Cereal processing

Level-II

Based on October 2019, Occupational standards Version 2

Module title: Operating a Dough Making and Freezing Process

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LG #39	LO #1- Preparing dough making equipment and process for operation

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Ingredients are weighed or measured to meet recipe requirements.
- Identifying Cleaning, maintenance and service requirements and status
- Handling mixing/blending equipment
- Processing/operating parameters
- Checking equipment performance

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Weigh Ingredients or measured to meet recipe requirements.
- Identify Cleaning, maintenance and service requirements and status
- Handle mixing/blending equipment
- Process/operate parameters
- Check equipment performance

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1 - Ingredients weighting or measuring

1.1 introduction

Dough is a thick, malleable, sometimes elastic paste made out of any grains, leguminous or chestnut crops. Dough is typically made by mixing flour with a small amount of water and/or other liquid, and sometimes includes yeast or other leavening agents as well as other ingredients such as various fats or flavorings.

The process of making and shaping dough is a precursor to making a wide variety of foodstuffs, particularly breads and bread-based items, but also including biscuits, cakes, cookies, dumplings, flatbreads, noodles, pasta, pastry, pizza, piecrusts, and similar items. Dough are made from a wide variety of flours, commonly wheat but also flours made from maize, rice, rye, legumes, almonds, and other cereals and crops used around the world.

The ingredients as per the formula re mixed either by hand or by machine called' ' Kneader. For the best results the ingredients should be mixed in certain order thoroughly.

There are two methods for mixing.

- ✓ Straight Dough Method and
- ✓ Sponge Dough Method

There are two common ingredients in dough making process those are

- ✓ Wheat flour
- ✓ Water

Both water and flour must be weighted and measured according to final product

1.2 Weighting of flour

- ✓ All official weighing of loose cereal is performed on bulk-weighing scales. A diagram of such a scale follows. The flour is weighed in a bin called the "Weigh Hopper," which in modern automatic scales is supported by load cells.

The load cells generate an electrical signal proportional to the weight they support. A device called a "Scale Indicator" supplies power to the load cells, sums their output, and produces a digital signal which represents the combined weight of the grain and weigh hopper. The flow of grain into or out of the weigh hopper is controlled by slide gates. A scale control computer records the output of the scale indicator, subtracts off the weight of the hopper itself, and operates the gates.

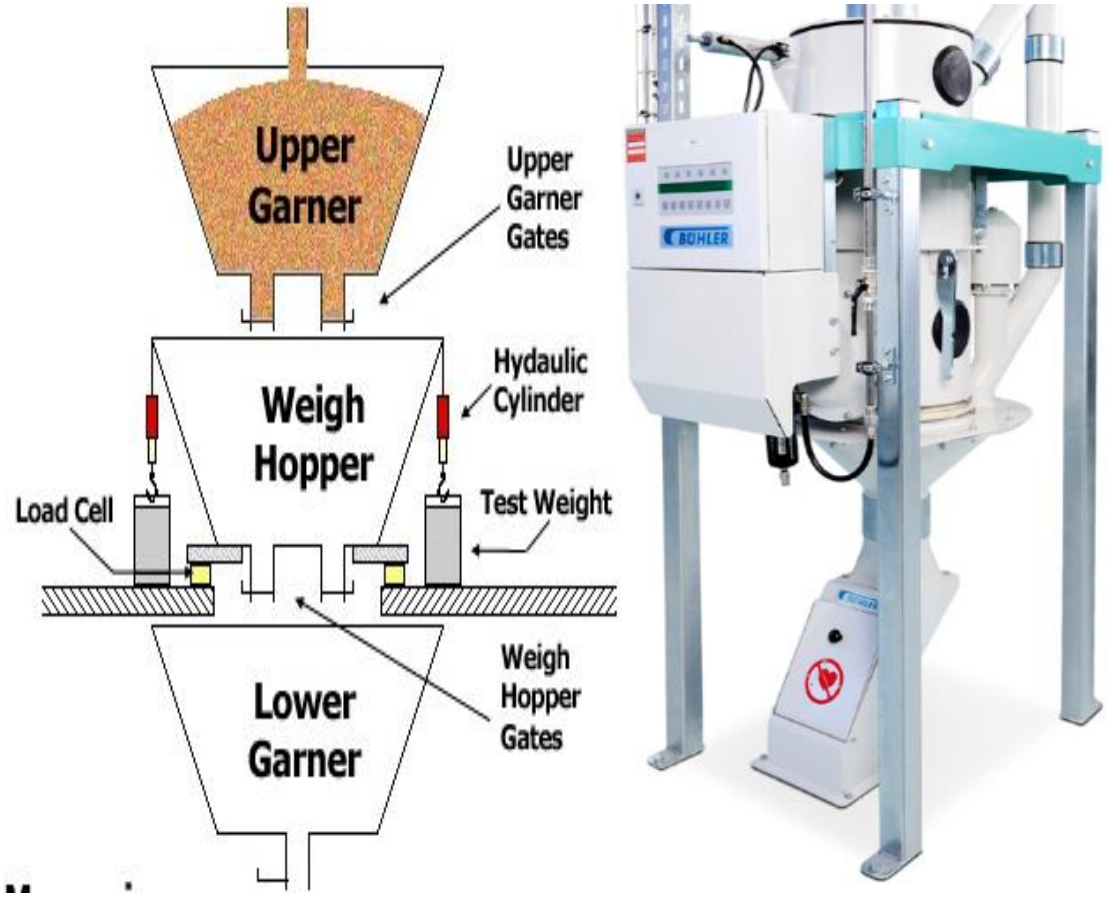

Fig 1: flour weighting scale

The scale is shown going through its normal weighing cycle.

The weight of the empty weigh hopper is measured with the upper garner and weighs hopper gates closed. The scale indicator sends the tare weight to the scale control computer, which waits until the weight readings are stable, showing that the weigh hopper is not moving and grain is neither entering nor leaving the weigh hopper, and records the tare weight. During this time, grain being carried to the scale

accumulates in the upper garner. The storage available in the upper garner keeps the elevator from having to constantly stop and start its conveyors.

After the scale control computer has recorded a valid tare, it opens the upper garner gates to allow grain into the weigh hopper. The indicator continually sends weight readings to the computer, which closes the upper garner gates when the weight passes a pre-set cutoff value. The computer again waits until the weight is stable and records the weight of the grain and hopper combined.

After recording a valid gross weight, the scale control computer opens the weigh hopper gates. Grain drains rapidly into the lower garner, which normally is simultaneously discharging to a duct or a conveyor. The lower garner discharges the grain at a slower rate than the weigh hopper, preventing it from overloading the conveyors downstream. When the weight readings from the indicator go below a pre-set lower cutoff value, the computer closes the weigh hopper gates and records another tare. Then the cycle repeats.

The net weight of the grain is the difference between the gross and the tare. When a scale is receiving inbound grain, the control computer takes a gross weight and subtracts the preceding tare weight to obtain the net weight. This gives the true net weight received, because any grain already in the weigh hopper at the beginning of weighing is subtracted out and not counted. When the scale is weighing outbound grain, the computer takes each gross and subtracts the following tare. This gives the true net weight of grain shipped, because any grain remaining in the weigh hopper at the end of weighing is subtracted out and not counted.

Fig 2: control system for weighting.

Ideally, two sets of scales are used, one weighing up to 5 kg with an accuracy of +/- 1g to weight small amounts of ingredients and a second weighing up to 20-50 kg having an accuracy of +/- 200g for flour. However, scales are expensive and it is cheaper and faster to replace smaller accurate scales with calibrated scoops, cups or other measures, which contain the correct quantity of an ingredient when filled level with the top. Operators should be trained to ensure that they use them properly to measure consistent weights. The scales have no spare parts or routine maintenance. They should be cleaned after use using a damp cloth

1.3 water or steam controlling

In cereal processing (pasta and macaroni) dough is maked by addition of partially hot water with flour in mixing tank therefore an operator should have to be control the amounts and temperature of water by water injector.

Steam injector operates by injecting steam directly into the water for an efficient transfer of heat – 100% of the available energy from the steam is instantly absorbed by the liquid.

The tremendous amount of energy available in the steam makes it imperative that the energy be dissipated quickly into the fluid to maintain stability. The Pick DSI Heater accomplishes this by dispersing the steam in many fine streams through precisely arranged orifices for rapid mixing and instantaneous heat transfer. As the

steam enters the internal injection tube, it acts against a spring-loaded piston to expose some or the entire pattern formed by the orifices. As the steam input varies due to load changes, the piston modulates to adjust the number of exposed orifices, providing rapid response to process changes.

The spring-and-piston arrangement prevents equalization of steam and liquid pressures, eliminating harmful shock and vibration. The helical flights inside the chamber ensure complete and thorough mixing of steam and liquid.

Fig 3: water injector

Note:

1. Water (or water-miscible liquid) enters mixing chamber here.
2. Set controller to desired outlet temperature.
3. Modulating steam control valve is activated by the temperature controller.
4. Steam and liquid mix instantly and thoroughly within the heater body.
5. Heated liquid outlet.

If steam are generated from boiler the following point must needed in water injection

The basics for proper operation require that an injector:

- Must have an unrestricted and controllable steam feed.
- Must have a smooth and unrestricted water feed.
- Preferably have a water filter on the inlet side.

- Must be absolutely sealed and air free on the water feed side.
- Should have a 'dry' steam supply from the highest part of the boiler.
- Must have a clear and unrestricted path in the delivery to the boiler.
- Must have a check valve for delivery to the boiler.
- Must have an overflow open to the atmosphere. (take care during installation that the over flow drips onto the ground and NOT onto the rails)
- All pipework should be smooth bends rather than elbows, and no sharp corners.

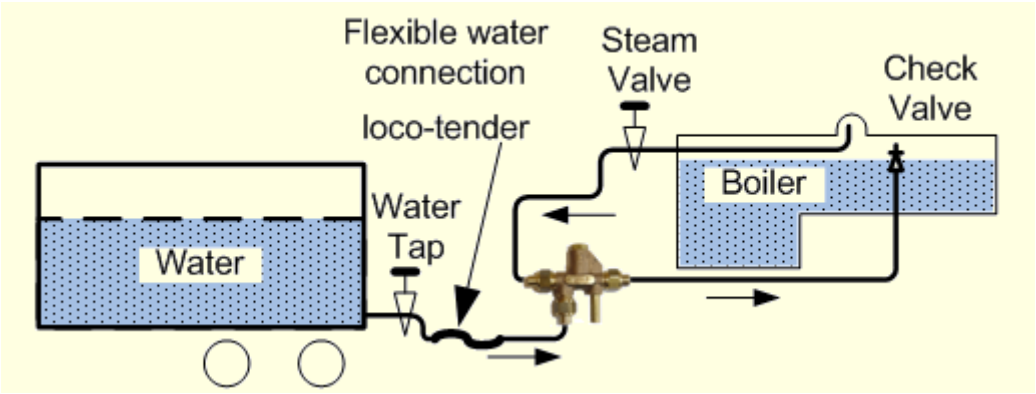

Fig4: steam injector from boiler

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: choice

1. Which one of the following are not common ingredients in dough making process

   A, Water B. Wheat flour C. Sands D. all

2. Both water and flour must be weighted and measured before starting mixing of dough

   A. True B. False

3. The flour is weighed in a bin called _____

   A. Scale indicator
   B. Weigh hopper
   C. Slide gates
   D. None of the above

4. _____ Supplies power to the load cells, sums their output, and produces a digital signal which represents the combined weight of the grain and weigh hopper.

   A. Scale indicator
   B. Weigh hopper
   C. Slide gates
   D. None of the above

5. The flow of grain into or out of the weigh hopper is controlled by____

   A. Scale indicator
   B. Weigh hopper
   C. Slide gates
   D. None of the above

Information Sheet 2 - identifying Cleaning, maintenance and service requirements and status

2.1 introductions

A high level of sanitation and hygiene should be practiced in every aspect of manufacture. The scope of sanitation and hygiene covers anything that could become a source of contamination to the product, i.e. personnel, premises, equipment, production materials, containers and cleansing agents.

Proper housekeeping is essential for obtaining premixes of high quality and safety. Therefore, the buildings must be cleaned on a regular basis, according to a defined procedure.

The equipment must be cleaned thoroughly and regularly according to a defined procedure to ensure hygienic conditions and to avoid contamination.

All procedures must be available in writing and should include the frequency and cleaning agents used. The cleaning agent used shall be a Food Industry Use Detergent or approved by the FDA; they shall be properly labeled and securely stored away from production or storage areas. This must be addressed as part of the hazard analysis, and all the material safety data sheets (MSDS) must be on file. Cleaning and sanitation should be carried out in accordance with a cleaning schedule; any deviation shall not compromise product quality or safety. Cleaning and sanitation shall be verified by inspection, and the concentration of the chemicals must be checked periodically.

A microbiological monitoring program must be set up for the entire production area, including equipment and other food contact surfaces.

Food processing equipment is either cleaned-in-place (CIP) or cleaned-out-of-place (COP). These cleaning methods offer processors an additional mechanism of process control in that each method CIP and COP systems enhance the ability of the sanitation crew to better clean and sanitize production equipment to a greater degree of food safety and quality assurance. CIP systems are extremely beneficial for

aseptic and other processing operations in which interior surfaces of equipment such as tanks and pipes cannot be easily reached for cleaning, and COP methods are utilized for pieces of equipment and utensils that cannot be cleaned where they are used and must be disassembled, and for pieces of equipment that are complex and hard to clean.

With a greater emphasis on sanitary design in food plants, equipment manufacturers and industry have worked together to make many improvements to equipment and parts that make cleaning and sanitizing more effective. Even so, plant sanitation crews and quality assurance/quality control (QA/QC) managers cannot rely solely on the fact that equipment is more cleanable today than in the past. Introducing or improving CIP and COP procedures, processes and systems in the food plant takes advantage of sanitary equipment design benefits, raising the level of assurance that when the production line starts up for a new run the process is in control from the get-go.

Inside Cleaning

CIP cleaning is utilized to clean the interior surfaces of pipelines and tanks of liquid and semi-liquid food and beverage processing equipment. This type of cleaning is generally done with large tanks, kettles or piping systems where there are smooth surfaces. CIP involves circulation of detergent through equipment by use of a spray ball or spray to create turbulence and thus remove soil. Chemical cleaning and sanitizing solution is circulated through a circuit of tanks and or lines to eliminate bacteria or chemical residues, which then flow back to a central reservoir so that the chemical solution can be reused. The system is run by computer, in a prescribed manner, to control the flow, mixing and diversion, temperature and time of the chemicals for cleaning and sanitizing. As with all cleaning methods, CIP systems utilize time, temperature and mechanical force to achieve maximum cleaning.

