# Confectionary processing

# Level-II

Based on May 2019, Version 2 Occupational standards

**Module Title: - Operating a Granulation, milling and Compression Process**

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**Instruction sheet**

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

- Confirming and make available Ingredients and additives to meet operating requirements.
- Identifying and confirming cleaning and maintenance requirements status
- Setting granulation/milling process to production specifications.
- Checking and adjusting granulation/milling equipment performance.
- Carrying out a 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:

- Confirm and make available Ingredients and additives to meet operating requirements.
- Identify and confirming cleaning and maintenance requirements status
- Set granulation/milling process to production specifications.
- Check and adjust granulation/milling equipment performance.
- Carry out a 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- Confirming and make available Ingredients and additives**

## 1.1 Confirming and make available Ingredients and additives

### 1.1.1 Ingredients

Ingredients are something that enters an element into mixture**.** For example Cake is a baked batter made from major and minor ingredients. These ingredients are listed as the following:

- flour
- sugar
- salt
- leavening agents
- shortening, milk
- Eggs and flavoring.

❖ **Essential Ingredients for Confectionary**

**a) Wheat Flour**

Flour furnishes structure in cakes and is used to hold the other ingredients together . In general, cake flours are milled from soft wheat's of low protein content. The role of wheat proteins in cake making is much less prominent than that in bread production. Low protein wheat's provide weak quality gluten desired in cakes. A good cake flour would have low protein content varying from 7.0% to 8.5% depending on the type of cake being prepared. Thus, high quality batter type cakes may be obtained from flour containing 8.0 to 8.5% protein, whereas foam-type

cakes are best prepared from flours of protein level below 8.0%.

**Fig 1. Wheat Flour**

**b) Sugars**

Sugars are used primarily as sweeteners in cakes as well as in other sweet goods. In cake making, sugar also has a softening effect on the gluten in flour, resulting in tender texture. Sugars also fasten the rate of caramelization of the batter, allowing the cake crust to color faster and thereby retain moisture in the baked cake. Sugar therefore contributes to texture, moistness and color in cakes as well as sweetness and richness.

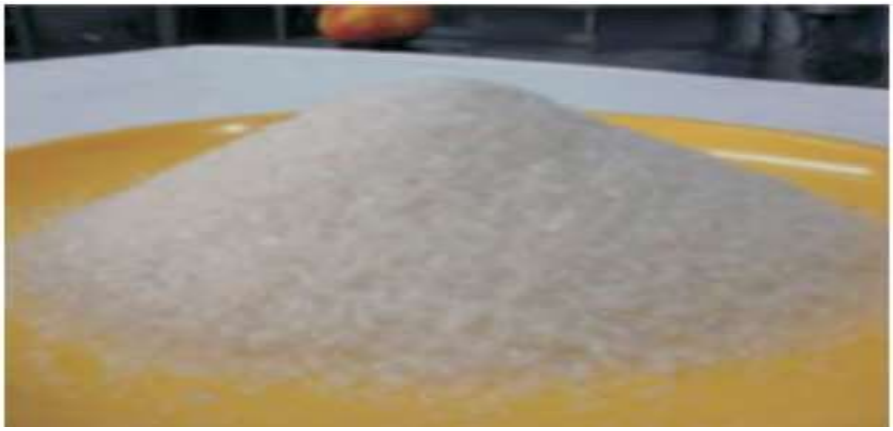


Fig 2. Sugar

**c) Fats**

**Fats** are the primary enriching ingredient in cakes.

The functional properties of fats with respect to cake making lie in its

- Shortening
- creaming
- Emulsifying effects on cake batters.

Fat distributed in a cake batter prevents the formation of a gluten structure, producing what is known as shortness, and results in tenderness in cakes. The creaming ability of fat is, its ability to entrap air, is a very important factor in the production of good volume and texture in cakes. The emulsifying property of fat determines how much liquid can be incorporated in a batter without the occurrence of curdling. The more liquid can be added to a cake batter, the more sugar will the batter be able to hold dissolved in the liquid.

**Fig 3. Fats**

- ❖ The types of fats available for cake making are:

1. **Butter**: Butter is an emulsion of the water-in-oil type and consists chiefly of the fat of milk or butter fat together with curd, milk sugar, mineral salts, and about 14% water. It is obtained by churning the ripened cream of cow's milk. Butter is known for the distinctive flavor it imparts to baked products, but its creaming and emulsifying properties are inferior to other cake fats.
2. **Margarine**: Margarine is a fat resembling butter and is an emulsion of edible oils and fats with ripened milk. Its composition is similar to that of butter but it lacks the characteristic flavor of butter. Cake margarine usually has good creaming and emulsifying properties.

Fig 4. Margarine

3. **Shortenings**: Shortenings are white or yellow fats for the most part from vegetable oils, refined and hardened. They are virtually 100% fat. Shortenings were first called compound fats because they are normally made from refined coconut oils, palm-kernel oil, cotton seed oil and other also have very good creaming properties and for this reason are commonly used in cakes as well.
4. **Vegetable oils**: These are blends of oils from vegetable sources refined in the same way as shortening. The differ only in that they are liquid at normal temperature. Vegetables oils are used mostly in chiffon cake production.

Fig 5. Oil

5. **Lard**: Lard is fat separated from the fatty tissues of pigs by rendering. Pure lard does not cream up well by itself but lard can now be processed which does have fairly good creaming property.

Quality cakes depend on the use of ingredients which is:

- High quality
- Proper mixing and panning methods
- Correct batter temperature
- Correct baking time and temperature and other factors

Cake formulas can be classified into two main types, depending upon differences due to batter appearance or character .

They are:

1. **Batter Type cake:** These cakes depend on eggs. Flour, and milk for structure and contain reasonably high percentages of fat. Much of the volume of the finished cake is achieved by the use of baking powder. Examples are butter cake, pound cake, layer cake, fruit cake etc.
2. **Foam Type Cakes** :These cakes depend principally upon the extension and denaturation of the egg protein for the bulk of the structure of the finished volume, and with one or two exceptions, can be regarded as shortened cakes or cakes without shortening.

### 1.1.2 Food Additives

Food additives are defined in as any substance not normally consumed as a food in itself and not normally used as a characteristic ingredient of food, whether or not it has nutritive value.

Fig 6. Food additives

Food additives are used either to facilitate or complement a wide variety of production methods in the modern food supply.

- Their two most basic functions are:-
- That they either make food safer by preserving it from bacteria and

  Preventing oxidation and other chemical changes, or they make food look or taste better or feel more pleasing in the mouth.

The intentional addition of which to a food for a technological purpose in the:

- Manufacturing
- Processing
- Preparation
- Treatment
- Packaging

### 1.2.1 Functions of Additives

a) Emulsifiers and stabilizers

The purpose of emulsifiers and stabilizers is to facilitate the mixing together of ingredients that normally would not mix namely fat and water.

- This mixing of the aqueous and lipid phases is then maintained by stabilizers.
- These additives are essential in the production of mayonnaise, chocolate products and fat spreads, for example.

The increasing awareness of problems with food allergy and intolerance has led to the requirement to state the source of certain emulsifiers on food labeling.

b) Colors

Colors are used to enhance the visual properties of foods. Their use is particularly controversial, partly because color is perceived by some as a means of deceiving the consumer about the nature of the food, but also because some of the most brightly colored products are those aimed at children. The brilliant yellow of saffron (from which Saffron Walden derives its name) and the reddish hue of Saunders (powdered sandalwood) were used along with green spinach and parsley juice to color soups in stripes or to give marbleized effects.

- ❖ Color is important in consumer perception of food and often denotes a specific flavor.
- ❖ Thus, strawberry flavor is expected to be red and orange flavor orange-colored.
- ❖ Consumer expectation is therefore a legitimate reason for adding color.

c) Sweeteners

Sweeteners perform an obvious function. They come in two basic types – “bulk” and “intense”, and are permitted in foods that are either energy-reduced or have no added sugar.

They are also sold direct to consumers as “table-top” sweeteners– well-known to dieters and diabetics.

Intense sweeteners, such as aspartame, saccharin, acesulfame-K and sucralose have, as their name suggests, a very high sweetening property.

d) Flavor enhancers

This is a group of additives that has attracted adverse attention, in particular monosodium glutamate (MSG: E621), which is widely blamed for an intolerance reaction that became known as “Chinese Restaurant Syndrome”.

Flavor enhancers are substances that have no pronounced flavor or taste of their own but which bring out and improve the flavors in the foods to which they are added.

Although salt has a distinctive taste of its own and is not classed as a food additive, it is in fact the most widely used flavor enhancer.

The next best known is glutamic acid and its salts, most commonly found in the form of monosodium glutamate, which has been used for several centuries in the Far East as a condiment in savory products.

One of the greatest challenges food research is facing in this century lies in:-

Maintaining sustainable food production and at the same time delivering high quality food products with an added functionality, to prevent life-style related diseases such as

- Cancer
- Obesity
- Diabetes

- Heart disease
- Stroke

| Self-check 1 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:**

**Instruction 1: Choose the Best Answer from the following choice**

1. Which of the following is basic function of additives?

A) Processing aids C) Flavor Enhancers

B) Preservatives D) Emulsifiers E) all

2. ---Is any substance not normally consumed as a food in it and not normally used as a characteristic ingredient of food, whether or not it has nutritive value is---------?

A) Additives C) Bread

B) Fruit D) Coffee

*Instruction 2: Matching*

| A Column | B Column |
|---|---|
| 1. Sculpture dioxide | A) sweetener |
| 2. Saffron | B) Preservative |
| 3. Aspartame | C) Coloring |

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

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

## Information Sheet 2- Identifying and confirming cleaning and maintenance

### 2.1 Identifying and confirming Cleaning

Cleaning removes and separates off-specification material, organic and non-organic debris, metals, and pesticide residues, among other contaminants, from the raw material prior to further processing.

- ❖ Reasons for Cleaning, includes the following:

- To reduce the risks from food hazards -food poisoning and foreign body contamination
- To comply with local and international legislation
- To meet specific customer requirements, e.g. Tesco
- To meet the requirements of global food safety standards (GFSI)
- To maintain positive audit and inspection outcomes
- To allow maximum plant productivity
- To present a hygienic visual image
- To promote safe working conditions for staff, contractors and visitors
- To maintain product shelf-life
- To avoid pest infestation

Fig1. Cleaning Equipment's


Fig2. Machine Cleaning

- The main purpose of cleaning is to remove undesirable foreign material and it should be designed to obtain:

1. Complete removal of separated contaminants and avoidance of recontamination

2. Maximum separation efficiency consistent with minimum wastage of desirable material

3. Minimum quantity and concentrations of residues the foreign material found on fruits and vegetables can be grouped under the following headings:

**Table1. Types of contaminants**

| Types of contaminant | Examples |
|---|---|
| **Metals** | Ferrous and non- ferrous metals, bolts, fillings |
| **Minerals** | Soil, sand, stones |
| **Animal** | Hair, bone, insects, larvae |
| **Plant** | Leaves, twigs, weed seeds, pods, skins |
| **Chemicals** | Herbicides, pesticides, fertilizers |
| **Microbial cells** | Soft rots, fungal growth, yeasts |
| **Microbial products** | Colors, flavors, toxins |

❖ **Cleaning methods**

a) Dry cleaning

Dry cleaning methods are used for products that are smaller, have greater mechanical strength and possess lower moisture content. The main advantages of dry cleaning methods are that, these methods are generally inexpensive and involve cheaper equipment than wet cleaning methods and produce a concentrated dry effluent which may be disposed of more cheaply but it suffers from various disadvantages such as, it is prone to production of dust, which can be a source of product recontamination and in some cases, a fire and explosion hazard.

The main groups of equipment used for dry cleaning are:

- Aspirators
- magnetic separator
- Separators based on screening of foods

b) Wet Cleaning

Wet cleaning more effective than dry cleaning for removing soil from root crops or dust and pesticide residues from soft fruits or vegetables. It is also dustless and causes less damage to foods than dry methods. Different combinations of detergents and sterilizers at different temperatures allow flexibility in operation.

The correct sequence of a general cleaning procedure for surfaces in a food plant is:

a) **Gross Clean/Preparation**

This step is most often omitted by food companies. This prevents effective cleaning of plant surfaces due to food residues remaining.

Negative impacts include:

- Protection of surfaces and bacteria from the action of detergents
- Reaction with and consumption of the detergent
- Holding bacteria and resulting in recontamination of the surface

**b) Pre-rinsing**

The purpose of this step is to remove deposits which cannot be easily removed by picking, scrapping or other manual form of gross cleaning. Excess water should be removed following pre-rinsing to avoid dilution of the detergent in the following step.


Figure4 Pre-Rinsing

**c) Detergent Application**

The purpose of the detergent is to remove the layers of proteins, greases and other food deposits that remain on surfaces. Detergents are not designed to remove large pieces of food deposits or thick layers of fat. It is in these layers that bacteria can survive and grow and make the use of a disinfectant pointless.

