



Cereal processing

Level-II

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Module title: Operating a Break Roll Process

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LG #20

LO1. Prepare the break roll 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:

- Preparing cereals for the break roll process.
- Identifying services for cleaning and maintenance requirements.
- Identifying operating equipment's and processes.
- Fitting and adjusting machine components and related attachments.
- Identification of processing/operating parameters.
- Checking and adjusting brake roll equipment performance.
- Carrying out pre-start checks.

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:

- Prepare cereals for the break roll process.
- Identify services for cleaning and maintenance requirements.
- Identify operating equipment's and processes.
- Fit and adjust machine components and related attachments.
- Identify processing/operating parameters.
- Check and adjust brake roll equipment performance.
- Carry out pre-start checks.

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 - Preparing cereals for the break roll process

1.1 Introduction

A cereal is any grass cultivated (grown) for the edible components of its grain composed of the endosperm, germ, and bran. In their natural, unprocessed, whole grain form, cereals are a rich source of vitamins, minerals, carbohydrates, fats, oils, and protein. When processed by the removal of the bran, and germ, the remaining endosperm is mostly carbohydrate.

Most of us would describe "flour" as fine powder, made from wheat, which we use in cooking. However, depending on the wheat variety and the blending processes used by millers, different types of flour, each with a different purpose, are obtained. For example, there are flours intended for cake/biscuit making, for bread making, for household use, and for pasta production.

In milling system, the break subsystem is the beginning of the actual milling process. The objective of the break subsystem is to open the wheat kernel and remove the endosperm and germ from the bran coat with the least amount of bran contamination, while at the same time, obtaining a granulation distribution of maximum large middling with a minimum of flour and fine middling that cannot be purified before reduction into flour.

1.2 Cereals for break roll process

Cereals typically undergo a range of processes to produce a variety of different products, including non-food products. Milling is the main process associated with cereals, especially the bread cereals wheat and rye. Slightly different milling techniques are used for the various cereals (see below) and a range of other processes may also be used (e.g. extrusion and fermentation) in the production of cereal products. As well as having technical consequences, processing also changes the nutritional content of cereals.

There are different types of cereal use break roll in cereal processing. Those are described below:

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1.2.1 Wheat

Wheat is a grass widely cultivated for its seed, a cereal grain which is a worldwide staple food. The many species of wheat together make up the genus *Triticum*. The most widely grown is common wheat. The archaeological record suggests that wheat was first cultivated in the regions of the Fertile Curve. Botanically, the wheat kernel is a type of fruit called a caryopsis

1.2.2 Rye

Although this is similar to milling wheat, rye is more prone to ergot so great care is taken to remove this fungus during cleaning. Rye is also tempered for a shorter period of time (6hrs) because rye kernels are softer than wheat kernels.

1.2.3 Sorghum and millets

These cereals are mainly processed by traditional methods, using a hand-operated wooden pestle and mortar. Generally the grains are pounded and the husk removed by winnowing or floatation. The grains are pounded further before sieving (to remove coarse material which is pounded again) to produce flour and meal.

1.2.4 Rice

Whole (paddy) rice is dehulled by a rubber-roll sheller to produce brown rice and coarse bran (from the husk). Brown rice can be further processed to remove the bran and produce white rice by pearling or whitening, and polishing

1.2.5 Barley

Barley is shelled and the husk removed (via aspiration) before sifting and cutting. Barley may then be pearled, with extensive pearling (removal of over 50% of the original grain) producing pearl barley and as a by-product, barley flour

1.2.6 Oats

Two different systems have developed: the traditional or dry-shelling system and the modern green-shelling system.



1.3 Conditioning cereal

Prior to grinding, water may be added to the cereal, which is allowed to rest before milling (tempering). This allows absorption of water by the grains, toughening the pericarp and germ so they do not splinter during milling. If heat is also applied during tempering (to mellow the endosperm and make it easier to grind) the process is referred to as conditioning. To ensure production of a uniform product, different grains may be blended prior to milling and this is referred to as gristing.

1.4 Importance of conditioning

- **Mellowing of the endosperm**
 - ✓ Flour extraction can be increased
 - ✓ Power consumption / noise level of the Rollermills reduced
 - ✓ Flour ash content reduced
- **Toughening of the bran**
 - ✓ Bran tends to break up less and remains in larger pieces
 - ✓ Large bran flakes can effectively be cleaned by the fluted rolls
 - ✓ Less bran specks in the Flour
- **Adjustment of the Flour moisture content**
 - ✓ Constant moisture level = constant milling conditions
 - ✓ Constant moisture level = constant baking conditions
 - ✓ Profitability for the Miller

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Self-Check – 1	Written test
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Name..... ID..... Date.....

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

Short answer (3pts each)

1. Define cereal
2. Write the importance of conditioning
3. List cereal used in break roll system
4. You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 12 points	Unsatisfactory below 12 points
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Information Sheet 2- Identifying services for cleaning and maintenance requirements

2.1 Introduction

Preventive maintenance is the practice of maintaining equipment on a regular schedule based on elapsed time or meter readings. The intent of preventive is to “prevent” maintenance problems or failures before they take place by following routine and comprehensive maintenance procedures. Also maintenance is the upkeep of all furniture, fittings and equipment to an exacting standard within the property so that all areas look consistently new and pristine. The goal is to achieve fewer, shorter, and more predictable outages

2.2 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:

2.3 Service requirements

Common services required to dough making operation

- power
- vacuum
- compressed and instrumentation air

2.3.1 Vacuum

Vacuum pumps are used in a variety of process plants to pump air, water vapor, organic and inorganic solvents and acids. There are many different types of vacuum pumps on the market today that meet special needs in pumping various gases pumps are used in a variety of process plants to pump air, water vapor, organic and inorganic solvents and acids. There are many different types of vacuum pumps on the market today that meet special needs in pumping various gases

2.3.2 Power

Electricity is usually supplied to the site by a high-voltage line from the local utility. The plant needs to install a step-down transformer and then an electrical distribution

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system with several voltage levels; 440 V, 220 V, and 120 V are common. The higher the voltage is, the less expensive the wiring and the more efficient the conversion of electricity to useful work in equipment motors or to light from fixtures. Equipment and areas of the plant are usually wired separately so individual pieces can be isolated. Switchgear and motor starters generate heat and so should be in rooms that are ventilated. Much of the switchgear is rarely accessed and thus may be located relatively remotely.

Control and communications wiring is normally relatively low-voltage and should be isolated from power wiring. Wire in a food plant is normally contained in metal conduits, which protect it from accidental damage as well as from water, dust, insects, and rodents. Conduits should not be over-filled. Local codes usually dictate good practice. Conduits should not be installed too close together for ease of cleaning. Conduits should be one inch away from walls for the same reason, and hangers should be of the same sanitary design as that used for utility and process piping that is, no perforated channel and no all-thread rods because these products are hard to clean, and all-thread rods can cause injury with their sharp threads.

2.3.3 Compressed air

One of the major methods of actuation of industrial machines is pneumatic actuation, ie, action by compressed air. It is nothing but air, at a pressure higher than the atmospheric pressure. It has been widely used as an energy source for operating simple to sophisticated equipment in mechanical, chemical, and other process industries. Even though air is the most abundant natural resource on the planet, compressed air is one the most expensive of services to provide.

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Self-Check – 2	Written test
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Name..... ID..... Date.....

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

Choose

1. which one of the following is not services in break roll system
 - a. power
 - b. vacuum
 - c. compressed and instrumentation
 - d. fire

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 11 points	Unsatisfactory below 11 points
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Information Sheet 3- Identifying operating equipment's and processes

3.1 equipment in break roll system

Roller mills are commonly referred to by the type of service they perform. A mill used to crack grain or other types of friable materials may be called a cracking mill. Mills used to flake grains or other products may be called flaking mills or flakers. Roller mills used to grind in a feed mill are commonly referred to as a roller mill or roller mill grinder. Double pair (two pair high) roller mills may be utilized in feed milling operations when two distinctly different grains are processed through one mill.