Automated CIP systems are most commonly used in processes in which liquid or flow-type material is being manufactured. This includes fluid products such as dairy, juice and beverages, as well as in operations using aseptic processing and packaging for low-acid or semi-fluid products such as liquid eggs, sauces, puddings,

meal-replacement drinks, aseptic dairy and fruit, jam and marmalade, soups, ketchups and tomato-based products and salad dressings. Processors also are increasingly finding application for CIP systems in the manufacture of semi-solid foods, such as stews and spreadable cheese.

A majority of food manufacturing operations producing these types of products today have installed CIP systems throughout the plant because they are efficient, cost effective and provide effective cleaning of cracks and crevices to reduce the formation of biofilms and growth niches where pathogens and other bacteria can survive. A major advantage of CIP is that it requires less labor since disassembly, manual brushing or scrubbing, rinsing, reassembly and final sanitizing steps are not required. CIP systems also pose little risk to workers, if the system is properly maintained and operated. Due to automation of the method, CIP is very effective at containing chemical costs, lowering labor costs, minimizing repair and maintenance to equipment, and allowing the reuse of cleaning solutions.

In general, a CIP operation involves the following steps:

- ✓ Removal of any small equipment parts that must be manually cleaned, making sure that CIP and processing components are clearly segregated.
- ✓ Cool temperature water (<80F) is used to pre-rinse the equipment lines and piping to remove gross soil and to minimize coagulation of proteins.
- ✓ After the pre-rinse water is flushed from the lines, the appropriate cleaner solution or treatment is circulated for a requisite period of time to remove any soil, chemical or other residues. This step is followed by another water rinse.
- ✓ The final step is application of a sanitizing agent or method just prior to operation of the equipment. In aseptic operations, this step will be programmed into the system. Sanitizing can be with a chemical rinse or by the circulation of hot water. Hot water is used at high temperatures for CIP of equipment lines on which low-acid products are produced, and acidified water is used in those operations producing acidified or acid-containing products.

Before plant engineers can begin to design a CIP system for an operation, they have to be able to evaluate the manufacturer's process thoroughly to determine what is going to work for each particular operation. Both the processor and suppliers need to understand the products being processed, the water chemistry involved and the operating parameters.

No matter how advanced and automated the CIP system is, there is always a need to clean the parts of production equipment not exposed to the cleaning process. There are pieces of equipment that simply cannot be cleaned where they are used, including piping, fittings, gaskets, valves or valve parts, filler parts and surfaces such as guides or shields, tank vents, tray pack, grinders, pumps, and product handling utensils such as knives. To properly clean and sanitize these units or parts, COP is employed to clean tear-down parts of processing and packaging equipment that require disassembly for proper cleaning . Because COP is essentially the systematic manual cleaning and sanitizing of production equipment that must be disassembled in many cases, specific attention must be paid to cleaning underneath and around gaskets, O-rings, small pipes and other small surface cavities, gaps or other niches and harborage points in which potentially harmful residue and bacteria may accumulate.

- **Out of Place But In Control**

Cleaning knives or spoons that are used in a plant's dishwasher would be considered a COP operation. In food plants, a common use of the COP cleaning method involves pieces of equipment that are small, complex and otherwise hard to clean. They are dissembled, rinsed and then cleaned and sanitized. COP may occur in a sink with a worker scrubbing to clean, or in tanks specially designed for COP In the tanks, detergent and agitation are used to clean the equipment in question. Sanitizing may be done using hot water or chemical sanitizers. Small items, such as valves, sanitary fittings and such, can be placed in cages and cleaned with larger items. Options include doing a rinse, hot water wash with detergent, rinse and soak in sanitizer. Operators can also sanitize COP items by raising the second rinse temperature and holding for 15 minutes at >180F.

Fig 5: COP cleaning

- The basic steps in a COP operation include:
  - ✓ Dry cleaning to remove dust, soil and other debris from the equipment to be cleaned and the area in which COP tasks will take place.
  - ✓ A pre-rinse of the equipment and area on racks or in COP tanks.
  - ✓ Soap and scrub the equipment and equipment components in COP tanks or vessels.
  - ✓ Post-rinse parts to remove residual detergent or cleaning chemicals.
  - ✓ Conduct pre-operational procedures and sanitize any equipment components that are not accessible once reassembled. Reassemble the equipment.
  - ✓ Sanitize the reassembled equipment with a sanitizing agent or heat treatment.

A clean mixer improves its longevity: The reasons to clean your mixer are pretty obvious. Besides contamination, a poorly cleaned mixing bowl could cause discoloration of the mixed product.

- Before you begin to clean your mixer turn it off and disconnect or unplug it from the electrical source.

FIG 6: unplugging electric

Do not hose down or pressure wash any part of the inner part mixer

Never use a scrubber pad, steel wool, or abrasive material to clean the mixer.

Never use bleach (sodium hypochlorite) or bleach based cleaner.

ALWAYS remove the agitator after each batch. If not, the agitator can become stuck on the shaft and become difficult to remove.

The recommended cleaning frequency for the bowl cradle, exterior and hub interior is daily. After each use, clean the agitators, bowl, safety guard, rear splash guard, and planetary shift.

People providing cleaning services could:

- ✓ work alone
- ✓ Access machinery and equipment from the rear or sides, or in unexpected ways
- ✓ climb on machinery and equipment
- ✓ enter confined spaces, or larger machinery and equipment
- ✓ become trapped by the mechanism of the machinery and equipment through poor
- ✓ isolation of energy sources or stored energy, such as spring-loaded or counter-balance mechanisms, compressed air or fluids, or parts held in position by hydraulics or pneumatic (air) rams
- ✓ Work with chemicals
- ✓ Operate electrical equipment in wet areas.

2.3 Maintenance

In the operation of dough mixing an operator should maintain the overall activities of the machines.

People providing maintenance or repair services for dough making machine could:

- ✓ work alone
- ✓ Work on machinery and equipment at height, or over machinery and equipment to connect services, such as electricity, air or water
- ✓ Access machinery and equipment from the rear or sides
- ✓ be required to enter confined spaces of larger machinery and equipment
- ✓ be trapped by the mechanism of the machinery and equipment through poor isolation of energy sources or stored energy, such as spring-loaded or counter-balance mechanisms, compressed air or fluids, or parts held in position by hydraulics or pneumatic (air) rams
- ✓ move heavy parts when changing the set-up of machinery and equipment, or repairing failed parts, such as electric motors or gear box assemblies
- ✓ Disable or remove normal safety systems to access the mechanism of machinery and equipment.

Lubrication for maximum performance:

A mixer is only as strong as its weakest link, so keep your mixer well-oiled to maximize its performance. For example, a mixer that is not regularly lubricated will cause the safety guard to seize up (not move freely) or cause the agitator to not go onto the planetary shaft easily. Another problem that can occur is that the mixing bowl will stick or stop operating entirely. Mineral oil or food quality grease is generally recommended for lubrication.

Never Overload

Prior to operating a mixer, determine how much product you'll be mixing in each batch. Remember to leave yourself extra space in the bowl so the mixture can be properly mixed. Don't forget, once you combine dry ingredients with liquid ingredients, your mixture will expand (also known as Absorption Ration or AR %).

2.3 Service

In cereal processing industry the all services can be used properly according to their necessity. In dough making process for bread, pasta processing and macaroni we use two common services those services are:

- **Electricity**

  Electric power is the most needed service in production process.it also used for starting all machineries in industries and give lightening services. without electric power it is not possible to run any activities of dough making process.

- **Water**

  Water is also one of the most common services in dough making process that plays the following role:

  ✓ Used to clean and sanitizations

  ✓ Used as ingredients for dough preparation

Service requirements

Common services required to dough making operation

- ✓ power
- ✓ water
- ✓ fuel
- ✓ vacuum
- ✓ compressed and instrumentation air

Steam

Steam is a convenient means to convey energy in food processing operations. It is produced from inexpensive and abundant water. Pressure control valves can be used to precisely regulate and maintain the temperature of steam. Large amounts of energy are contained in a relatively small mass of steam, so heat transfer equipment can be compact. Steam is easily and inexpensively conveyed over fairly long distances and into remote locations of the process. Steam used by food processors commonly falls into two broad categories. The first is the so-called “culinary,” “sanitary” or “clean” steam. This type of steam is used for direct injection into the product or to clean or sterilize product contact surfaces. We will refer to steam in this category as “culinary” steam

Steam can be used in most applications that do not involve contact with food products or with surfaces that contact food products. An example of a non-contact use of plant steam is indirect heating. Most people are familiar with radiant heaters (a type of indirect steam heater) used in residential and commercial applications.

Condensation – conversion of water from the vapor state to a liquid phase.

Culinary steam: steam that is suitable for direct injection into food products or direct contact with food products or surfaces that contact foods.

Heat transfer: energy in transit as the result of a temperature difference. **Indirect heating: heat** transfer from a warmer body to a cooler body through a physical barrier such as steel.

Latent heat: heat given off or absorbed in a process (as fusion or vaporization) other than a change of temperature. Latent heat of vaporization – the heat added to water to make it vaporize without a change in temperature.

Compressed air

Compressed air or gas is introduced intermittently at high velocities through nozzles present at the bottom or side of the silo, to mix powder materials that exhibit expansion characteristics when aerated.

Particles are reoriented in relation to one another as a result of the expansion of a powder bed by gas. The nozzles are arranged in a manner that escaped air stream in vertical motion gives a chance for powers to settle.

To achieve mixing, the system employs blower or compressor to generate airflow. The solid particles rise due to the drag force of the air injected and an increase in air velocity causes agitation in the bed, resulting in the formation of bubbles which causes blending to take place.

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Which one of the following is source of contamination to the product?

A. equipment,

B. personnel,

C. premises,

D. production materials

2. (CIP) stands for:

A. Clean out place

B. Clean in place

C. A and B

D. all

3. One the following is the correct CIP operation steps

A. Removal of small equipment --pre-rinse --water flushing --sanitizing agent

B. Pre rinse-- water flushing---sanitizing agent- --Removal of small equipment

C. Removal of small equipment--- sanitizing agent--- Pre rinse- --water flushing

D. water flushing--- sanitizing agent--- Pre rinse- -- Removal of small equipment

Information Sheet 3 - Workplace policies and procedures

3.1 Introduction

Before they start using any machine operator need to think about what risks may occur and how these can be managed. They should therefore do the following:

- Check that the machine is complete, with all safeguards fitted, and free from defects. The term 'safeguarding' includes guards, interlocks, two-hand controls, light guards, pressure-sensitive mats etc. National legislation often requires the supplier to provide the right safeguards and inform buyers of any risks ('residual risks') that users need to be aware of and manage because they could not be designed out.
- Produce a safe system of work for using and maintaining the machine. Maintenance may require the inspection of critical features where deterioration would cause a risk. They should also look at the residual risks identified by the manufacturer in the information/instructions provided with the machine and make sure they are included in the safe system of work.
- Ensure every static machine has been installed properly and is stable (usually fixed down).
- Choose the right machine for the job and do not put machines where customers or visitors may be exposed to risk.

Make sure the dough making machine is:

- Safe for any work that has to be done when setting up, during normal use, when clearing blockages, when carrying out repairs for breakdowns, and during planned maintenance;
- Properly switched off, isolated or locked off before taking any action to remove blockages, clean or adjust the machine;

Also, make sure they identify and deal with the risks from:

- Electrical, hydraulic or pneumatic power supplies;
- Badly designed safeguards. These may be inconvenient to use or easily overridden, which could encourage their workers to risk injury and break the law. If this is happening employers should find out why workers are doing it and take appropriate action to deal with the reasons/causes.
- **Preventing access to dangerous parts**

Employers should think about how they can make a machine safe. The measures they use to prevent access to dangerous parts should be in the following order. In some cases it may be necessary to use a combination of these measures:

- ✓ Use fixed guards (e.g. secured with screws or nuts and bolts) to enclose the dangerous parts, whenever practical. Use the best material for these guards – plastic may be easy to see through but may easily be damaged. Where you use wire mesh or similar materials, make sure the holes are not large enough to allow access to moving parts.
- ✓ If fixed guards are not practical, they should use other methods, e.g. interlock the guard so that the machine cannot start before the guard is closed and cannot be opened while the machine is still moving. In some cases, trip systems such as photoelectric devices, pressure-sensitive mats or automatic guards may be used if other guards are not practical.
- ✓ Employers should control any remaining risk by providing the worker/operator with the necessary information, instruction, training, supervision and appropriate safety equipment.

Other things employers should also consider

- If machines are controlled by programmable electronic systems, changes to any programmes should be carried out by a competent person (someone who has the necessary skills, knowledge and experience to carry out the work safely). It is good practice if employers' keep a record of such changes and check to ensure they have been made properly.

- Ensure control switches are clearly marked to show what they do.
- Have emergency stop controls where necessary, e.g. mushroom-head push buttons within easy reach.
- Make sure operating controls are designed and placed to avoid accidental operation and injury,
- Don’t let unauthorized, unqualified or untrained people use machinery – never allow children to operate or help at machines. Some workers, e.g. new starters, young people or those with disabilities, may be particularly at risk and need instruction, training and supervision.
- Adequate training should ensure that those who use the machine are competent to use it safely. This includes ensuring they have the correct skills, knowledge and experience – sometimes formal qualifications may be needed.
- Supervisors must also be properly trained and competent to be effective. They may need extra specific training and there are recognized courses for supervisors.
- Ensure the work area around the machine is kept clean and tidy, free from obstructions or slips and trips hazards, and well lit.

check the machine is well maintained and fit to be used, i.e. appropriate for the job and working properly and that all the safety measures are in place – guards, isolators, locking mechanisms, emergency off switches etc.;

- use the machine properly and in accordance with the manufacturer’s instructions;
- Make sure operators are wearing the appropriate protective clothing and equipment required for that machine, such as safety glasses, hearing protection and safety shoes.

Operator should do not do the following:

- Use a machine or appliance that has a danger sign or tag attached to it. Danger signs should only be removed by an authorised person who is
- satisfied that the machine or process is now safe;
- wear dangling chains, loose clothing, rings or have loose, long hair that could get caught up in moving parts;
- distract people who are using machines;
- Remove any safeguards, even if their presence seems to make the job more difficult.

Self-Check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Say true or false

1 Employers should not control any remaining risk by providing the worker/operator with the necessary information
2 Electrical, hydraulic or pneumatic power supplies have not risk
3 operators must the appropriate protective clothing and equipment required for dough making process.
4 On process line its necessary to distract people who are using machines

4.1 Introduction

Operators should know how to stop a dough mixer before they start. Also they must identify all components or parts of dough mixer and their full function during operation.

