ALCOHOLIC &NON ALCOHOLIC BEVERAGE PROCESSING

Level-II

Based on October 2019, Version 2 Occupational standards

Module Title: Receiving and Handling Raw Materials for Processing

LG Code: ND ANB2 LO (1-4) LG (13-16)

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LG #13	LO #1- Receive raw materials from transport

Instruction sheet

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

- Receiving raw materials from transport
- Weighing and screening accept raw materials
- Store intake raw materials
- Recording information

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:

- determine receiving raw materials from transport
- Select, weigh and screen to accept the raw materials
- Understand store intake and inventory of raw materials
- Recording work place information

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,

9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Checking documents

1.1 Introduction

This module covers the knowledge, attitudes and skills needed to perform alcoholic & nonalcoholic beverage processing conforming to the required specifications. for performing alcoholic &non-alcoholic beverage processing, it is essential to carry out various operations such as selection, washing, extraction, size reduction, filtration, concentration and centrifugation according to work /operational standard requirements adjusting machines in accordance with defined standard procedures performing receiving raw materials, weighing and screening, determine the capacity of store intake of raw materials and recording work place information and determining the required test sampling procedures, and checking the raw materials meet to the specifications and assure its quality etc. are to be performed to make /produce a product of desired taste and flavor as the given standard.

As a production operator you are required to perform sampling test and to apply according the procedures, first you have to read and interpret working procedures accurately to determine specifications such as size, extract, nitrogen, pests, taint ,weather damage e.g., sprouting, black-tip, metal and other foreign, objects, total fermentable sugar, reducing sugar, acidity, colour, turbidity, ash, floc test, extract, Calcium & magnesium as sulphate, brix (Total dissolved solid content), sieving test, thousand kernel weight, Hectolitre weight, Germinating capacity,Technical alcohol grade and PH.

Performing the operations according defined standard procedures and measure manufactured components to specified tolerances using the sampling test equipment and your sense organs.

To get the maximum benefit from the training, it is essential that you use every opportunity to consolidate what you observe and to interact between yourself and staff member in charge of your training. On compilation of the training and though the hands-on practice given, within a self-study environment and the sub course text, you will acquire some of the basic knowledge and skills involved with these processes.

Definition: Raw Materials it is the materials that the company is required to transform into finished goods. It is very important.

The shortage of halts can stop the production and can cause high losses. It is different for different industries.

As for example, for brewery industry the malt is main input.

For flour factory and sugar industry, the wheat grain and sugar cane are the main input respectively.

1.2 Checking documents

Documents should checked during raw material receiving to meet the following purposes:

Documents should capture:

- Place of origin, certificate of analysis that includes
  - ✓ [(**dates, name of raw materials, type/variety(e.g. barely, wine grape)] production date, ingredient, chemical composition, expire date, date of transportation, storage condition , lot number, pallet tag, quantity, size and weight) of raw materials**
- At point of intake, all documentation with the load should checked.
- Confirmation is needed that all raw material purchases assured from assured producers or assured suppliers.
- Check the documents, if it contains the requirements satisfy your companies specification

A clear understanding of the materials being purchased is vital for producers and customers alike.

- Check inward stamp
- Check legality of the document

Materials that do not meet your company specification,

- significantly reduces productivity,
- increase costs due to additional testing,
- rework, or destruction; and can place your
  - ✓ product,
  - ✓ company
  - ✓ customers
  - ✓ and end consumers put at risk for hazardous issues.

- The documents pesticide passport paperwork is examined and a note taken of any post-harvest treatment to ensure that no excess chemical has been applied inadvertently and that correct pre-delivery procedures have been followed.
- The parameters that should be checked in the document of raw materials suppliers can be described
- as:size, extract, nitrogen, pests, taint, weather damage e.g., sprouting, black-tip, metal and other foreign, objects, total fermentable sugar, reducing sugar, acidity, colour, Turbidity, Ash, floc test, extract, Calcium & magnesium as sulphate, brix (Total dissolved solid content), sieving test, thousand kernel weight, Hectolitre, weight, Germinating capacity, Technical alcohol grade and PH by the manufacturers.
- The documents pesticide passport paperwork history should be checked thoroughly and
- a note taken of any post-harvest treatment should assured carefully
- ensure the document do not contain the raw material is treated with excessive chemical and correct pre-delivery procedures have been followed

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 (6 point)

1. A document should include one the following elements;
   A. Wine grape B. date C. color D. all
2. Why document are checked while purchasing materials?
   A. To understand pesticide history B. to verify the inward stamp C. to check legality of the document D. all
3. One of the following is the consequence of raw material deviation
   A. Increase productivity B. production cost increase D. increase product quality

Test II: Short Answer Questions

1. List at least three advantages of checking document (5 point)
2. List down three material out of specification consequences followed (6 point)
3. Write down three elements included in a document? (3points)

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

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

Information Sheet 2- determining required tests for received raw materials

Definition: Standard operating procedures (SOP)

A Standard Operating Procedure is a document which describes the regularly recurring operations relevant to the quality of the investigation.

The purpose of a SOP is to carry out the operations correctly and always in the same manner. A SOP should be available at the place where the work is done.

SOPs should be:

Simple -- concise, easy to understand and easy to follow

Detailed -- step-by-step instructions so anyone can perform the task

Specific for your facility -- should represent how daily operations are performed in your facility and reflect what you do in the beverage processing industry (alcoholic and non-alcoholic)

Updated -- periodically reviewed to ensure they are accurate and up-to-date

1. **Receiving general**

The shipper/receiver will:

1.1 Inspect all incoming trucks for the following:

- The trucks must be covered and closed.
- Floor boards are dry and clean.
- No evidence of chemical spills, garbage, waste or spoiled foods.
- Insect and rodent activity.
- Bad odor.
- Make a note of the truck license plate or trailer number.
- Notify the Supervisor and quality assurance (QA) of any issues.

1.2 Unload the shipment and inspect the condition of the shipment to ensure:

- All products are on clean pallets.
- No damaged cases or packages.

- No evidence of any non-food items or items that could contaminate the products being received.
- On receipt of damaged goods follow
- Check the drivers slip to ensure the company states 'the receiving company
- Tag each skid with the product name and notify the Supervisor and quality assurance of any issues.

1.3 Complete the "receiving Log" with the following information:

Product Information.

- Received date
- purchase order (PO) number
- Description
- Weight in kg (if applicable)
- Lot number
- Quantity received
- Shipment Supplier
- Shipment Carrier

Vehicle Inspection:

- Visual inspection
- Odor inspection
- Pest / Rodent activity
- Truck/trailer number

1.4 Receiving Raw Materials

- Place on hold labels on the skid/boxes.
- Pass the Purchase order (PO) with all relevant information to the quality control (QC) department.
- QC will take sample as per sampling procedure SOP New Raw Material Approval.

