. Jewelers or accessories should not be allowed inside the premises. Working clothes are so important for hygiene. The employer should ensure that the clothes are clean, ironed and plain. Light colored dresses should be preferred because they show dirt.

The employer should establish periodic training programs that include production and hygiene issues, and develop personal hygiene habits in these training programs. Warning signs, notifications and sanitation programs should be supported in the work environment. Due to good hygiene and sanitation practices, the personnel should be supported and encouraged.

One of the most important tasks for the employer to ensure all of this is to have adequate and social facilities designed in accordance with sanitation rules in the organization.

## 5. OPERATING STRUCTURE AND DESIGN

### 5.1. PROPERTIES

In a food operation; all tools, equipment and reusable containers used in production and in contact with food must be easy and well cleanable, disinfectable, smooth and free from contamination, in accordance with the requirements of health. These should always be kept clean and properly disinfected if necessary.

Hygienic equipments must be available at the production entrance.

- Materials, tools and equipment used in accordance with production technology must be resistant to heat, steam, acid, alkali, salt and other substances.
- Repair, paint, whitewash and periodic maintenance of buildings, installations, materials, tools and equipment should be done without interruption.
- The workplace should be installed in such a way as to prevent the entry of harmful organisms and environmental pollutants.
- The area of the production area should be waterproof, non-slip, washable, non-cracking, clean and disinfection-compatible, and have sufficient leaning to allow liquid wastes to flow based on the nature of the workplace.
- The walls should be made of smooth and light-colored material, not cracked, easily cleanable and disinfected, which does not penetrate water, washable, does not allow harmful living things to settle according to the nature of work done.
- Windows and similar open spaces must be constructed so as not to allow contamination, thinly porous, easily cleanable, dismountable and permanently cleanable.
- The doors should have a smooth, waterproof surface, self-sealing and leakproof as the case may be.
- Apart from the unavoidable circumstances, cleaning and disinfecting power materials such as untreated wood should not be used.
- The water used in production must be of a potable and suitable nature. Proper installation must be available for continuous and adequate supply of water, storage, control of pressure and temperature.
- The waste system of the workplace must be arranged in such a way that it is not affected by corrosion, its cleaning and maintenance can be easily carried out, and it must be capable of removing the amount of liquid waste.
- The social facilities and toilets at the workplace must be separate from the food processing areas. Toilets should not be opened directly to food production areas. Toilets should be designed in such a way that the hygiene rules of the articles are properly removed, and hygiene rules warning signs must be

provided in these areas. In accordance with the nature of the production, it is necessary to install a washbasin with taps suitable for mixing hot and cold water. Liquid soap, dryer or paper towel should be available and measures should be taken to disinfect the hands if necessary. The dining hall must comply with hygiene regulations.

- First aid equipment should be available at work.
- Safety sections with animals must be separate from production and storage facilities.

- Harmful anti-inflammatory drugs or other substances that may put health at risk should only be stored in lockable chambers or cabinets used for this purpose.
- Protective precautions should be taken for all materials to be broken in the production area.
- The workplace should be installed in such a way as to prevent the entry of harmful organisms and pollutants such as dust and fumes.
- There must be a closed solid waste storage place suitable for washing and disinfection that is suitable for proper collection of solid wastes according to the characteristics of the workplace.
- There should not be any suitable places for the accumulation of water and harmful living things in the trash and waste piles that will cause pollution around the workplace.