- **Components of dough mixer**
  - ✓ Control panel
  - ✓ fixed guard
  - ✓ Mixer blades
  - ✓ Space between fixed and moving parts to void trapping
  - ✓ Mixing trough which tips

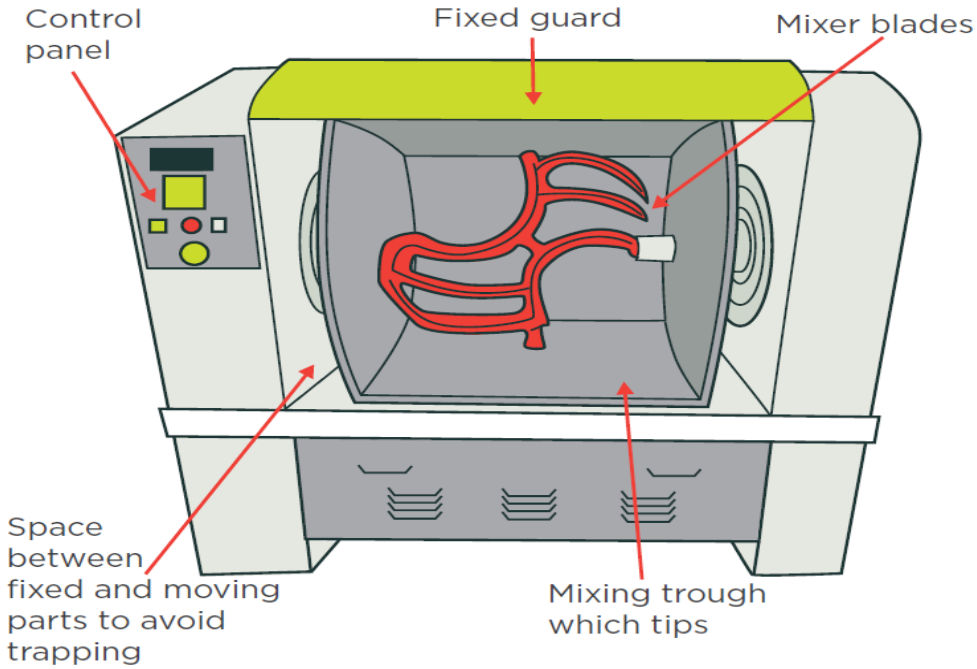

Fig7: rotary dough mixing equipment

- ✓ **Control panel**

Control panel is the major components of dough blending machine that an operator always must memorize without any complains. This control panel includes:

- ✓ Switch ON/OFF button
- ✓ Emergency push button

Control panel always located on the right hand side of machine, on the Control Panel.

Pressing this button will stop all movement of the machine. Only attempt to re-start after the fault is corrected. The machine cannot be re-started until The Emergency Stop Button is pulled up to release.

- ✓ Motor speed controller
- ✓ Display digital
- ✓ Conveyor controller
- ✓ Input/output button

Mixing blade

Mixing blade are the heart of dough blending machine that used to mix all ingredients enters mixing chamber by agitating them.it connect with rotary motor.

When the ingredients of a dough are mixed, three important processes take place:

- ✓ The mixing action blends the water with the flour so the flour proteins can hydrate. This is the first step in the development of gluten.
- ✓ Air is mixed into the dough. The oxygen in the air reacts with the gluten and helps strengthen it and make it more elastic.
- ✓ The mixing action develops the gluten by stretching and aligning the gluten strands into an elastic network.

In the case of bread dough, the dough is soft and sticky at first. As the gluten develops, the dough becomes smooth and less sticky. When the dough reaches the ideal state of development, it is said to be mature. If mixing continues, gluten strands break and the dough becomes sticky and stringy. Over mixing results in poor loaf volume, because the broken gluten is no longer able to support the structure.

In products for which tenderness is desired, such as cookies, cakes, and short dough, the mixing time is kept short. Some gluten development is desired for these

products, or they will be too crumbly. Pie dough will not hold together, biscuits will slump rather than rise properly, and cookies will crumble.However, over mixing results in toughness.

Dough relaxation is an important technique in the production of most dough. After mixing or kneading, gluten becomes stretched and tight. At this point, it becomes difficult to work or mold the dough. A period of rest or relaxation allows the gluten strands to adjust to their new length and shape, and they become less tight. The dough can then be handled more easily, and it has less of a tendency to shrink.

Self-Check – 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I true or false

1. Operators should know how to stop a dough mixer before they start
2. Mixer blades is not Components of dough mixer
3. Dough relaxation is an important technique in the production of most Dough
4. Switch ON/OFF button included under Mixing blade

5.1 Introduction

Preferably, die instantaneous energy value is an instantaneous current value drawn by the variable speed motor. Preferably, the desired energy value is a desired current value.

Preferably, die energy deviation value is a current deviation value. In another aspect, die invention consists in a dough mixer comprising: a mixing bowl for receiving a dough mixture; a variable speed electric motor to drive a mixing element; at least one mixing element for transferring energy from the variable speed electric motor to die dough mixture; and a control system adapted to control said variable speed electric motor such that die energy transferred to die dough mixture during mixing remains substantially constant.

5.2 controlling Speed of motor

Preferred embodiment dough mixer includes a mixing bowl or chamber into which a number of ingredients used to form dough are placed. In this specification "bowl" understood as including any vessel or container within which dough may be mixed. Rotatable mounted above the mixing bowl and extending into the mixing bowl is a dough arm having a mixing or kneading tool attached that is used to mix the ingredients placed in the mixing bowl together.

The dough arm and mixing tool is driven by a variable speed electric motor which rotates the dough arm in a substantially circular pattern around the mixing bowl to mix the dough ingredients and form dough. A controller interfaced with the variable speed electric motor is programmed to drive the variable speed electric motor within certain operating parameters that will be discussed later.

The dough mixer and control system is used for mixing, kneading, or mixing and kneading dough. The dough mixer and control system is used in commercial bakery applications.

- Preferably, die control system comprises a control circuit for:
  - ✓ ascertaining an instantaneous energy value transferred to die dough mixture;
  - ✓ comparing die instantaneous energy value wide a desired energy value to obtain an energy deviation value; and
  - ✓ Selectively varying die speed of die variable speed electric motor in response to the energy deviation value to substantially maintain die instantaneous energy value equal to die desired energy value.

Preferably, die control circuit furdier measures force or torque on die mixing element. Preferably, the dough mixer includes a display for displaying die speed and/or current drawn by die variable speed electric motor, said display being controlled by said control circuit. It has been found diat inconsistencies in die loading of die motor and die transfer of mechanical work leads to longer time periods required to reach optimum work input levels. Wide the dough mixer and method of die invention, die optimum time to mix dough can be reduced relative to die mixing time wide a dough mixer comprising a fixed speed motor.

To do skilled in die art to which die invention relates, many changes in construction and widely differing embodiments and applications of die invention will suggest die m selves without departing from die scope of die invention as defined in die appended claims. The disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

The term 'comprising' as used in this specification and claims means 'consisting at least in part of, that is to say when interpreting statements in this specification and claims which include that term, the features, prefaced by that term in each statement, all need to be present but other features can also be present.

The invention consists in the foregoing and also envisages constructions of which the following gives examples only.

Self-Check – 5	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I choose

1. Which one of the following is controlled parameter in dough mixing
   A. Speed of motor
   B. Energy value
   C. Volume of mixing chamber
   D. all
2. The dough mixer and control system is used for
   A. Mixing dough
   B. Kneading dough
   C. agitating
   D. all

Information Sheet 6- Checking and adjusted equipment performance

6.1 Introduction

Dough processing requires adjustments before starting operation. It can mix powdery substances and powdery substances evenly. Of course, it can also mix liquid substances and powdery substances evenly. It is a machine that mixes two or more different substances together evenly.

6.2 Adjustment method of dough making machine

After all raw materials are prepared from preparation room, we need to make some adjustments to the machine, and adjust all aspects of it to a suitable state. This adjustment is related to the use of the machine behind, and whether the mixed product meets the qualified requirements.

Therefore, we should pay attention to the adjustment of the machine, and be responsible and serious, not careless at all.

First of all, every mixer has different requirements for voltage.

Some machines need low voltage and some machines need high voltage. If we give it low voltage, then the machine cannot run or even burn up, so the generator of the machine will be ruined and can no longer be used.

The supply on machine to be provided with a three phase it is imperative that the outlet to which this plug is connected be properly earthed (grounded). Prior to installation, testing the electrical service to assure it agrees with the specifications on the machine data plate located on the back side of the stand is necessary. Permissible voltage fluctuation is ± 10% of nominal voltage.

Components having adjustments protected (e.g. paint sealed) by the manufacturer, are only allowed to be adjusted by an authorized service agent.

- ✓ Next we need to connect the power supply,

After connecting the power supply, we will start the machine.

Let the machine work to observe whether the direction of the machine's winch is the same as the correct direction.

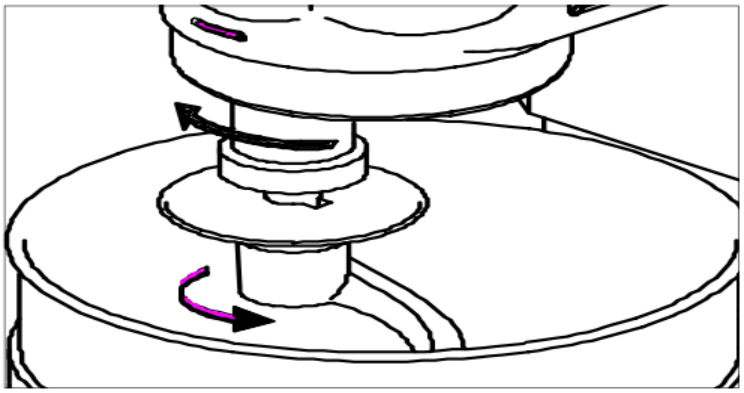

Fig8: direction of rotation of mixing dough

If the direction of operation is different, we need to adjust, reinstall the connection of the motor so that the direction of the winch can return to the normal direction.

Of course, when the mixer is running, we should pay attention to whether the machine emits some abnormal sounds. If the mixer emits some abnormal sounds, we should stop immediately and repair it.

- **Fitting the Bowl**

The bowl must be installed before the agitator. To install the bowl, fully lower the bowl support Position the bowl so the alignment bracket on the back of the bowl is in the bowl retainer and the alignment pins on the front of the bowl support fit in the holes on the sides of the bowl.

- **Fitting the Agitators**

To install an agitator, the bowl must be installed and fully lowered. Place the agitator in the bowl, push it up on the agitator shaft, and turn it clockwise to seat the shaft pin in the slot of the agitator shank.

Self-Check – 6	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Fitting the Bowl not needed in adjustments in dough mixing process
2. To install an agitator, the bowl not installed and fully lowered.
3. Dough processing requires adjustments after starting operation

7.1 Carrying out pre-start checks

Pre start checks are pretty much exactly what they sound like, they are checks made to something - most often a piece of plant, equipment or machinery prior to that thing being started or used; or checks made prior to doing something specific - like a days work or specific hazardous activity. Pre starts often involve routine inspections conducted by the machine or equipment operator. Because of this, pre starts often take the form of checklist or inspection form.

- **Electrical connections**

Before starting to work on the mixer, make sure that the electrical power supply is disconnected and cannot be accidentally reconnected. First connect the earthing cable (yellow/green). It is recommended to install a high sensitivity (30 mA) differential switch, as an auxiliary protection against lethal electric shocks, in case earthing connection is not correctly working. Make sure the power supply voltage corresponds to the rated one.

Figure7. Electrical connection and dangerous symbols

The electrical connection must always be carried out by qualified personnel, in compliance with the applicable and possible local regulations. Always refer to the data on the voltage and frequency plate, in order to ensure a correct connection with the power supply network. If not specified, tolerance can be of ±5% on the voltage and ±1% on the frequency values indicated in the plate. The connection diagrams are normally provided with the motor or are printed in the terminal box. Should they be missing, refer to those provided in the manual.

The identification plate shows the following data:

- ✓ power supply voltage
- ✓ three-phase winding, connection (Y) or (Δ)
- ✓ current consumption under normal load

The motors are calibrated for voltage with 1:√3 ratio; e.g. 380/660 V Δ/Y, and can be started in the following ways:

Direct insertion in the network with line voltage equal to the lower voltage value indicated on the identification plate ("Δ" triangle connection of the winding).

Direct insertion in the network with line voltage equal to the higher voltage value indicated on the identification plate ("Y" star connection of the winding).

Make sure that, in the presence of star/triangle start up, the switch from star to triangle is performed only when the startup current corresponds to the star value. This is important to prevent risk of overloads not allowed.

Connect the motor to the mains via a multi-polar switch or other device that ensures multiple disconnection (breaking all the electric wires) from the mains, with a contact gap of at least 3 mm. Remove the cover of the motor terminal box. Make connections as shown in the back of the terminal box cover or as indicated in the following page. Use certified cable glands for the area in which it the mixer is installed.

The electric power supply to the motor must be fitted with a thermal-magnetic circuit breaker or magnetic starter with overload and minimum voltage protections, a thermal relay and fuses installed upstream by the installer. The overload relay must be set to the rated motor current.

The dough mixer should not be started (if not specified in the sales documents) if the impeller is immersed in settled solids. The direction of rotation is usually clockwise if seen from the motor towards the impeller. However, the correct direction of rotation is indicated on the mixer by an arrow. If necessary, reverse the direction of rotation exchanging the position of any two wires of the power supply (this is true only for three-phase electric motors. Refer to the relevant manuals for the other motor types)

- **Operation Checks**

Before starting the dough mixer, it is also necessary to perform the following checks

- ✓ All screws and bolts are tightened. - Vent the air in the area of the mechanical seal, if necessary.
- ✓ All moving parts are inaccessible and all their guards are properly installed.
- ✓ For mixers with double mechanical seal: check the connections of tubes and accessories.

Start up and, if necessary, check correct the flow of the flushing or cooling system (read the relative manual).Immediately after the first startup of the mixer, check the following:

- ✓ Check that the mixer does not produce “strange” noises. If it does, stop it immediately and discover and prevent the causes before restarting it.
- ✓ Check that the mixer does not produce evident vibrations or oscillations. If it does, stop it immediately and discover and prevent the causes before restarting it.
- ✓ Check that there are no leaks of oil, grease, water or other fluids. If there are, stop the mixer immediately and discover and prevent the causes before restarting it. Measure the voltage at the motor terminals and check that it is within the limits shown on the data plate.
- ✓ Measure the current consumption on each phase and make sure it is less than the rated value shown on the motor data plate

It is important to follow the instructions before operate the mixing machines. The mixing machine is designed as a safe and efficient food processing product as long as the machine is used in accordance with the instructions. User has taken following precautions and pre-start checks in order to operate the mixer safely.