Once the goods are acceptable, QC will:

- Place a “QC Approved sticker” on the product.
- Tag the product with lot number, date received, product name, and release against assortment (RA)-code, purchase order number and quantity.
- Complete the “Receiving Log” with the following information:

1.5 Quality control (QC) Check elements

- Certificate of Analysis
- QC Approval
- Expiration Date
- Date of Rejection
- Date of sample taking

1.6 QC inspector initial

- Material deemed unacceptable (out of specification) will be tagged by quality control (QC) as “on hold” and should be moved to the quality control hold area.
- Further testing would be done by QC/ research and development (R&D) supervisor and if the material is still out of specifications, it will be tagged with “**QC Rejected” tags and noted as rejected** in the receiving log.
- Purchasing Manager will contact the supplier as to the action required for the rejected material i.e. to be returned, replaced, destroyed, etc.
- Purchasing manager will inform the Receiver and QC with the status of rejected material. QC will record the status of raw materials on original PO and return the original PO back to Purchasing Manager
- QC will file the copy of PO in QC rejected material binded

1.7 Label control will:

- Remove 5 samples from each batch of labels/sleeves/bags/boxes/etc, write the new count on the roll/box/etc., attach the samples to the PO and receiving paperwork then pass to QC for inspection.

- QC and the Product Development Coordinator will review the printed materials as per SOP: Label Control.
- On receipt of the “approved green stickers” from the Product Development Coordinator, apply the ‘approved’ stickers over the ‘on hold’ stickers and store product in the designated area (i.e. label room
- Material deemed unacceptable (out of specification) will be tagged by Product Development Coordinator as “rejected” and returned.

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: Choose the best answer (6point)

1. Which one of the following is the element of receiving general parameters

   A, the trucks must be covered and closed. C, Remove 5 samples from each batch

   B. receive date D, all

2. One is the element of label control unit;

   A. Further testing would be done by QC C. approved green sticker

   B. . Certificate of Analysis D. Place on hold labels on the skid/boxes

3. One of the following is quality control checking element;

   A. Floor boards are dry and clean C. rejected" and returned material

   B. Certificate of Analysis D. all

Test II: Short Answer Questions (9) points each)

1. Write down what SOP stands? (3)
2. Write down three of the SOPs parameters in what manner should be available in work place?(3)
3. What is the purpose of SOP? (3)

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

Note: **Satisfactory rating 11 points** **Unsatisfactory below 11 points**

Service requirements

- Common services required to mixing and blending operation
- power
- steam
- fuel
- vacuum
- compressed and instrumentation air

Steam

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

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

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

Culinary steam – steam that is suitable for direct injection into food products or direct contact with food products or surfaces that contact foods. Culinary steam must meet all applicable codes of the appropriate regulatory agency (e.g. FDA and USDA) for the application.

- ✓ **Heat transfer** – energy in transit as the result of a temperature difference.

- ✓ **Indirect heating –** heat transfer from a warmer body to a cooler body through a physical barrier such as steel.
- ✓ **Latent heat** – heat given off or absorbed in a process (as fusion or vaporization) other than a change of temperature. Latent heat of vaporization – the heat added to water to make it vaporize without a change in temperature.

Compressed air

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

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

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

- **Application area and limitation of compressed air**

Pneumatic mixers sometimes called air-mix mixers or air-driven mixers are mixers that use compressed air or air bubbles instead of electricity to mix or homogenize materials or powders. The blender consists of a mixing silo and in some cases a central conveying tube with an inverted conical deflector at the top for spreading material.

Advantages of Pneumatic Mixers

- ✓ There is less risk of failure due to misapplication.
- ✓ They are safe for use with flammable solvents.
- ✓ They are easy to clean and maintain.
- ✓ Contamination of material is minimal since there are no moving parts.
- ✓ The blending process is extremely gentle.
- ✓ Less handling of materials is required with pneumatic blender.
- ✓ Pneumatic blender is insensitive to heat.
- ✓ The compressed air expanding in the air engine cools the agitator.

- ✓ Air is practically available everywhere in unlimited qualities.

- **Disadvantages of Pneumatic Mixers**

✓ Compressed air requires good preparation and constant piston speed.

✓ Compressed air is economically only up to a certain force requirement.

✓ The exhaust air is loud.

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 (2point)

1. Which one of the following services required during mixing and blending operation
    b. Steam
    c. Vacuum
    d. Compressed air
    e. Power
    f. all

Test II: Short Answer Questions (3 points each)

1. Write the application of steam in food factory?
2. What is the purpose of estimating amount of steam during processing?
3. Describe application area of compressed air?

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

Note: **Satisfactory rating 11 points**	**Unsatisfactory below 11 points**

Information Sheet 4 - Testing samples of raw materials for the required parameter

1. 1 Introduction

The main raw material properties of importance to the processor are geometry, color, texture, functional properties, and flavor.

Geometric Properties Food units of regular geometry are much easier to handle and are better suited to high-speed mechanized operations.

In addition, the more uniform the geometry of raw materials, the less rejection and waste will be produced during preparation operations such as peeling, trimming, and slicing.

For example, potatoes of smooth shape with few and shallow eyes are much easier to peel and wash mechanically than irregular units.

Smooth-skinned fruits and vegetables are much easier to clean and are less likely to harbor insects or fungi than ribbed or irregular units.

This would require a vast number of measurements to perform exactly, and thus approximations must be made. Size and shape are also important to heat processing and freezing, as they will determine the rate and extent of heat transfer within food units.

Postharvest Handling and Preparation of Foods for Processing may be defined.

These include the development of statistical techniques based on a limited number of measurements and more subjective approaches involving visual comparison of units to charted standards.

Uniformity of **size and shape** is also important to most operations and processes.

Process control to give accurately and uniformly treated products is always simpler with more uniform materials.

For example, it is essential that wheat kernel size is uniform for flour milling. Specific surface (area/mass) may be an important expression of geometry, especially when

considering surface phenomena, such as the economics of fruit peeling, or surface processes such as smoking and brining.

The presence of geometric defects, such as projections and depressions, complicate any attempt to quantify the geometry of raw materials, as well as presenting processors with cleaning and handling problems, and yield loss. Selection of cultivars with the minimum defect level is advisable.

There are two approaches to securing optimum geometric characteristics: first, the selection of appropriate varieties, and second, sorting and grading operations.

1.2 Sampling test methods

1.2.1 **Color**

Color and color uniformity are vital components of the visual quality of fresh foods, and play a major role in consumer choice.

However, it may be less important in raw materials for processing.

For low-temperature processes, such as chilling, freezing, or freeze drying, the color changes little during processing, and thus the color of the raw material is a good guide to suitability for processing.

For more severe processing, the color may change markedly during the process.

Green vegetables such as peas, spinach, or green beans change color on heating from bright green to a dull olive green. This is due to the conversion of chlorophyll to pheophytin.

It is possible to protect against this by addition of sodium bicarbonate to the cooking water, which raises the pH.

Some fruits may lose their color during canning, while pears develop a pink tinge. Potatoes are subject to browning during heat processing due to the Maillard reaction. Therefore, some varieties are more suitable for fried products, where browning is desirable, than for canned products, in which browning would be a major problem.

1.2.2 Texture

The texture of raw materials is frequently changed during processing.