- The raw material must be stored on a suitable material at a certain height and humidity that does not contact the substrate, additives and other auxiliaries, tools and equipment and the packaging material individually and on conditions to prevent degradation.
- When manufacturing equipment is placed in the production area, gaps should be left to allow inspection and cleaning.
- When the machines are installed, all connection points must be closed so that no clearance is left.
- The ground on which the machines are installed must be accessible for the cleaning operation or must be completely closed.
- When the equipment passes through sections such as ceilings, floors, walls, etc., adequate clearance must be provided between the equipment and the wall for cleaning, and the wall must be mounted so that there is no space left in the machine.
- The auxiliary equipment must be detachable and re-mountable to facilitate cleaning.
- The manufacturing area must be covered with hard, smooth, easily cleanable and non-absorbent material.
- For insulation, non-absorbent material should be used. These surfaces must be accessible.
- When products are stored, they should be stacked on pallets with a distance of at least 100 mm from the ground.
- The doors and windows opening out of the production area must be insulated to prevent any contamination from the outside.
- Sufficient ventilation should be provided in the washing rooms.
- Water and water vapor, which come in direct contact with the product, must be drinkable.
- Pipes, valves and fittings that are used for liquid materials should be easily installed and dismantled.
- All fixed pipes must be sealed to prevent condensation.
- The drainage systems for the wastewater should be installed in the cleaned areas.
- The ground slope should be such as to prevent water accumulation on the surface.
- The lighting lamps must be protected to prevent falling and breaking.
- Electrical wiring must be secured (ground contact must be avoided).
- The electrical parts of the machines must be closed to prevent dusting.
- Water must be prevented from entering the electroluminescent panels.
- Machine parts, such as fans and motors, must be accessible.
- The motor and other auxiliary equipment must be positioned so that it does not touch the ground.
- Use of wood should be avoided.

Production enter must be controlled and required equipment must be available. A picture should be used for guests as follows.

## 6. WATER HYGIENE

Air, water, heat, light and nutrients are essential elements for the survival of living things. At the beginning of these elements are oxygen and water. The cells that make up the living organism need aquatic resources to sustain their life activities. Water is one of the most compelling materials for life. Water hygiene does not engage with the qualities of water used for drinking alone. It also relates to the determination of the qualities of waters to be used in production and domestic works, the prevention of water pollution and the disinfection of waters. The relationship between water and health are related each other. Therefore, in order to be able to decide a clean water with hygienic qualities and evaluate the required qualities thoroughly, the source of the water must be well known in advance. Biological agents that can be found in the water and are detrimental to human health include pathogenic bacteria, viruses and parasites. The infections caused by the waters are spread around by the patients and the porter. Depending on many factors such as the geographical location of the area, infrastructure facilities, the process of the waste materials, and the socio-economic structure of the community, pathogenic bacteria and other microorganisms reach the waters with faeces and the like. Drinking water is the most important ring of the oral-fecal infection chain. Avoiding bacterial contamination of large quantities of water is possible by disinfecting the water. Scientists and health care providers are working to get clean water, setting water standards, and setting specific criteria for water that is drinkable and usable.

### 6.1. IMPORTANT MICROORGANISMS TRANSMITTED BY WATER

Waterborne outbreaks are called water epidemics. Salmonellae, Vibrios, Shigellas Anthrax, Burcellose, Ruam and many other pathogenic bacteria and viruses that can cause dangerous water epidemics can be mixed with the feces of the portraits. As a result, cholera, typhoid fever, dysentery and infectious hepatitis can occur.

## 6.2. CAUSES OF WATER CONTAMINATION

Water is naturally clean when in the air. However, this clean water is polluted by taking the gases, dust, radioactive sprays and microorganisms present in the layers of polluted air that pass through the ground as it falls on the earth in the form of rain, snow or the like. Its chemical structure comes from being purified water. Water may contaminated by taking organic, animal and plant organic residues, agriculture, industry, sewage and nuclear pollution in the course of passing through the depths.

The potable water should, at least physically, bear the following qualities:

a. The water is not blurry,
b. Be colorless
c. It must be odorless, have a unique taste.

## 6.3. WATER CLEANING

The water properties of chemical, physical and microbiological, should be completely clean, free from any odor, odorless, colorless, harmful substances and no pathogenic substances in it. Taking off the these dangerous factor is called water cleaning.

Cleaning of the water is divided into 3.
These are:

1. Physical cleaning: removal of odor and blur
2. Microbiological cleaning (disinfection of waters)
3. Correction of chemical defects

This phase is the most important phase of cleaning the waters. The disinfection of the processing water is carried out in order to destroy the organisms, which disturb the color, smell and taste of the water with the pathogenic bacteria that make the disease in the water. Physical and chemical methods are used to kill pathogenic microorganisms in the water.