- ✓ Do not wear loose clothes or ring while operating, and keep hands, hair and clothing away the moving parts.
- ✓ Never use an extension cord to connect electrical power.
- ✓ Make sure the safety guard is closed and bowl is lifted to right position before operating.
- ✓ Never reach into the bowl when the mixer is running.

- ✓ Never place your hand or any kitchen utensil in the bowl whilst the mixer is in operation.
- ✓ When mixing product always follow the recommends agitator and speed setting according to the capacity chart.
- ✓ Stop the mixer before changing speed.
- ✓ Stop the mixer before removing or installing attachments into the hub.
- ✓ Always unplug before cleaning or doing any maintenances.
- ✓ Do not hose down or pressure wash any part of mixer. .
- ✓ avoid exposing to vibration environment

Self-Check – 7	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

True or false

1) The dough mixer should not be started if the impeller is immersed in settled solids.
2) Before starting to work on the mixer, make sure that the electrical power supply is disconnected and cannot be accidentally reconnected
3) Pre starts often involve routine inspections conducted by the machine or equipment operator

LG #40	LO2. Operate and monitor the dough making process

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Starting and operating the with workplace procedures
- Introducing ingredients to the mixing process in correct sequence and quantity.
- Monitoring equipment variation in operating conditions.
- Identifying variation in equipment operation and reporting maintenance requirements
- Monitoring the process to confirm that dough meets specifications
- Identifying, rectifying and/or reporting out-of-specification product/process outcomes to maintain the process
- Transferring the finished dough to required location
- Maintaining the work area housekeeping standards.
- Conducting work with workplace environmental guidelines.
- Maintaining workplace records

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Start and operate the with workplace procedures
- Introduce ingredients to the mixing process in correct sequence and quantity.
- Monitor equipment variation in operating conditions.
- Identify variation in equipment operation and reporting maintenance requirements
- Monitor the process to confirm that dough meets specifications

- Identify, rectify and/or report out-of-specification product/process outcomes to maintain the process
- Transfer the finished dough to required location
- Maintain the work area housekeeping standards.
- Conduct work with workplace environmental guidelines.
- Maintain workplace records

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1 - Starting and operating with workplace procedures

During starting of process in dough making process Operator of dough making machine has taken following precautions in order to operate the mixer safely.

- ✓ All operators should be at least 18 years old and are adequately trained and supervised. Also, have fully read and understand the manual.
- ✓ Do not hose down or pressure washes any part of mixer.
- ✓ Do not wear loose clothes or ring while operating, and keep hands, hair and clothing away the moving parts.
- ✓ Make sure the safety guard is closed and bowl is lifted to right position before operating.
- ✓ Never place your hand utensil in the bowl whilst the mixer is in operation.
- ✓ Never put your hand and finger into the feed chute when using any mixer's attachments. Always use the pusher plate with attachment.
- ✓ Never reach into the bowl when the mixer is running.
- ✓ Never use an extension cord to connect electrical power.
- ✓ Owner should not let customer, visitor or other unauthorized people come in contact with this machine.
- ✓ Stop the mixer before changing speed.
- ✓ Stop the mixer before removing or installing attachments into the hub.
- ✓ When mixing product always follow the recommends agitator and speed setting according to the capacity chart.
- ✓ Never bypass, alter or modify this machine. .
- ✓ avoid exposing to vibration environment

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short answer

1) Write precautions in order to operate the dough mixer safely.

Information Sheet 2 - Introducing ingredients to the mixing process

2.1 Introduction

Ingredient is any substance that is added to a food to achieve a desired effect. The term “food ingredient” includes food additives, which are substances added to foods for specific technical and/or functional purposes during processing, storage or packaging. Ingredients provide convenience and allow food makers to produce a wide variety of foods that are safe, appetizing, uniform, nutritious and tasty. They are used in very small quantities, but contribute significantly to our vast and varied food supply—ensuring that the foods we love look, taste and feel the way we have come to expect.

Leavened or fermented doughs (generally made from grain cereals or legumes that are ground to produce flour, mixed with water and yeast) are used all over the world to make various breads. Salt, oils or fats, sugars or honey and sometimes milk or eggs are also common ingredients in bread dough.

Adding the flour

The principal ingredients were incorporated in a specific order (flour, yeast and water).

Strong flour

is milled from hard wheat and has a high content of protein which is necessary for the development of gluten. Carbon dioxide produced during fermentation is trapped within the elastic network of gluten, thus making the dough rise.

White flour

Made by grinding wheat kernel, excluding bran and germ.

• Always use strong flour when using the recipes in this book.

• Do NOT use plain or self-raising flour as a substitute for bread flour.

Whole meal flour:

Made by grinding entire wheat kernel, including bran and germ.

Makes bread rich in minerals, but lower in height and denser than bread baked with white flour because the gluten strands are cut by the edges of bran flakes and germ.

Rye flour:

Contains some proteins, but these do not produce as much gluten as wheat flour.

Makes dense, heavy bread with a flat or slightly sunken top crust

The addition of salt depended on the application. For some, salt was added to the standard mixture at the beginning and for others it was added after 5 minutes to estimate the change in texture on the acoustic properties**.**

Water added to soften the dough and decreases the hydration time and the energy required for mixing.

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short answer

1) Write the ingredients added during dough making process
2) Why water is added to dough?
3) List types of flour added to mixer.

Information Sheet 3 - Monitoring equipment variation in operating conditions.

Batch mixing often lacks precision and can lead to dough variations that impact the consistency of your finished products. Even if the dough is perfect when it leaves the batch mixer, changes can occur to the dough while it waits to be processed.

Continuous Mixing, on the other hand, enables you to produce large quantities of uniform dough and prevent undesirable variations from batch to batch. Benefit from the better integration of minor ingredients, eliminate errors, and operate with less labor and energy than batch mixing

Fig 9. Continuous dough mixer

Is ideal for wheat-based products and all but the lowest viscosity powder/liquid mixtures

Low moisture, stiff products are easily mixed.

Dough is gently mixed and developed without generating excessive heat.

In the rare instance dough making machine is experiencing an issue, we're here to help. Below are the best troubleshooting tips to dough making machine operator. This guide is here for diagnosing the problem for equipment operators. More complex issues will need to be identified and repaired by an authorized service technician.

- **If the dough mixer Won't Operate**

  - ✓ **Switch is off**

Before looking around for other possible causes, double check that the main powers switch is on.

- ✓ **Bad power connection**

Double check that the power cords in plugged in or the electrical outlet is working properly.

- ✓ **Circuit breaker off**

The building's circuit breaker could be off. Check the breaker box.

- ✓ **Bowl guard isn't closed**

To put the bowl guard in a closed position, rotate the guard to right until it's fully closed.

- ✓ **Tripped internal overload**

On button press the RESET button on back of machine. On larger SP models, wait about two minutes before pressing the START button.

This will restart the mixer. If the overload still trips, you might need to reduce your batch's size or adjust the recipe.

- ✓ **Gear isn't engaged**

The mixer won't work if the speed control lever is positioned between speeds. Switch the gear fully into position.

- ✓ **Triggered safety fuses and no-volt release switches**

Contact an authorized service technician to replace the safety fuses or the magneto-thermal, no-volt release switches.

- **Mixing Takes Too Long**

✓ **Three-phase mixer is wired incorrectly**

If the agitators aren't rotating clockwise around the bowl, have an electrician fix the wiring in the unit.

✓ **Small batch size**

If the batch size is too small, this can extend mixing times. Increase the batch size or use a smaller bowl adapter kit.

✓ **Incorrect portion or temperatures**

Make sure you're using the proper portions and temperatures in the recipe.

- **Stops during Mix Cycle**

✓ **Broken belts**

If the belts are broken or worn out, contact an authorized technician to replace them.

✓ **Tripped internal overload**

Press the STOP button. Then, press the reset button on back of machine. On larger SP models, wait about two minutes before pressing the start button. This will restart the mixer. If the overload still trips, you might need to reduce your batch's size or adjust the recipe.

✓ **Speeds changed during mixing**

Start by returning the speed control lever to the speed model position. Then, restart the mixer.

The water content as a parameter in the process induces significant variation in the viscoelastic properties of the matter, especially in the stability phase. The higher elasticity the bread dough is foam because of the air cells trapped in the mixing process. Foams are, by definition, disperse systems; however, bread dough, like many other food products, is much more complex a system than a simple dispersion of bubbles in an aqueous medium.

It can indeed be referred to as a hierarchy of dispersed gaseous, liquid and solid phases, which can be dramatically modified by changes in temperature and moisture, as well as by mechanical stresses.

The state of dispersion implies the presence of domains which are kept apart from one another because of the overall medium hindrance that opposes the formation of bulk phases layered according to the relevant densities.

If some excess water is added, such a layering can be actually achieved by ultracentrifugation that simply accelerates the change of a finely dispersed system into separated layers of bulk phases One can also recognize that a bread dough is indeed formed by several aqueous phases, each rich in a given component of the dough - gluten, starch granules, globular proteins, non-starch carbohydrates, etc.

Self-Check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Matching

1. Circuit breaker off	B. Switch is off
2. Bad power connection	C. Incorrect portion or temperatures
3. Bowl guard isn't closed	D. Speeds changed during mixing
	E. Start by returning the speed control lever to the speed model position.
3. Rotating the guard to right until it's fully closed.	F. Using the proper portions and temperatures in the recipe
4. Need double checking	

2. Short answer

Write the vibration occurred during dough making operation

Information Sheet 4 Identifying variation in equipment operation and reporting maintenance requirements.

4 .1 introduction

Condition monitoring and process analysis most machine and process characteristics which affect quality, availability, capacity, safety, risk and cost can be continually evaluated throughout an asset's lifetime. This is essential in identifying impending failure and will be applied to critical areas identified in the reliability plan.

The current state-of-health of process plant is important information related to current information, diagnosis and prognosis of various defects, and predicted useful life in the optimization of safety, quality and high production rates.

A combination of one or more equipment failures, human errors, or both causes a loss of system function. The following factors may influence the prospect of dough making equipment failure

- ✓ Design error
- ✓ Faulty material
- ✓ Improper fabrication and construction
- ✓ Improper installation
- ✓ Improper operation
- ✓ Inadequate maintenance
- ✓ Maintenance errors

There are the obvious functions of monitoring and controlling the process for reasons of safety and product specification. Additionally, there is invaluable information to be gained from the process parameters that can give an understanding of the current health of the asset.

Condition monitoring has historically focused on the acquisition and analysis of measurable parameters that would give useful information as to the condition of machine components and, hence, a forecast of the likely serviceability of the machine.

The wider view of condition management must take into account the performance of the machine, or the system of which it is a part, and report on excursions away from previously defined acceptable tolerances.

The definition of condition monitoring embraces the concept of performance monitoring also: the process of systematic data collection and evaluation to identify changes in the performance or condition of a system or its components, such that remedial action may be planned in a cost effective manner to maintain reliability.

The Purpose of performance monitoring there is the classic story of the condition monitoring technician who completed a vibration survey on a pump after it was reported as running erratically. The pump had the lowest vibration levels ever measured and it was therefore in perfect condition. Shortly after receiving this advice the plant operator noted that the pressure gauge was much lower than usual and further investigation showed that the pump wasn't pumping at all!

The pump was isolated and opened up and it was found that the impeller had sheared off. Of course it had a beautiful vibration signature; it wasn't doing anything! This illustrates one dimension of why performance monitoring is needed to make sense of some situations.

The technology of process control allows access too much of the information needed to trend machinery and system performance parameters. These parameters are monitored and alarms set for out-of-tolerance conditions. This is particularly true for systems more so than individual machines unless they are process critical and individual monitoring can be justified. There are still many situations in industry where it is not immediately apparent that performance of a particular machine has dropped off. Sometimes systems are self-compensating without identifying the reason why, for example, three pumps are now needed to be running to do the work formerly handled by two.

There are other situations where, in the normal course of events, there is quite insufficient data to enable any accurate judgment on performance to be made. An example would be the fuel efficiency of a heavy-haul vehicle. The only way to determine the specific fuel consumption of one vehicle compared to another doing similar work

would be to install instruments and data logging to record fuel flow, throttle position, brake usage, vehicle speed and the like.

With continuing advances in sensor technologies and a growing trend for on-board mounted machinery sensors permitting on-line monitoring, the performance monitoring of machines and the systems in which they work will give people real-time information on equipment health and condition and let them fine-tune the process to maximize uptime and machine reliability.

Establishing a planned maintenance programme is a useful step towards reducing risk, as well as having a reporting procedure for workers who may notice problems while working on machinery.

Some items of plant and equipment may have safety-critical features where deterioration would cause a risk. Employers must have arrangements in place to make sure the necessary inspections take place.

There are other steps to consider:

Before employers instruct workers to start maintenance

Decide if the work should be done by specialist workers. Never take on work for which other workers are not prepared or competent.

Plan the work carefully before it starts, ideally using the manufacturer's maintenance instructions, and produce a safe system of work. This will avoid unforeseen delays and reduce the risks.

Make sure maintenance staff are competent and have appropriate clothing and equipment.

Try and use downtime for maintenance. This can avoid the difficulties in coordinating maintenance and production work if maintenance work is performed before start-up or during shutdown periods.

Self-Check – 4	Written test

Name…… ID……. Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Choice

1) Which one the following factors that influence the prospect of dough equipment failure

A. Inadequate maintenance
B. Improper fabrication and construction
C. Improper operation
D. all

2 one of the following is not included in dough equipment maintenances

A. parameters monitoring
B. performance monitoring equipment's
C. A& B
D. none

Short answer

1. list the steps before employers instruct workers to start maintenance

Information Sheet 5 Monitoring the process to confirm that dough meets specifications.

At the bakery, frequent complaints such as “the dough is too tough” or “the dough has too much pan flow” or “let’s decrease water, the dough is too sticky” are often discussed. Bakers always aim to produce the best dough possible for the makeup stage. A big portion of the credit for baking high-quality bread goes to the handling properties of dough.

It is important to understand what the handling properties of dough mean, how they are affected and how they affect the finished products.

There are 4 major dough control properties:

- ✓ Extensibility
- ✓ Elasticity
- ✓ Resistance to deformation (tenacity)
- ✓ Stickiness

- **Extensibility:** Ability of the dough to be stretched extended or elongated when forces, stress and pressures are applied to it. A certain amount of extensibility is necessary for dough to be moulded into different shapes. An extensible dough has the ability to stretch (expand) as the gas pressure from yeast fermentation builds up.
- **Elasticity:** Ability of the dough to regain its original shape after a deforming force has been applied and removed. Simply put, it is the ability of a dough to spring back when it is stretched.