Textural changes are caused by a wide variety of effects, including:

- Water
- Loss protein denaturation which may result in loss of water-holding capacity or coagulation
- hydrolysis, and
- solubilization of proteins.
- In plant tissues, cell disruption leads to loss of turgor pressure and softening of the tissue, while gelatinization of starch, hydrolysis of pectin, and solubilization of hemicelluloses also cause softening of the tissues. The raw material must be robust enough to withstand the mechanical stresses during preparation, for example, abrasion during

1.2.3 **Barely malt is evaluated**:

Assessment by hand, physical and chemical examinations

Barleys for malting are selected mainly on the basis of the variety and the growth site

Assessment hand is the evaluation of the external appearance of barely examined by:

- Smell
  - ✓ Earthy, musty, mouldy smells indicate a barley which has undergone damp, inappropriate storage.
  - ✓ The barely educed germinative capacity and processing difficulties arc then to be expected.
- Dampness
  - ✓ Grains stick to the hand. this indicates a high moisture content
- Color and brightness

  - ✓ The barley should have a light yellow straw color and a bright, uniform appearance.
  - ✓ Greenish coms indicate too early harvesting.

- ✓ Barleys which have suffered rain damage appear grey and dull.

- Red corn
  - ✓ Red corns (red colored endosperms) indicate a massive infestation of fusarium
- Husk property
  - ✓ The husk should be finely wrinkled - this shows a thin husk. Fine wrinkling indicates a good, extract barley.
- Sprouting occurs when in extremely damp conditions, the barely starts germinating and shoots arc visible
- Amount of impurities (purity)
  - ✓ There should be no foreign bodies such as weed, Seeds, Sand, Stones, string. String, .ears, awns, metal objects, half-coms, ergot or foreign cereals.
- Damaged corns (not intact)
  - ✓ Damaged corns cause technological and biological problems during processing and must be removed.
- Barely shape and size

The corns should be large, well-filled and rounded.

1.2.4 **Physical and chemical examinations**

1.2.4.1 **Physical examination**

1.2.4.2 Sieve - A simplistic definition of sieving is the separation of fine material from coarse material by means of a meshed or perforated vessel

Grading by size is the most important physical examination of barely and can be performed quickly and easily. The barely is sorted by and 2.8mm, 2.5mm and 2.2 mm vibrating sieves in to four components.

Everything which remains on sieve 1 (2.8mm) and sieve 2(2.5 mm) is grade 1(well filled barely).

Everything which passes through sieves I and II but retained on sieve III is grade II.

Everything which passes through sieves III is screening and is sold food barely. Because 100g of barely is always examined the weight in g= the percentage for example:

Sieve I 42.5g Grade I

Sieve II	46.0g	88.5% (well-filled fraction)
Sieve III	10.5 g	10.5 % grade II
Base	1.0g	1.0%
	100.0g =	100.0%

Normal values for the well-filled fraction

Malting barley (average properties)	min. 85%
Fine malting barley	min. 90%
Premium quality barely	min. 95 %

Normal for screening value

Insufficiently cleaned barley	above 4%
Average malting barley	3 to 4 %
Fine malting barley	2 to 3 %
Premium quality barley	less than 2 %

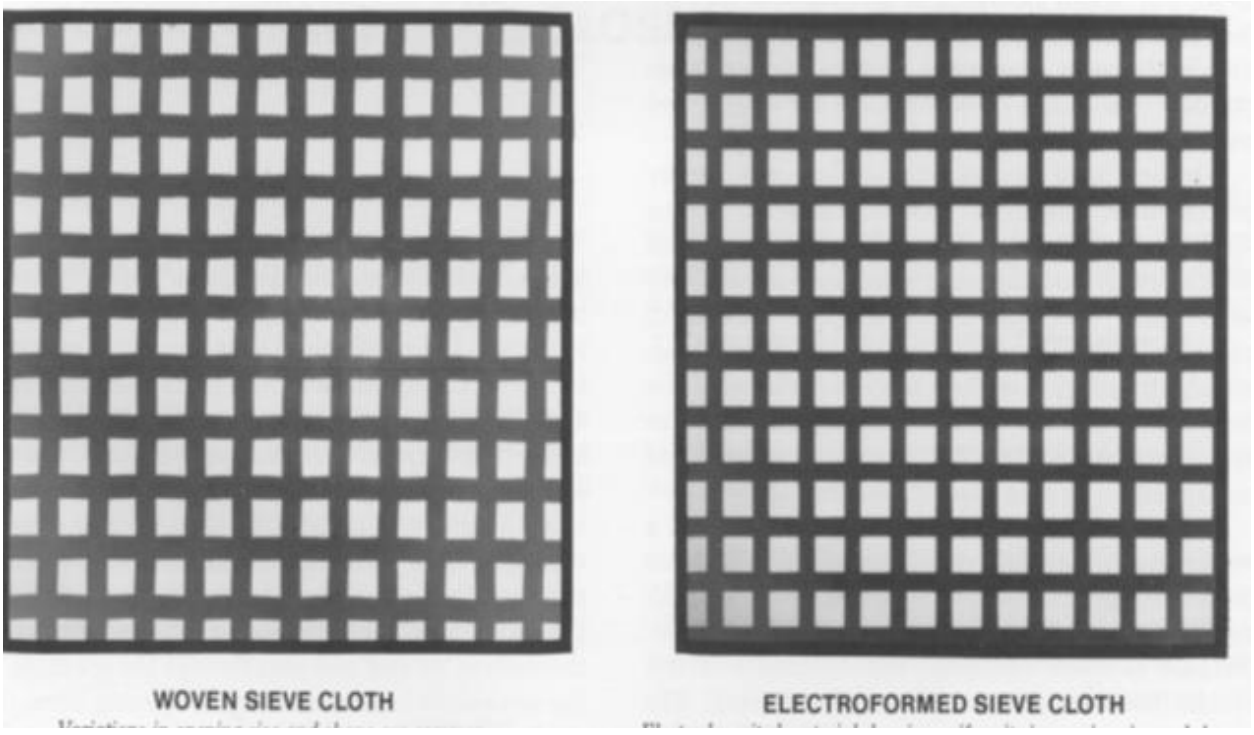


Figure. 1

1.2.4.3 Hectoliter mass

Hectoliter mass (still sometimes known as hectoliter weight) is the mass of a 100 liters of barley. In general a brewing barley has a hectoliter *mass between* 68 *and* 75 *kg.* The predictive value of the hectoliter mass depends, however, on so many factors that is hardly ever measured nowadays.

1.2.4.4 Thounsand corn mass

Thounsand corn mass (some times known as thounsand corn weight) increase with increasing water content, it is calculated on a dry weight basis.

The thounsand corn mass can be related to the classification results and the extract yield from the barely. With an increasing thousand corn mass Grade one I percentage and with it the extract content of the barely can increase.

The thousand corn mass is determined with a counting device and a balance. Broken and foreign corns must be removed previously and their weight subtracted.

The calculation is done using the equations 1000 corn mass, air dry weight (g) =

$$\frac{\text{1000corn mass (air dry) X(100-W)}}{100}$$

W = % water content of the barely

Figure.2 Six raw barely

Figure.3 Two tow barely and Properly threshed malting barley.