### 6.3.1. Physical Methods

#### 6.3.1.1. With Heat

If water is boiled for 10 minutes at 100 °C, all microorganisms that can cause water epidemics in the body die. Although some sporicidal microorganisms are based on these temperature gradients, they have no hygiene.

#### 6.3.1.2. With Ultraviolet Light

The ultimate effect of ultraviolet light on microorganisms are very high. Various systems (Nogier and Lacarriere lamp) are available for this purpose. Since the ultraviolet effect lasts for some time after the water has been irradiated, it should not be used immediately to take advantage of this effect.

### 6.3.2. Chemical Methods

Mostly chemical methods are used for water disinfection. The effect of chemical substances on microorganisms in the water is high, cheap, easy to apply.

## 6.4. CHEMICALS USED FOR WATER DISINFECTION

### 6.4.1. Ozone

Ozone is a form of oxygen that is a very active oxidant and a very strong bactericidal gas. It has a superiority over all other disinfectants. The excess is not harmful. Venting is enough to remove the ozone from the water. Ozone can degradates bacteria. Oxidation of organic substances makes it impossible for later bacteria to develop. The ozone's superiority is quite high. They provide a quick disinfection in 10 minutes; the water gives no taste disorder and is harmless. The bactericidal effect is 10 times faster than the chloride. Kroll is more effective against sports and cysts.

### 6.4.2. Iodine

It is applied in hot countries. Bacteria and protozoans are destroyed. The high bactericidal effect of iodine found in nature is exploited. This method is required to be filtered before the water to be applied is clear.

### 6.4.3. Potassium Permanganate

Especially effective in cholera outbreaks. It can also be applied in fuzzy waters. It does not change the taste of the water. After filtration, clear, colorless and clean water is obtained.

### 6.4.4. Chlorinated Lime (limestone, javelin, calcium hypochlorite)

Although the waters can be disinfected with the chemical substances described above, it is the most suitable chemical for the disinfection of water that is needed by large human communities. Chlorine was discovered in 1774 by a Swedish chemist named Scheele. It was first used by Houston in 1904 for the disinfection of drinking water in Lincolin. Chlorine is yellowish-green colored air 1.5-2.5 times heavier, pungent irritant. One liter of liquid chlorine is assumed to form 455 liters of gas. Chlorine bactericidal effect is a physico-chemical phenomenon. By acting on the membrane of the chlorine microorganisms, the chloramines from the amino acids present in the proteins of these proteins prevent the growth and development of microorganisms.

### 6.4.5. Correction of Water Chemical Deficiencies

Some of the chemical substances that they have dissolved from the soil layers that they have passed through the waters are very beneficial because of their ability to maintain their body needs and others cause technical and economical problems in water plants or usage areas or they can be directly harmful to health. On the other hand, industrial wastes and residues can be mixed with poisonous substances or mixed with war and murder from the cupboards. Such waters need to be chemically corrected. A variety of chemicals are used for this type of cleaning.

## 7. GOOD MANUFACTURING PRACTICES

Good manufacturing practices in food industry are a quality control system that supervises the processes of production, storage, distribution and consumption of products. This system can be easily applied in many different sectors. The general characteristics that a production facility to be installed according to good production practices should carry are as follows.

| Building, ground and environment design | Hygiene and sanitation | Protection |
|---|---|---|
| Water, ice and steam to be used at work | Cleaning and disinfection | Control of domestic animals |
| Liquid waste lines | Health check | Fighting harmful creatures |
| Social facilities and toilets | Disease notification | Staff education |
| Lighting | Personnel statements and behaviors | |
| Ventilation | Surveillance | |
| Storage and disposal of solid wastes | Visitors | |
| Workplace surroundings | | |
| Raw material purchase locations | | |
| Storage | | |
| Lab | | |
| Fuel tanks | | |


### 7.1. GOOD MANUFACTURING PRACTICES FOR FOOD SECTOR

The increased expectation of safe food brought with it many applications. It is possible to increase them as good agricultural practices, good hygiene practices, good production practices. The best production practices, which is the oldest from these

applications, are a series of techniques that must be applied seamlessly in raw material, processing, product development, production, packaging, storage and distribution phases to ensure quality in products, which is the basis for the production and distribution of food products.