**d) Post Rinsing**

The purpose of **post rinsing** is to remove the remaining food deposits. Care should be taken to minimize the amount of splash and aerosol formed which may re-contaminate surfaces. After post rinsing the surface should be free of all visible deposits, layers of soiling and residues of detergent.

**e) Disinfection**

**Disinfection** should only be carried out on a visually clean, well rinsed surface, with minimal amounts of water. Direct food contact surfaces should be disinfected at least daily with other surfaces disinfected on a regular basis. Disinfectants should be used safely according to the supplier's instructions.

**f) Terminal Rinsing**

Most disinfectants are safe to leave on non-food contact surfaces without **final rinsing**. In some sections of the food industry there is a requirement to rinse food contact surfaces with water after disinfection.

Fig3 Cleaning Equipment's by

### 1.3 Confirming Maintenance

- **Definition 0f Maintenance**

Maintenance can be defined as "a combination of technical, administrative and managerial measures during the life cycle of the object, focusing on its maintenance in the state or its return to the state in which it can perform the desired function". To ensure the maintenance of its own production equipment, companies build maintenance systems.

The maintenance system should perform mainly the following tasks:

- Identify the major types of repair works according to the nature of the equipment used and the operating conditions
- Identify the required period of repair works
- Identify the necessary amount of work based on the standards of maintenance labor
- effectiveness, the volume of material costs and minimizing downtime of production equipment
- Use modern methods of organizing repairs
- Establish an appropriate stimulation system based on the outcome of maintenance
- Ensure proper organization of material provision of maintenance

❖ **Types of maintenance**

a) Preventive maintenance

Preventive maintenance defined as an equipment maintenance strategy based on replacing, or restoring, an asset at a fixed interval regardless of its condition.

b) Time-based maintenance

Time-based maintenance refers to replacing renewing an item to restore its reliability at a fixed time, interval or usage regardless of its condition.

c) Predictive maintenance

Predictive maintenance where we use potentially many process parameters gained from online sensors to determine if our equipment is moving away from stable operating conditions and is heading towards failure.

d) Corrective maintenance

Corrective maintenance Is strategy only restores the function of an item after it has been allowed to fail.it is based on the assumption that the failure is acceptable (i.e. no significant impact on safety or the environment) and the preventing failure is either not economical or not possible.

Machine breakdowns arise from a number of different causes. They reduce productivity and increase production costs. Poorly maintained machines also produce substandard products and can contaminate products with metal fragments, as well as being a potential hazard to operators. To put preventive maintenance into practice, the following actions are needed:

- Identify priority machinery which have components that wear out more frequently
- Make a clear description of the procedures and standards for the work of machine operators and maintenance workers (such as lubricating, tightening bolts, adjustments etc.) In daily, weekly and monthly routine maintenance plans
- Organize a schedule and train staff to implement maintenance plans.
- Prepare a maintenance budget
- Record inspection results, analyses the records and evaluate the success of maintenance

- Continuously update procedures and standards. Cleaning tools are an essential 'must have' to implement an effective cleaning programme,but the choice available is vast and often confusing and conflicting with many variations and designs to choose from.

| **Self-Check – 2** | **Written test** |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

***Instruction: Say True or False***

1. Preventive maintenance defined as an equipment maintenance strategy based on replacing, or restoring, an asset at a fixed interval regardless of its condition……..?(3pts)
2. Corrective maintenance is strategy only restores the function of an item after it has been allowed to fail……...?(3pts)

***Instruction: Choose the best Answer***

**1.** Reasons for Cleaning, including (3pts)

A. To meet specific customer requirements
B. To meet the requirements of global food safety standards (GFSI)
C. To maintain positive audit and inspection outcomes
D. all

2. The main groups of equipment used for dry cleaning are: (3pts)

A. Aspirators
B. magnetic separator
C. Separators based on screening of foods
D. All

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

***Note:*** **Satisfactory rating - ≥6 points** **Unsatisfactory - below 6 points**

**Information Sheet 3- Setting granulation/milling process to production specifications**

### 3.1 Setting granulation/milling process to production

#### 3.1.1 Pre- milling process to production

The first milling steps involve equipment that separates wheat from seeds and other grains, eliminates foreign materials such as metal, sticks, stones and straw; and scours each kernel of wheat. It can take as many as **six steps**

**1. Magnetic Separator**

The wheat first passes through magnet that removes iron and metal particles


Fig1. Magnetic Separator

**2. Separator**

Vibrating screens remove bits of wood and straw and almost anything bigger or smaller than wheat

Figure 2.Separator

## 2. Aspirator

- Air currents act as a kind of vacuum to remove dust and lighter impurities


Fig3. Aspirator

### 4. De-Stoner

Using gravity, the machine separates the heavy material from the light to remove stones that may be the same size as wheat kernels.


Figure4. De-Stoner

**5. Cockle Cylinder**

Wheat passes through a separator that identifies the size of the kernels even more closely. It rejects anything longer, shorter, more round, more angular or in any way a different shape

**Fig5. Cockle Cylinder**

**6. Scourer**

The scourer removes outer husks, crease dirt and polish the outer surface with an intense scouring action. Currents of air pull all the loosened material away.

Fig6. Scourer

**3.2 Milling Process to production**

**Milling process** is a gradual reduction of the wheat kernels to produce particles of endosperm which are then graded & separated from the bran by sieves & purifiers

Each size returns to corresponding rollers & the same process is repeated until the desired flour is obtained.

Fig7. Milling Machine

The rolls are paired & rotate inward against each other, moving at different speeds just one pass through the corrugated "first break" rolls begins the separation of bran, endosperm and germ.

- **Milling process includes the following:**

**a) Sifting**

The broken particles of wheat are introduced into huge, rotating, box-like sifters where they are shaken through a series of bolting cloths or screens to segregate the larger from the smaller particles

Fig8. Sifting

Up to 6 different sizes of particles may come from a single sifter, including some flour with each sifting. Larger particles are shaken off from the top, or "scalped," leaving the finer flour to sift to the bottom

These fractions are sent to other roll passages and particles of endosperm are graded by size and carried to separate purifiers

**b) Purifiers**

In a purifier, a controlled flow of air lifts off bran particles while at the same time a bolting cloth separates and grades coarser fractions by size and quality

Fig9. Purifier

**c) Reduction Rolls**

Reduction of particle size of semolina into fine flour by passing it through a pair of smooth rolls

Figure10. Rolls

### d) Final Product

The process is repeated over and over again, sifters to purifiers to reducing rolls, until the maximum amount of flour is separated, consisting of close to 75 percent of the wheat

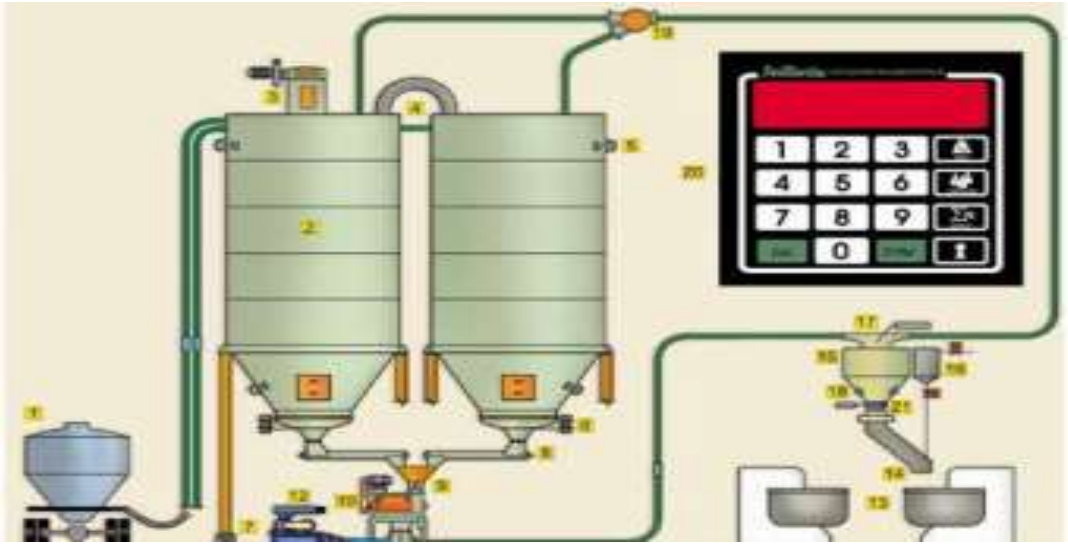



Fig11. Final product process

**Miller's Job**

"The job of the miller is to produce the best flour from the cheapest grist for the maximum number of days per year, at the lowest conversion cost

### ❖ Wheat Milling & Flour

Why should a baker care about the wheat?

-Flour comes from the wheat

-All wheat is not created equal

-Therefore all flour is not created equal

❖ **Types of Flour**

| | |
|---|---|
| Bakers Flour | Pan Breads, Roll & Buns (automated bakeries |
| All Purpose Flour | Pizza, French Breads, Arabic breads |
| High Extraction Flour | Tandoori Bread, Chapati & Puri |
| Soft Flour | Cake & Biscuits |
| Whole Meal Flour | Whole Meal & Brown Bread |
| Semolina | Pasta & Sweets |
| Pre-Mixes | Specialty Breads & Cakes |

**Table1. Types of Flour**

### 3.1.2 Granulation Process to production

Granulation is a technique of particle enlargement by agglomeration is one of the most significant unit operations in the production of dosage forms, mostly tablets and capsules.

During the granulation process, small fine or coarse particles are converted into large agglomerates called granules.

Generally, granulation commences after initial dry mixing of the necessary powder ingredients along with the active pharmaceutical ingredient (API), so that a uniform distribution of each ingredient throughout the powder mixture is achieved. Although granules used in the pharmaceutical industry have particle size in the range of 0.2-4.0 mm, they are primarily produced as an intermediary with a size range of 0.2-0.5mm to be either packed as a dosage form or be mixed with other excipients before tablet compaction or capsule filling**.**

❖ **Manufacturing Methods / Granulation**

Granulation may be defined as a size enlargement process which converts small particles into physically stronger & larger agglomerates.

Granulation method can be broadly classified into two types:

- Wet granulation
- Dry Granulation Ideal characteristics of granules

The ideal characteristics of granules include spherical shape, smaller particle size distribution with sufficient fines to fill void spaces between granules, adequate moisture (between 1-2%), good flow, good compressibility and sufficient hardness.

- **The effectiveness of granulation depends on the following properties**

i) Particle size of the drug and excipients

ii) Type of binder (strong or weak)

iii) Volume of binder (less or more)

iv) Wet massing time (less or more)

v) Amount of shear applied

vi) Drying rate (Hydrate formation and polymorphism).

- **Wet granulation**

The most widely used process of agglomeration in industry is wet granulation.

Wet granulation process simply involves wet massing of the powder blend with a granulating liquid, wet sizing and drying.

- **Important steps involved in the wet granulation**

i) Mixing of the additives(s) and excipients

ii) Preparation of binder solution

iii) Mixing of binder solution with powder mixture to form wet mass screens).

iv) Course screening of wet mass using a suitable sieve

v) Drying of moist granules screen).

vi) Screening of dry granules through a suitable sieve (14-20

vii) Mixing of screened granules with disintegrate, glidant, and lubricant.

- **Limitation of wet granulation**

i) The greatest disadvantage of wet granulation is its cost. It is an expensive process because of labor, time, equipment, energy and space requirements.

Ii) Loss of material during various stages of processing

iii) Stability may be major concern for moisture sensitive or thermo labile drugs

iv) Multiple processing steps add complexity and make validation and control difficult

v) An inherent limitation of wet granulation is that any incompatibility between formulation components is aggravated.

| Self-Check -3 | Written Test |
|---|---|

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

***Instruction 1: Say True /False***

1. In a purifier, a controlled flow of air lifts off bran particles while at the same time a bolting cloth separates and grades coarser fractions by size and quality……..?(2pts)
2. The scourer removes outer husks, crease dirt and polish the outer surface with an intense scouring action……..?(2pts)
3. Milling process is a gradual reduction of the wheat kernels to produce particles of endosperm which are then graded & separated from the bran by sieves & purifiers..?(2pts)

***Instruction 1: Choose the Best Answer***

1. **---------- is technique of particle enlargement by agglomeration is one of the most significant unit operations in the production? (2pts**)

A) Granulation C) Separator

B) Scourer D)All

2. **……..is using gravity; the machine separates the heavy material from the light to remove stones that may be the same size as wheat kernels? (2pts)**

**A) Granulation C) Separator**

**B) Scourer D)De-stoner**

3. **Which of the following is included in type of Flour?**

A) High Extraction Flour
B) Bakers Flour
C) All Purpose Flour
D) All

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

***Note:*** **Satisfactory rating - ≥6 points Unsatisfactory - below 6 points**

**Information Sheet 4- Checking and adjusting granulation/milling equipment Performance**

## 4. 1 Checking and adjusting granulation/milling equipment performance

Measuring machinery health by performance monitoring has the potential to give warning of a developing failure through the changing levels of a suitable parameter being measured, thereby indicating a change in condition of a component, machine or system.