A machine processing both corn and oats, for example, requires one set of coarse grooved rolls to crack corn and one set of fine grooved rolls to be able to effectively process the oats. A double pair mill equipped with differential roll speeds (one turning faster than the other) can be utilized as a grinder to reduce all kinds of friable material including grains, pelletized products, oilseed and byproduct meals, and many other common feed ingredients. Double pair mills are usually referred to as roller mills or roller mill grinders. Triple pair (three pair high) mills are used for special applications requiring a finer finished product or when a wide range of materials will be processed through the same machine.

A triple pair mill may be employed to achieve a variety of finished products from different feed stocks such as whole grain, mixed meals, or other combinations. Occasionally, three pair high roller mills will be used to permit one machine to serve as both a two pair high grinder and a single pair cracking/crimping mill.

3.1.1 Two-roller mills

Two-roller mills are the simplest variety, in which the material is crushed between two rollers before it continues on to its final destination. The spacing between these two rollers can be adjusted by the operator. Thinner spacing usually leads to that material being crushed into smaller pieces.

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3.1.2 Four-roller mills

Four-roller mills have two sets of rollers. When using a four-roller mill to mill grain, the grain first goes through rollers with a rather wide gap, which separates the seed from the husk without much damage to the husk, but leaves large grits. Flour is sieved out of the cracked grain, and then the coarse grist and husks are sent through the second set of rollers, which further crush the grist without damaging the crusts. Similarly, there are three-roller mills, in which one of the rollers is used twice.

3.1.3 Five- and six-roller mills

Six-roller mills have three sets of rollers. When using this type of mill on grain, the first set of rollers crush the whole kernel, and its output is divided three ways: Flour immediately is sent out the mill, grits without a husk proceed to the last roller, and husk, possibly still containing parts of the seed, go to the second set of rollers. From the second roller flour is directly output, as are husks and any possible seed still in them, and the husk-free grits are channeled into the last roller. Five-roller mills are six-roller mills in which one of the rollers performs double duty.

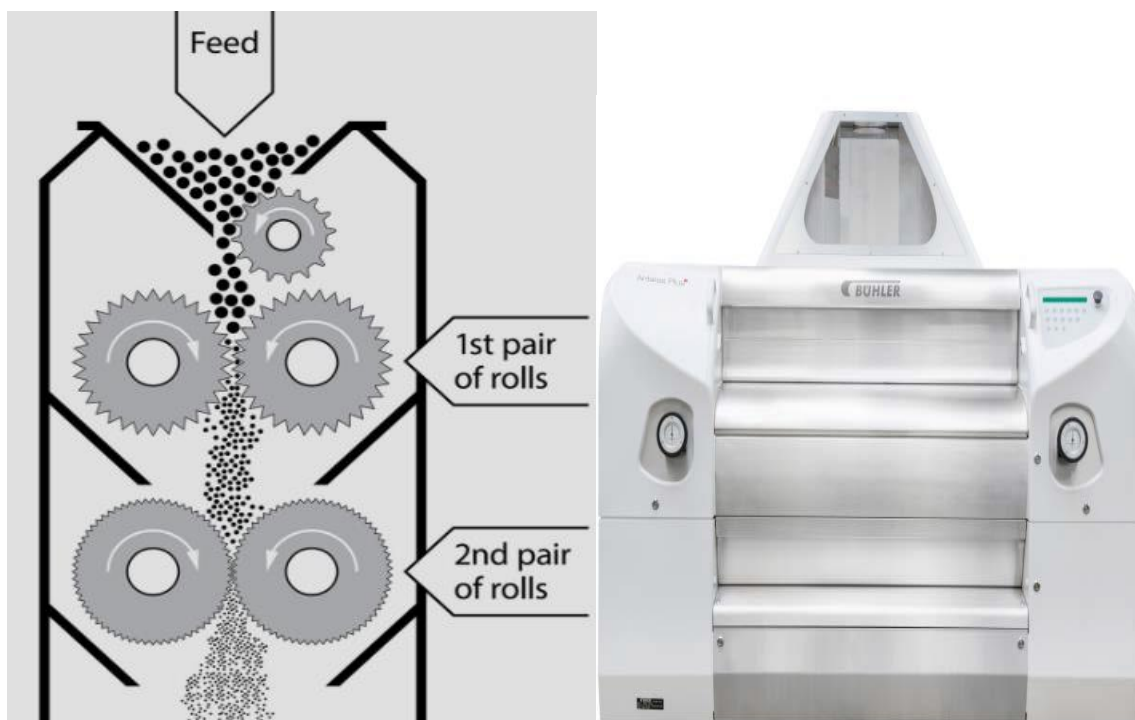


Fig1. Break roll equipment



3.2 Break roll process

The break system is beginning of the actual milling process. The aim of breaks system is as follows:

- **On the earlier breaks**

To shear open the wheat and scrape away the endosperm from bran skin in large particles and the bran is left as large flat flakes.

- **On the latter breaks**

To scrape the endosperm off the wheat skin as cleanly, as possible, with least and no undue cutting up of the bran skin.

The bran powder can never be separated from flour and hence it is essential that the wheat skin is kept as large and whole as possible. This is achieved by shearing open and scraping the wheat on first break and residual bran skin.

The object of break system is to release maximum amount of coarser material such as semolina and middling and minimum amount of flour. Semolina of different granulations is handled on purification system to separate out clean endosperm particles, which are finally ground down to flour in reduction system.

The moisture content of wheat, break release, condition of flutes of rolls of break system is the factors that influence the extraction and quality of semolina and flour.

Wheat is scraped progressively on subsequent 3rd or 4th break passages. That means break operation are carried out on either 4-break or 5-break passage systems and is used for milling of wheat.

Higher the number of break passages, lesser would be the possibilities of cutting bran skin. Hence, a 5th break system is used when more of clean low ash flour is required to be produced. Also, a 5-break system is used, for milling soft wheat, which has thicker bran than hard wheat and scraping of endosperm from bran is difficult, when the extraction of large proportion of low ash flour is not critical, a 4-break system is used.

3.3 Sifter

Proper test sifter procedures are important in determining break or grinding releases from roller mills. The test sifter used must be large enough to process the entire sample collected.

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Break releases were originally monitored by using a hand-held sieve to mimic the coarse separations of the sieve or centrifugal. More recently, a mechanical sieve, which has a pre-set timing device, is commonly used. Accordingly, the miller selects for break release adjustment sieves with apertures similar to those used at the top of the corresponding break sifters sections in the mill and sifts each sample the same amount of time.