Fig 10: elastic dough

- **Resistance to deformation (tenacity):** Ability of the dough to resist deformation when being stretched. A dough with too much tenacity is difficult to work with during makeup. Laminated doughs that are too tenacious are often difficult to roll out.
- **Stickiness:** Ability of the dough to stick to the surfaces which they come into contact with. Dough needs to have minimum stickiness to be properly shaped and conveyed during makeup stages. In most cases, dough stickiness is the least desired property given the operational and cleaning issues that a bakery has to deal with. The simplest way of modifying the stickiness of dough is by increasing or decreasing water absorption.

Optimizing dough properties

In general, dough should have good extensibility and just enough elasticity to retain gasses yet expand sufficiently during proofing and baking (oven spring) while retaining its original or desired form.3

Similarly, a dough should have as little resistance to deformation as possible to allow for a proper moulding while preserving the “delicate” cell structure.

The balance between elasticity and extensibility may of course change depending on the product and dough needed. For example, hearth breads require good extensibility and good elasticity otherwise the loaves could flatten out rather than bake up high and round.

Aspects that influence dough handling properties

- ✓ Wheat class used at the mill (% extraction)
- ✓ Hydration (water absorption)
- ✓ Percentage of functional polymers (i.e. arabinoxylans, gluten-forming proteins, damaged starch)
- ✓ Quality of gluten-forming proteins (gliadins and glutenins)

- ✓ Presence of bran particles (exerting a cutting or disrupting action on the gluten matrix)
- ✓ Presence of some non-wheat cereal flours
- ✓ Mixing conditions (rpm, work input, mix time)
- ✓ Over mixing/undermixing
- ✓ Degree gluten development
- ✓ Dough temperature
- ✓ Presence of water-competing ingredients (e.g. sugars, salt, egg proteins) that limit the hydration of functional polymers
- ✓ Addition of functional ingredients, such as oxidizing and reducing agents
- ✓ Length of dough resting period

Characteristics of a dough that is too extensible, with very low elasticity and poor resistance to deformation:

If dough is too elastic, with very low extensibility and too much resistance to deformation, it will exhibit the following characteristics during processing:

- ✓ **Dough mixing:** possible undermixing (dough too stiff, tight and/or tough), insufficient water absorption.
- ✓ **Dough pump:** excessive friction against equipment surfaces causes excessive heat which increases dough temperature beyond allowable limits (promoting excessive gas production).
- ✓ **Dough divider:** bucky or gassy dough could cause considerable scaling weight variations.
- ✓ **Dough sheeting and moulding:** poor machining as moulder and Sheeter settings (pressures) must be increased (tightened) to form the final dough shape leading to cell structure damage, excessive 'spring-back' after application of stress, poor pan flow.

As a result, the finished product will have too round of corners, wild break and shred, and poor symmetry, volume and diameter

In dough making process, it is necessary to conduct the correct final specification of dough like:

- ✓ Elasticity
- ✓ Stability
- ✓ Color
- ✓ temperature

Controlling dough temperature during mixing until final development is critical for a consistent fermentation process .The less variation in the final mixed dough; the simpler it is on the downstream process.

To maintain consistency in dough temperature, many mixer manufacturers incorporate cooling features into their equipment design.

For instance, individual cooling set-points on its horizontal mixers that is customizable by recipe and also takes environmental factors into consideration. Various temperature control modes (by timer versus by set-point) allow better control independent of changing environment conditions, noting improved repeatability over manual settings in adjusting for conditions such as summer or winter.

Temperature control can happen through a refrigerated jacket on the bowl or a refrigerated agitator bar, such as with horizontal mixers from Shaffer, a Bundy Baking Solution. “

It’s a reason a bread manufacturer would want to consider a horizontal mixer for artisan production — that consistent, cooler dough temperature.”

Shaffer offers a refrigerated agitator as a key component of its horizontal mixers. For us, it’s all about adding that refrigerated system that cools the bar in the triple roller-bar agitator.” The system, he said, can reduce dough temperature from 4 to 6 F°.

Over all dough mixing process showed on (https://youtu.be/whT0hb_d_YE) links.

Self-Check – 5	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Choice

1. _____Is ability of the dough to be stretched extended or elongated when forces, stress and pressures are applied to it

   A. Elasticity
   B. Extensibility
   C. Resistance to deformation
   D. Stickiness

2._____ Is_aability of the dough to stick to the surfaces which they come into contact with.

   A. Elasticity
   B. Extensibility
   C. Resistance to deformation
   D. Stickiness

Short answer

1. Write the four major dough control property
2. Aspects that influence dough handling properties

Information Sheet 6 - Checking and adjusting equipment performance

6 .1 Introduction

At the beginning an operator should know. How perform whether your mixer needs adjusting there's no magical bell or whistle that sounds or light that signals your attention, so how do you know

If bowl height is too high, the adjustment needing to be made before see any signs of damage to your bowl or blades. It sounds like, well, metal on metal. If your bowl is too low, you won't hear it, but will notice that the bottom and sides are continually not being scraped down.

6 .2 Adjustment of dough mixing machine

- **Check for signs of damage**

Once bowl height has shifted, the more using without taking a moment to adjust it, the more damage it will cause. Check the bottom of the beater blade and the inside bottom of the bowl for wear and tear. If there are loose bits of metal, it might be time to get a new beater, and if there's an issue with the finish or deep scratches, then it might be time to look into another bowl for sanitary reasons. Mostly, it will just look gnarly, but be just fine. You just don't want any loose metal in your food.

- **Unplug the mixer**

This is the first rule in any electronic repair. Safety first!

- **Locate the adjusting screw**
  - ✓ **For Stationary head models:**

The screw on a model with a stationary head will be directly behind the piece that contains the arms that hold the bowl. When it's in the down or lowered position you'll be able to see it. When the bowl is raised, it will go into hiding, so lower those bowls.

- ✓ **For tilt head models:**

If you have a tilt head model, the screw is almost in the same place. It will sit right below where the head attaches to the stand. You'll need to have the head tilted back in order to see it!

- **Making the adjustment**

To make the beater and the bowl further apart (so lowering bowl or raising head depending on the model), then turning the screw to the right.

For shorten the distance (if it keeps leaving food on the sides and bottom) turning the screw to the left.

- **Reattach the parts**

Adding blade back on the mixer and placing bowl into place. Lock things in and check first to see if your blade is touching in places it shouldn't. Checking visually first will help in case turned the screw the wrong direction and will save you before grinding blade into your bowl.

- **Test the mixer**

With everything hooked up, plug the mixer in and turn it on. Start it on low and listen. Hopefully you shouldn't have any metallic sounds coming from the mixer. Turn the speed up and listen again. Turn the mixer off.

- **Make further adjustments**

After you've tested it out, there's a good chance you'll be a little off. Make the needed adjustments, turning the screw left or right as needed until you find the right spot.

Self-Check – 6	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

True or false

1. Reattach the parts is not needed in adjustments
2. Unplugging is not necessary when mixing machine are adjusted

Information Sheet 7 - Transferring the finished dough to required location

7.1 Introduction

Dough conveying is the transfer, flow, or movement of amounts of dough via conveying equipment. Dough can be transferred from one equipment to another by using conveying units. In large-scale bakery plants, the large masses of dough produced during mixing, usually ranging from 200 Kg to several tons, are moved along the production line by conveyors. This reduces or eliminates the need for the manual labour involved in dough handling. Dough conveying systems fills the gap between the mixer and the dough dividing equipment. It is a smooth-handling system that moves dough from one stage to another in an efficient and productive way.

Bulk or large amounts of dough coming from mixers can be moved by using:

- ✓ A band or belt conveyor that normally connect dividers with rounders, and rounders with the rest of the production equipment down the line.
- ✓ An auger or endless screw, also known as a dough pump. Often connecting mixers and dividers, this type of conveying equipment is commonly used in continuous mode production environments. It requires a high level of automation and is usually found in large-scale production bakeries such as white pan bread production plants.

Discrete or single pieces of specially shaped dough can only be moved by band or belt conveyors.

Conceptually speaking, dough conveyors are the “bridge” of the production line. The following is a good example of a straight dough concept:

Horizontal mixer →Divider → Rounder → Intermediate Proofer → Sheeter/Moulder → Panner → proofer → Splitter → Oven

- The arrow symbol (→) represents dough conveying system

In a high-speed bakery plant, dough conveying systems are fully mechanized and are usually connected to the supervisory control and data acquisition system (SCADA)

These conveyors are then centrally supervised and controlled electronically. In some cases, dough conveying systems are used occasionally or temporarily (e.g., in production peaks), and hence may not require permanent connection to the line. However, they may still need to be set manually, e.g., belt speed.

Fig 11: Dough transmission with mechanical and manual transfer system.

Quality considerations

Whether the conveying equipment is designed as closed or open equipment, it should as any other product-contact surface, allow for maintenance, inspection, cleaning and sanitation activities to be performed easily, adequately and quickly to reduce downtime.

Dough conveying equipment should be properly designed, constructed and installed so as to preserve food safety in the production environment. This is important since dough pickups on conveyor surfaces could cause cross-contamination if various types of bakery products (allergenic or gluten-free) are processed in the same line (shared line).

Dusting flour and/or oiling conveyor product-contact surfaces to manage wet and sticky doughs are possible options, but the costs of doing so should be appropriately considered. The design of the food-grade material used as band or belt should be such that minimizes dough pickup.

If equipment units inside production line are connected through dough conveyors, e.g., mixer and divider, the design and operation of the conveying equipment should minimize transfer times and distances between equipment units. In bread and rolls production bakeries, the fully developed and fermented dough should not be allowed to stand more than 20 minutes without making it to the rounding step.

Self-Check – 7	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Write the two techniques that dough coming from mixers is moved.
2. What is transferring of dough means?
3. Why conveyer used in transporting of dough?

Information Sheet 8 - Maintaining the work area housekeeping standards

In manufacturing many hazards occurred and fires start when waste materials are ignited by smoking materials, hot surfaces, electrical arcs, short circuits, and mechanical sparks. Not only is industrial waste the most common material first ignited, but it provides fuel for the fire to spread rapidly. Seldom, if ever, are fire brigades called upon to attend major fires involving premises which have a high standard of housekeeping. Yet the advantages of good housekeeping are too often overlooked.

- A good housekeeping programme will:

  - ✓ Considerably reduce the possibility of a fire starting.
  - ✓ Prevent rapid spread of a fire and therefore reduce property losses.
  - ✓ Ensure that exits and fire escape routes remain clear and so reduce life losses.
  - ✓ Improve accessibility of fire-fighting equipment to facilitate its maintenance and use in an emergency.
  - ✓ Bolster productivity through improving staff morale since nobody enjoys working in a dirty or untidy environment.

Define responsibilities

Managers decide that good housekeeping will form an integral part of working procedures, and the decision must be conveyed to all employees first in writing, then followed up on bulletin boards, in newsletters or during face-to-face meetings. Every employee must feel involved and be committed to the cause.

However, storage and working areas change, staff change and unless the housekeeping programme is constantly monitored, it could soon deteriorate. Key personnel are assigned to be responsible. Delegate these responsibilities in writing - if not written down, they will be easily forgotten.

Whilst fire and safety personnel are intimately involved in the housekeeping programme, supervisors and foremen should be made responsible for the standard of housekeeping in their area of jurisdiction. If necessary, advertise the face, with signage, using names if necessary, that proclaims responsibility for housekeeping.

Housekeeping guidelines

Three factors can be identified as being paramount if the general standard of housekeeping is to be upgraded and maintained.

- **Layout of equipment and production flow**

Ensure wherever possible that sufficient work space is provided. Working areas need to be demarcated, preferably with lines painted on the floor to show where goods may or may not be stored. Adequate space should be provided for operators, equipment and work-pieces within these areas.

- **Handling and storage facilities**

Experience will dictate how much space is required for temporary storage of raw materials and finished goods at each place of work. Always aim to keep these to the absolute minimum, particularly where they are of a combustible nature. This will reduce the fire loading within the manufacturing area where most ignition sources are present.

Strict control of flammable liquids should be exercised and these should be issued to operators only in quantities sufficient for single production runs or shifts and even then safety containers and/or flammable liquid cabinets need to be provided.

It would be most useful to detail an employee to collect finished products for return to the finished goods area and to draw and supply raw materials from the stores as and when required. This leaves the machine operators free to supervise uninterrupted manufacturing runs.

Clean and tidy premises

Each operator should be made responsible for tidiness in his/her own work place. As they clean up swarf, cuttings, fluff, dust, overspray, shavings, etc. it can be placed in non-combustible receptacles for removal by cleaning staff. Always appreciate that loose, thin and finely divided materials ignite readily.

- **General guidelines**

The following guidelines should be followed to maintain the efficacy of a formal housekeeping programme.

- **Cleaning materials**

Use only non-flammable cleaning solvents and waxes wherever possible. Stipulate suitable materials and monitor what is used. Frequently, highly flammable materials are found in working areas simply because they are readily available or slightly cheaper. Avoid using sawdust to absorb oils or hydraulic fluids - there are other alternatives.

- **Dust and fluff**

Production processes and product handling frequently generate dusts and fluff which accumulates on machinery, structural elements, pipes and ledges. Regular cleaning is necessary to prevent unsightly and dangerous accumulations which become expensive and difficult to remove.

Sometimes ineffective or leaking extraction systems compound the problem so dust handling equipment needs regular checking. Cleaning should be effected through using industrial vacuum cleaners and not by blowing dust away with compressed air.

Self-Check – 8	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short answer

1. Write guide lines of house keeping

Information Sheet 9 - Conducting work with workplace environmental guidelines

Working environment is a broad term and means all your surroundings when working. Your physical working environment is, for example, your work tools as well as air, noise and light. A good working environment is one of the most important elements in making you feel good and for our activities to function and develop.

layout

The layout of the workplace is required to allow persons to enter and exit the workplace and move within safely, both under normal work conditions and in an emergency.

Entry and Exit

Entries and exits are required to be safe to allow impeded access and egress for all workers, students and visitors including those with special needs. In particular:

- ✓ entries and exits should be slip resistant under wet and dry conditions
- ✓ aisles and walkways need to be at least 600mm wide and kept free of furniture or other obstructions
- ✓ any walkways, boundaries or pathways shall be marked with 50mm wide with a contrasting colour e.g. white or yellow
- ✓ open sides of staircases should be guarded with an upper rail at 900mm or higher and a lower rail
- ✓ handrail should be provided on or at least one side of every staircase
- ✓ separate entry and exits for mobile equipment e.g. forklifts or trucks, and pedestrians are to be provided
- ✓ Power operated doors and gates should have safety features to prevent people from being stuck or trapped.
- ✓ Location of exits should be clearly marked and signs posted to show direction of exit doors to aid emergency evacuation.