**Keyword**

- Equipment performance monitoring.
- Equipment condition assessment.
- Equipment health monitoring.

### 4.1.1 Condition Monitoring and Process Analysis

Most machine and process characteristics which affect

- availability
- capacity
- quality
- 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.

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.

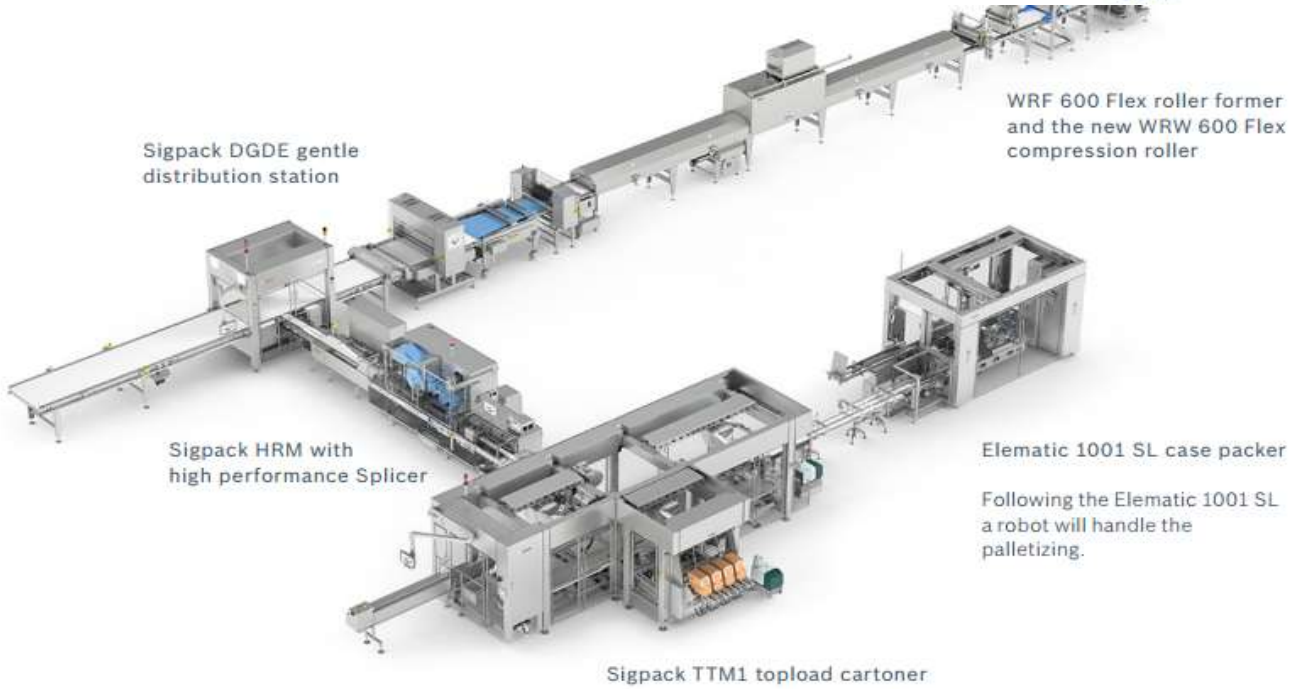



**Fig1. Set-up of machines**

### 4.1.2 The Purpose of Performance Monitoring

There is the classic story of the condition monitoring technician who completed a vibration survey on a miller after it was reported as running erratically. He reported that the miller 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 miller wasn't milling at all!

With continuing advances in sensor technologies and a growing trend for on board mounted machinery sensors permitting on-line monitoring, the performance mentoring 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.

### 4.1.3 Checking Equipment Performance

Equipment's for which Performance Monitoring surveys may be required on a routine basis include the following items:

Those electric motors are not included on the list because fall-off in performance is usually measurable by standard condition monitoring processes such as vibration and thermography.

Perhaps the most useful parameter for performance measurement of an induction motor is speed in relation to load. This should always be a constant and variations are measurable with vibration analysis.

Therefore, generally speaking, special purpose performance monitoring surveys for electric motors are not required. Though the final decision to performance monitor motors should consider the risk associated with their failure.

### 4.1.4 Counting Stress and Overload Conditions to check the machine problem

One great benefit of performance monitoring electric motors is

- To identify the frequency and number of times that they are overloaded.

Each overload causes stresses to the electric motor components and to those in the machinery it drives. Each overload stress destroys operating life of the parts and causes the motor and the attached machine to fail sooner. By monitoring the extent of the overload and counting the number of times overloads occur we can develop a relationship between operating conditions and operating life.

| Self-Check -4 | Written Test |
|---|---|

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

***Instruction 1: Choose the Best Answer***

1. The wider view of Condition Management must take into account _____?(4pts)

A. the performance of the machine

B. the system of which it is a part

C. And report on excursions away from previously defined acceptable tolerances

D. All

2. One great benefit of performance monitoring electric motors is _____? (4pts)

A. to identify the frequency

B. And number of times that they are overloaded

C. A and B are Answers

D. None

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

***Note:*** **Satisfactory rating – ≥ 4 points** **Unsatisfactory - below 4 points**

**Information Sheet 5- Carrying out a pre-start checks**

## 5.1 Carrying out a pre-start checks

It is important to carry out a series of checks before using a piece of machinery. This is particularly important in situations in which a number of people use the same machine. Larger companies and organizations usually have a system of checks, and a maintenance department that will deal with reported defects. Individuals working alone or in small teams will be responsible for checking and maintaining their own machines. Operator should be able to follow a checklist to ensure that they complete all the necessary checks

### 5.1.2. Pre-Start-Up Check procedures

- Corrosion resistant materials of construction are used for all equipment from the supply source to the membrane including piping, vessels, instruments and wetted parts of pumps
- Equipment is compatible with designed pressure
- Equipment is compatible with designed cleaning
- Equipment is protected against galvanic corrosion
- Media filters are backwashed and rinsed
- Ingredient addition points are properly located
- Check/anti-siphon valves are properly installed in Ingredient addition lines
- Provisions exist for proper mixing of ingredient in the feed stream
- Planned instrumentation is installed and operative.
- Instrument calibration is verified
- Pressure relief protection is installed and correctly set

- Interlocks, time delay relays and alarms are properly set
- Pressure vessels are properly piped both for operation and cleaning mode
- Millers are ready for operation: aligned, lubricated, proper rotation
- Fittings are tight
- Cleaning system is installed and operative

❖ **Preparation for start-up**

**1. Electrical connections**

The machine has only one connection to the main electricity supply

**2. Hydraulic connections**

The machine has only one hydraulic connection. The hose must have ½ “fastening.

❖ **DANGER:**

- Be sure that the values of the main electricity supply comply with the power specifications of the machine.
- Electrical hazards. Be sure that the machine is adequately earthed before making any other connection to the main power supply.

| Self-Check – 5 | Written test |
|---|---|

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

*Instruction 1: Choose the Best Answer from the following Choices*

**1. Which of the following Pre-Start-Up Check procedures?**

A) Equipment is compatible with designed pressure

B) Equipment is compatible with designed cleaning

C) Equipment is protected against galvanic corrosion

D) Media filters are backwashed and rinsed

E) All

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

***Note:*** **Satisfactory rating – 3 points** **Unsatisfactory - below 3 and 4 points**

| Operation Sheet 1 | Apply Cleaning Requirements on the Equipment |
|---|---|

**Procedure:**

**Step** 1 Gross Clean/Preparation

**Step** 2 Pre-rinse

**Step** 3 Detergent application

**Step** 4 Post-rinsing

**Step** 5 Disinfection

**Step** 6 Terminal rinsing

| Operation Sheet 2 | Carrying out pre-start checks |
|---|---|

**Procedure**

**Step** 1 Equipment is compatible with designed cleaning

**Step** 2 Equipment is protected against galvanic corrosion

**Step** 3 Media filters are backwashed and rinsed

**Step** 4 Ingredient addition points are properly located

**Step** 5Check/anti-siphon valves are properly installed in Ingredient addition lines

**Step** 6Provisions exist for proper mixing of ingredient in the feed stream

**Step**7 Planned instrumentation is installed and operative.

**Step** 8Instrument calibration is verified

**Step** 9 Pressure relief protection is installed and correctly set

**Step** 10 Interlocks, time delay relays and alarms are properly set

**Step** 11 Pressure vessels are properly piped both for operation and cleaning mode

**Step** 12 Millers are ready for operation: aligned, lubricated, proper rotation

**Step** 1 3 Fittings are tight

**Step** 14Cleaning system is installed and operative

| **Operation Sheet 3** | **Wet Granulation** |
|---|---|

**Procedure**

**Step** 1 Mixing of the additives(s) and excipients

**Step** 2 Preparation of binder solution

**Step** 3 Mixing of binder solution with powder mixture to form wet mass screens).

**Step** 4 Course screening of wet mass using a suitable sieve

**Step** 5 Drying of moist granules screen.

**Step** 6 Screening of dry granules through a suitable sieve (14-20

**Step** 7 Mixing of screened granules with disintegrate and lubricant.

| LAP Test | Practical Demonstration |
|---|---|

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within 8-12 hours.

**Task 1: Apply general cleaning of equipment**

**Task 2: check pre-start milling/granulation equipment**

**Task 3: Perform wet granulation**

| LG #35 | LO #2- Prepare the compression process for operation |
|---|---|

**Instruction sheet**

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

- Confirming granulated/milled materials
- Setting compression equipment and process to production specification
- Checking and adjusting compression equipment performance
- carrying out 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**:

- Confirm granulated/milled materials
- Sett compression equipment and process to production specification
- Check and adjusting compression equipment performance
- carryout 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- Confirming granulated/milled materials

### 1.1 Confirming granulated/milled materials

Flour is a powder made by grinding raw grains, roots, beans, nuts, or seeds. It is used to make many different foods. Flour is also;

- Finely ground purified material from the wheat kernel
- Purification of process depends up on wheat source
- Usually remove the outer fibrous coating through a gradual milling process
- Increased palatability but reduced nutritional value
- Wheat Flour Pass through 10 XX sieve
- Flour particle size range from 1µ to 200µ

Fig1. Flour Types

### 1.1.2 Types of flour

- **Whole wheat flour** retains the wheat germ, and is often used to replace a portion of all-purpose flour in a recipe to boost the nutritional profile.
- **Whole grain flour** also retains the entire kernel of grains such as wheat, oats, rye, millet, quinoa, barley, or a combination of grains.
- **Bread flour** contains more protein, and therefore more gluten, and is ideal for baking chewy yeast breads.

- **Cake flour** is lower in protein and gluten than all-purpose flour, and is chemically treated and finely ground to produce cakes with a lighter texture.
- **Pastry flour** is medium-protein flour that's ideal for tender pie crusts.
- **Self-rising flour** has baking powder and salt already mixed in.
- **Alternative non-wheat flours** are milled from other grains, nuts, and seeds.
- **Cornmeal** is for cornbread, crunchy waffles, pancakes, etc.
- **Cornstarch** is finely ground corn flour used for thickening sauces and pie fillings

| **Milled products** | | **Bakery Products** | |
|---|---|---|---|
| **Composite flours**<br>**Finger millet flour**<br>**Legume flours** | **Maize flour**<br>**Rice flour**<br>**Sorghum flour** | **Biscuits/cookies**<br>**Breads**<br>**Cakes**<br>**Doughnuts** | **Pastries**<br>**Pies**<br>**Pizzas**<br>**Samosas** |

Table1. Types of processed cereal products

| Self-Check – 1 | Written test |
|---|---|

Name…… ID…… Date…….

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

**I. Say True or False**

1. **Whole wheat flour** retains the wheat germ, and is often used to replace a portion of all-purpose flour in a recipe to boost the nutritional profile….?(2pts)
2. **Whole grain flour** also retains the entire kernel of grains such as wheat, oats, rye, millet, quinoa, barley, or a combination of grains….?(2pts)
3. **Bread flour** contains more protein, and therefore more gluten, and is ideal for baking chewy yeast breads….?(2pts)

**II. Choose the best answer from the Following?**

1. Which of the Following is **not milled** product? (2pts)

A) Composite flours E) Wheat

B) Finger millet flour D) Legume flours

2. Which of the Following is one of Bakery Products? (2pts)

A) Biscuits/cookies C) Pizzas

B) Breads D) Cakes E) All

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

***Note:*** **Satisfactory rating - ≥5 points** **Unsatisfactory - below 5points**

**Information Sheet 2- Setting compression equipment and process to production**

## 2.1 Setting compression equipment and process to production

2.1.1 Setting up of Machinery

In setting machinery, the equipment should be located, if possible in a lighted dry place with plenty of room to work around it for cleaning and repairs. The arrangement should be that the minimum amount of sanitary piping is used, consistent with efficient operation. Related equipment may be grouped together to facilitate supervision. Straight-line flow of product is usually desirable. If possible allow space for unit machine to be added later when the business grows.