Appropriate sifting time can be determining by sifting in 10-second time increments and determining when less than a 1% change in through stock based on the original sample weight has been identified, with the sample screen remaining clear and no fines observed in the over tail

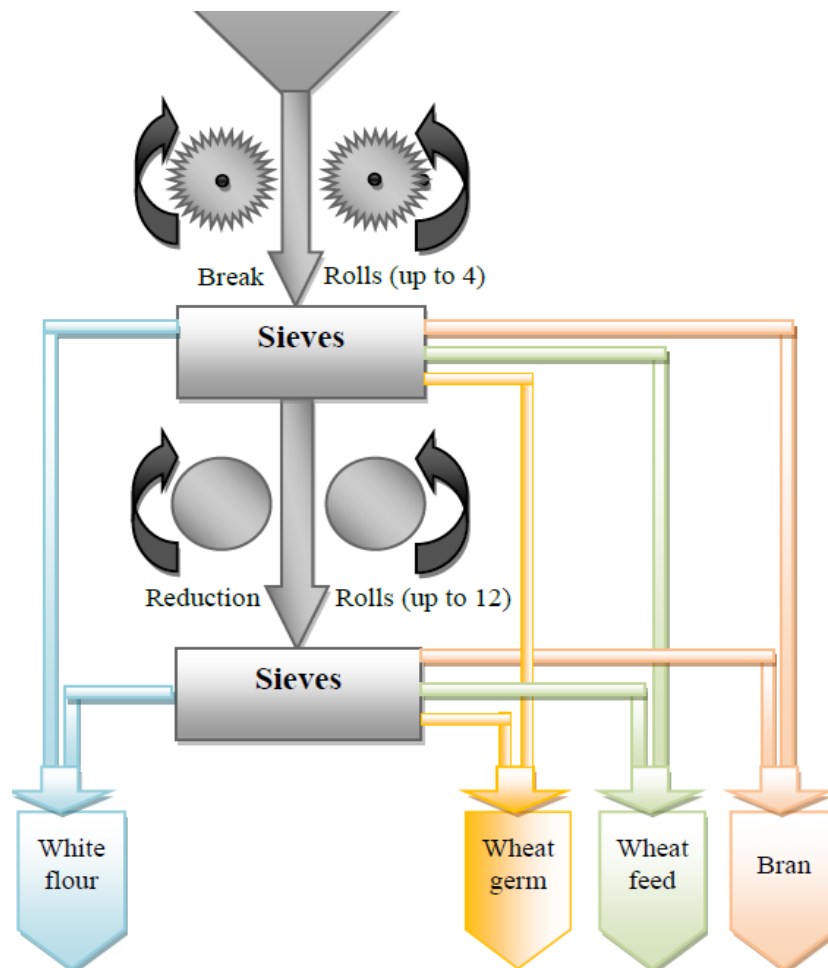


Fig 2. Break roll system and sieving wheat flour

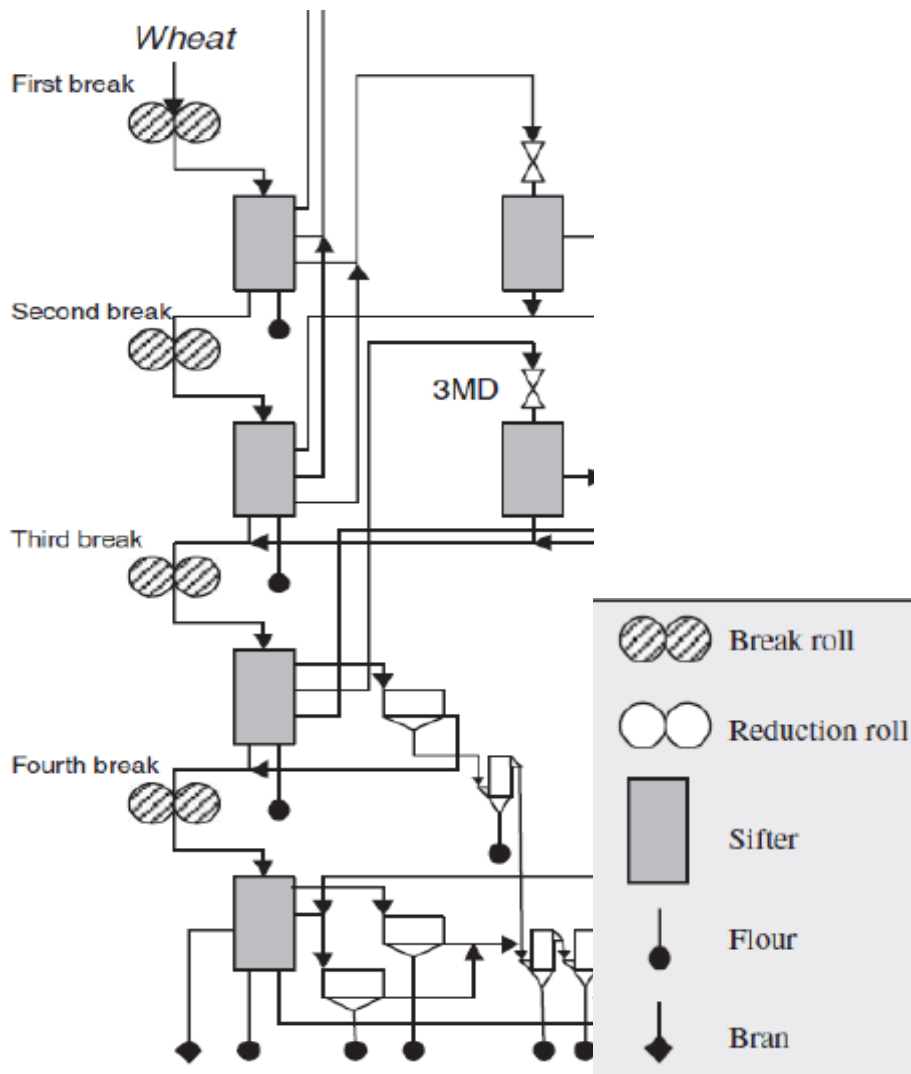


Fig 3.break roll processes

3.4 Bran Finishers

Based on the disposition of rotors, two types of bran finishers are available to Flour Milling Industry. These are

- **Horizontal bran finisher**

Horizontal wheat bran finisher is mainly composed of rotor, cylinder, shell, adjustable baffle and drive.

The bran goes into the machine in a tangent line and thrown to buffering plate and sieve plate, realizing separation of bran and flour.



Fig 4. Horizontal bran finisher

- **Vertical bran finisher**

Vertical bran finisher is composed of bracket, rotary scouring plate, sieve cylinder and drive.



Fig 5. Vertical bran finisher

3.5 Pneumatic conveying in break roll system

Pneumatic conveying systems are basically quite simple and are eminently suitable for the transport of powdered and granular materials in factory, site and plant situations. The system requirements are a source of compressed gas, usually air, a feed device, a conveying pipeline and a receiver to disengage the conveyed material and carrier gas.