Figure.4 Germinated barley from properly threshed malting barley. Note that the sprout is completely protected by the undamaged husk

Figure. 5 Skinned and broken kernels from improper threshing

Figure .6 Skinned and broken kernels of germinated barley. Note exposed sprouts.

1.2. 5 Chemical test (Protein test method)

Step 1 – Digestion The goal is to break down the bonds that hold the polypeptides together and convert them into simpler molecules (such as water, carbon dioxide and ammonium sulphate).

These reactions can be speeded up by the temperature used during digestion (the higher the temperature used, the faster the digestion can be obtained) and by the presence of acid, salt and catalysts (selenium, copper, mercury, titanium). Vapors that escape from the tubes are aspirated through the suction cap by a JP recirculating water vacuum pump and eliminated in an SMS scrubber. This configuration optimizes the efficiency of the operation.

Avoid using digesters without an exhaust system: this will dramatically shorten its life and might cause expensive damage. This is the most time-consuming step of the analysis.

Figure. 7 Kjeldahl digestion

Step 2 – Distillation The ammonium sulphate present in the digested sample are converted into ammonia gas, heated and distilled. The ammonia gas is led into an acid trapping solution where it dissolves and becomes a trapped ammonium ion once again. Using the Kjeldahl method, nitrites and nitrates are not detected. In order to quantify these elements, a reduction of the sample is necessary (using Devarda alloy) before the digestion stage.

- Add distilled or deionized water to the test tube containing the digested sample to dilute it (automatically on UDK 139, 149, 159 and 169). In this way it's easier to detect all the ammonia.
- Separate the nitrogen from the digested mixture by steam distilling (steam output regulation 10-100% on UDK 139, 149, 159 and 169), in order to extract ammonia from the alkaline solution.
- Raise the pH of the digested mixture using sodium hydroxide (35%) (Automatically on UDKs) to convert NH4 + (in solid format) into NH3 (gaseous), that will be detected with titration.
- Trap the distilled vapors in a dedicated solution of 25-30 ml of boric acid (automatically on UDK 149, 159 and 169) to trap all the nitrogen, eliminating the risk of loss.

- Drain the test tube with the digested sample (automatically on UDK 139, 149 and 159 and 169).
- The final step is the titration of the ammonia distilled from the sample, considering that if the nitrogen content of the sample is high, a high-concentrated acid for the titration is needed. Another solution is reducing the quantity of the sample used for the analysis, but in some cases it may cause errors giving wrong results.

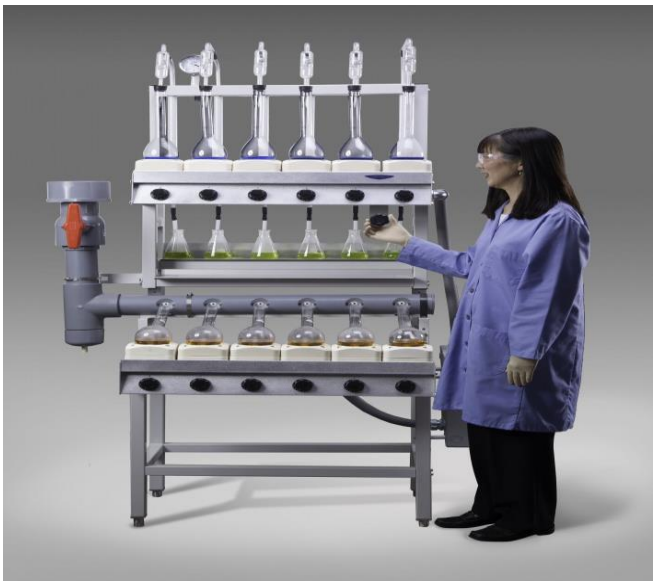


Figure. 8 Kjeldahl distillation

Step 3 – Titration (neutralization) the goal is to determine the amount of ammonia distilled off from the digested solution and hence calculate the nitrogen or protein amount, as %.

During the Kjeldahl distillation process, the ammonia content is condensed and collected in a boric acid solution to avoid loss of gaseous NH3.

Figure.9 Kjedahl Titration

Step 4 – follows nitrogen and protein calculation

Calculations The calculations for % nitrogen or % protein must take into account which type of receiving solution was used and any dilution factors used during the distillation process. In the equations below, “N” represents normality. “mL blank” refers to the millilitres of base needed to back titrate a reagent blank if standard acid is the receiving solution or refers to millilitres of standard acid needed to titrate a reagent blank if boric acid is the receiving solution.

When boric acid is used as the receiving solution the equation is:

$$\% \text{ Nitrogen} = \frac{(\text{ml standard acid} - \text{blank}) \times N \text{ of acid} \times 1.4007}{\text{Weight of sample}}$$

When standard acid is used as the receiving solution, the equation is:

$$\% \text{ Nitrogen} = \frac{[(\text{mL standard acid} \times N \text{ of acid}) - (\text{mL blank} \times N \text{ of base})] - (\text{mL standard base} \times N \text{ of base}) \times 1.4007}{\text{weight of sample (g)}}$$

If it is desired to determine % protein instead of % nitrogen, the calculated % N is multiplied by a factor that depends on the type of protein present in the sample, e.g. for eggs or meat the factor is 6.25, for dairy products it is 6.38, for wheat it is 5.70, soya and derivatives 5.71, etc.

1.2.6 **Determination of moisture**

1.2.6.1 **Apparatus**

- Grinding Mill - capable of grinding rapidly and uniformly without development of appreciable heat. The ground material should pass through 1.0 mm I.S sieve. Cold grinding mills can be used instead.
- Moisture dishes – made of Aluminium or stainless steel approx 7.5 mm wide and 2.5 mm deep with tight fitting lids.
- Electric oven – well ventilated and thermostatically controlled to maintain temperature between 130 – 133°C.
- Desiccators containing an effective desiccant.

1.2.6.2 Procedures

Mix the test sample and grind suitable quantity to give sufficient ground material for replicate determination.

Ensure that the sample is neither too coarse nor too fine and passes through 1.0 mm sieve. Weigh accurately about 5 gm of sample in a previously dried and tared dish and place the dish with its lid underneath in the oven for 2 hours.

The time should be reckoned from the moment the oven attains 130°C after the dishes have been placed.

Remove the dish after 2 hours, cool in the desiccators and weigh.

The dish should be placed back in the oven at half hour intervals till constant weight is achieved. The specification for the size of the dish should also be included.

$$\text{Calculation Moisture percent} = \frac{(W1 - W2) \times 100}{W1 - W}$$

Where, W1 = Weight in gm of the dish with the material before drying

W2 = Weight in gm of the dish with the material after drying

W = Weight in gm of the empty dish

W = Weight in gm of the empty dish

Figure.10 Low temperature heating to measure moisture content

1.2.7 Determination of Total Ash

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

Analytical techniques for providing information about the total mineral content are based on the fact that the minerals (the analyte) can be distinguished from all the other components (the matrix) within a food in some measurable way.

Ash content is determined by high temperature incineration in an electric muffle furnace.

When a sample is incinerated in an ash oven, the high temperature drives out the moisture and burns away all the organic materials (starch, protein, and oil), leaving only the ash.