Machines especially the heavy ones, are set directly on the floor or on concrete base and grated in thoroughly with a rich cement mixture (1 part cement and 2 1/2 parts sand) and sufficient water

For monitored machines running Windows, the following settings must be made on the monitored machines:

- Set the account name and password as specified with connection settings.
- The connection account must belong to the Administrators group or Performance Monitor Users group of the monitored machine.

Configure the Security Settings for the account and for the group which that the account belongs to as follows:

- Assign the "Access this computer from the network" right to the account or to the Administrators group or the Performance Monitor Users group which the account belongs to.
- Avoid that the account and the Administrators group or the Performance Monitor Users group which the account belongs to are added to the list of the "Deny access to this computer from the network" right.

Local Security Policy: When the monitored machine OS is Windows Vista, Windows 7, Windows Server 2008, Windows 8 or Windows Server 2012 and an Administrators

group account is used for the access account for a target machine, perform the following steps. This setting is not necessary if a domain user is used.

1. Start the Local Security Policy using the Administrative Tools in Control Panel
2. The Local Security Settings are appeared. Select Security Options of Local Policies from the tree on the left side.
3. When the built-in Administrator is used; Display the properties by double-clicking User Account Control: Admin Approval Mode for the Built-in Administrator account. When an Administrators group account other than the built-in Administrator is used; Display the properties by double-clicking User Account Control: Run all administrators in Admin Approval Mode.
4. Select Disabled and then Click OK.

- **Setting the Connection Account to the Monitored Machine**

Set the account name and password so that the Performance Monitoring Service can access the monitored machine. To register, complete the following steps:

1. Start the management console.
2. Right-click the management server name from the navigation tree window in the main window of the management console.

A popup menu appears.

3. Click Set Configuration.

A Configuration window with the name of the server appears.

4. In the Connection tab, specify a new account and password, and then click OK. If the OS on the monitored machine is Linux/KVM, select the correct connecting options in the Protocol and Authentication Protocol boxes. If Public key authentication is selected, then specify the path for the private key file in Key file path. The private key is stored on the management server. The Protocol and Authentication Protocol settings are ignored if the monitored machine is VMware ESX/ESXi or Citrix XenServer.

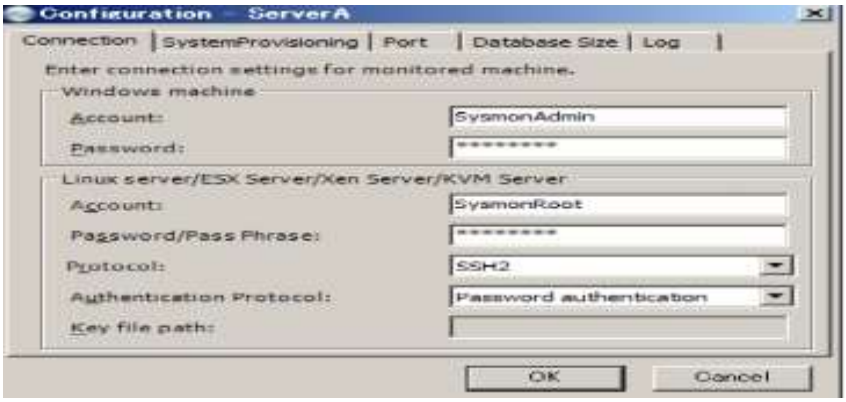



Fig1. Connection Account

| Self-Check – 2 | Written test |
|---|---|

Name…… ID…… Date…….

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

## Test I: Say True /False

1. In setting machinery, the equipment should be located, if possible in a lighted dry place with plenty of room to work around it for cleaning and repairs…..?(2pts)
2. Machines especially the heavy ones, are set directly on the floor or on concrete….?(2pts)

## Test I: choose an appropriate answer from the following?

1. Which of the following settings must be made on the monitored machines?(4pts)

A) Set the account name C) A $ B

B) Password as specified D) All

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

***Note:*** **Satisfactory rating - ≥ 5 points** **Unsatisfactory - below 5 points**

**Information Sheet 3- Checking and adjusting compression equipment performance**

### 3.1 Checking and adjusting compression equipment performance

In order to use System Monitor - Performance Monitoring Services functions, the Performance Monitoring Service must have started on the management server. The Performance Monitoring Service resides in the background as a Windows service. The Performance Monitoring Service startup type is "Automatic" by default, so it runs automatically when the OS starts.

The Performance Monitoring Service can be started and stopped manually. The procedure is as follows.

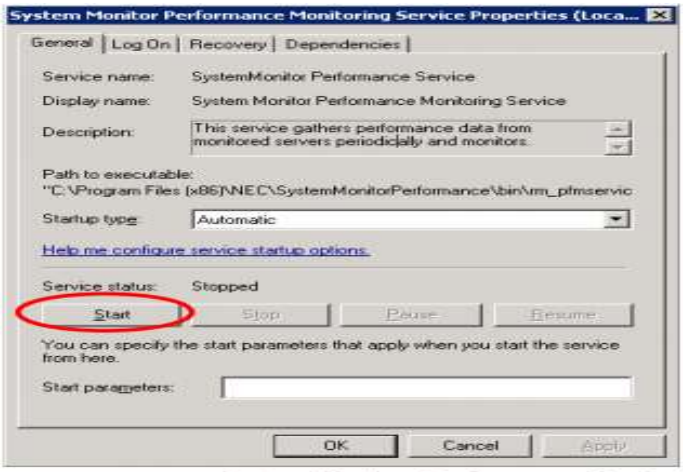
1. Start Services from the Administrative Tools in Control Panel.

The Services window appears.

Double-click "System Monitor Performance Monitoring Service" from the services list.

The System Monitor Performance Monitoring Service Properties window appears.

2. On the General tab, click Start. The Performance Monitoring Service will start.




System Monitor - Performance Monitoring Services User's Guide

Fig1. Performance Monitoring Service

### 3.1.1 Displaying Formats for Performance Status Graphs

System Monitor - Performance Monitoring Services displays Performance Indicators using different graph formats, as described below.

1. Node Comparison Display

In this format, the performance status for a particular Performance Indicator item and a particular statistic are displayed for each node. This format is valid for situations such as comparing groups or checking whether there is anything unusual about the performance status of a particular machine in a certain group, in terms of, for example, the average values for CPU usage.

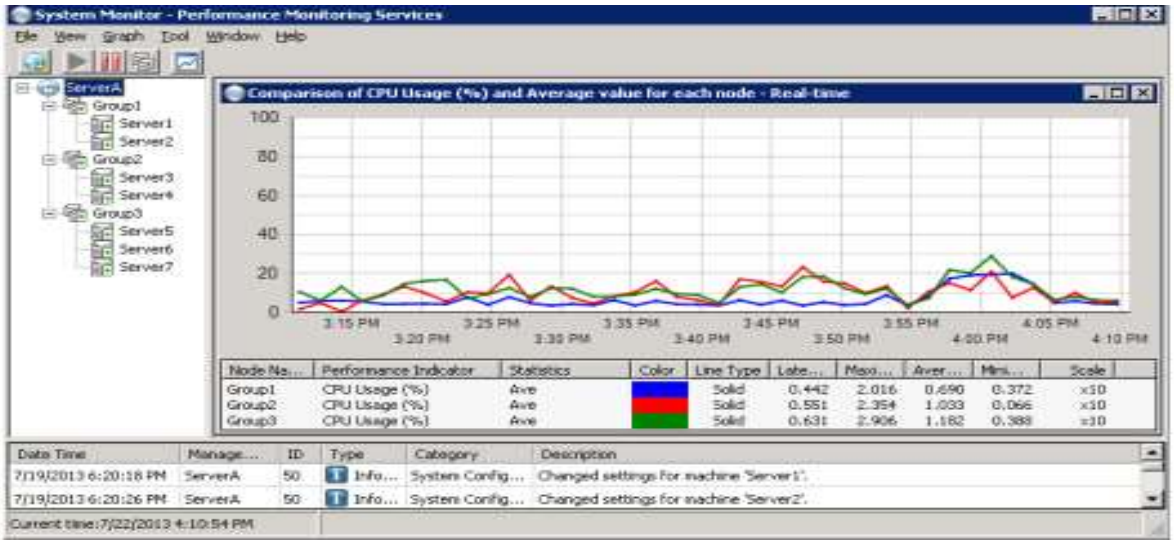



Fig2. Displaying the Performance Status

- **Performance Monitoring Systems**

Typical performance questions to be considered when prepared a monitoring process are:

- What service levels and performance measures have been set for each asset type?
- What technical performance measures will be used to manage asset performance.

- What are the risks associated with asset performance?
- Determine whether the asset is performing reliably, and meeting user capacity/service requirements.

### 3.1.2 Setting up of Compression Equipment

In setting machinery, the equipment should be located, if possible in a lighted dry place with plenty of room to work around it for cleaning and repairs. The arrangement should be that the minimum amount of sanitary piping is used, consistent with efficient operation. Related equipment may be grouped together to facilitate supervision. Straight-line flow of product is usually desirable. If possible allow space for unit machine to be added later when the business grows.

Machines especially the heavy ones, are set directly on the floor or on concrete base and grated in thoroughly with a rich cement mixture (1 part cement and 2 1/2 parts sand) and sufficient water.

| Self-Check – 3 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: Choose the Appropriate Answer from the Following?**

1. The performance of the asset measured in terms of:

A) Reliability
B) Availability
C) Meeting customer demands and needs.
D) All

2. Therefore the benefits of knowing the current condition and performance level of an asset are:

A) Ability to plan for and manage the delivery of the required level of service.
B) Avoidance of premature asset failure, leaving open the option of cost effective renovation.
C) Risk management associated with asset failures, and mitigation of the consequences of failure.
D) All

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

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

**Operation Sheet 1- Checking and adjusting compression equipment performance**

**Procedure**

**Step 1.** Start Services from the Administrative Tools in Control Panel. The Services window appears.

**Step 2.** Double-click "System Monitor Performance Monitoring Service" from the services list.

The System Monitor Performance Monitoring Service Properties window appears.

**Step 3.** On the General tab, click Start. The Performance Monitoring Service will start.

| 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 check Performance of monitoring Service**

| LG #36 | LO #3- Operate and monitor the granulation/milling and compression process |
|---|---|

**Instruction sheet**

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

- Starting and operating a process according to workplace policies and procedures
- Combining and pouring ingredients in specified sequence.
- Monitoring granulation/milling process to confirm granules of the required particle sizes are produced.
- Producing compressed product from compression process
- Monitoring equipment to identify variation in operating conditions.
- Identifying and reporting a Variation in equipment operation and maintenance.
- Identifying, rectifying and/or reporting Out-of-specification product/process outcomes.
- Maintaining work area according to housekeeping standards
- Conducting a Work with workplace environmental guidelines
- Maintaining Workplace records to workplace information requirements

Carrying out process testing in production process

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 a process according to workplace policies and procedures
- Combine and pour ingredients in specified sequence.
- Monitor granulation/milling process to confirm granules of the required particle sizes are produced.
- Produce compressed product from compression process
- Monitoring equipment to identify variation in operating conditions.
- Identify and report a Variation in equipment operation and maintenance.
- Identify, rectify and/or report Out-of-specification product/process outcomes.

- Maintain work area according to housekeeping standards
- Conduct a Work with workplace environmental guidelines
- Maintain Workplace records to workplace information requirements
- Carryout process testing in production process

**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- Starting and operating a granulation/milling and compression process**

### 1.1 Starting a granulation process

Granulation is an important unit operation in a large number of industries including the food, pharmaceutical, agricultural, mineral processing and agrochemicals. Granulating a material allows the engineer to improve the material properties; size, strength, dissolution time and porosity usually without altering the material itself. Particle motion within a granulator has largely been measured using two techniques; high speed imaging techniques and positron emission particle tracking (PEPT).

However conditions inside the granulator are changing with time. Changing granule size structure and surface moisture content will affect bed surface velocities. The conditions inside the granulator at the beginning and end of the granulation process are very different.

### 1.2 Steps of Milling Process

The milling process involves separating the wheat grain into its constituents that is the germ, bran, and endosperm.it follows the steps below:

**a)** **Cleaning**; here the wheat is cleaned to remove impurities such as sticks and stones and other coarse and fine materials.