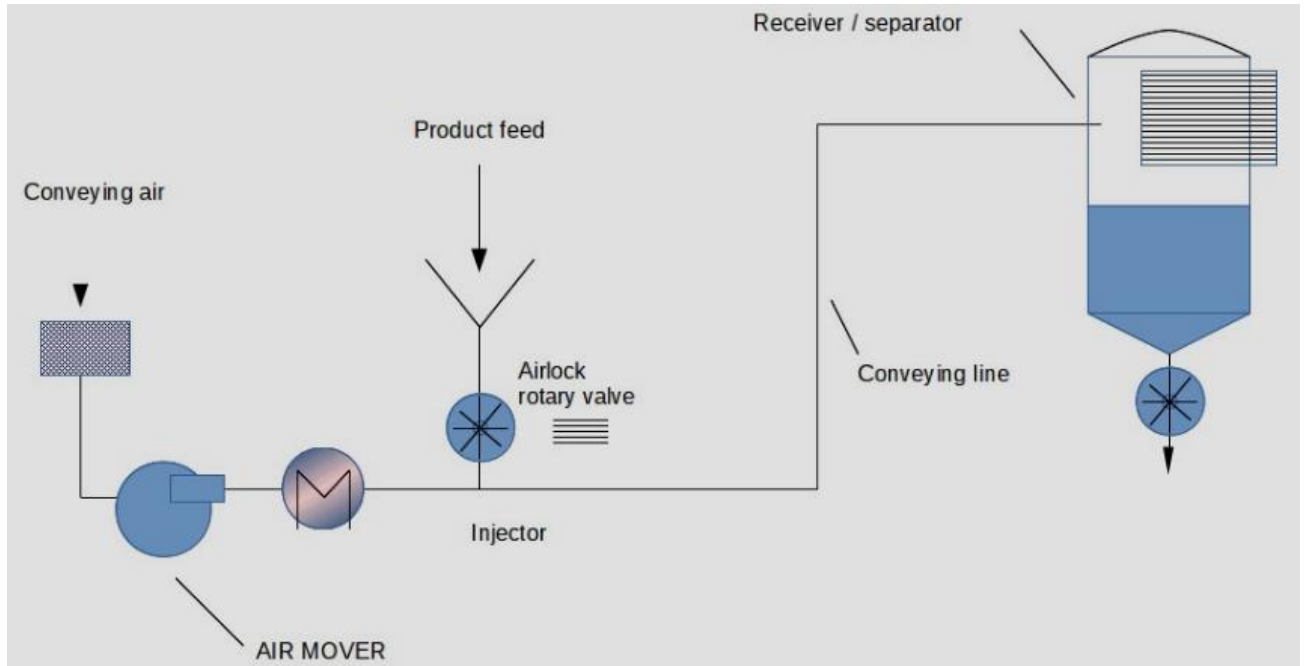


Fig 6. Pneumatic conveying in break roll system

The system is totally enclosed, and if it is required, the system can operate entirely without moving parts coming into contact with the conveyed material. High, low or negative pressures can be used to convey materials. For hygroscopic materials dry air can be used, and for potentially explosive materials an inert gas such as nitrogen can be employed. A particular advantage is that materials can be fed into reception vessels maintained at a high pressure if required.



Self-Check – 3

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 break roll?
2. List the aim of break role
3. Write types of break roller
4. Write importance of sifter
5. List two types of bran finisher
6. What is a Pneumatic conveying system?

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 12 points

Unsatisfactory below 12 points

Information Sheet - 4 Fitting and adjusting machine components and related attachments

4.1 Adjustment in break role system

- **Adjusting gap between the rolls**

Break roll is fixed in the frame and the opposing roll can be adjusted to set the clearance or gap between the rolls. This roll gap adjustment needs to be quick and easy and must accommodate the requirement of maintaining the rolls in parallel. Common systems employ screws, cams, or fluid-operated (hydraulic or pneumatic) cylinders to achieve this roll adjustment. Adjustment can be manual or remote operated and may feature some means to display the roll gap setting at a remote location.

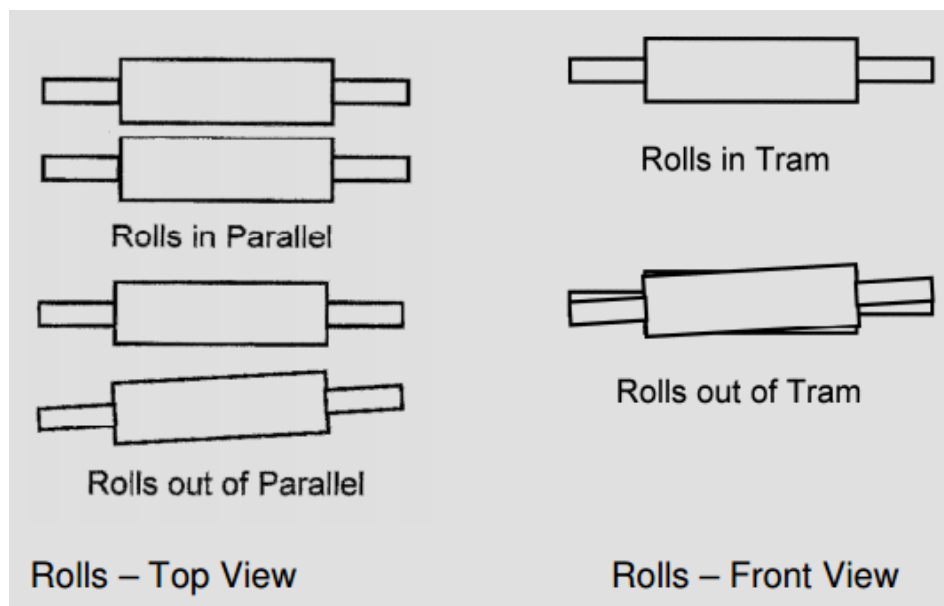


Fig 7. Break roll gap

- **Adjusting Roll corrugations**

Roll corrugations (also described as roll cut or fluting) will vary depending on the material to be processed, initial and finished product sizes and the product quality (amount of fines) desired. Coarse grooving will produce a coarse finished product at high capacities while finer grooving produces a finer finished product at lower capacities. While flour milling may require many different corrugation styles to

produce the desired finished products, feed processing can usually be accomplished with less sophisticated roll corrugations.

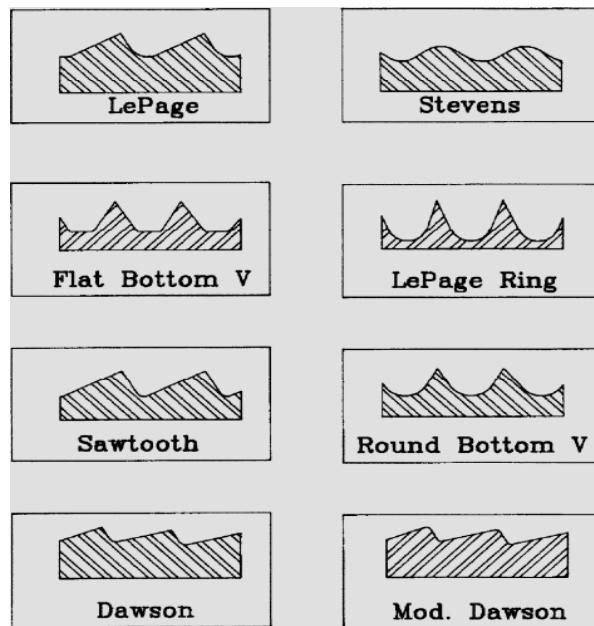


Fig 8. Break roll corrugation

The most commonly employed corrugation styles for roller mill grinding will be Round Bottom Vee (RBV). For certain special applications such as high moisture grain, some form of a raked tooth with different leading and trailing angles, commonly known as sawtooth may be beneficial. Occasionally, crumbler rolls (roller mills dedicated to the reduction of pellets) will feature a classical LePage cut, with one roll corrugated longitudinally and one corrugated circumferentially. The circumferential roll will often be equipped with a groove known as the LePage ring cut.



Self-Check – 4	Written test
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Name..... ID..... Date.....

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

True or false 3pts for each

1. Break roll is fixed in the frame and the opposing roll cannot be adjusted
2. Roll corrugations will vary depending on the material to be processed

Short answer 3pts for each

1. Why Break roll is fixed in the frame and the opposing roll can be adjusted?
2. Write the adjustment method of break roll

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 12 points	Unsatisfactory below 12 points
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Information Sheet - 5 Identification of processing/operating parameters

5.1 processing/operating parameters in break roll system

5.1.1 Class and Variety of Wheat

There are different classes and varieties of wheat vary considerably in both physical and chemical composition.

Ash content variation in wheat kernels is due primarily to the type of growing season, type of soil used during growth, and wheat variety.

This composition variation of the wheat kernel between classes and varieties can affect the comparison of milling results when using ash content percentages as means of evaluation.

- ✓ Structure
- ✓ Hardness
- ✓ size

5.1.2 Conditioning or Tempering

Conditioning of wheat is an important aid in the removal of endosperm from bran. Basically, the purpose of conditioning in this regard has been twofold.

First, moisture is applied to toughen the bran in order for it to resist abrasion and attrition in the milling process.