The residue (ash) is composed of the non-combustible, inorganic minerals that are concentrated in the bran layer.

Ash content results for wheat or flour ash are expressed as a percentage of the initial sample weight; for example, barely ash is 1.5 of 2.5%.

Wheat or flour ash is usually expressed on a common moisture basis of 14%.

The ash content in wheat and flour has significance for milling.

Millers need to know the overall mineral content of the wheat to achieve desired or specified ash levels in flour.

Take fresh sample for the determination, rather than left over after determination of moisture.

Ignite the dried material in the dish left after the determination of moisture with the flame of a burner till charred.

Transfer to a muffle furnace maintained at 550 – 600°C and continue ignition till grey ash is obtained.

Cool in a desiccator and weigh.

Repeat the process of heating, cooling and weighing at half hour interval till the difference in weight in two consecutive weighing is less than 1 mg.

Note the lowest weight. If ash still contains black particles add 2-3 drops of pre-heated water at 60 degrees Celsius.

Break the ash and evaporate to dryness at 100-110°C.

Ash at 550 °C. Until ash is white or slightly grey.

Performance characteristics to be defined in the current method as proposed below:

Limit of detection: 0.055

Repeatability: 0.06g/100g

Reproducibility: 0.20 g/100 g for homogeneous products like milk powders

0.60 g/100 g for heterogeneous products like pet foods, meat products etc.

Safety and Good laboratory Practice (GLP) aspects:

- Crucibles/Dishes must be cleaned carefully.
- Never use abrasive products such as sand, hot concentrated nitric acid, free alkalis or aqua regia.
- Very hot crucibles/dishes must not come into contact with silica, quartz or metal oxides since there is a risk of alloy formation resulting in perforations.
- After use, wash the crucibles/dish with tap water, using a laboratory brush to remove any adhering material.
- Remove any stains with cold concentrated hydrochloric acid.
- In some cases it may be necessary to melt potassium hydrogen sulphate (KHSO4) in the crucible/dish.

- If this does not help, carefully rub the stain with wet keiselguhr, talc or kaolin.
- During the analysis do not touch crucibles/dish with fingers, but handle them with platinum-tipped tongs.
- Maintain Internal control plan of the instruments, eg : Check actual temperature of the muffle furnace on a regular basis using a reference certified thermocouple.
- Re-calibrate temperature controller of muffle furnace if actual operating temperature is not within the range of 550±25 degree Celsius.

Calculation Total ash on dry basis percent = $\frac{(W2 - W) X100}{W1 - W}$ by weight.

Where, W2 = Weight in gm of the dish with the ash

W = Weight in gm of empty dish

W1 = Weight in gm of the dish with the dried material taken for test

Figure. 12 High temperature incineration measure mineral (ash) content

Sample preparation procedure for ash determination of barely

1.2.7.1 Tools for measuring pH

Assuming that litmus test strips will not suffice, the following outlines mandatory and optional tools for a proper setup to measure pH.

1.2.7.2 **Mandatory tools**

These tools should be considered necessary for a proper pH measurement setup.

- pH meter
- Electrode(s) (aka probe or sensor) (if not integrated or included with meter)
- Electrode fill solution (for re-fillable electrodes)
- Calibration buffer solutions
- Cleaning solution(s)
- Storage solution

- Deionized water Kim Wipes

1.2.7.3 Optional tools

- These tools should be considered optional.
- They are beneficial, but not strictly necessary.
- Glass beakers; 250-500mL and 50-100mL
- Laboratory wash bottle
- Magnetic stirrer

Figure. 13 PH meter

Figure. 14 Wireless Bluetooth pH and temperature electrode, paired

1. **2. 8 Taint or musty odor**

- Good, sound grain has its own distinctive aroma that can be recognized by experience.
- Any mustiness or taint odor on the grain is treated by maltsters as a warning sign of possible adverse storage conditions,
- Leads to closer investigation of the load of barley waiting to be delivered into the maltings.
- Barley with an adverse "**nose**" is unlikely to be accepted for malting.
- The warnings signs indicates potential problems with toxins from storage moulds,
- Or threats to grain germination.

- This decision is based on subjective experience, not analysis, but maltsters have been using this skill for over 100 years.

1.2.8.1 Taint in water

- Water is a raw material used in the processing of barley and wheat.
- Any taints affecting the water supply have the potential to be transferred to the end product.
- Species of potentially taint-causing Streptomyces, Nocardia, Micromonospora, Microbispora,Oscillatoria and Phormidium can contaminate water.
- These microorganisms produce the compounds **geosmin and 2-methylisoborneol**, which are common causes of musty-earthy odours in water supplies
- Contaminated water is a known source of must-earthy malodourants in beer, for example
- Other common water-borne taints are caused by phenolic compounds, particularly chlorophenols.
- These can be formed by spontaneous reaction of phenol with the free chlorine present in mains water.
- Plastic fittings and hoses or phenol-based resins used as protective coatings on processing plants often function as ready sources of **phenol**
- **Trichloroanisole** formation can easily occur in water distribution systems and it is linked mainly to fungal contamination

  Other raw materials

  Other raw materials (ingredients) and processing aids can become contaminated with microorganisms or chemical substances that may cause taints.
- Bacterial or fungal contamination of malt and wort can easily occur, generating musty, fungal and other flavours.
- It has been shown that bacterially-produced butyric acid (rancid, sickly flavour) in beer adjunct (an additional source of fermentable sugars used in brewing) passes almost entirely through the brewing process into the final product.

- Wild yeast of the genus Dekkera/Brettanomyces, although desirable for some beers, can cause mousey off-flavours in others.
- It can also cause a plastic flavour during fermentation.
- Ingredients used during processing of barley and wheat can become tainted through various routes.
- Bromophenol can migrate from packaging material (recycled paper, cardboard, fireproofing materials) into the ingredients and cause an inky flavour.

Chlorinated phenols can also come from packaging materials and produce a mouthwash taint.

Naturally occurring chemicals in non-contaminated ingredients can also give rise to taints.

For example, S-methylmethionine, formed during germination of barley, is converted to dimethylsulphide (DMS) during kilning.

The kilning regime influences the amount of DMS produced, which if excessive, will cause an undesirable flavour

Processing Control of the different processing steps is important in order to prevent the formation of undesirable flavours.

Kilning, as seen above, can influence the occurrence of off-flavours.

High temperature processes like wort boiling or baking generate many compounds through the Maillard reaction.

Some of these compounds contribute to desirable flavours and aromas, but others can

Odour & flavour taints in malting barley and milling wheat 12 cause off-flavours.

For example, free fatty acids in flour can give rise to Maillard-type browning compounds with unpleasant flavours during kilning.

Sulphur compounds are important sources of off-flavours in whisky and beer (although small concentrations in beer contribute positively to the flavour).

Factors such as yeast strain, fermentation conditions, metal ion concentration and sources of sulphur determine the amount of sulphur in the final product

Many other steps in the processing of barley and wheat (storage of ingredients, cleaning practices, composition of any materials in contact with the products) have the

potential for introduction of taints and off-flavours and therefore, need to be properly controlled.