**b)** **Tempering and Conditioning**; at this stage, soaking of the wheat in water takes place for easy removal of the bran**.**

**c)** **Gris ting;** refers to the blending of conditioned and cleaned wheat.

**d)** **Separating;** the rolls only split the wheat open to separate the inner white portion from the bran

**e)** **Milling;** the wheat is ground by a machine that crush it in to pieces**.**

**f)** **Blending;** here constituents are mixed together to produce different flours.

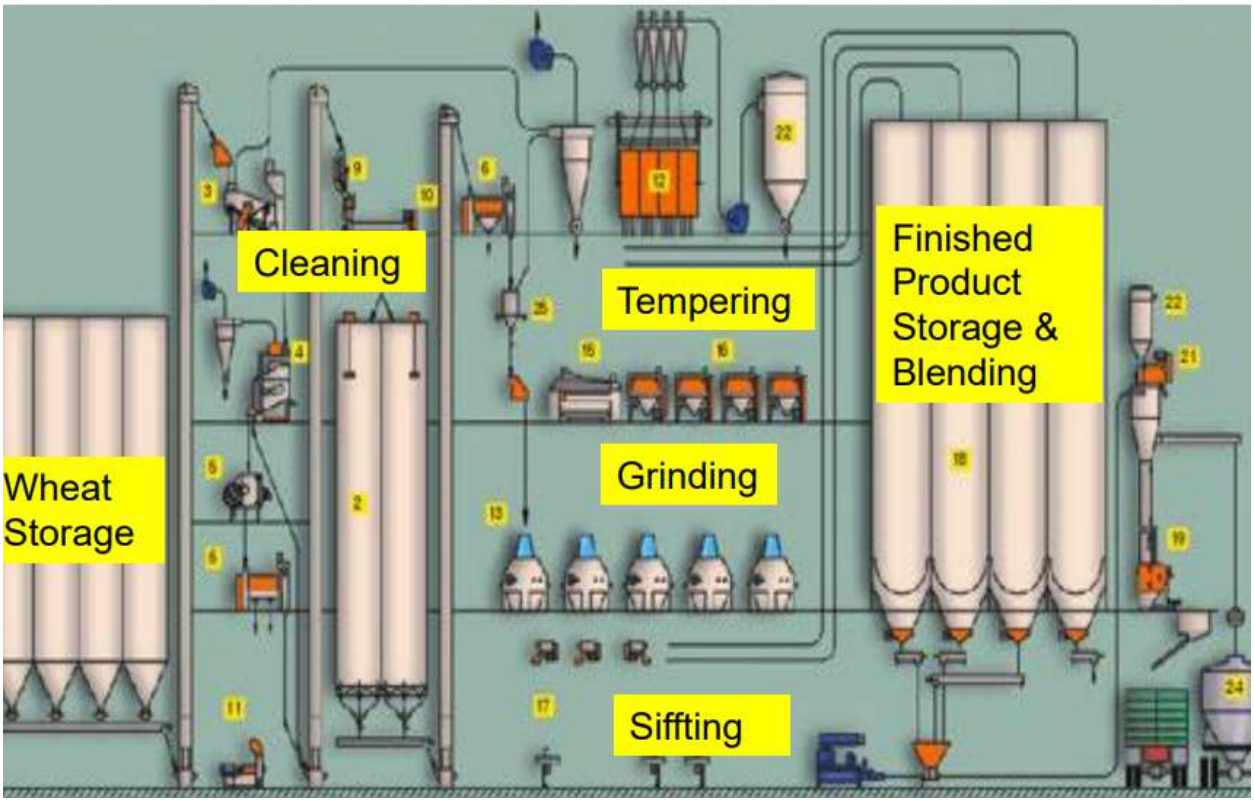



Fig 29 Wheat Milling Process

| 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 I: Say True or False**

1. **Milling is** the rolls only split the wheat open to separate the inner white portion from the bran….?(2pts)
2. **Separating;** the wheat is ground by a machine that crushes it in to pieces**…..**….?(2pts)
3. **Gris ting;** refers to the blending of conditioned and cleaned wheat……..?(2pts)

**Test II: Choose the best answer**

1. ……..is a term when constituents are mixed together to produce different flours….?(2pts)

**A) Gris ting** **C) Cleaning**;

**B) Separating** **D) Blending** **E) All**

2. Granulating a material allows the engineer to improve the material properties….?(2pts)
   A) Size and strength
   B) dissolution time
   C) porosity usually without altering the material itself
   D) none
   E) All

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

***Note:*** **Satisfactory rating - ≥ 5 points** **Unsatisfactory - below 5 points**

**Information Sheet 2- Combining and pouring ingredients**

## 2.1 Combining and pouring ingredients

Combining and pouring is a unit operation in which a uniform mixture is obtained from two or more components, by dispersing one within the other(s). The larger component is sometimes called the continuous phase and the smaller component the dispersed phase by analogy with emulsions, but these terms do not imply emulsification when used in this context. Mixing has no preservative effect and is intended solely as a processing aid or to alter the eating quality of foods. It has very wide applications in many food industries where it is used to combine ingredients to achieve different functional properties or sensory characteristics.

**Examples** include:-

- Texture development in dough's and ice cream
- Control of sugar crystallization
- Aeration of batters and some chocolate products.

In some foods, adequate mixing is necessary to ensure that the proportion of each component complies with legislative standards (for example mixed vegetables, mixed nuts, sausages and other meat products).

The first step is blending of flour and shortening until the flour particles are thoroughly coated with fat. This is followed by the addition of the dry ingredients and about 35% of the required liquid, including eggs. The whole mixture is mixed for a pre-determined period. Lastly , the remainder of the liquid is added and mixing is continued until the batter is smooth.

The mixed batter should be deposited into cake pans and baked without delay. It must be kept in mind that once the leavening agents have been added to the batter, they begin to react and evolve carbon dioxide gas.

In a fluid batter, this gas tends to rise upwards, the tiny bubbles coalescing as they come in contact with each other to form larger cell with greater buoyancy . It should be noted that there is an inevitable escape of gas from the batter as well as a coarsening of the cell structure if a mixed batter is left too long out of

the oven. It is, therefore, a good practice to place panned cake batters into the oven soon after mixing.

The oven temperature at which these cakes should be baked will vary over a considerable range, depending on factors such as richness of the formula, size of pan, and moisture content of the batter. Batters which are high in sugar content require low baking temperatures in the range of 325-350ºF(160-175ºC), while leaner mixtures may be baked at a temperature range of 350-400ºF(175-200ºC).

The average baking time for layer cakes will take 15-20 minutes and for cupcakes 10-15 minutes.

A good cake shows evenly distributed minute (very fine) cells without any large holes.

- Have Good Color.
- Should Eat Moist.
- Have Good Flavor, and general appearance should be attractive with good eye appeal.

Fig1 combining Ingredients

| Self-Check – 2 | Written test |
|---|---|

Name…… ID…… Date…….

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

Instruction

**I. Choose the Best Answer**

**1.** Combine ingredients to achieve different functional properties or sensory characteristics..?

A) Texture development in dough's and ice cream
B) Control of sugar crystallization
C) Aeration of batters and some chocolate products.
D) All

2. The degree of combining that is achieved depends on:

A) The relative particle size, shape and density of each component
B) The moisture content, surface characteristics and flow characteristics of each component.
C) The tendency of the materials to aggregate
D) The efficiency of a particular mixer for those components
E) All

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

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

**Information Sheet 3- Monitoring granulation/milling process to required particle size**

**Produced**

## 3.1 Monitoring granulation/milling process

Different types of food processing can be categorized into:

1) Primary processing (post-harvest operations including drying, milling, etc.).

2) Secondary processing (e.g. baking, frying etc.) in which raw materials from primary processing is transformed into a wide range of added value products that are attractive and add variety to the diet. Hand in hand with good manufacturing, hygiene and management practices, all partners in the food supply chain must remain aware of the expanding number of domestic and international food safety laws and regulations.

Production planning involves thinking ahead to make sure that everything is in place to Produce the required amount of product. This includes:

Number of workers required and their different jobs

Equipment needed to achieve the planned production level

- Quantities and specifications of raw materials and ingredients to be bought
- Number of packages required.

Poor production planning leads to stoppages or insufficient levels of production. If this happens frequently, the output falls below the planned capacity and the business cannot produce enough to pay the bills and it fails.

The information required to plan production includes:

- How much product is sold (not made) each month?
- How many hours are worked per day?
- How many days are worked per month?

The first step is getting detailed information on current sales for each product (Fig 3.1) by adding the daily sales figures to produce monthly totals (these figures also show trends in sales which can be used to plan for additional equipment, new staff, or development of new products).

❖ **Wheat milling process**

The first milling steps involve equipment that separates wheat from seeds and other grains, eliminates foreign materials such as metal, sticks, stones and straw; and scours each kernel of wheat

.

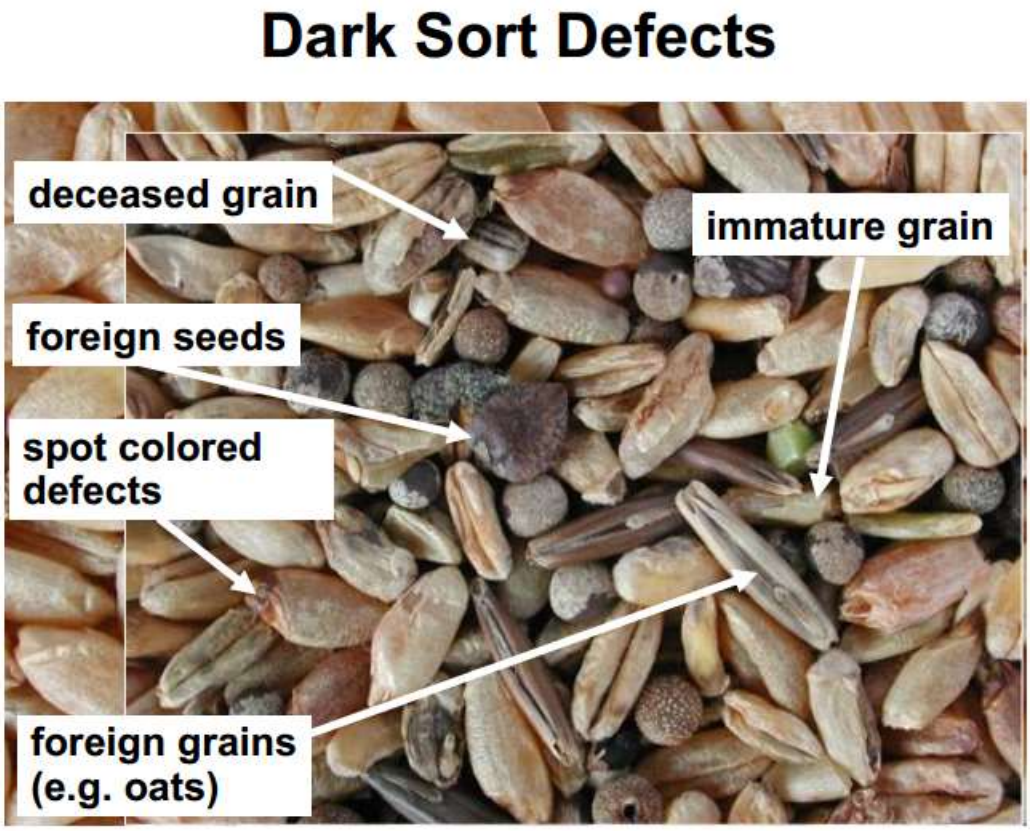



Fig3 Dark Sort Defect

**3.2 Size Reduction**

Wheat milling is a progressive size-reduction process in which the wheat endosperm is gradually milled to a specific size range of flour. Per the U.S. Code of Federal Regulations (CFR, 2013) for cereal flours and related products, for classifying the end product of the milling process as flour, “not less than 98 percent of the flour passes through a cloth having openings not larger than those of woven wire cloth designated 212 µm (No. 70).” In general, particle size is an important quality parameter of flour that greatly affects the processing techniques and end product quality, especially in the case of wheat flour (Sullivan et al., 1960). Different techniques are used for powder particle size determination, including sieve analysis, sedimentation, microscopy, Coulter

Counter, laser diffraction, and near-infrared reflectance spectroscopy (Hareland, 1994). Except for sieve analysis, although accurate, these methods are limited to analytical laboratories due to the cost and measurement time involved.

- **Particle Size and Distribution**

The most common way to analyse ground feed materials for particle size and distribution (uniformity) is to perform a complete a sieve analysis. The particle size distribution of common ground feed materials is skewed when plotted on normal – normal graph paper; when plotted on log-normal graph paper, the curve becomes more like the typical bell shaped curve.

| U.S. Standard Sieve | Nominal Opening | |
|---|---|---|
| | mm | inches |
| 4 | 4.76 | 0.187 |
| 6 | 3.36 | 0.132 |
| 8 | 2.38 | 0.937 |
| 12 | 1.68 | 0.0661 |
| 16 | 1.191 | 0.0469 |
| 20 | 0.841 | 0.0331 |
| 30 | 0.594 | 0.0234 |
| 40 | 0.420 | 0.0165 |
| 50 | 0.297 | 0.0117 |
| 70 | 0.212 | 0.0083 |
| 100 | 0.150 | 0.0059 |
| 140 | 0.103 | 0.0041 |
| 200 | 0.073 | 0.0029 |
| 270 | 0.053 | 0.0021 |

Table1 Particle size and Distribution

- **Size reduction/ grinding equipment**

Both roller mills and hammer mills have been applied to the task of particle size reduction or grinding in feed milling applications. Hammer mills have traditionally been

used to produce the finer grinds commonly used for pelleting and for many mash (meal or non-pelleted) feed applications as well. The hammer mill is a relatively simple machine and requires a fairly low degree of skill in regards to both the operation and maintenance.