Second, it allows the outer layers of the kernel to be removed in large pieces and mellows the endosperm pieces for easy reduction into flour in later processes

5.1.3 Temperature and Humidity

To some extent, the effect of elevated temperatures on the physical properties of wheat can replace those of moisture. An increase in the period of temper of Hard Winter wheat (cereal) caused an increase in the amount of first break release. Temperature also affects the extraction rate proportion of flour.

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5.1.4 Roll Speed

Roll speed or velocity is expressed in revolutions per minute (rpm) of the fast roll in milling literature. However, differences in roll diameter will affect the velocity of a point on the periphery of the rolls at a constant rpm. The rapidity of movement of this point on the surface of the roll is called the peripheral or circumferential speed.

5.1.5 Roll Clearance

Roll clearance or gap is the opening between paired, break rolls. The distance of this opening influences the grinding action that will occur on passage of wheat kernels between the rolls. Recommended settings for roll clearance are determined by the quality of the product after roll passage rather than a specific distance



Self-Check – 5	Written test
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Name..... ID..... Date.....

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

Short answer

1. Write processing/operating parameters in break roll system (10pts)

You can ask your teacher for the copy of the correct answers.

Note: Satisfactory rating 10 points	Unsatisfactory below 10 points
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Information Sheet - 6 Checking and adjusting break roll equipment performance.

6.1 introduction

The purpose of an inspection is to identify whether work equipment can be operated, adjusted and maintained safely with any deterioration detected and remedied before it results in a health and safety risk. Not all work equipment needs formal inspection to ensure safety and, in many cases, a quick visual check before use will be sufficient. However, inspection is necessary for any equipment where significant risks to health and safety may arise from incorrect installation, reinstallation, deterioration or any other circumstances. The need for inspection and inspection frequencies should be determined through risk assessment.

6.2 Adjustments break roll equipment

Break roll equipment settings can be adjusted according to three basic principles.

- **The first is a setting done by hand**

When the product is squeezed equally by keeping from both ends of the roller mill rolls, the decision is taken by touching

- **The second is a setting done by eyes**

Flaking and fragmentation of the milled product at both ends are looked with eye.



Fig 9. Visual inspection of break roll machine



- **The third is based on heat**

The temperature in the roller mill rolls is coordinated with the heat meters from the both ends of the roller mill rolls and manually if there is no heat meter. It is effective to find the healthy setting to use these three methods together while the roller mills are set. Also the product received from two sides of the roller mill rolls in the crushing roller mills can be adjusted, and can be adjusted according to the rate of product under the sieve by passing through laboratory sieve. For example about 30-35 percent of the particles must pass below 1000 microns sieve in B1 roller mills.

6.3 Roller mill care and maintenance period

Maintenance and repair is a system that we still are forced to fix nowadays we committed to provide the necessary training on maintenance and repair to our customers. Our customers' technical teams are trained at our factory and in customers' factories prior to delivery of the machine.

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Self-Check – 6	Written test
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Name..... ID..... Date.....

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

True or false 3 pts. For each

2. all work equipment needs formal inspection to ensure safety
3. purpose of an inspection is to identify whether work equipment can be operated, adjusted

Short answer 4 pts.

1. write the three techniques to inspect break roll

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating	points	Unsatisfactory	below points
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Information Sheet - 7 Carrying out pre-start checks.

7.1 Introduction

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 day's 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 a pre start checklist or inspection form. 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.

3.1.1 Electrical connections

Before starting to work on the roll break, 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.

7.2 Importance of pre start check in break rolls system

- The most obvious reason for why they are important is for human safety.
- Heavy machinery or equipment which malfunctions is not just a project or financial risk; it can result in serious injury or death to people.
- Pre starts are one of the most relied upon and basic safety steps for almost any company who engages with dangerous equipment or activities.
- Pre starts protect the operator as well as other people on site, on the factory floor etc.
- Pre start checks are the financial gains which companies and projects get from doing good pre starts regularly.

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- Pre starts enable companies to catch small/minor issues before they snowball into bigger issues.
- Catching minor issues which take minutes or hours to repair also minimises the chance of large scale repairs and downtime, which has a very real cost in terms
- Pre starts are crucial for safety and an important part of good asset and equipment management.



Self-Check – 7	Written test
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Name..... ID..... Date.....

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

True or false 3 pts. For each

1. Pre starts often involve routine inspections conducted by the machine or equipment operator
2. Pre starts are crucial for safety and an important part of good asset and equipment management
3. Checking electrical connection is not needed in prestart check

Short answer 4 pts.

1. Write the importance of prestart check in break roll system

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 13 points	Unsatisfactory below 13 points
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Operation Sheet - 1 Carrying out pre-start checks.



Pre-Operational Safety Checks

1. Prior to commencing operation of the milling plant you must familiarize yourselves with all aspects of the mill and auger system to the operating instruction contained in the mill manual.
2. Ensure area around Phase Converters is clear of any obstruction and electric motors have good air flow around cooling fins. Switch on each Phase Converter one at a time and check that both have powered up properly.
3. Check all nuts, bolts and attachments to ensure that they have not shaken loose during operation.
4. Ensure that all covers and safety guards are fitted and operation signs attached to plant.
5. Locate all emergency stop buttons and note their location. 6. Locate and identify all electric motor isolating switches.
6. Check all electrical leads. Do not operate if electrical leads are damaged.
7. On the Main Switch Board, Inspect and identify all control switches and the power for their operation.
8. If in doubt ask.
9. Ensure work site is clear of tools and other equipment or debris to prevent tripping.
10. Ensure that there is sufficient ventilation for fumes and dust to dissipate to enable safe operation.



LAP TEST	Performance Test
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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.

Task1. Apply PPE

Task2. Perform Pre-Operational Safety Checks



LG #20

LO2. Operate and monitor the break roll process

Instruction sheet

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

- work place policies and procedures
- Starting and operating process operation
- Identifying equipment variations in operating conditions
- Monitoring and reporting Variation in equipment operation.
- Separating bran from endosperm.
- Identifying out-of-specification product/process outcomes.
- Maintaining housekeeping standards on the work area
- Conducting work related to 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:

- work place policies and procedures
- Start and operate process operation
- Identify equipment variations in operating conditions
- Monitor and reporting Variation in equipment operation.
- Separate bran from endosperm.
- Identify out-of-specification product/process outcomes.
- Maintain housekeeping standards on the work area
- Conduct work related to 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
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”



Information Sheet - 1 work place policies and procedures

1.1 Introduction

A workplace policy is a statement from company leaders outlining standards of behavior or limitations. Companies have policies that cover a wide array of business activities. While employees sometimes complain about certain policies, a thorough human resources manual is critical to shaping the culture and ethics of an organization. Workplace policies provide a clear structure and framework on accepted behaviors in the organization. This benefits both managers and employees. Clear policies guide employees in situations where uncertainty or moral dilemmas exist.

1.2 policies and procedures for break roll system

Break roll system require special safety precautions while being used.

- ✓ Do not make contact with the revolving cutter.
- ✓ Place a wooden pad or suitable cover over the table surface to protect it from possible damage.
- ✓ Use the buddy system when moving heavy attachments.
- ✓ Do not attempt to tighten arbor nuts using machine power.
- ✓ When installing or removing milling roller, always hold them with a rag to prevent cutting your hands.
- ✓ While setting up work, install the roller last to avoid being cut.
- ✓ Never adjust the workpiece or work mounting devices when the machine is operating
- ✓ Chips should be removed from the workpiece with an appropriate rake and a brush.

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Self-Check – 1	Written test
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Name..... ID..... Date.....

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

1. Define workplace policy (5pts)
2. the policies and procedures for break roll system(5pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 10 points	Unsatisfactory below 10 points
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Information Sheet - 2 starting and operating process operation.