Work Areas

The layout of the work area should be designed to provide sufficient clear space between furniture, fixtures and fittings so workers can move freely without strain or injury also evacuate quickly in case of an emergency.

In determining how much space is required, the following should be considered:

- ✓ the physical actions needed to perform the task
- ✓ the need to move around while working
- ✓ whether the task is to be performed from a sitting or standing position
- ✓ access to workstations
- ✓ the equipment to be handled and the personal protective equipment that may be worn to perform the work

Environmental factors including heat or noise may require an increase to the space, as will work activities that involve manual tasks or the use of equipment.

Floors and Other Surfaces

Floor surfaces shall be suitable for the work area and be chosen based on the type of work being carried out at the workplace, as well as the materials used during the work process, the likelihood of spills and other contaminants, including dust and the need for cleaning.

In general:

- ✓ floors shall be free from slip or trip hazards e.g. cables, uneven edges, broken surfaces floor surfaces shall have sufficient grip to prevent slipping, especially in areas that may become wet or contaminated
- ✓ anti-fatigue matting, carpet, shock absorbent underlay, cushion backed vinyl shall be provided for workers where static standing occurs
- ✓ carpet shall be properly laid without loose edges or ripples and should be well maintained
- ✓ Floors should be strong enough to support loads placed on them.

Workstations

Workstations should be designed so workers are comfortable undertaking their task and allow for a combination of sit and standing tasks. For tasks undertaken in a seated position, workers should be provided with seating that:

- ✓ provides good body support, especially for the lower back
- ✓ provides foot support, preferable with both feet flat on the floor, otherwise a footrest shall be provided

- allows adequate space for leg clearance and freedom of movement
  - ✓ is fully adjustable to accommodate different size workers (e.g. seat height, back rest height and back rest tilt adjustments) and should not tip or slip utilizing a five-point-base
  - ✓ Chairs shall be fitted with castors for carpeted surfaces and glides or braked castors on hard surfaces.

Lighting

Sufficient lighting is required to allow safe movement around the workplace and to allow workers to perform their job without having to adopt awkward postures or strain their eyes to see.

Emergency lighting is to be provided for the safe evacuation of people in the event of an emergency.

The following factors are to be taken into account:

- ✓ the nature of the work activity
- ✓ the nature of hazards and risks in the workplace
- ✓ the work environment
- ✓ illumination levels, including both natural and artificial light
- ✓ the transition of natural light over the day
- ✓ glare

Air Quality

- ✓ Workplace are to be adequately ventilated which includes provision of fresh, clean air drawn from outside the workplace, uncontaminated from flues or other outlets and be circulated through the workplace.

Hot or cold

- ✓ Extremes in temperature in either hot or cold conditions can contribute to thermal discomfort.
- ✓ The risk to the health of workers increases as the conditions move further away from those considered as comfortable. Heat strain/illness can arise from working in high air temperatures, exposure to high thermal radiation and/or high levels of humidity. Hypothermia arises when a person gets an abnormally low body temperature as a result of exposure to environments that are too cold. Both of these conditions are potentially fatal

Self-Check – 9	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short answer

1. What is working environment?
2. What are the examples of physical working environments

Information Sheet 10 - Maintaining workplace records

Records: Provide evidence of various actions taken to demonstrate compliance with instructions, e.g. activities, events, investigations, and in the case of manufactured batches a history of each batch of product, including its distribution. Records include the raw data which is used to generate other records. For electronic records regulated users should define which data are to be used as raw data. At least, all data on which quality decisions are based should be defined as raw data

- The Processing Instructions should include:
  - ✓ A statement of the processing location and the principal equipment to be used;
  - ✓ The methods, or reference to the methods, to be used for preparing the critical equipment (e.g. cleaning, assembling, calibrating, sterilizing);
  - ✓ Checks that the equipment and work station are clear of previous products, documents or materials not required for the planned process, and that equipment is clean and suitable for use;
  - ✓ Detailed stepwise processing instructions [e.g. checks on materials, pre-treatments, sequence for adding materials, critical process parameters (time, temp etc.)
  - ✓ The instructions for any in-process controls with their limits;
  - ✓ Where necessary, the requirements for bulk storage of the products; including the container, labeling and special storage conditions where applicable;
  - ✓ Any special precautions to be observed.
- Over all working reports content included in dough making are:
  - ✓ Name of company
  - ✓ Section of processing
  - ✓ Progression record
  - ✓ Name of operator

Operator shall ensure that all documents, records and data critical to the management of product quality and safety arena place and effectively controlled.

A master list of documents shall be in place, including the location and person responsible for updating the list.

Manufacturing records shall contain all relevant data that will permit investigation into the history of any product. The design and use of documents depend upon the operator.

Documents should have unambiguous contents. The title, scope and purpose should be clearly stated.

All documents should be approved, signed and dated by appropriate authorized persons, and kept up-to-date; correct versions should be readily available to appropriate staff.

No documents should be changed without authorization.

Any changes or amendments critical to the requirements of product quality or safety systems and procedures shall be documented.

Obsolete documentation should be rescinded and, if necessary, revised and replaced in a controlled manner.

Effective change control and investigation procedures should be implemented to manage both planned and unplanned deviations and documented.

- ✓ The operator shall have a system of records and documentation that reflect all aspects of the working area

Accurate record keeping is essential to the application of a preventive control plan. Your records should be sufficient to enable you to confirm easily and with confidence that your preventive control plan is implemented and working effectively.

Records can also help to improve your preventive control plan by providing a means for you to, for example:

- ✓ Identify the root cause of an issue
- ✓ Analyze and improve a process or procedure
- ✓ Identify gaps in training and in training needs

- The following make up the records of a Hazard Analysis and Critical Control Point (HACCP) Plan for dough making and freezing operation
  - ✓ List of HACCP team and their assigned responsibilities

- ✓ Description of dough menu item
- ✓ Flow diagram for dough menu item indicating CCPs
- ✓ Hazards associated with each CCP and preventive measures
- ✓ Critical limits
- ✓ Monitoring procedures
- ✓ Corrective actions plans
- ✓ Record keeping procedures
- ✓ Procedures for verification of the HACCP plan
- ✓ Production process
- ✓ Variation of results

Self-Check – 10	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Short answer

1. Write importance of recording for operation
2. List working reports content in dough making

LG #41	LO3. Store frozen dough

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Retaining quality characteristics of frozen dough
- Monitoring the freezing processes

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Retain quality characteristics of frozen dough
- Monitor the freezing processes

Learning Instructions:

1) Read the specific objectives of this Learning Guide.
2) Follow the instructions described below.
3) Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4) Accomplish the “Self-checks” which are placed following all information sheets.
5) Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6) If unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet - 1 Retaining quality characteristics of frozen dough

Introduction

The Frozen Dough Procedure is the procedure that the dough or semi-finished bread is obtained through a process interruption of the normal production process, the dough or semi-finished bread being processed is conducted rapid freezing (at 30℃ or less), and then stored at -18 ℃. The frozen dough's shelf life (-18 ℃ storage) can reach 3-6 months, usually to be used up within 3 months.

According to the process, the frozen dough can be divided into:

- ●Unfermented frozen dough
- ●Pre-fermented frozen dough
- ●Pre-baked frozen dough
- ●Fully-baked frozen dough

Advantages of Frozen Dough Procedure for Bakery Chain Stores

- Long-locked freshness
- Centralized quantified production, and on-demand production at stores
- chain management
- labor saving and equipment saving at stores

Flour Farinograph water absorption (%),

The farinograph is a tool to assess baking qualities and performance of wheat flour dough's. It records the resistance to deformation, or the consistency of dough mixed from flour and water.

To millers and bakers, farinographs are essential for:

- Adjusting dough mixing parameters: absorption, time, pre-hydration ratio
- Studying the effect of flour improvers dough handling properties
- Establishing quality control measures to properly handle wheat crop changeovers
- Preparing wheat and flour blends to comply with flour specifications

Farinographs measure and record the resistance to deformation of flour/water dough against the mixing action of blades over time and at a specific speed (rpm) and

temperature. Dough resistance is expressed as motor torque, in dimensionless units known as Farinograph. during the test the dough is developed and further broken down.

- Resistance has traditionally been known as “consistency.” The maximum consistency of the dough is adjusted to a fixed value by altering the quantity of water added (i.e. % absorption).

The farinograph is a tool used for measuring the shear and viscosity of a mixture of flour and water. The primary units of the farinograph are Brabender Units, an arbitrary unit of measuring the viscosity of a fluid.

A baker can formulate end products by using the farinograph's results to determine the following

- Water absorption
- Dough viscosity, including peak water to gluten ratio prior to gluten breakdown
- Peak mixing time to arrive at desired water/gluten ratio
- The stability of flour under mixing
- The tolerance of a flour's gluten

Fig 12: a laboratory equipment to measure the water absorption of flours an determine the rheological properties of the dough

Farinograph parameters

- **Water absorption (%)**

The amount of water added to balance the farinograph curve on the 500-FU line, expressed as a percentage of the flour (14% mc). This parameter is useful in adjusting the water relationships in commercial doughs when flour changes.

Factors that affect Water absorption is:

- ✓ Amount of starch damage
- ✓ Gluten-forming proteins present
- ✓ Amount of arabinoxylans / hemicellulose
- ✓ Presence / absence of cellulosic fiber (bran)
- ✓ Particle size distribution of flour

- **Dough development time / mixing time or peak time**

Provides the time (in minutes) between the origin (time zero) of the curve and its maximum (peak). It is used to make adjustments during mixing in commercial processes when the flour mixing requirements change. Stronger flours with higher protein content have a longer development time than weaker flours with equivalent particle size distribution.

Factors that affect Dough development time is:

- ✓ Quality (chemical conformation of glutenins)
- ✓ Particle size distribution of flour
- ✓ Amount of arabinoxylans / hemicellulose

- **Stability**

Difference in minutes between the arrival time (the time at which the top of the curve reaches the 500-FU line) and departure time (the time at which the top of the curve falls below the 500-BU line)

It is a measurement of how well flour resists over mixing. Stronger flours are usually more stable than weaker ones from the same wheat class.

Factors that affect Stability are:

- ✓ Quality (chemical conformation of glutenins)
- ✓ Presence / absence of cellulosic fiber (bran)

- **Mixing Tolerance Index (MTI)**

Measured as the difference in Brabender units between the top of the curve at the optimum and the point on the curve 5 min later

The MTI indicates how fast the gluten structure breaks down after reaching its full development. Lower MTI values correspond to stronger flours, typically used in the production of high specific volume bread.

Factors that affect Mixing Tolerance Index (MTI) is

- quality (chemical conformation of glutenins)

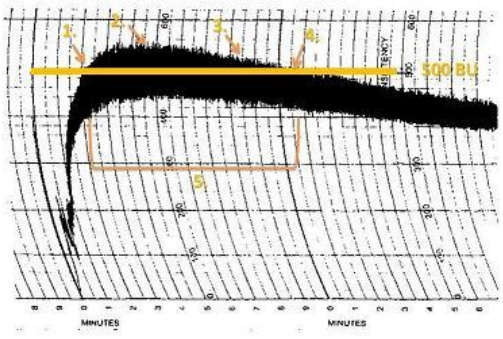

Fig 13: 500 BU line

The farinograph is drawn on a curved graph with the vertical axis labeled in Brabender Units (BU) and the horizontal axis labeled as time in minutes. The graph is generally

hockey-stick shaped, with the curve being more or less acute depending on the strength of the gluten in the flour.
A weaker flour, such as a cake or pastry flour with much lower gluten content would have a much steeper decline after peak time.

The Farinograph is used worldwide by bakers and food technicians in building bakery formulations.

The farinograph gives bakers a good snapshot of the flour's properties and how the flour will react in different stages of baking, which helps them pick certain flour for any given purpose.

Millers use the Brabender Farinograph to access the properties of the flour, to ascertain whether changes need to be made in the mill.

The miller also uses the farinograph to prepare dough for further testing for extensibility after a resting period (akin to proofing) with the Brabender Extensograph.

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Write factors that affect stability of dough
2. write Factors that affect Dough development time
3. what is the role of farinography
4. what are types of frozen dough according to process

Information Sheet - 2 monitoring the freezing processes

2.1 introduction

Freezing is a phase transition where a liquid turns into a solid when its temperature is lowered below its freezing point. In accordance with the internationally established definition, freezing means the solidification phase change of a liquid or the liquid content of a substance, usually due to cooling.

Advantages of freezing of dough are reduction of losses caused by aging of products. But freezing deteriorates the baking quality of frozen bread dough. These include gradual loss of the dough strength, reduced yeast activity and deterioration in the texture of the final product.

The negative effects of freezing and defrosting of dough can be reduced by incorporating hydrocolloids in dough. Furthermore Biogenic ice nucleators, such as extracellular ice nucleators (ECINs) isolated from Erwinia herbicola, are a group of lipoglyco proteins that has been demonstrated to minimize the super cooling. Ice nucleation materials function as heterogeneous ice nucleators to minimize the super cooling of water.

Mechanism of protective effects from extracellular ice nucleators was possibly that ECINs helped in preserving the viability of yeast cells during freeze/thaw cycles.

2.3 Advantages of freezing

The main advantages of freezing of dough are reduction of losses caused by aging of products and harmonization of production with the market demands. However, the use of frozen dough can result in problems such as change of dough characteristics and stability loss during long term storage in the frozen state

- The stability loss is expressed by one or more of the following characteristics:
  - ✓ the prolonged final fermentation time, lower loaf volume, poor bread characteristics (shape of bread, uniform pores, crust color, crust shine, crust oiliness, crumb, and crust elasticity),
  - ✓ Quick loss of freshness.
- The use frozen dough in the bakery industry permits the baker to

- ✓ reduce night work and reduce logistic constraints.
- ✓ Facilitate the centralization of dough production and extends the distribution area.
- ✓ give a longer shelf life and preserve freshness;

this parameter is greatly dependent on an adequate control of freezing rate and thawing.

Frozen dough is obtained by adapting mechanized processes usually developed by international companies, which reduce production costs. Moreover, manufacturers can provide standard products at any time.

The freezing rate of free water has a great influence on quality of final product. Large ice crystals are formed due to slow freezing of free water and cause damage of yeast cell membranes.