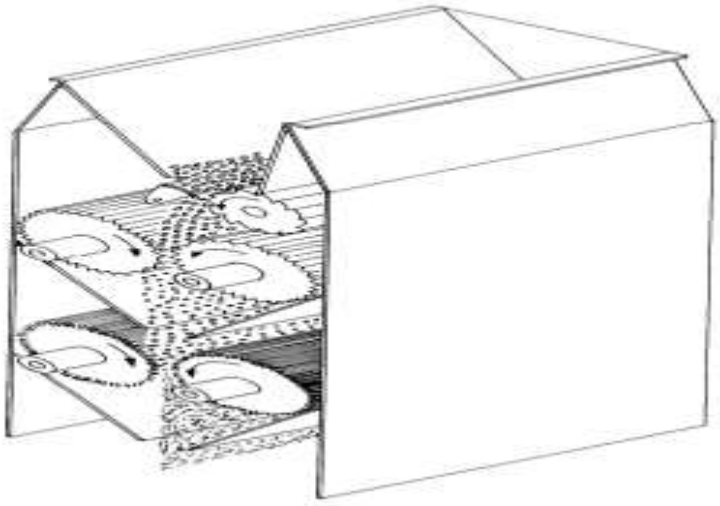


Fig.4 Grinding Equipment

- **Roller Mill Grinding**

Roller mills have been used in the processing of common feed materials for years. The earliest roller mills used in the feed milling were abandoned flour milling roll stands, used primarily to produce coarse granulations of friable materials. Over time, roller mills have been used to perform a wide variety of tasks related to the production of animal feeds.

- **Roller Mill Equipment Description**

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

| Self-Check –3 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: choose the best answer**

1. Both roller mills and hammer mills have been applied to the task of particle size…?(2pts)
2. Wheat milling is a progressive size-reduction process in which the wheat endosperm is gradually milled to a specific size range of flour…?(2pts)

**Test II: choose the best answer**

1. Which of the following information required planning production includes?(3pts)

A) How much product is sold (not made) each month?
B) How many hours are worked per day?
C) How many days are worked per month?
D) All

2. Which of the following is included in Primary processing ? (3pts)

A) Drying
B) Milling
C) Bakery
D) Frying
E) A$B
F) All

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

***Note:*** **Satisfactory rating - ≥ 5 points** **Unsatisfactory - below 5 points**

**Information Sheet 4- Producing compressed product from compression process**

## 4.1 Producing compressed product from compression process

Compressed products are a products pressed together; in size or volume (as by pressure) and flattened as though subjected to compression**.**

**Fig1.** Milled Flour

- **Compressed products are categorized into the following;**

**1. Cakes and Pastries**

This section includes the different preparations like-dry cakes, fresh cakes, cupcakes, puddings and pies. This section covers most of the products we see in a pastry shop.

**2. Chocolate Section**

This section deals with the different preparations like molded chocolate, handmade chocolates, chocolate garnishes, sculptures etc.

**3. Sugar Confectionery**

This section deals with the different preparations like candies, caramel, sugar craft, fondant, pulled sugar etc.


**Fig2. Cookies, banana cake and biscuits**

The main problem facing is to ensure an adequate supply of raw materials (often for a full year's production). To buy grains at the lowest prices, the crop must be bought at harvest time and this means that sufficient cash should be put aside to pay for the entire crop at one time. If this is not possible and crop has to be bought throughout the year, the changes in price may lead to difficulties in financial planning and production planning.

This offers benefits to millers, including:

• An assured supply of grain and easier production planning because of guaranteed supplies

• Reduced uncertainty over the cost of grain (and income for farmers)

• Better understanding by farmers of millers' quality requirements

Good production planning is also needed to control expenditure and reduce product costs. The main considerations are:

• Maintaining equipment to prevent breakdowns and ensure uninterrupted production

• Training staff to ensure high product quality

• Full utilization of staff and machinery to maximize productivity.

| 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: Choose the best answer**

1. Which of the following are benefits of financial planning and production planning to millers?

**A)** An assured supply of grain and easier production planning because of guaranteed supplies

**B)** Reduced uncertainty over the cost of grain (and income for farmers)

**C)** Better understanding by farmers of millers' quality requirements

**D)** All

2. Which of the following is **Sugar Confectionery**?

**A)** Candies

**B)** Caramel

**C)** Sugar craft

**D)** Fondant

**E)** Pulled sugar

**F)** All

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

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

**Information Sheet 5- Monitoring equipment to identify variation in operating conditions**

## 5.1 Monitoring equipment to identify variation in operating conditions

### 5.1.1 Measurement of process variables.

In order to determine the degree of effectiveness of the different treatment processes, several physical and chemical parameters associated with equipment must be measured. After they are measured, the information must be evaluated so that necessary adjustments can be made in the treatment processes.

Controlling Equipment of plant processes may be controlled by manual, semiautomatic or automatic methods, which are defined as follows.

a) Manual control. Manual control involves total operator control of the various water treatment processes. The personnel at the water treatment plant observe the values of the different variables associated with the treatment processes, and make suitable adjustments to the processes.

b) Automatic control. Automatic control involves the use of instruments to control a process, with necessary changes in the process made automatically by the controlling mechanisms. When a process variable changes, the change is measured and transmitted to a control device which adjusts the mechanisms controlling the process. Automatic control systems have been developed which are reliable, but provision for emergency manual control must be included.

c) Semiautomatic control. Semiautomatic control utilizes instruments to automatically control a function or series of functions within control points that are set manually. The operator manually starts the automatic sequence of operations. An example of semiautomatic control is the automatic backwashing of a filter after operator initiation of the program,

## 5.1.2 Monitoring equipment throughout the job

Workers have to monitor the equipment's operation correctly and report tools/equipment malfunctions or problems according to procedures to his immediate supervisors. A

finished product may exhibit several quality characteristics. Quality control (QC) techniques apply by inspecting and measuring the product quality characteristics using inspection equipment and some procedures. By comparing to the standard, the product can be identified whether conforms to requirements or fails, consider as accepted or rejected as well.

Inspection provides useful information about the current demonstrated product quality. Then, any managerial decision made based on this information, which is concentrate more on the effort of product and process improvement program. Many procedures, especially for acceptance inspection, has been developed to conduct the inspection which technically effective and/or economically efficient. Consistent monitoring on quality will ensure that products meet the requirements defined by either the manufacturer's product design department or by customers

Recognizing deviations of variables to be monitored include:

- Equipment performance (e.g. speed, output, variations)
- equipment component performance
- sequences and timing of operation
- materials changes (desired and not desired
  - ❖ Deviations May include but not limited to:
  - equipment production outputs
  - equipment operating conditions
  - Operating parameters like temperatures and pressures.so all these expected deviations has to be recognized monitored and reported.

### 5.1.1 Equipment inventories

An accurate equipment inventory provides immunization programme managers and maintenance teams with important information about existing cold chain equipment appliances, including their functional status, age, location and net storage capacity. This cold chain equipment inventory helps technicians plan repair activities and manage spare parts. Cold chain managers can use these data to plan cold chain equipment purchases. Equipment inventories also make contingency planning easier, helping to identify alternative storage locations when needed due to equipment failure.

| 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 the best Answer**

1. Manual control involves total operator control of the various water treatment processes..?(2pts)
2. (2pts)

**Test I: choose the best Answer**

1. Which of the following included in important information about existing equipment appliances?(2pts)

A) Their functional status
B) Age and location
C) Net storage capacity.
D) All

2. Controlling Equipment of plant processes may be controlled by…..?(2pts)

A) Manual
B) semiautomatic
C) automatic methods
D) All

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

***Note:*** **Satisfactory rating - ≥ 4 points** **Unsatisfactory - below 4 points**

**Information Sheet 6- Identifying and reporting a Variation in equipment operation and maintenance**

## 6.1 Identifying and reporting a Variation in equipment operation and maintenance

The primary goal of an equipment maintenance and repair system is to eliminate or to avoid unnecessary or unplanned equipment downtime due to failure.

Maintenance activities can be divided into two major categories:

a) Inspection
b) preventive maintenance (IPM)
c) Corrective maintenance

❖ **IPM** (Inspection preventive maintenance)

- Activities are scheduled to ensure equipment functionality and prevent breakdowns or failures.
- **Inspections** verify proper functionality and safe use of a device.
- Preventive maintenance activities are scheduled to extend the life of a device and prevent failure.
- Examples of these activities are c**alibration**, **part replacement**, **lubrication a**nd **cleaning**.
- **Inspection** can be a stand-alone activity or can be conducted along with preventive maintenance to ensure functionality.

❖ **Corrective maintenance and unscheduled maintenance**

- Are performed after there has been a failure of equipment.
- They are regarded as equivalent to the term repair.

Implementing a preventive maintenance strategy will result in lower repair costs and fewer unexpected equipment failures.

In contrast, a maintenance system that is only able to react to equipment failures will probably not only result in higher total cold chain equipment costs but will also put vaccine potency and availability at risk

Preventive action is any proactive methodology used to determine *potential* discrepancies before they occur and to ensure that they do not happen (thereby including, for example, preventive maintenance, management review or other common forms of risk avoidance).

Corrective and preventive actions both include stages for investigation, action, review, and further action if required. Investigations to root cause may conclude that no corrective or preventive actions are required, and additionally may suggest simple corrections to a problem with no identified systemic root cause. When multiple investigations end in no corrective action, a new problem statement with expanded scope may be generated, and a more thorough investigation to root cause performed.

Figure 2 – Types of maintenance activities

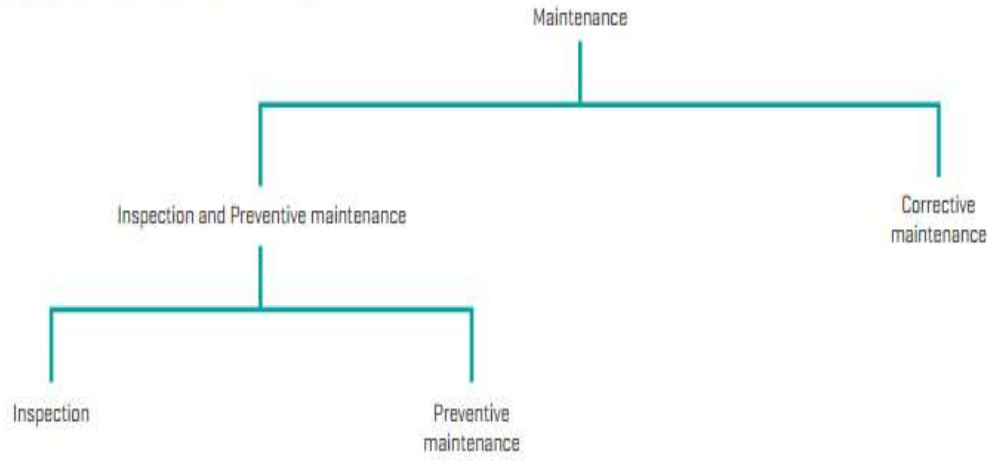



Fig1 Types of maintenance

### 6.1.1 Identifying and Reporting Operation

### 6.1.1 Reporting systems

The maintenance and repair of equipment should comply with policies, work plans, service-level agreements.

Compliance monitoring requires a reporting system that registers all maintenance and repair services and tracks equipment performance.

❖ **Reporting systems will help immunization programmes:**

- verify that maintenance services are performed as required
- build equipment maintenance and performance histories to help managers predict equipment performance problems
- identify common user errors that should be addressed with supportive supervision and training
- track and order spare parts
- plan equipment replacement schedules
- demonstrate the cost–effectiveness of maintenance services

| Self-Check – 6 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: Choose the best answer**

- **Which of the following is category of Maintenance activities?(5pts)**

A) Preventive

B) Corrective

C) Inspection

D) All

- **Reporting systems will help immunization programmes?** (5pts)

**A)** verify that maintenance services are performed as required

B) build equipment maintenance and performance histories to help managers predict equipment performance problems

C) identify common user errors that should be addressed with supportive supervision and training

D) All

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

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

**Information Sheet 7- Identifying, rectifying and/or reporting product/process outcomes.**

## 7.1 Identifying, rectifying and/or reporting product/process outcomes.

Identification of product/processes outcomes used to check either the products or processes are out of specification or not because every products or processes have their own specifications and have effects on the outcome after processing.

Main objective of Identifying and rectifying out-of-specification product/process outcomes in order to take corrective action in response to out-of-specification results

### ❖ Specification of product/processes

The specifications of dough product have their own specification. Identifying and rectifying the processes and the products outcomes take place throughout the process and take actions when they occur, the processes or products will be out-of-specifications.