2.1 Starting operation

First, the flour mill equipment should be placed in a place where the environment is suitable; the ground is flatness and should keep the condition cool and dry. Before using the flour mill machine, check the material store chamber to see if there is any impurity. When the material is crushed, it must be inspected. Any impurities in the material must not be mixed to avoid damage to the flour machine.

During the use of the flour machine, it is necessary to periodically check whether the fixing nut of the movable tooth plate is loosen or all the fastening parts are loosen or not. In particular, check the screws in the fixed sprocket. Before starting the machine, inject proper amount of lubricants. Increase the number of refuelling for continuous operation. When the actual work time is 300 hours, the spindle bearing must be serviced and replaced with new lubricant. When changing the wearing parts, the repairman should be familiar with the operation of the wheat flour machine, if there is a major damage to contact the manufacturer for repair the machine.

It is a necessary part of maintaining and fixing the flour mill equipment. Proper maintain will prolong the service life of the machine and brings more benefits, as a flour mill machine manufacture, we suggest you to check your machine time by time to make sure they can work well.

During the process of break roll operation an operator must implement the following activity:

- Cross checking the overall activities with the standards of product
- Inspecting the performance of equipment visually
- Taking the sample of product in the break roll depend on company procedure

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Self-Check – 2	Written test
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Name..... ID..... Date.....

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

True or false

1. During the use of the flour machine, it is necessary to check. (4pts)

Short answer

2. Write activity of operator During the break roll process operation (6pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 10 points	Unsatisfactory below 10 points
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Operation Sheet - 2 starting and operating process operation.

Steps to start and operate break roll process

4. Select silo for which grain is to be used.
5. Open the silo slide gate approximately 2 cm by moving the slide handle which is located on the outer ring of the silo base. Note: if the slide gate is open wider than 2 cm then additional vertical load is placed on the auger screw, but no additional feed of grain will occur, so there is no advantage to do so. Once grain is flowing, slide can be set to appropriate position to maintain required flow.
6. Check that the bunk which is to have the rolled grain is clean and clear of other plant.
7. Once the selected bunk is determined, position the lever below the mill discharge auger in the correct position.
8. Shut off slide gate to allow all grain through mill system and then shut down.
9. Start electrical power: follow switch order for mill start.
10. Start the mill: check the restart button before starting the mill. Use the control points at surge bin and drag auger to regulate output.
11. Lock nut to be fastened again when required setting is made. Mill adjustment - the mill adjustment screw requires manual setting by loosening the lock nut and adjusting the mill settings (with large spanner).
12. Use caution when restarting the mill. In the case of a blackout the mill will need to be restarted. Do not restart the mill under load.
13. Close the silo slide first to clear the drag, the surge bin and roller mill in sequence. Once milling is completed the system will need to be shut down
14. Lockout for any work on the mill is achieved by the isolator switch located on the control panel.



Information Sheet - 3 Identifying equipment variations in operating conditions.

3.1 Introduction

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 break roll system equipment failure

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

There are mainly the following aspects influencing the equipment in break roll system.

3.2 Variation in break rolls system

3.2.1 Feeding effect

The feeding effect mainly depends on the following aspects:

- **Feed roller parameters selection**

A reasonable roller speed and surface condition of the roller will affect whether the material enters the grinding zone accurately. If the feeding is inaccurate, the material will collide and splash between the two rollers and cannot directly enter the grinding zone, thereby affecting the yield and the grinding effect. However, if the feeding

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speed is too fast, it will be beneficial to the improvement of production, but it will result in inaccurate feeding and accumulation of materials in the grinding zone. In severe cases, it will cause plugging.

- **The uniform distribution of the material in the full length of the roller**

If the material distribution in the grinding area is not uniform, not only the grinding effect and equipment utilization rate are reduced, but also the grinding roll at the thick material is likely to be locally worn, making the rolling distance of the entire grinding roller length inconsistent. Therefore, it is important to carefully adjust the working gap of the feed valve and master the minimum material level in the feed cylinder.

- **Roller cooling and cleaning**

In the continuous operation of the milling machine, the temperature of the roller body will increase, especially the temperature rise of the roller will be higher, which will easily cause the evaporation and condensation of moisture, which will reduce the screen and grinding effect, and thus affect the yield and the quality of the wheat flour.

When pneumatic conveying is used, the roller can be air-cooled, but the picker for the device's strong suction should be selected. In order to further reduce the temperature of the grinding roller, the water cooling method of the roller can be considered. That is, the water inlet and outlet pipes are set at both ends of the roller shaft, and the heat is taken away by the cold water flowing through the roller body to reduce the temperature of the roller body, the bearing and the material.

In the milling process, the phenomenon that the powdery material adheres to the surface of the grinding roller is called a winding roller, which affects the grinding of the material and generates vibrations of the machine body in severe cases. Therefore, it is necessary to keep the roller cleaning mechanism working properly, and pay attention to the pressure between the rollers should not be too large, the moisture into the grinding water should not be too high.

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3.2.2 The oldness of grinding teeth

Newly drawn rolls have sharper tooth angles, stronger grinding effect, higher stripping rate, brittle brittleness, and more granular materials, less fines, low power consumption, and high flow rates. However, after a period of use, the tooth angle becomes dull, the grinding effect decreases, the output decreases, the bran flakes in the milled material are large, the wheat flour is large, the slag grain is reduced, the grinding temperature is increased, and the power consumption is particularly high. Therefore, the old and new grinding teeth will affect the balance of grinding effect and powder load. In order to balance the load and stabilize the production, the rollers must be changed in batches according to the wear of the rollers.

3.2.3 Number of teeth and tooth angle

It is determined by the particle size of the grinding material, the nature of the material, and the degree of crushing required.

3.3 Operational Factors

3.2.1 Rolling distance

The rolling distance is the main operating factor that determines the grinding effect. The rolling distance adjustment is the main operation content of the grinding machine. In actual production, the technical characteristics of the powder path and the grinding roller are generally relatively stable, and when the conditions of the raw material, moisture, climatic conditions, grinding teeth are changed, the grinding effect is mainly corrected by adjusting the rolling distance.

When the 1B rolling distance is 0.9mm, the peeling rate is 20%; when the rolling distance is 0.7mm, the peeling rate is increased to 35%; when the rolling distance is reduced to 0.5mm, the peeling rate is 75%. The rolling distance is in the range of 0.5-0.7mm, which has the greatest influence on the stripping rate.

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3.2.2 Flow rate

The unit flow rate of the flour mill is usually expressed in units of contact length of the roller unit, i.e. kg/cm. d. When the flow rate is too large, the homogeneity of material crushing will be reduced. If the flow rate is too small, the feeding state is not normal and the equipment operation is unstable.

The 1B mill will control the entire powder flow. In addition to the final equipment, the grinding effect of each milling machine and the screening effect of the corresponding screening equipment will affect the working status of subsequent equipment.

When the flow rate is large, the rotation speed of the grinding roller can be appropriately increased. However, when the rotation speed is high, the loss and vibration of the equipment will increase

3.2.3 Temperature

Temperature control is very important in especially reduction in other words straight roller mills. While making crushing and blasting operation in these roller mills, it may occur more heat.



Self-Check – 3	Written test
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Name..... ID..... Date.....

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

Short answer 4 pts. . For each

1. Write operational factor that makes variation in break roll system
2. List Feeding effect in break roll system
3. Write factors may influence the prospect of break roll system equipment failure

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating points12	Unsatisfactory below points 12
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Information Sheet -4 Monitoring and reporting Variation in equipment operation

4.1 Introduction

Controlling the operational efficiency of equipment is key to managing and improving the environmental performance of construction operations. However, efforts to improve environmental performance are limited due to the industry's lack of a practical method for monitoring the operational efficiency of construction equipment and related environmental performance. Currently available methods are costly or have compatibility issues

4.2 Temperature control in roller mill and roll compartments

The crushing and blasting operation performed here should be applied so as not to impair the gluten and starch features of the flour. The roller mill rolls temperature should not be more than 40 to 45 °C. If this temperature is more, there would be deterioration in the final value of flour, also it begins to appear the deformations on the roller mill rolls and this temperature spreads to the bearings.