Reports show a taint in flour where the water in a storage tank became contaminated with phenols from the breakdown of the bonding resin of the **fibreglass** lining, which subsequently reacted with **hypochlorite** used to clean the processing equipment, ultimately resulting in **chlorophenol** in the processing lines and contamination of the flour.

1.2.8.2 Taint also develop in packaging

- Packaging materials generate taints.
  - ✓ For example, **aluminium kegs used for** beer is coated with a lacquer that, if insufficiently cured, may cause phenolic taints.
  - ✓ A sulphur taint may develop if the lacquer on the inside of aluminium cans is damaged,
  - ✓ and the same situation in steel cans will result in a metallic taint due to migration of iron from the can into the beer.
  - ✓ colour of the glass of beer bottles can also have a significant impact on the flavour of the beer.
  - ✓ **Brown glass** offers the highest protection against lightstruck/sunstruck off-flavour, which is caused by a light-induced reaction between different compounds in beer.
  - ✓ Defective wooden casks used for whisky maturation can become contaminated with fungi or actinomycetes, tainting the spirit with mouldy/earthy notes
  - ✓ Cardboard and plastic packaging can be sources of taints derived from residual monomers, additives, and printing inks.
  - ✓ The concentration of taint compounds can increase in storage due to microbial action and oxidation reactions.
  - ✓ Chloroanisoles are derived from the action of microorganisms on chlorophenols used industrially as fungicides and biocides in wood and fibreboard, and contaminate food through packaging or stacking on treated wooden pallets Transportation and storage

- ✓ Bottled beer has been reported to have been tainted by ingress of trichloroanisoles through the bottle closure.
- ✓ In one instance the source of the taint was mouldy fibreboard within shipping containers; in a separate instance the source was mould growth on shrink-wrapped pallets
- ✓ In addition to microbial residues in shipping and storage containers, residual cleaning products can also cause taints such as alkaline flavours from caustic soda and fishy flavours from quaternary ammonium compounds

1.2.9 Pest infestation grain test

Infestation of cereal crops by pests can be a problem, both before and after harvest. Insects (*e.g.* mites and weevils) cause the most damage in stored cereals.

Insects can produce substances with unpleasant tastes and smells (such as uric acid) and some transmit pathogenic bacteria. They can also affect the cereal's nutritional value, for example, **decrease the carbohydrate** content and **increase free fatty acid levels** found insects could affect the vitamin content of cereals, decreasing the thiamin content by up to 69%, riboflavin content by up to 67% and niacin by up to 32%. When infestations are detected in a silo or a ship, insecticides may be used, although the type of insecticide and the level used are tightly controlled. Birds and rodents can also contaminate stored cereals and cause food safety problems

Table 6 Examples of moulds producing mycotoxins in cereals

Mould	**Mycotoxin produced**
Aspargilus flaws	**Aflatoxin B1 and B2**
Pencillum venucasum (temprate regors)	**Ochratoxin**
Aspergilus ochraceus (tropica regors)	**Fumonisis** **Zearlenone** **Deoxynevanol**

1.2.9.1 Materials and methods for pest infestation test

Plant Materials

Extraction of the Oils from grain

The oil extraction of the dried and powdered cereal seeds (5 g) carry out at 40 °C for 6 h by Soxhlet extractor using diethyl ether. The solvent was removed by rotary evaporator. The obtained oil is esterified to determine the fatty acid composition. Methylation of the fatty acids carry out according to the AACC Official Method Fatty Acid Analysis by (Gas chromatography-Mass spectrometry) GC/MS GC analysis was performed on an Agilent 6890N system. The column was Hewlett-Packard (**HP**)

In no wax Capillary; 60 m × 0.25 mm, 0.25 µm.

The column temperature should held initially at 60 °C for 3 min after the injection, then increased to 185 °C with 10 °C min-1 heating ramp, and increased to 200 °C with 5 °C min-1 heating ramp for 10 min. Then, the final temperature should increase to 220 °C with 5 °C min-1 heating ramp for 20 min. The injector temperature should be 250 °C; detector (FID) temperature is 275 °C. The carrier gas with an inlet pressure of 40.65 psi. The linear gas velocity at 39 cm s-1 where the column flow rate is 2.7 mL min-1. The splitless mode is used with an injection volume of 1 µL. Agilent 6890N system is used for the GC/MS analyses combined with Agilent 5973 MS Selective Detector. The GC conditions are; as column HP Innowax Capillary (60 m × 0.25 mm, 0.25 µm). The oven temperature program should set so that the column held initially at 60 °C for 3 min after injection, then increased to 185 °C with 10 °C min-1 heating ramp and increase to 200 °C with 5 °C min-1 heating ramp for 10 min.

Then the final temperature should increase to 220 °C with 5 °C min-1 heating ramp for 20 min. The injector temperature set to 250 °C. The carrier gas was helium with an inlet pressure of 40.65 psi. The linear gas velocity was 44 cm s-1 at a column flow of 2.9 mL min-1 in splitless mode. The MS conditions were; ionization energy was 70 eV, the ion source temperature is 280 °C, the interface temperature 250 °C where the MS range set to 35–450 atomic mass units.

Determination of the components in the cereal fatty oils is performed by comparison of their MS with commercial their retention indices, relative to n-alkanes (C6-26 series) as well as corresponding data from relevant literature. The relative percentages (%) of the **components are calculated from the GC peak areas using the normalization method.**

Figure.15 Gas chromatography

1.2.10 Management of taint risks

The evaluation of taints and off-flavors in wheat and barley is a subjective exercise based on the skills and judgment of experts, not on analytical tests.

There are not specific risk assessments for taints, however, the presence of taints is closely linked to crop quality and to factors like microbial contamination, growing, harvest, storage conditions and hygiene, all of which are covered by quality assurance schemes followed by the industry.

Figure. 16 Smoke taint a problem for grape growers

Consumers have been shown to respond negatively to smoke-tainted wines. There are no effective ways to remove smoke taint from grapes or wines. Grapes which are tainted thus have no commercial value and are not likely to be harvested.

1.2.11 Sugar in wine grape (brix)

The refractive index at 20°C, expressed either as an absolute value or as a percentage by mass of sucrose, is given in the appropriate table to provide a means of obtaining the sugar concentration in grams per liter and in grams per kilogram for grape musts, concentrated grape musts and rectified concentrated grape musts.

1.2.11.1 Apparatus

Refractometer

The refractometer used must be fitted with a scale giving:

- Either percentage by mass of sucrose to 0.1%;
- Or refractive indices to four decimal places.

The refractometer must be equipped with a thermometer having a scale extending at least from +15°C to +25°C and with a system for circulating water that will enable measurements to be made at a temperature of 20 ± 5°C. T

The operating instructions for this instrument must be strictly adhered to, particularly with regard to calibration and the light source.

1.2.11.2 Preparation of the sample

Must and concentrated must

Pass the must, if necessary, through a dry gauze folded into four and, after discarding the first drops of the filtrate, carry out the determination on the filtered product.