Furthermore, due to altered distribution of non-frozen liquid phase, the content of solutes increases in the non-frozen medium, resulting in disruption of metabolism of surviving yeast cells and reduction of yeast activity during processing of frozen dough.

Frozen products are not indefinitely stable; they gradually deteriorate until they reach an unacceptable quality. This quality loss is reflected by reduction in dough volume and an increase in proofing time in comparison with dough prepared by using traditional methods.

The shelf life of frozen dough is estimated for 8–9 weeks if the dough has not been abused during transportation and frozen storage(temperature, formulation, freezing, transportation)

However, the decrease of frozen dough volume is related to phenomena that occur during freezing and frozen storage:

- ✓ reduced yeast fermentative capacity
- ✓ Loss of the gluten network integrity. This behavior affects the dough machinability, creating a problem in the industrial chain (reducing the dough shelf life), because the dough quality is reduced (resistance losses during proofing)

- ✓ The resistance decrease leads to cracking of dough gluten network, the latter resulting in poor gas retention and loss of volume when baking. These phenomena are probably due to uneven water redistribution in dough matrix during freezing.

The quality of the bakery product made from frozen dough is largely influenced by:

- ✓ dough formulation
- ✓ processing parameters such as
  - dough mixing time,
  - freezing rate, frozen storage temperature,
  - storage duration, and
  - Thawing rate.

- The freezing rate plays an important role in the final quality of frozen product, two opposite effects:
  - ✓ A high freezing rate allows the formation of ice micro crystals, which do not affect the integrity of the three dimensional gluten networks. This remains the most important parameter which reduces physical damage (disturbance and dehydration of gluten network) induced by freezing, ultimately to the extent that the starch granules appear to be associated with the network gluten.
  - ✓ Rapid freezing might fatally compromise the yeast activity. A compromise of freezing rate is needed to freeze the dough, slowly enough to maximize yeast activity but fastly enough to limit dough weakening. On other hand, during freezing the death yeast release reducing agents (glutathione) in dough have been which reduces disulfide cross the gluten network.

Fig14: dough freezer

Blast Freezing

Blast freezing is a rapid or short time thermal preservation technology commonly used in bakery and other food applications to extend the product's shelf life and maintain its safety, physicochemical stability and freshness.

Blast freezers blow very cold air (typically at -30°C and -50°C and high flow rates of 3.0–6.0 linear meters per second) over the product to promote a faster rate of heat removal from the food products.

Blast freezing of wrapped or unwrapped bread, followed by frozen storage does the following:

- ✓ Temporarily arrests starch retro gradation involved in bread firming or staling
- ✓ Prevents mold spoilage
- ✓ Ensures freshness of bakery products

It is required to prevent formation of large ice crystals within the product structure so that minimal damage occurs to the product texture

Blast freezers are available in batch or continuous modes. They require efficient compressors to force cold air over the food product until it reaches the desired temperature. To achieve blast freezing, the product must be exposed to a low-temperature for a short but sufficient time to remove its sensible and latent heat of fusion. By reducing product temperature water is converted from a liquid to solid state. To accomplish the freezing process in desired short times, a large convective heat-transfer coefficient must be created.

Blast freezing and subsequent frozen storage can virtually stop all chemical reactions e.g., enzymatic and oxidative, metabolism, and microbiological growth, a consequence of the availability of less free water to support deteriorative reactions, and mold and bacteria growth.

By shortening the time the bakery product spends in the critical temperature zone of 10°C to -7°C (50–20°F), where starch retrogradation rate is faster than in the crumb, there will be less firming and staling.

Blast freezing of finished products helps large bakeries better prepare for unusual high demand peaks. During this preparation time, baking plants start building up inventory of dough/batter and/or baked bread without worrying about their shelf life, in an effort to buffer or balance the large temporary outflow of stock.

Blast freezing of dough/batters aims to preserve them for extended periods of time—usually during transportation and storage—until they can be processed (proofed and baked) by an external retail or in-store bakery. The frozen dough market is becoming a very important business segment within the baking industry. Bakeries often benefit from frozen dough because they don’t have to invest in a complete production line. Plus, the cycle time is reduced to baking and packaging times

Important considerations when freezing dough

- ✓ Keeping or maintaining the yeast vitality (fermentation capacity) after thawing and normal processing operations at the bakery. Exposure of yeast to extremely low temperatures leads to cell stress and death in a portion of the yeast population. Therefore, higher yeast proportions are recommended in frozen dough formulations to compensate for the activity loss and to retain normal gas production capacity.
- ✓ Preventing the dough from becoming too slack or weak due to internal structure damage from ice crystals via incorporation of emulsifiers such as diacetyl tartaric acid esters of mono- and di-glycerides and sucrose esters as stale inhibitors.
- ✓ As a colligative property, high concentrations of solutes such as sugars, salt and fats, depress the freezing point of doughs, thus the need for longer freezing times and/or more energy consumption to lower product temperature. Rich formulas may require different process conditions than lean formulas.

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

True or false

1. Blast freezers are available only in batch process.
2. Frozen products are not indefinitely stable

Short answer

1. Define freezing
2. Write the advantage of freezing for dough

Operation Sheet - 2 Techniques of measuring frozen dough characteristics

1. Place 300 g of flour (14% moisture basis) is in the farinograph bowl.
2. Add Water from a burette.
3. To ensure that farinograms from different samples can be compared, the midpoint of the farinograph bandwidth at the maximum resistance is always centered on the 500-FU line. This is accomplished by adjusting the amount of flour and water used.
4. Record dough behaviour under identical test conditions in which the mixing bowl is kept at constant temperature.
5. Record dough resistance against constant mechanical shear is on a chart in the form of a torque-time curve.

Lap Test	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1** hour. The project is expected from each student to do it.

Task 1: perform measuring of frozen dough characteristics

LG #42	LO4. Thaw frozen dough

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Thawing dough to meet food safety and quality requirements
- Identifying, rectifying and/or removing unacceptable dough
- Disposing of wastes
- Conducting work in accordance with workplace information and environmental guidelines
- Maintaining housekeeping standards

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Thaw dough to meet food safety and quality requirements
- Identify, rectify and/or remove unacceptable dough
- Dispose of wastes
- Conduct work in accordance with workplace information and environmental guidelines
- Maintain housekeeping standards

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If unsatisfactory, see your trainer for further instructions or go back to

“Operation sheets”.

Information Sheet - 1 Thawing dough to meet food safety and quality requirements

1.1 introduction

Frozen dough is very easy to defrost and you can use a number of various methods to thaw it. Defrost any type of dough using a microwave, a fridge, or an oven. If you're in a hurry, the microwave is your best bet to quickly defrost your dough. The fridge will take the longest but requires the smallest amount of effort. Using the oven will ensure a thorough thaw but takes much longer than the microwave.

- **Thawing by Using a Fridge**
  - ✓ **Putting cooking spray on a pan.**

Lay a pan flat on a clean work surface. Use a bottle of cooking spray and squirt it across the surface of the pan. The dough will rise to double its size in the fridge so make sure that your pan is big enough for this expansion.

You can also make your own cooking spray. Buy a spray bottle and fill it with canola, olive, or another type of oil and use that on your pan instead.

- ✓ **Wrapping the dough in plastic wrap and place it on the pan.**

Coat your plastic wrap with cooking spray. Tightly wrap the plastic around the dough on the pan. Spraying the plastic wrap will stop the dough from sticking to it when it rises.

- ✓ **Putting pan in the refrigerator and leave it overnight.**

Ensure the dough has enough room to double its original size. If your pan is too big for the shelves, pull the shelf out of the fridge and place it on a lower groove on the inside wall of the fridge.

If you don't have the time to leave the dough in the fridge overnight, you can leave it in there during the day for 8 hours or so.

- ✓ **Leaving the dough rise at room temperature.**

If you think the dough still needs to rise a bit more, remove the plastic wrap and leave it on the worktop in your kitchen. Allow it to rise for 30-60 minutes.

You can preheat your oven while the dough rises at room temperature

Thawing with a Microwave

- ✓ **Coat a microwave-safe plate with cooking spray.**

You can use store-bought cooking spray or make your own cooking spray by filling a spray bottle with your favorite type of oil. Make sure you clean the spray bottle beforehand.

- ✓ **Placing frozen dough on the plate and covering with plastic wrap.**

Take your frozen dough out of the freezer. Place it directly on the microwave plate coated in cooking spray. Before you place the plastic wrap over the dough, squirt the wrap with cooking spray. This will make sure the dough doesn't stick to it.[6]

Wind the plastic wrap tightly around the dough.

- ✓ **Microwaving the dough on high for 25 seconds.**

The high setting on microwave will heat the dough but it won't cook it in 25 seconds. When the 25 seconds are up, the dough out of the microwave.

- ✓ **Flipping the dough over and microwave it for another 25 seconds.**

Ensuring that all the dough is covered in plastic wrap before microwaving it again. When the time is up, the dough from the microwave removed and placing it on a clean work surface.

- ✓ **Remove the plastic wrap and inspect your dough.**

Tearing off the plastic wrap and putting it in the trash. Looking at and touch your dough to check how frozen it is. It should still feel cool to the touch, but it shouldn't be hard.

It's also unlikely that the dough will have raised a significant amount.

- ✓ **Microwave the dough on defrost for 3 to 5 minutes.**

The defrost setting will evenly defrost the dough.

Generally, a smaller amount of dough will need around 3 minutes to defrost in the microwave and a larger amount of dough will take closer to 5 minutes to defrost.

- ✓ **Leaving the dough out at room temperature for an hour to rise.**

Once dough is finished defrosting in the microwave, taking it out and place it on a work surface. Leaving it out at room temperature will give the dough plenty of time to properly rise.

Once the dough has risen enough, place it in the oven and bake it as per the recipe.

Defrosting with an Oven

Squirt cooking spray on a bowl or baking pan.

Make sure that your cooking pan or bowl is large enough to support the dough once it rises to twice its frozen size.

Use cooking spray you bought in a store or fill a spray bottle with your favorite type of oil.

Place the dough in the pan and cover it with plastic wrap.

Coat the plastic wrap first with your cooking spray to make sure the dough doesn't stick to it when it rises.

- Wrap the plastic tightly around the dough to ensure its properly heated when it's put it in the oven.

Put the pan in the oven at 100°F (38°C).

If you have a gas oven, put the heating on the lowest gas mark. Some ovens have a "bread proofing" setting, which will set the temperature to 100°F (38°C). This temperature is the perfect heat for defrosting frozen dough.

Take the pan out of the oven after 1 hour to test it.

When the time is up, put on oven gloves and remove the pan from the oven. Take the plastic wrap off the dough and inspect it to see if the dough has fully defrosted and risen.

Putting dough in the oven for 30 mins - 1 hour if it's not fully defrosted

If the dough hasn't risen to twice its size, it may need more time. Rewrap the dough in plastic wrap before putting it back in the oven.

- If the dough has raised a small amount, you should put it back in for 30 minutes. If it hasn't risen at all, put it back in for another hour.

Removing the plastic wrap before baking the dough as the recipe indicates.

When the time is up, remove the plastic wrap and place the dough on your work surface. Then, put it on a clean pan and bake it following the instructions in your specific recipe.

Fig15: dough thawing machine

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Short answer

1. Write methods of dough thawing.
2. Write thawing method of dough by using oven

Information Sheet - 2	Identifying, rectifying and/or removing unacceptable dough

After all activities of dough making process there is unacceptable dough which remains inside of the mixing chamber and restudies attached to the blending blade or shafts and also other scraped dough mean that not well mixed dough must be removed before starting another batch of dough making started. These activities either done by CIP or COP cleaning methods.

- **Reusing**

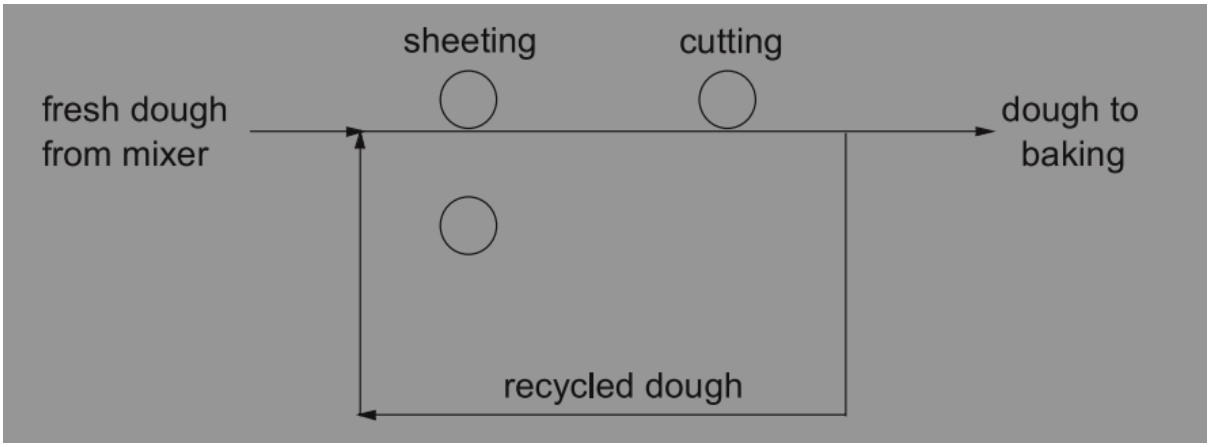

fig16: recycling dough

Incorporation of scrap dough is the biggest in recycling programme. This is difficult because to handle old dough and it can often be in a condition where it is hard and it's not easily dispersed in a mixing chamber. For the same point of view one can easily get into various circle where use of scrap dough in mixing creates substandard mix which either means more scrap dough or substandard product after baking.by every means possible the amount of dough to be recycled should be kept as well as possible and incorporated at steady state rate in mixing unit is used up.

The dough that infected or cross contaminated is not added to mixing that means it not recycled and totally removed as waste.

Wasted dough used for animal feed.

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Say true or false

1. Incorporation of scrap dough is the biggest in recycling programme
2. The dough that infected or cross contaminated is added to mixing
3. Not well mixed dough must be removed before starting another batch of dough making started.

Information Sheet - 3 disposing of wastes

3.1 Waste disposal

The golden rules for waste disposal are based on common sense. Remember first that waste accumulations are never necessary in manufacturing areas. Get rid of it as soon as possible. Large accumulations must be prevented - irrespective of manpower shortage excuses. Small accumulations should be collected regularly and placed in non-combustible refuse receptacles pending removal.

Second, clean up after every shift. Make this a routine and third, appreciate that waste or dirty flammable liquids are just as hazardous as clean liquids. Liquids/solvents must receive priority attention during removal. If all the liquids are not used up in the process have them returned to the flammable store or pre-designated waste liquid magazine immediately.