The oil used in the bearings become thinner and exudes outward; in this case the life of the bearings is reduced.

4.3 General monitoring in cereal break roll system

Variation during break roll of cereal is monitored by taking the following corrective action:

- ✓ Monitoring all parameter like
 - Temperature
 - Moisture contents of cereal
 - Humidity
 - Ash contents
 - Particle size
- ✓ Monitoring the alignments of rolls
- ✓ Monitoring the gap between rolls

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Moisture content: The loss in mass, expressed as a percentage, undergone by the product under the conditions specified in this International Standard.

In operation of cereal break roll its mandatory to control the percentage of moisture by using the following materials.

- ✓ Manual measurements
- ✓ Automatic measurements
- **Equipment used to measure moisture content of cereal**
 - ✓ Analytical balance.



Fig10. Analytical balance

- Grinding mill, having the following characteristics: characteristics:
 - ✓ made of material which does not absorb moisture;
 - ✓ easy to clean and having as little dead space as possible;
 - ✓ enabling grinding to be carried out rapidly and uniformly, without appreciable development of heat and, as far as possible, without contact with the outside air;
 - ✓ adjustable so as to obtain particles of the dimensions indicated in 7.1.1



Fig11. Lab grinding mill

- ✓ Metal dish, non-corrodible under the test conditions, or, failing this, a glass dish, with a sufficiently tightfitting lid, and having an effective surface area enabling the test portion to be distributed so as to give a mass per unit area of not more than 0.3 g/cm².
- ✓ Constant-temperature oven, electrically heated, controlled in such a way that, during normal working, the temperature of the air and of the shelves carrying the test portions is within the range 130 to 133°C in the neighbourhood of the test portions.



Fig 12. Drying oven

- ✓ Desiccator, containing an effective desiccant.



Fig13. Desiccator

- **Flour ash content**

Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food.

- ✓ **Dry Ashing**

Dry ashing procedures use a high temperature muffle furnace capable of maintaining temperatures of between 500 and 600 °C.

- ✓ **Wet Ashing**

Wet ashing is primarily used in the preparation of samples for subsequent analysis of specific minerals.



Self-Check – 4	Written test
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Name..... ID..... Date.....

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

Short answer (5pts for each)

1. Write the corrective action to monitor variation in break roll system in cereal processing
2. What is moisture content
3. List the equipment that we use to calculate moisture contents

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 15 points	Unsatisfactory below 15 points
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Operation Sheet - 3 techniques to measure moisture content of cereal.

Techniques to measure moisture content of cereal

1. Weigh and grind a small sample of flour (2–3 grams) and placing it into a dish
2. Heat sample at 130°C (266°F) in an air oven for 60 minutes
3. Cool sample to room temperature
4. Weigh residue (dried sample)
5. Determine moisture content by comparing the weight of the sample before and after heating.

The moisture (water) content is calculated by the following formula:

$$\% \text{ Moisture} = \frac{\text{Loss in moisture (g)}}{\text{Initial weight of sample (g)}} \times 100$$

Loss in moisture = Initial weight (g) – Final weight (g)

Initial weight = wet or original weight of sample before drying

Final weight = weight of sample after drying

Information Sheet - 5 Separation methods of bran from endosperm.

5.1 Introduction

Bran, also known as miller's bran, is the hard outer layers of cereal grain. It consists of the combined aleurone and pericarp. Along with germ, it is an integral part of whole grains, and is often produced as a byproduct of milling in the production of refined grains. Bran is present in cereal grain, including rice, corn (maize), wheat, oats, barley, rye and millet. Bran is not the same as chaff, which is a coarser scaly material surrounding the grain but not forming part of the grain itself, and which is indigestible to humans.

Bran is particularly rich in dietary fiber and essential fatty acids and contains significant quantities of starch, protein, vitamins, and dietary minerals. It is also a source of phytic acid, an antinutrient that prevents nutrient absorption.

5.2 Separation method of bran from endosperm

Grain to be processed into flour is first ground, typically in one or more steps, and then the bran is separated from the flour produced by grinding the grain. The flour produced from the grain is further separated by size through sifting (or bolting).

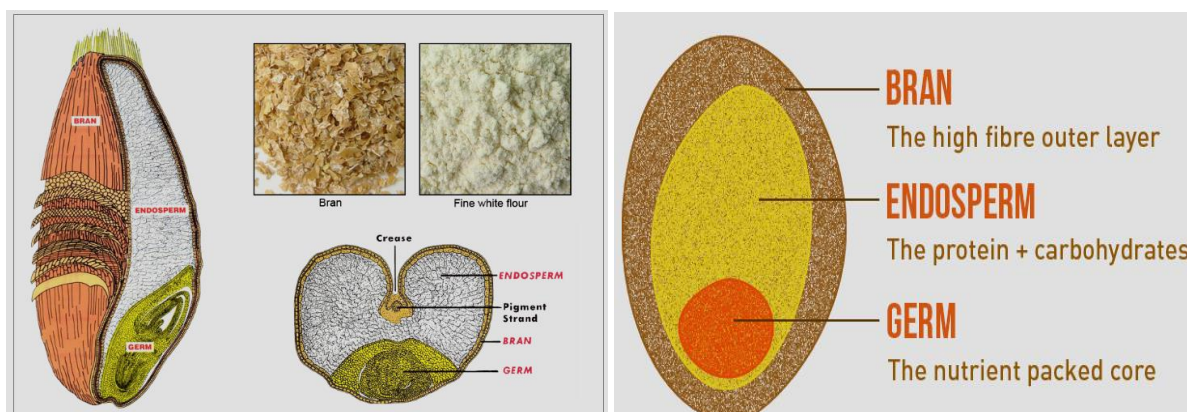


Fig14. Structure of cereal

5.2.1 Bran separation principle

A centrifugal reel or flour dresser is used to perform this separation, producing the finished flour and a number of byproducts, such as bran and dust. A centrifugal reel

is a cylinder which a cloth filter is stretched. Inside of the cloth-covered cylinder are beaters which stir and toss the ground grain against the cloth. A brush moving across the outside of the cylinder removes the flour and keeps the cloth functioning. A flour dresser is constructed similarly to the centrifugal reel, but lacks the beaters. A typical mill process involves passing the flour coming off the millstones through successive dressers so as to achieve optimum separation of flour from bran and germ components of the grain.

- **Flour dresser**

Flour dresser is a mechanical device used in grain mills for bolting, which is the process of separating the finished flour from the other grain components following milling.



Fig 15 centrifugal flour dresser

5.3 By product break roll system of cereal

5.3.1 Pollard

Pollard is a by-product of the flour milling of grain. Cereal byproducts of bran pollard, middlings, shorts which are major source of protein supplements for ruminants.

It also used also to a limited extent as a fodder by grazing the green crop or as green chop. Pollard is fine protein rich feed supplement for farm animals. It is a byproduct from the milling of wheat for flour. It also called short.



Fig16. Wheat pollard

5.3.2 Cereal germ

The **germ** of a cereal is the reproductive part that germinates to grow into a plant. It is the embryo of the seed. Along with bran, germ is often a by-product of the milling that produces refined grain products. Cereal grains and their components, such as wheat germ oil, rice bran oil, and maize, may be used as a source from which vegetable oil is extracted, or used directly as a food ingredient. The germ is retained as an integral part of whole-grain foods.