1.12.3 *Rectified concentrated must*

Depending on the concentration, use either the rectified concentrated must itself or a solution obtained by making up 200 g of rectified concentrated must to 500 g with water, all weighing's being carried out accurately.

1.2.12.3 Procedure

Bring the sample to a temperature close to 20°C.

Place a small test sample on the lower prism of the refractometer, taking care (because the prisms are pressed firmly against each other) that this test sample covers the glass surface uniformly.

Carry out the measurement in accordance with the operating instructions of the instrument used.

1.2.12 Determination of reducing sugar

Reducing sugar in the fruit was determined by following Nelson's modification of Somogy's (Nelson, 1944) method.

- In this, 25mg of sample was crushed with 10 ml of 80% ethanol.
- The content was centrifuged for 10 minutes at 4000rpm.
- Then the supernatant is made up to 10 ml to 1ml of the aqueous extract, 1ml of Somogy reagent (4ml of reagent A+ 1ml of reagent B) was added.
- Then the mixture was incubated at 1000 C for 10 min in water bath.
- After cooling the contents, 4ml of arsenomolybdate reagent is added.
- The blue green color developed and its O.D. is measured at 640 nm in a UV-VIS spectrophotometer.
- The values are calculated from the standard curve prepared from glucose.

1. 2.12.1 Method: Estimation of reducing sugars using Clinites tablets:

- Using a Pasteur pipette or plastic transfer pipette, add 10 drops of distilled water to a test tube.

Figure. 17 Pasteur pipet

- Add 5 drops of the solution to be tested
- Add 1 Clinitest® tablet and allow to react. (Caution: the reaction generates heat, do not touch the bottom of the test tube)
- When bubbling has ceased, swirl the test tube to mix.
- Compare the colour after 15 seconds with the supplied colour chart. Where the test colour is in between two colour plates, estimate the sugar content. Estimation of reducing sugars using Benedict's Solution:
- Set up a rack of 7 test tubes.
- Using a hotplate and large beaker, prepare a boiling water bath (or use a laboratory boiling water bath if available)
- Add 1mL of Benedict's solution to each test tube.
- Add 5 drops of distilled water to the first test tube, and 5 drops of each of the glucose standard to the next 5 test tubes.
- Add 5 drops of the sample to be tested to the final test tube.
- Lightly stopper the test tubes and place in the boiling water bath for 5 minutes.
- Remove and allow to cool.
- Compare the sample solution colour to the standards and estimate the sugar content.

Figure. 18 Rebelein Reagents and phenolphthalein indicator 0.5%

1.2.12.3 Determination of reducing sugars by Rebelein Titration:

- Pipette 10.0mL of Z1 solution and 5.0mL of Z2 solution into an Erlenmeyer flask.
- Add a few boiling granules.

- Pipette 2.0mL of wine sample into the flask.
- Heat until boiling, allow to boil for 30 seconds.Remove the flask from the heat source and allow to cool to room temperature.
- Add 10.0mL of each of Z3, Z4, Z5 solutions in that order.
- Fill the burette with Z6 (standard thiosulphate solution)
- Record the initial burette reading.
- Titrate the mixture in the Erlenmeyer flask, shaking the flask well to mix throughout the titration. 8. The endpoint is cream. The solution will fade from yellow-brown (free iodine) to a blue-grey from the starch, before turning cream.
- Record the final burette reading.
- Carry out a reagent blank using 2.0mL of distilled water instead of wine, at the same time as the test sample. Treat the blank identically (steps 1-9).
- Calculate the net titres for both the sample and the distilled water blank. The blank titre should be in the range 29-31mL. The sample titre will be less.
- Calculate the reducing sugar content using the formula below. If no sample dilution was performed, the dilution factor = 1:

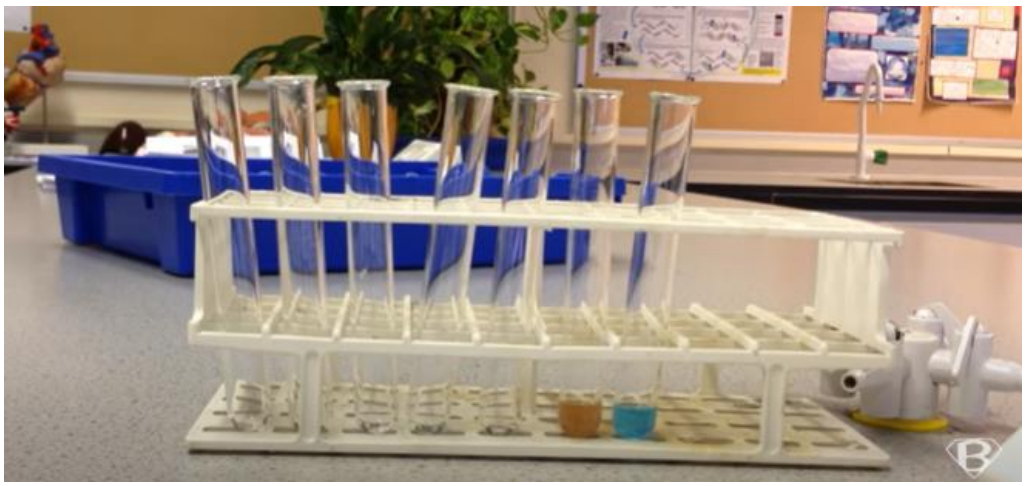


Figure.19 Benedict's test for Reducing Sugar

1.2. 13Turbidity measurement

The importance of measuring turbidity

Turbidity is the amount of cloudiness in the water. This can vary from a river full of mud and silt where it would be impossible to see through the water (high turbidity), to a spring water which appears to be completely clear (low turbidity).

Turbidity can be caused by:

- Silt, sand and mud ;
- Bacteria, viruses and other germs ;
- Chemical precipitates.

It is very important to measure the turbidity of domestic water supplies, as these supplies often undergo some type of water treatment which can be affected by turbidity. For example, during the rainy season when mud and silt are washed into rivers and streams, high turbidity can quickly block filters and stop them from working effectively. High turbidity will also fill tanks and pipes with mud and silt, and can damage **valves and taps.** Where chlorination of water is practiced, even quite low turbidity will **prevent the chlorine killing the germs** in the water efficiently.

Some treatment systems, such as sedimentors, coagulators and gravel prefilters are designed to remove turbidity.

It is important for operators of both large and small treatment systems to know how well these systems are working.

Measuring the turbidity of the water before and after each part of the system can tell the operator where maintenance or cleaning is needed.

1.2.13.1 Turbidity meter

There are many different types of electronic turbidity meter available.

Their advantages and disadvantages are as follows :

Advantages;

- very accurate, and especially useful for measuring very low turbidities (less than 5 TU)

Disadvantages

- high cost
- need power supply (mains or battery)
- easily damaged
- It is impossible to give general guidelines on their use here.

You should refer to manufacturers' instructions for use and maintenance of these meters.