Good manufacturing practices, which can be defined as practice standards to ensure food safety and utilization, were first proposed by the FDA in 1967 for food products. The European Food Authority, HACCP, Good Hygiene Practice (GHP) and GMP systems, which began its activities in 2003 in the EU, have also entered into force legally. This law covers candidate countries and third countries engaged in trade while taking responsibility for EU countries. Turkish Food Legislation has passed many developments and innovations. A significant part of the legislation constitutes the Turkish Food Codex. This codex has been harmonized with the Codex Alimentarius of JECFA (Joint FAO / WHO Expert Committee on Food Additives), FDA and EU directives. HACCP and GMP are going towards the reliability approach applied by quality systems of the Turkish food system. Good production practices will facilitate the implementation and monitoring of the country's food industry in order to fully demonstrate its performance.

## 8. FOOD SAFETY MANAGEMENT SYSTEMS

It is necessary to establish systems related to hygiene, sanitation and preventive maintenance in order to ensure health safety in food industry. Sanitation can be considered as part of quality control. Sanitation programs must be put in place to ensure cleanliness of the installation, microbiological quality of the raw material, health and reliability of the products cause of sanitation has an important role in the formation of quality.

Various programs are being implemented to ensure quality, especially in terms of microbiological safety of food. The most common are HACCP, GMP and ISO 9000, 22000 series.

### 8.1. HACCP (Hazard Analysis Critical Control Point)

Hazard Analysis and Critical Control Points define as a system that identifies, evaluates, and controls the hazards that are important to food safety.

The main work on the HACCP issue started with applications in 1959, NASA's space programs. NASA intended to provide 100% safety of the food it sends with astronauts with this work.

HACCP implementations have been enacted in 1993 and entered into force in the EU countries.

GMP (Good Manufacturing Practice) good manufacturing practices: These are application standards that ensure the safety of food. The experience gained in food operation, including design and construction possibilities, as well as processing storage, sanitation control procedures and records, and thus the product is handled in all aspects.

The applications of the ISO 22000 Food Safety Management System standard is an improved version of the HACCP Standard, which was published as an international standard and started to be implemented as a mandatory standard in the EU;

Production, product and equipment control
Maintenance and general hygiene practices
Staff and visitor hygiene
Transportation, storage, product information
Supplier selection and evaluation
Education, communication, etc.

The basic aim of ISO 22000 Food Safety Management System is determining the sources of risk that cannot be removed from the production process errors for ensure product quality and consumer health.

Basically, ISO 22000 not only provides food safety, but also sensory and nutritious


quality enhancement and production, as well as quality assurance in service and service applications. In the Food Safety Management System, everybody is given responsibility after production and more motivation is provided with more participation. Additionally, resources are more efficient (profitable) and losses are reduced and the enterprise is moving toward total quality system.

## 8.2. STANDARD SANITATION OPERATION PROCEDURES (SSOP)

Standard Sanitation Operation Procedures are written procedures for defining sanitary conditions in food enterprises and as well as for defining sanitary conditions to ensure a healthy and safe product.

Sanitation checks can be done in 2 ways:

1. Internal audit: Sanitation should be included in the quality assurance program and explain to audit how could be. When an inspection program is being carried out, areas and storages should be included in this program. In the audit, each section should be handled separately and the status of before and after sanitation must be specified separately on the report.
2. External audit: When the operation is audited by an external auditor or expert, a good review should be made in terms of sanitation.

The areas covered by the audit are:

- Control of the operation environment
- Control of food processing departments
- Warehouse control
- Locations outside the producing areas
- Basement and roof
- Control of personnel and facilities
- Sanitation applications control

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