If the **over mixing** above the standard and **poor quality dough**

- Churning temperature is high decrease the temperature to$10^0$C
- Churn speed is high decrease the speed of the 60rpmI

If high **fat content** of butte produced

- Churning temperature is decreased adjust the temperature to $10^o$C
- Churn speed is decreased adjust the speed of churner 60rpm

If high **yield, weak** and **leaky** butter produced

- Churning temperature is high decrease the temperature $10^0$C
- Churn speed is high decrease the speed of the 60rpm

### 7.1.2 Reporting unacceptable product

- Corrective and preventive action (CAPA, also called corrective action/preventive action or simply corrective action) consists of improvements to an organization's processes taken to eliminate causes of non-conformities or other undesirable situations.
- It is usually a set of actions that laws or regulations require an organization to take in manufacturing, documentation, procedures, or systems to rectify and eliminate recurring nonperformance.
- Non-conformance is identified after systematic evaluation and analysis of the root cause of the non-conformance. Non-conformance may be a market complaint or customer complaint or a failure of Machinery or a quality management system, or misinterpretation of written instructions to carry out a work.
- The corrective and preventive action is designed by a team that includes quality assurance personnel and personnel involved in the actual observation point of nonconformance.
- It must be systematically implemented and observed for its ability to eliminate further recurrence of such non-conformation.
- It focuses on the systematic investigation of the root causes of identified problems or identified risks in an attempt to prevent their recurrence (for corrective action) or to prevent occurrence (for preventive action).
- Corrective actions are implemented in response to customer complaints, unacceptable levels of product non-conformance, issues identified during an internal audit, as well as adverse or unstable trends in product and process monitoring such as would be identified by statistical process control (SPC).

Preventive actions are implemented in response to the identification of potential sources of non-conformity.

- To ensure that corrective and preventive actions are effective, the systematic investigation of the root causes of failure is pivotal. CAPA is part of the overall quality management system (QMS).

### 7.1.3 Reporting systems

The maintenance and repair of equipment should comply with policies, work plans, service-level agreements and SOPs.

Compliance monitoring requires a reporting system that registers all maintenance and repair services and tracks equipment performance.

- **Reporting systems will help immunization programmes:**
- verify that maintenance services are performed as required;
- build equipment maintenance and performance histories to help managers predict equipment performance problems;
- identify common user errors that should be addressed with supportive supervision and training;
- track and order spare parts;
- plan equipment replacement schedules; and
- demonstrate the cost–effectiveness of maintenance services

| Self-Check –7 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: Say true or false**

1. Non-conformance is identified after systematic evaluation and analysis of the root cause of the non-conformance…?(3pts)
2. The corrective and preventive action is designed by a team that includes quality assurance personnel and personnel involved in the actual observation point of nonconformance…….?(3pts)

**Test I: choose the best answer**

1. Which of the following is True about compliance monitoring requirement……?(4pts)
   A) reporting system that registers
   B) maintenance and repair services
   C) tracks equipment performance
   D) All

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

***Note:*** **Satisfactory rating - ≥5 points** **Unsatisfactory - below 5 points**

**Information Sheet 8- Maintaining work area according to housekeeping standards**

## 8.1 Housekeeping standards in the workplace

Effective housekeeping can help control or eliminate workplace hazards. Poor housekeeping practices frequently contribute to incidents. If the sight of paper, debris, clutter and spills is accepted as normal, then other more serious hazards may be taken for granted. Housekeeping is not just cleanliness. It includes keeping work areas neat and Housekeeping practices are part of the workplace quality program as well as the safety program.

Poor housekeeping practices may cause accidents in the workplace and/or provide fuel for fires. Poor housekeeping practices may lead to slips, trips and falls. These accidents may be the result of:

- Poor maintenance practices
- Inadequate cleaning practices
- cracked and uneven floors
- work areas and walkways blocked by waste, equipment, unused items, broken items etc
- hoses and equipment lying around
- product overflow

### 8.1.1 Good housekeeping practices and supervision in the work place

Work health and safety laws mandate that senior management must take a risk management approach to minimize the risks to health and safety in the workplace. This involves taking a systematic approach to identifying all the risks associated with poor housekeeping and implementing control measures to eliminate the risks or, if that is not possible, to reduce the risks to the lowest possible level

❖ **5S (METHODOLOGY)**


**Fig1 5s**

**Good housekeeping practices need the following:**

❖ **Sanitary accessories**

To assure thorough sanitation, the use of the following items (and others) may be necessary:

- **Alkaline steel wool**
- **Detergent**
- **Dry ice blast Sanitizer**
- **Soap**
- **Vapor steam cleaners**
- Potable water
- **NAV-CO2 system**

Sanitation Standard Operating Procedures (SSOP) should address each of the bulleted points listed here. This standard procedure is applicable to any food processing facilities. However, food-processing plants may establish their procedures on how to conduct and implement sanitation in the processing area.

| Self-Check –8 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Instruction I**

I. Choose the best answer from the following?

1. Which of the following is an individual SSOP should include?

A) The equipment or affected area to be cleaned, identified by common name
B) The tools necessary to prepare the equipment or area to be cleaned
C) How to disassemble the area or equipment
D) The method of cleaning and sanitizing
E) All

1. Which of the following item is **not** used to assure sanitation?

A) Alkaline steel wool
**B)** Detergent
C) Dry ice blast Sanitizer
D) Soap
E) Hazard

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

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

**Information Sheet 9- Conducting a Work with workplace Environmental Guidelines**

## 9.1 Conducting a Work with workplace Environmental Guidelines

- Clarification of work requirement

This describes the interpreting of schedules and plans, as well as a clear understanding of procedures to be undertaken and the targets to met.

When the requirements of the standards' met, employees understand the role their work

- plays, in maintaining quality output
- Motivated work force supports management in detecting, solving, correcting and preventing problems in the production area.
- Identification of the required resource
- Doing any work related with modern dairy production system we have to allocate the necessary resources which, proper and suitable to undertake the general work activities.

It is usually done within routines methods and procedures where some discretion and judgment is required in the selection of equipment and materials, organization of work, services, and actions to achieve outcomes within time and budgetary constraints should be properly allocated.

The resource, which allocated used to achieve the work. Some of the resources are, materials, tools and equipment, financials, labours, machinery, personal protective equipment, etc, have to be allocated so as to run the work properly

- **Develop Health and Safety Program**

A good, sound health and safety program is an effective way to manage risks and productivity in your operation.

- Accidents are not only costly in human terms, but they can disrupt the flow of work and halt production.

- There are always hidden costs.
- The actual injury to an employee is only the “tip of the iceberg”.A good health and safety program should include the following components:

❖ **Written Health and Safety Policy**

This simple statement shows your commitment to health and safety for all employees. It only needs to be a few sentences or a short paragraph.

❖ **Written Safety Rules**

A set of basic rules for your operation as well as specialized safety rules for specific tasks, equipment or processes need to be developed.

The list should not be long and unmanageable. Rules should be simple and easy to understand and may need to translate into a worker’s language.

The rules should be reviewed with all new employees, as well as posted for all employees to see

❖ **Safety Director/coordinator**

You need to appoint someone to look after safety as a part of their job. You may also want to have a safety committee or safety representatives from both workers and management. This will keep safety out front all the time.

❖ **Employee Training**

- Employees should receive periodic training as necessary to review safety procedures.
- New employees should receive safety training both before and on the job.
- Close -calls or accidents should trigger an immediate review of procedures and safety with employees.

❖ **Workplace Inspection**

- System of workplace inspection should be set up to review hazards and practices in the workplace.

- Any time that there is a new process introduced or new machinery installed, an inspection should take place
- Employees should be encouraged to report hazards, close calls or anything out of the ordinary that could lead to

❖ **Injury Emergency Plan**

- There should be an emergency plan for any accident, fire, disaster or other unexpected event that may occur
- Employees should know what their responsibilities are during an emergency.
- Plan could include what to do during fires, power failures etc.

Documentation is important

- To keep records of training
- Safety meetings/concerns
- Corrective actions for accident investigations etc. as “Due Diligence”.

❖ Managing West material from dairy products processing like

- Effluent from
  - ✓ Tanker washing,
  - ✓ Cleaning milk splits
  - ✓ Cheese whey
- Air emission gases
  - ✓ Milk powder dust
  - ✓ Refrigerant gases odor
- Solid Waste
  - ✓ Damaged product
  - ✓ Out of date products

❖ **Occupational safety and health(OHS)**

Occupational safety and health commonly referred to as occupational health and safety (OHS), occupational health, or workplace health and safety (WHS), is a multidisciplinary field concerned with the safety, health, and welfare of people at work. Occupational health is a multidisciplinary field of healthcare concerned with enabling an individual to undertake their occupation, in the way that causes least harm to their health.

Personal protective equipment can help protect against many of these hazards

A) Physical hazards

Physical hazards affect many people in the workplace. Machines have moving parts, sharp edges, hot surfaces and other hazards with the potential to crush, burn, cut, shear, stab or otherwise strike or wound workers if used unsafely.

B) Biological hazards

Biological hazards (biohazards) include infectious microorganisms such as viruses and toxins produced by those organisms such as anthrax. Biohazards affect workers in many industries; influenza, for example, affects a broad population of workers. Chemical hazard

Dangerous chemicals can pose a chemical hazard in the workplace. There are many classifications of hazardous chemicals, including neurotoxins, immune agents, dermatologic agents, carcinogens, reproductive toxins, systemic toxins, asthmagens, pneumoconiotic agents, and sensitizers.

C) Psychosocial hazards

Psychosocial hazards include risks to the mental and emotional well-being of workers, such as feelings of job insecurity, long work hours, and poor work-life balance

## Occupational Safety equipment


Figure1 PPE

| Self-Check – 9 | 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 are types of food business need to register most types of business will need to register including.

   A. Shop, catering business run from home B. Retailers C. Food manufacturing business D. All

2. Which one of the important food hygiene and safety considerations

   A. Cleaning B. Cooking C. Chilling D. all

3. ……an Hazard which include infectious microorganisms such as viruses and toxins?

A) Chemical Hazard
B) Physical Hazard
C) Biological Hazard
D) All

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

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

**Information Sheet 10- Maintaining Workplace records**

## 10.1 Maintaining Workplace records

Documentation is the key to GMP (Good Manufacturing Practices) compliance and ensures traceability of all development, manufacturing, and testing activities. Documentation provides the route for auditors to assess the overall quality of operations within a company and the final product.

❖ **General requirements**

- Good documentation constitutes an essential part of the quality assurance system. Clearly written procedures prevent errors resulting from spoken communication, and clear documentation permits tracing of activities performed.
- Documents must be designed, prepared, reviewed, and distributed with care.
- Documents must be approved, signed, and dated by the appropriate competent and authorized persons.
- Documents must have unambiguous contents. The title, nature, and purpose should be clearly stated. They must be laid out in an orderly fashion and be easy to check. Reproduced documents must be clear and legible.
- Documents must be regularly reviewed and kept up-to-date. When a document has been revised, systems must be operated to prevent inadvertent use of superseded documents (e.g., only current documentation should be available for use).
- Documents must not be handwritten; however, where documents require the entry of data, these entries may be made in clear legible handwriting using a suitable indelible medium (i.e., not a pencil). Sufficient space must be provided for such entries.
- Any correction made to a document or record must be signed or initialed and dated; the correction must permit the reading of the original information. Where appropriate, the reason for the correction must be recorded.

- Record must be kept at the time each action is taken

There are various types of procedures that a GMP facility can follow. Given below is a list of the most common types of documents, along with a brief description of each.

1. *Quality manual*: A global company document that describes, in paragraph form, the regulations and/or parts of the regulations that the company is required to follow.

2. *Policies*: Documents that describe in general terms, and not with step-by-step instructions, how specific GMP aspects (such as security, documentation, health, and responsibilities) will be implemented.

3. *Standard operating procedures (SOPs)*: Step-by-step instructions for performing operational tasks or activities.

4. *Batch records*: These documents are typically used and completed by the manufacturing department. Batch records provide step-by-step instructions for production-related tasks and activities, besides including areas on the batch record itself for documenting such tasks.

5. *Test methods*: These documents are typically used and completed by the quality control (QC) department. Test methods provide step-by-step instructions for testing supplies, materials, products, and other production-related tasks and activities, e.g., environmental monitoring of the GMP facility.

   Test methods typically contain forms that have to be filled in at the end of the procedure; this is for documenting the testing and the results of the testing.

6. *Specifications*: Documents that list the requirements that a supply, material, or product must meet before being released for use or sale. The QC department will compare their test results to specifications to determine if they pass the test.

7. *Logbooks*: Bound collection of forms used to document activities. Typically, logbooks are used for documenting the operation, maintenance, and calibration of a

piece of equipment. Logbooks are also used to record critical activities, e.g., monitoring of clean rooms, solution preparation, recording of deviation, change controls and its corrective action assignment.