5.3.3 Bran

Bran is the outer coating or shell on grain that is removed while processing white flour. Bran consists of the pericarp, the seed coat, and the aleurone layer. The pericarp itself consists of three layers of differentiated types of cells. Wheat, oat, rice, and rye are common sources of bran. The bran content of wheat is approximately 15% of the whole grain.



Self-Check – 5

Written test

Name..... ID..... Date.....

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

Choose (4 pts. For each)

1. Which one of the following is not byproduct of cereal flour

- A. Cereal germ
- B. Bran
- C. Pollard
- D. Bread

3.4 _____ is the reproductive part that germinates to grow into a plant

- A. Cereal germ
- B. Bran
- C. Pollard
- D. Flour

3.5 _____ device used in grain mills for bolting, which is the process of separating the finished flour from the other grain components

- A. Cereal germ
- B. Bran
- C. Microscope
- D. Flour dresser

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating points 12

Unsatisfactory below points12



Information Sheet - 6 Identifying out-of-specification product/process outcomes.

6.1 Introduction

The term OOS (out of specification), is defined as those results of in process or finished product testing, which falling out of specified limits. In cereal break roll system there is flour that to be grinded according to the common standards.

Operator should identify or check the following specification of processes.

• Length of the break system

the number of breaks needed to release the stock with the minimum production of break flour depends on the percentage of flour extraction required overall i.e. 70%; 72%; 74%; 76%; or even higher according to the quality required. The normal number of breaks is four with an extraction of 72% to 74% as the target.

According to food standards, the following is a correct final result of the number of break passages according to the extraction required.

- ✓ For 72-74% extraction 4 breaks
- ✓ For 74-76% extraction 4 breaks and bran finishers
- ✓ For 76-78% extraction 5 breaks and bran finishers.

• Surfaces

The number of break passages can vary according to the size of the mill. The original design was in inches per sack of flour, but in metric terms we now use mm per 100 kilograms per 24 hours of wheat ground.

- ✓ First break 5.4 to 7.2 mm
- ✓ Second break 6.6 to 8.4 mm
- ✓ Third break 4.8 to 6.6 mm
- ✓ Forth break 4.2 to 5.4 mm

Grinded flour without above standards is not meet with correct break roll system of cereal.

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- **Break roll release percentage**

Percentage release figures differ considerably for different mills, depending on the length and design of the system.

The possible release ranges for a reasonably well surfaced mill having four or five break passaged, when milling normal blends of bakers flour:

- ✓ First break 35/45%
- ✓ Second break 50/55%
- ✓ Third break 30/35%
- ✓ Fourth and fifth break normally set to clean out the bran with as little bran powder production as possible.



Self-Check – 6	Written test
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Name..... ID..... Date.....

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

Matching (3pts for each)

Part A

1. First break
2. Second break
3. Third break
4. Fourth and fifth break

Part B

- A. 30/35% of break roll release
- B. 50/55% of break roll release
- C. 35/45% of break roll release
- D. set to clean out the bran
with bran powder
production



You can ask your teacher for the copy of the correct answers.

Note: Satisfactory rating 12 points

Unsatisfactory below 12 points



Information Sheet - 7 Maintaining housekeeping standards on the work area

7.1 Introduction

A good housekeeping program plans and manages the orderly storage and movement of materials from point of entry to exit. It includes a material flow plan to ensure minimal handling. The plan also makes sure that work areas are not used as storage areas by having workers move materials to and from work areas as needed. Part of the plan could include investing in extra bins and more frequent disposal.

7.2 Housekeeping guidelines

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

7.1 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.

7.2 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

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when required. This leaves the machine operators free to supervise uninterrupted manufacturing runs.

7.3 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.

7.3 General guidelines

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

7.3.1 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.

7.3.2 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.



7.4 Housekeeping rules for break roll system.

- Do not attempt to clear an auger while it is running.
- Do not remove any covers or guards while the plant is running.
- Do not allow children or inexperienced people to operate plant.
- Do not allow spilt materials to accumulate near electric motors. Remove spilt grain and dust as soon as the spillage occurs.
- Do not weld on the plant without taking the following steps:
 - ✓ Dust and grain removed
 - ✓ Inside auger tube free of dust
 - ✓ Electric system is isolated
 - ✓ Obtain a hot work permit
- Note: grain dust is explosive in confined spaces
- Do not operate equipment with employees who are allergic to grain dust. This could be fatal.
- Do not operate if electric controls are wet.

Regular cleaning and maintenance of the infrastructure and the equipment is necessary to maintain good hygiene in the premises and you must take all the necessary actions to keep the premises clean.

Develop a daily house-keeping & sanitation schedule that specifies-

- ✓ the instructions for cleaning,
 - ✓ time scheduled for cleaning, and
 - ✓ person responsible for cleaning
- You should store house-keeping chemicals at dedicated places to avoid mix-up and/or mis-use by workers.
 - Handle the cleaning chemicals with care and use them as per the instructions given on the label.
 - You must clean all the equipment used at the end of day's operations.
 - Clean the ceilings, walls, floors, doors, windows, wire mesh and grills periodically to remove any accumulated dust, dirt, spider webs etc.

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Self-Check – 7	Written test
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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 break roll operation

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating points	Unsatisfactory below points
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Information Sheet - 8 Conducting work related to workplace environmental guidelines

8.1 Introduction

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.

8.2 Work Environment

- **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.

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- ✓ 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**

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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**

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- ✓ 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 – 8

Written test

Name..... ID..... Date.....

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

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 - 9 Maintaining workplace records

9.1 Introduction

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

- Over all working reports list included in break roll 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.

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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 you 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 cereal break roll 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 – 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. Write importance of recording for operation (5pts)
2. List working reports content in break roll system (10 pts.)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating points 15 Unsatisfactory below points 15



LAP TEST	Performance Test
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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.

Task1. Perform starting and operating process operation

Task2. Perform techniques of moisture content measurement



LG 33

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
- process 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
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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

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 6 points	Unsatisfactory below 6 points
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Information Sheet 2- Shutting down and cleaning the process

2.1 Introduction

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.

2.2 Cleaning the process

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.

- **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 (CIP)**

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**

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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.



Self-Check – 2	Written test
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Name..... ID..... Date.....

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

Choose 5 pts.

1. Which one of the following is an examples of dry cleaning
 - A. brushing,
 - B. aspiration (vacuuming)
 - C. Magnetic separation.
 - D. all

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 5 points	Unsatisfactory below 5 points
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Information Sheet 2- Identifying and reporting maintenance requirements

2.1 Maintenance requirements

Roller mills are used around the feed mill to perform a variety of tasks. Applications include crumbling pellets, cracking corn, dry rolling and steam flaking grain, and grinding corn, wheat, or milo for mash and pelleted feeds. While each application has some unique aspects, maintenance and operation of the equipment is remarkably similar.

Roller mill maintenance can be broken down into three general areas

- ✓ Rolls Maintenance
- ✓ Bearings Maintenance
- ✓ Drives Maintenance

Maintenance requirements may vary from application to application but are most directly linked to the horsepower connected to the equipment.

- **Roll Maintenance**

Over the life of the corrugations, some roll wear will occur due to normal processing, and some wear will occur due to extraneous conditions.

- **Bearings Maintenance**

Bearing maintenance is critical to proper long term roller mill operation. Normal maintenance would include frequent addition of small quantities of grease. ½ to 1 ounce of grease added every 40 hours of operation will be sufficient for most machines used for cracking, crumbling, or grinding.

- **Drives Maintenance**

Roller mills normally operate as less than motor RPM so some form of belt drive between the motor and the rolls will normally be employed.

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Self-check 3	Written test
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Name..... ID..... Date.....

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

Short answer

1. What are the three areas of roller maintenances(10pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating 10points	Unsatisfactory below 10points
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