Too often excess liquids are used for cleaning machinery and overalls and waste liquids are dumped down drains! Remember too that when flammable liquids and people share the same environment, accidents can happen. Provide suitable absorbent materials on-site for mopping-up spillages.

Bakery solid waste includes stale bakery products, dropped raw materials (e.g., dough), and packages. The most simple and common way is to directly transport these to landfill or incineration. Landfill can cause the waste to decompose, which eventually leads to production of methane (a greenhouse gas) and groundwater pollution (organic compounds and heavy metals).

Incineration of bakery waste can also release nitrogen oxide gases.

Reclamation of the bakery waste can play an important role in its management. The waste consists primarily of stale bread, bread rolls, and cookies – all of which contain high energy and can be fed directly to animals, such as swine and cattle. Another application is to use the waste for production of valuable products successfully used bakery waste to produce lactic acid with a good conversion efficiency of 47.2%.

Self-Check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

1. List some wastes during dough making process
2. What is the best way to transfer wastes from bakery's

Information Sheet - 4 conducting work in accordance with workplace information and environmental guidelines

4.1 introduction

More generally, we suggest that you keep the equipment in a stable environment, adequate in terms of temperature and ventilation. This will help avoid degrading your production line.

For example, in a dough clean room, if the machine is not in production, it may not be necessary to maintain PPM, particles per million, in the air at a level similar to that during production. However, keeping the temperature and humidity level stable is important so that the machine does not start to rust.

As for air compressors especially air dryers and filters we highly recommend that you change these components at shutdown so there will be no contamination or blockage of filters. If you have just recently replaced filters, then you may not need to change to new filters at the time of the shutdown process.

The main goal here is to avoid letting your machinery be dormant with dirty filters in place, as this could adversely affect the general functioning of your machine.

When your equipment is in an industrial environment, certain activities such as cutting materials, welding, generate dust and debris. This poses the risk of generating contaminants and damaging all that is mechanical, such as seals. Accumulated metal shavings, for example, can cause internal damage and pose a risk to operators when the machine is switched back on after the shutdown period.

Normally, when the fans in the factory are running, dust or contaminants are filtered. when a machine is on physical hold at the customer's request, we always cover it with plastic wrap to protect the machine and fragile components from contaminants. This simple step can save you from these problems at restart.

Having a safe and healthy physical work environment, including amenities and facilities, is critical to eliminating and controlling risk in the workplace. This includes ensuring the work environment, facilities and amenities are compliant with legislative and other identified requirements.

4.2 Conducting work in accordance with workplace guideline

A safe work environment including:

- ✓ Facilities,
- ✓ Amenities and accommodation.

Facilities refer to toilets, washrooms, showers, lockers, dining areas, drinking water, etc. These facilities must be in good working order, clean, safe and accessible. When considering how to provide and maintain facilities that are adequate and accessible, a person conducting a business or undertaking must consider all relevant matters including:

- ✓ The nature of the work being carried out at the workplace
- ✓ The nature of the hazards at the workplace
- ✓ The size, location and nature of the workplace
- ✓ The number and composition of the workers at the workplace.

During Conducting work in accordance with workplace guideline a person should ensure the following requirements.

- ✓ Legislative Requirements
- ✓ Responsibilities
- ✓ Need assessment
- ✓ work environment
    - Welfare Facilities
    - Inspect and Monitoring

Self-Check – 4	Written test

Name…… ID……. Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Choose

1. A safe work environment including

A. Facilities, B. Amenities C. accommodation D. All

2. During Conducting work in accordance with workplace guideline a person should ensure the following requirements

A. Responsibilities
B. Need assessment
C. work environment
D. All

3. Which one of the following is not a safe and healthy physical work environment?
   A. amenities
   B. facilities,
   C. A&B
   D. none

Information Sheet - 5 maintaining housekeeping standards

- **Layout of equipment and production flow**

Ensure wherever possible that sufficient work space is provided for thawed dough.. Working areas need to be demarcated, preferably with lines painted on the floor to show where goods may or may not be stored. Adequate space should be provided for operators, equipment and work-pieces within these areas.

- **Handling and storage facilities**

Experience will dictate how much space is required for temporary storage of thawed dough at each place of work. Always aim to keep these to the absolute minimum, particularly where they are of a combustible nature. This will reduce the fire loading within the manufacturing area where most ignition sources are present.

Strict control of flammable liquids should be exercised and these should be issued to operators only in quantities sufficient for single production runs or shifts and even then safety containers and/or flammable liquid cabinets need to be provided.

It would be most useful to detail an employee to collect finished products for return to the finished goods area and to draw and supply raw materials from the stores as and when required. This leaves the machine operators free to supervise uninterrupted manufacturing runs.

- **Clean and tidy premises**

Each operator should be made responsible for tidiness in his/her own work place. As they clean up swarf, cuttings, fluff, dust, overspray, shavings, etc it can be placed in non-combustible receptacles for removal by cleaning staff. Always appreciate that loose, thin and finely divided materials ignite readily.

General guidelines

The following guidelines should be followed to maintain the efficacy of a formal housekeeping programme.

- **Cleaning materials**

Use only non-flammable cleaning solvents and waxes wherever possible. Stipulate suitable materials and monitor what is used. Frequently, highly flammable materials are found in working areas simply because they are readily available or slightly cheaper. Avoid using sawdust to absorb oils or hydraulic fluids - there are other alternatives.

- **Dust and fluff**

Production processes and product handling frequently generate dusts and fluff which accumulates on machinery, structural elements, pipes and ledges. Regular cleaning is necessary to prevent unsightly and dangerous accumulations which become expensive and difficult to remove.

Sometimes ineffective or leaking extraction systems compound the problem so dust handling equipment needs regular checking. Cleaning should be effected through using industrial vacuum cleaners and not by blowing dust away with compressed air.

Self-Check – 5	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

True or false

1. Inadequate space should be provided for operators, equipment and work-pieces
2. Each operator should be made responsible for tidiness in his/her own work place
3. Irregular cleaning is necessary to prevent unsightly and dangerous accumulations

Short answer

1. Write the guidelines for housekeeping in dough making process

Operation Sheet - 2 Techniques of thawing dough with microwave

1. Coat a microwave-safe plate with cooking spray.
2. Place frozen dough on the plate and covering with plastic wrap.
3. Microwave the dough on high for 25 seconds
4. Flip the dough over and microwave it for another 25 seconds
5. Remove the plastic wrap and inspect your dough.
6. Microwave the dough on defrost for 3 to 5 minutes.
7. Leave the dough out at room temperature for an hour to rise**.**

Lap Test	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1** hour. The project is expected from each student to do it.

Task 1: perform dough thawing with microwave

LG 43	LO5. Shut down the process

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Identifying shutdown procedure • processing shut down according to workplace procedures • identifying and reporting maintenance requirements This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Identify shutdown procedure • Know process shut down according to workplace procedures • identify and report maintenance requirements
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks 5. Perform Operation Sheets 6. Do the “LAP test

Information Sheet 1- Identifying shutdown procedure

1.1 Shutdown procedure

Lock-out procedures work safe regulations require that all powered machinery or equipment shut down for maintenance or repair must be secured against the possibility of the equipment being accidentally turned on while being worked on. To safeguard the person working on such equipment, lock-out procedures must be posted near the equipment, and the procedures listed must be followed before repairs or maintenance can start. Locking out a machine usually means the power feeding the machine is disconnected either by pulling a plug, placing a switch in the off position, or turning a circuit breaker to the off position. The disconnected circuit is then secured in the inoperative position by the use of a padlock. The person doing the maintenance or repair keeps the key to this lock until the work on the machine has been completed. The worker then removes the lock and the machine is again operable.

Depending on the situation, the lock might be used to secure the power switch of the machine or it might be used to lock shut the door to a circuit breaker panel where the thrown breaker is located. If the machine is not wired into its own power circuit but simply plugs into the wall, the lock-out procedure may require that the machine be turned off with its power switch and unplugged from the power receptacle. The plug end of the machine must be kept in plain view of the repair person so no one can inadvertently restore power without the repair person's knowledge.

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Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test II: Short Answer Questions (3 point each)

1. Identify the shutdown procedures
2. Describe machine parts related to shut down procedures

Information Sheet 2- Shutting down and cleaning the process

Food-contact surface: All equipment surfaces that intentionally and unintentionally (e.g., due to splashing) come into contact with the product, or from which product or its condensate form may drain or drip down to the main product food container, including surfaces (e.g., tanks, mixers, tables, packaging materials) that may indirectly cross-contaminate food-contact surfaces or containers.

Dead space: Space wherein a product, sanitizing agents, or debris/soil can be trapped (i.e., become stagnant), or not be completely removed during the operation of cleaning.5

Cleaning Out of Place (COP)

Equipment is taken to a designated decontamination station for cleaning. COP requires dismantling/disassembling, washing, checking/inspecting, validating, and reassembling.

Cleaning In Place (ClP)

Cleaning of equipment by circulation of flowing cleaning solutions, with water rinsing into and over surfaces in equipment or systems without dismantling them

Dry cleaning

Cleaning designed or intended for equipment in which the products held or contained are not at risk of contamination after production runs. Products are usually non-hygroscopic and non-sticky. In general, dry cleaning can be an option for products with a water activity below 60%.

Examples of dry cleaning include brushing, aspiration (vacuuming) and magnetic separation.

Wet cleaning

Cleaning in which water is used. Water can be used as a solvent to prepare sanitizing solutions.

Cleanable

Refers to equipment designed to be easily freed from dirt and other contaminants.

- **Crevice**

Sharp, cleft-like, irregular opening of small depth that adversely affects clean ability

- **Readily accessible**

Location that can be reached by an employee from the floor, a platform, or other permanent work area

- ✓ **Readily removable**

Refers to equipment components designed to be easily separated from the machine with or without the use of simple hand tools.

- ✓ **Seal**

Closure of an aperture so as to effectively prevent the entry or passage of unwanted matter

- ✓ **Self-draining**

A condition resulting from a combination of design, construction, installation, and surface finish to prevent the retention of liquid except for normal surface wetting.

Fig: 17 cleaning after shutdown

Members of the bakery staff should have access to the technical specifications (e.g., data sheets) of equipment, especially when buying new assets. These documents should always be provided by the supplier or manufacturer of the equipment.

Some particulate processing and handling equipment (e.g., flour storage bins, pneumatic conveyor systems, and continuous mixers) should only be dry-cleaned. Equipment that processes and handles liquid products (e.g., milk and juice processing) requires strict wet cleaning (COP/CIP) procedures to prevent microbiological contamination.

Certain components of continuous dough mixing units (e.g., centrifugal and axial-flow pumps) can be cleaned in place by using cleaning solutions and rinse cycles.

It is essential to make equipment manufacturers aware of the cleaning and food safety issues that the bakery has faced during normal operation. This allows for upgrading and improving the standard design of equipment.

In some cases, bakeries can try to customize food processing equipment to meet hygienic expectations (e.g., by providing specifications to equipment suppliers regarding the design, construction, and installation of equipment).

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

True or false

1. Certain components of continuous dough mixing can be cleaned in place
2. CIP (clean in place) requires dismantling/disassembling, washing, checking/inspecting, validating, and reassembling.
3. Dry cleaning is cleaning in which water is used.

Information Sheet 3- Identifying and reporting maintenance requirements

3.1 Identifying and reporting maintenance requirements

Preventive/Predictive Maintenance Indicators of Ineffective PPM

- Low equipment utilization due to unscheduled stoppages
- High wait or idle time for machine operators during outages
- High scrap and rejects indicative of quality problems
- Higher than normal repair costs due to neglect of proper lubrication, inspections or service.
- Decrease in the expected life of capital investments due to inadequate maintenance

Equipment maintenance

Maintenance on plant and equipment is carried out to prevent problems arising, to put faults right, and to ensure equipment is working effectively.

Maintenance may be part of a planned programme or may have to be carried out at short notice after a breakdown. It always involves non-routine activities and can expose those involved (and others) to a range of risks.

3.2 Importance of maintenance plant and equipment

An effective maintenance programme will make plant and equipment more reliable. Fewer breakdowns will mean less dangerous contact with machinery is required, as well as having the cost benefits of better productivity and efficiency. Additional hazards can occur when machinery becomes unreliable and develops faults. Maintenance allows these faults to be diagnosed early to manage any risks. However, maintenance needs to be correctly planned and carried out. Unsafe maintenance has caused many fatalities and serious injuries, either during the maintenance or to those using the badly maintained or wrongly maintained/repaired equipment.

Employers should do

Employers who provide equipment for use, from hand tools and ladders to electrical power tools and larger plant, need to ensure that, so far as is reasonably practicable that the machinery and equipment under their control is safe and without risk to health. One way to achieve this is for employers to have arrangements in place to make sure machinery and equipment is maintained in a safe condition. They should think about what hazards can occur if:

- tools break during use;
- machinery starts up unexpectedly;
- There is contact with materials that are normally enclosed within the machine, i.e. caused by leaks/breakage/ejection etc.

Failing to correctly plan and communicate clear instructions and information before starting maintenance can lead to confusion and can cause accidents. This can be a particular problem if maintenance is during normal production work

Whether the shutdown affects all of your manufacturing lines or just a portion, we recommend you use the disruption as an opportunity to perform preventive maintenance on your equipment.

The manufacturer's operation and maintenance manual is the best source for guidance on how to care for your equipment and how to identify issues that need repair.

Dealing with repair needs today will help you to be better able to restart quickly. It is also advisable to ensure that you have critical parts and components that need frequent replacement beforehand. Lead times to supply your parts can be unpredictable, so we suggest that you make a list of parts that need changing and share it with your suppliers to anticipate when the product will be available.

Table.1 maintenance check list

	Tool	Yes	No	Remark
1	Are tools in safe condition?			
2	Are instruction manuals available?			
3	Are power tools properly grounded?			
4	Are guards and shields in place?			
5	Is Personal Protective Equipment available?			
6	Are tools properly stored?			

If necessary:

- Tighten nuts and bolts.
- Smooth off splinters and sharp points.
- Tighten shafts.
- Unblock pipes and nozzles.
- Sharpen blunt tools.
- Clean nozzles on sprayers.
- Check and maintain cables and plugs.

Self-check 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Instruction: I Short answer questions

1. How do we/you perform maintenance safely?(10pts)
2. Define maintenance and write what maintenance may include. (5pts)
3. Write Importance of maintenance plant and equipment

Note: **Satisfactory rating – 20 points Unsatisfactory - below 20 points**

Test II: Short Answer Questions (3 point each)

1. Write the maintenance requirements status of machine?
2. Write the role of operator if hazards can occur

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