**10.2. Documentation system.**

- Arrangements for the preparation, revision, and distribution of documents
- Necessary documentation for the manufacture
- Any other documentation related to product quality that is not mentioned elsewhere (e.g., regarding microbiological controls and product quality includes
  - specifications
  - sampling procedures
  - testing procedures and records (including analytical worksheets and/or laboratory notebooks)
  - analytical reports and/or certificates
  - data from environmental monitoring, where required
  - validation records of test methods, where applicable
  - Procedures for and records of the calibration of instruments and maintenance of equipment.

| Type of record | Information to be recorded |
|---|---|
| **Production records** | Recipes (bakery)<br>Raw materials or ingredients received and suppliers' details<br>Wastage % at different stages of the process<br>Stock levels for each raw material and ingredient<br>Production volumes and measurements<br>Maintenance routines, details of spare parts kept in stock |
| **Quality assurance records** | Target amounts of ingredients and any changes made to recipe<br>Measurements made at process control points<br>Batch numbers and product code numbers<br>Cleaning standards and schedules |
| **Sales records** | Names of customers and amounts sold to each<br>Weekly and monthly sales volumes |
| **Financial records** | Income from sales<br>Costs of all process inputs<br>Staff records<br>Cash flow<br>Profit/loss<br>Tax records<br>Bank statements |

**Table1Types of records for a small-scale cereal processing business**

| Self-Check – 10 | Written test |
|---|---|

Name…… ID…… Date…….

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

1. **Maintenance and repair records** contain information about each service performed on a piece of equipment, including…?
   **A)** Make, model
   **B)** Location of the specific device
   **C)** The date and time of the service provided
   **D) all**
2. Which of the following included in types of records?

A) Production Records
B) Quality Control /Assurance Records
C) Financial Records
D) Sales Records
E) A $ B
F) All

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

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

**Information Sheet 11- Carrying out process testing in production process**

## 1.1. Carrying out process testing in production process

Manufacturers may commission testing from many organisations, provided that the requirements for testing organisations can be met. Manufacturers own test data may also be acceptable. This applies to both laboratory and field tests.

### 1.1.1 Process test

The field test requirements take into account two scenarios:

- Established products that have a track record of use in a variety of applications
- Products that are new on to the market and as such do not have data to demonstrate use in a real environment.

In keeping with the European new approach directives, sets out some essential requirements, written in general terms which must be met before products can be certified as meeting.

Emphasis will be placed upon the manufacturer setting out a case justifying, with appropriate evidence, why the product will meet the field test requirements.

Acceptable data might include:

- Field test reports from qualified laboratories
- Validated reports from users of the equipment
- Manufacturer's data validated by an independent third party.

This data will be augmented by a rigorous assessment of maintenance and service records carried out during the manufacturing audit. More emphasis will also be placed on continued compliance of the products to the general requirements and this will be carried out during the regular surveillance audits.

| Self-Check – 11 | Written test |
|---|---|

Name…… ID…… Date…….

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

1. Which of the following is might include in Field test Acceptable data?
   A) Test reports from qualified laboratories
   B) Validated reports from users of the equipment
   C) Manufacturer's data validated by an independent third party.
   D) All

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

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

## Operation sheet 1 –Milling Process

**Procedure:**

**Step1** Cleaning of wheat

**Step2** Tempering and Conditioning

**Step3** Gris ting

**Step4** Separating

**Step5** Milling

**Step6** Blending

## Operation sheet 2–Performance Monitoring Service Access

**Procedure:**

**Step 1.** Start the management console.

**Step 2.** Right-click the management server name from the navigation tree window in the main window of the management console. A popup menu appears.

**Step 3.** Click Set Configuration. A Configuration window with the name of the server appears.

**Step 4.** In the Connection tab, specify a new account and password, and then click **OK.**

| Lap Test | Demonstration |
|---|---|

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

**Task 1 Milling Process**

**Task 2 Performance Monitoring Service for equipment**

| LG #37 | LO #3- Shut down the compression process |
|---|---|

**Instruction sheet**

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

- Identifying the appropriate shutdown procedure
- Shut down the process.
- 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 the appropriate shutdown procedure
- Shut down the process.
- 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 the appropriate shutdown procedure

### 1.1 Identifying the appropriate shutdown procedure

Shut down/isolation means and includes isolation of mechanical, electrical drives, pipework (pressure) rotating equipment etc. utilizing electrical lock-off isolators, mechanical and power driven valves etc. in accordance with standard operating instructions.

Pull plug or throw switch to off position before cleaning or adjusting any machine. Keep fingers, hands, spoons, etc., away from moving parts. Wait until machine stops before moving food.

❖ Relevant regulations:

- Shut-down sequence is undertaken safely and to standard operating procedures.
- Machine/equipment is depressurized /emptied/de-energized/bled to standard operating procedures.
- Safe shut-down of machine/equipment is verified.
- Safety/security lock-off devices and signage are installed to standard operating procedures.
- Do not start a miller until the bowl is locked in place and the attachments are securely fastened.
- When using a miller, turn off motor before you scrape down the sides of the bowl.
- Machine/equipment is left in clean and safe stat
- When working with tools at height makes sure they cannot fall
- Do not leave power tools switched on when disconnected from their power as unexpected starting will occur when power is re-connected.
- Ensure that cables, power lines, pipes and hoses are not allowed to trail across gangways or work areas
- Check insulation, switches and fuse boxes for possible hazards. Ensure warning signs are clear and easily seen.

- Ensure that correct type of firefighting equipment
- Remove empty cartons, wrappings and other flammable waste as soon as possible
- Never use any machine you have not been trained to use.
- Check all switches to see that they are off before plugging into the outlet.
- First pull the plug.
- Turn the gauge to zero in order to cover the edge of the blade
- Clean the blade from the center out.
- Clean the inside edge of the blade with a stick that has a cloth wrapped around one end.
- Never start a machine until you are sure all parts are in their proper places. If it is a machine that operates with gears, check the gear position.
- You must be aware of the lock-out procedures that are to be followed before repairing or cleaning any machine.
- Lock-out procedures must be clearly posted by management near each machine.

| 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 I: Choose the best answer (4 pts.)

1. Which of the following are true about the relevant regulations for shut down water treatment equipment?

A. Shut-down sequence is undertaken safely and to standard operating procedures.

B. Machine/equipment is depressurized /emptied/de-energized/bled to standard operating procedures.

C. Safe shut-down of machine/equipment is verified.

D. Safety/security lock-off devices and signage are installed to standard operating procedures.

E. All

**Test II: Short Answer Questions (8pts)**

1. Define the meaning of cleaning?
2. What is the meaning of sanitizing?
3. List and define all cleaning agents.
4. Why you make available cleaning/sanitizing equipment?

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

Note: Satisfactory rating ≥ 6 points Unsatisfactory - below -6 points

| Information Sheet 2- | shutting down the process |
|---|---|

### 2.1 Shutting down process

Shutting down process is the act of closing a factory or business or stopping a machine/Equipment either temporarily or permanently.

Reading, interpreting and following information on written job instructions, specifications and other applicable reference documents

- Checking and clarifying task-related information
- Entering information onto preforms and standard workplace forms.
- Shutting down machine/equipment.
- Purging/de-energizing equipment.
- Installing safety/security lock-off devices and signage

❖ **Compression Equipment Shutdown Procedure**

1. Shut off Compression Equipment **at** stop/start switch.
2. Shut off at disconnect behind Compression Equipment.
3. Apply lock to disconnect. Put key in pocket. Do not leave key in lock!
4. Attempt to start Compression Equipment, reset or return switch to “off” position.
5. Complete work on Compression Equipment.
6. Ensure Compression Equipment are clear of loose pieces, tools, etc
7. Remove lock.
8. Restart Compression Equipment and run up to operating speed.

❖ **Shutdown Compression Equipment Operational Procedures**

According to manufactures or operational procedures and specification, workers should apply:

- Make sure power tools are properly grounded or are double insulated
- Switch off and unplug power tools before changing blades or servicing and repairing

- Wear appropriate personal protective equipment (PPE), such as glasses, goggles, dust masks, face shields, hearing protection, etc.
- Keep bystanders at a safe distance
- Keep all guards and shields in place
- Unplug and store tools after use
- Consider keeping power tools locked up to prevent unauthorized use
- Cleaning and other activities by turning off the equipment by unplugging a power or by pressing emergency button.
- In addition, after any cleaning and maintenance activity, equipment has to be put on and checked its functionality and if any deviations against SOPs.

| Self-check 2 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: Say true or false**

1. Shutting down process is the act of closing a factory or business or stopping a machine/Equipment either temporarily or permanentely..?(4pts)

**Test I: Short Answer Questions**

**1.** Which of the following is **not correct** about Turning on and off the equipment by the **packaged plant** procedure**?** (3pts)

A) Make sure power tools are properly grounded or are double insulated
B) Switch off and unplug power tools before changing blades or servicing and repairing
C) Wear appropriate personal protective equipment (PPE)
D) Keep bystanders at a safe distance
E) Keep all guards and shields in place
F) None

2. **Which of the following is Performance Statements In achieving Shutdown Equipment**? (3pts)

A) Accurately input and set shutdown settings, process variables and services
B) Safely shut down the process system
C) Effectively protected against shutdown hazards
D) Effectively monitored shutdown and corrected faults and problems as appropriate
E) All

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

Note: Satisfactory rating ≥ 5 points Unsatisfactory - below -5 points

| Information Sheet- 3 | Identifying and reporting maintenance requirements |
|---|---|

## 3.1. Identifying and reporting maintenance requirements

Maintenance is the upkeep of plant and machinery in proper working condition at all times

3.3.1 Maintenance plan in Milling/compression process includes

- Maintenance activities and schedules
- Maintenance costs and budget details
- Staff resource and supply requirements
- Staff roles and responsibilities
- Contingency plan for staff and supply problems
- Reporting requirements
- Hazard and risk control measures
- OHS procedures, personal protective clothing and equipment requirements
- Environmental impact control measures

❖ Enterprise requirements include

- Standard Operating Procedures (SOP),
- Industry standards and production schedules,
- Material Safety Data Sheets (MSDS)
- Legislative and licensing requirements
- Work notes, product labels and manufacturers specifications,
- Operator's manuals, enterprise policies and procedures (including waste disposal, recycling and
- Re-use guideline, and OHS procedures

| Self-Check – 3 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: Say True or False**

1. Maintenance is the upkeep of plant and machinery in proper working condition at all times..?(4pts)

**Test II: Choose the best answer**

1. Which of the following are included in Maintenance plan in Milling/compression process? (4pts)

A) Maintenance activities and schedules
B) Maintenance costs and budget details
C) Staff resource and supply requirements
D) Staff roles and responsibilities
E) All

2. Which of the Following is Included in Enterprise requirements..? (4pts)

A) Standard Operating Procedures (SOP),
B) Industry standards and production schedules,
C) Material Safety Data Sheets (MSDS)
D) Legislative and licensing requirements
E) All

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

***Note:*** **Satisfactory rating - ≥6 points** **Unsatisfactory - below 6 points**

| Operation Sheet 1 | Shutdown Compression Equipment equipment |
|---|---|

**Procedure**

**Step 1** Make sure power tools are properly grounded or are double insulated

**Step 2** Switch off and unplug power tools before changing blades or servicing and repairing

**Step 3** Wear appropriate personal protective equipment (PPE), such as glasses, goggles, dust masks, face shields, hearing protection, etc.

**Step 4** Keep bystanders at a safe distance

**Step 5** Keep all guards and shields in place

**Step6** Unplug and store tools after use

**Step 7** Consider keeping power tools locked up to prevent unauthorized use

**Step 8** Cleaning and other activities by turning off the equipment by unplugging a power or by pressing emergency button.

| LAP Test | Practical Demonstration |
|---|---|

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within 8-12 hours.

**Task 1: Shutdown Compression Equipment?**

## Reference Materials

Book:

Daniel, A.R. ,Bakery Questions Answered, 1972, Applied Science, London.

Bathie Baking for Profit: Starting a small bakery, G. 1999, ITDG Publishing

Bosch, J, Baking technology for professional bakers, 1990, Kiambu institute of science and technology.

Almond, N, Bakery service unit, Kiambu, Kenya Biscuits, Cookies and Crackers, the biscuit making process,., Vol 2, 1989, Elsevier Applied Science, Essex, UK.

Bagachwa, M.S.D, Choice of technology in industry: the economics of grain-milling in Tanzania, , 1991, IDRC publication 279.

Phung K. Le, Paul Avontuur, Michael J. Hounslow, Agba D. Salman. A microscopic study of granulation mechanisms and their effecton granule. Powder Technology. 2011; 206: 18-24.

Ansari M. A., Stepanek F. The Evolution of Microstructure in Three-Component Granulation and Its Effect on Dissolution. Particulate Science and Technology. 2008; 26: 55–66.

Gianfrancesco A., Turchiulie C., Dumoulin E., Palzer S. Prediction of Powder Stickiness along Spray Drying Process in Relation to Agglomeration. Particulate Science and Technology. 2009; 27, 415–427.

## WEB ADDRESSES

- www.chipsbooks.com/listbak.htm
- www.preparedfoods.com(ingredients and recipes from magazine articles)
- www.bakingbusiness.com(bakers dictionary, the Encyclopedia of Bakingand the Bakers Production Manual)
- American Institute of Baking, www.aibonline.org
- National Association of British and Irish Millers, www.nabim.org.uk/index.asp
- North American Millers' Association, www.namamillers.org
- The Flour Advisory Bureau, www.fabflour.co.uk

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