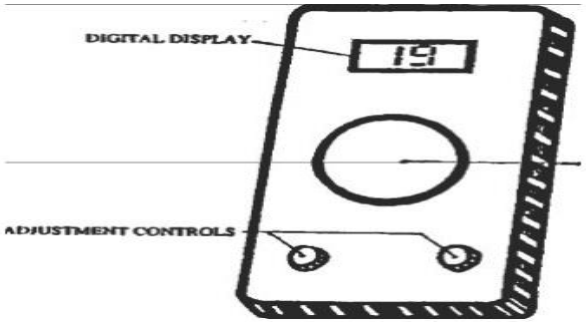


Figure 20 shows an example of an electronic turbidity meter

1.2.13.2 Turbidity tube

The advantages and disadvantages of the turbidity tube are as follows:

Advantages

- simple design
- low cost
- not easily damaged

Disadvantages

- Cannot measure very low turbidities (usual minimum is 5 TU)
- Less precise since the turbidity tube is simple to use, instructions are given below. It is, however, recommended that you refer to the instructions provided with the tube that you are using.
- To measure the turbidity of a water sample using a turbidity tube :
- Where the tube is in two parts, push the two parts together; making sure that they fit squarely.
- Take a sample of water from the water source. .
- Hold the tube in one hand near the bottom and look into the open end with your head about 10 to 20 centimetres above the tube, so that you can clearly see the black circle,

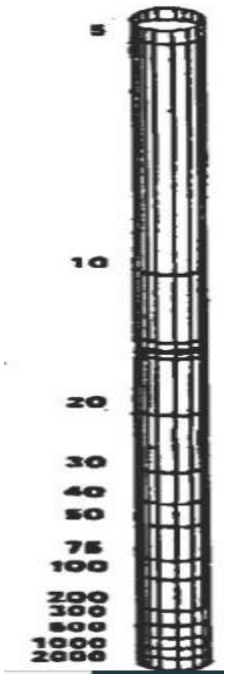


Figure. 21 A turbidity tube

- To measure the turbidity of a water sample using a turbidity tube: Where the tube is in two parts, push the two parts together; making sure that they fit squarely.
- Take a sample of water from the water source.
- Hold the tube in one hand near the bottom and look into the open end with your head about 10 to 20 centimetres above the tube, so that you can clearly see the black circle,
- Cross or other murk on the bottom of the tube.
- Slowly pour the water sample into the tube, waiting for air bubbles to rise if necessary, until the mark on the bottom of the tube just disappears.
- Stop pouring the water sample into the tube and look at the level of water in the tube.
- For turbidity tubes which have a turbidity scale marked on the side, read the number on the nearest line to the water level.
- This is the turbidity of the water.
- I f the tube does not have a scale marked, measure the distance from the bottonz of the tube to the water level with a tape measure and look up or

calculate the turbidity of the water sample using the instructions provided with the tube.

1.2.14 Flocculation test

A flocculation test procedure is used to determine how much flocculants suspension (slurry or pulp)

To cause the individual particles to collect in the form of flocs. The formation of flocs aids in improved setting rates, better overhead clarity and /or faster filteration rates. There are three main mtheds for achieving aggregation of very small or colloidal particles in suspesion.

- Coaggulation,i.e. aggregation caused by the compression of the electrical double layer of the solids by addition of simple electrolytes.
- Aggregation caused by the action of hydrolysing electrolytes such as ferric or aluminium sulphate, the mechanism involved being a composite of both coagulation by the polyvalent ions and bridge flocculation by the pricepitating hydrooxides
- Flocculation, i.e. aggregation through the use of long-chain organic polymers that bridge between adjoining particeles. Flocculation is by far, most import of aggregation methods used in the mineral industry

Figure.22 Flocculator mixing schemes

Flocculator mixing schemes vary and may include a baffled basin, maze basin, vertical or horizontal paddles, axial-flow impellers and others.

There are basically three types of organic polymers (or flocculants) that cant can be used, **nonionics or cationics. The non anionics** which are the neutral polymers molecule, have a wide application and can be used as flocculants for most **solids in acid, basic or neutral** conditions. In some systems where flocculation is depend upon attachment the ionic charge of the particles a polymers with either a positive or negative charge will aid in the attachment in to the solid particles and hence improve efficiency of flocculation. The charge on the particles is depend on a number of factors and is usually **PH** dependent. If the charge on the particle is overall positive, then the anionic polymer will be most suitable and vice versa.

- The solubility of polymers varies considerably , but in general is very low and there for they should be prepared as very dilute solution, usually less than 1% by weight, the flocculation test the addition of polymer aqueous solution should be very slow, with slow agitation.

The method of application is also important with most flocculants adsorption is rapid and irreversible, so thorough and complete dispersion of the flocculants throughout the slurry is a necessity. The recommended test techniques of application for maximum efficiency are as follows:

- Application as very dilute solution
- Multiple point to the suspension
- Gentle agitation or mixing, that is agitation sufficient to ensure distribution throughout the pulp but not violent enough to destroy rapidly formed flocs.
- Consumption of flocculants usually range from 0.005 to 0.2 k /tone of dry solids

Rapid mix each jar at 100 to 150 rpm for 1 minute. The rapid mix helps to disperse the coagulant throughout each container

Reduce the stirring speed to 25 to 30 rpm and continue mixing for 15 to 20 mins

This slower mixing speed helps promote floc formation by enhancing particle collisions which lead to larger flocs

Turn off the mixers and allow flocs to settle for 30 to 45 mins

Measure the final residual turbidity in each jar

Plot residual turbidity against pH

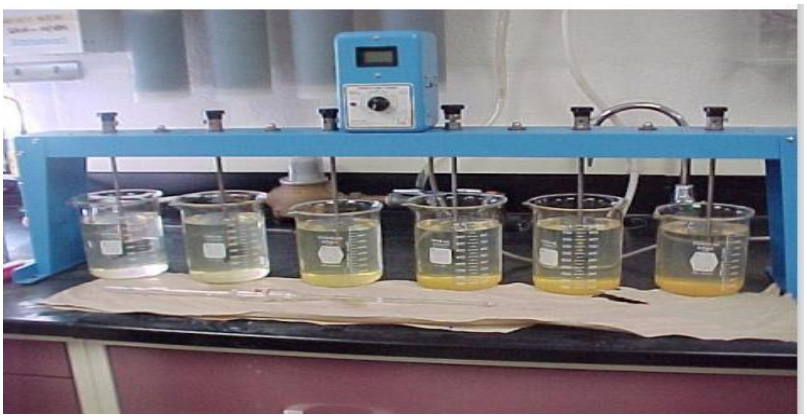


Figure. 23 Jar Test set-up for PH

is placed on the prism, a contrast line develops at the “0” mark on the scale.

1.2. 15 Technical alcohol grade

Ethanol is a chemical compound. It is the “alcohol” that is consumed in alcoholic beverages.

Ethanol has other uses as well, and its disinfectant properties make it a common choice for use in hand sanitizers and other disinfectant product.

Contains usually about 95% v/v (i.e. with about 5% v/v water) C2H6O; other grades with a different water content may be used depending on the technological requirements; these specifications apply only to undenaturated ethyl alcohol

Ethanol analysis

Ethanol can be analyzed by Gas chromatography Gas chromatography (GC) and high performance liquid chromatography (HPLC) an analytical technique for volatile and semi-volatile compounds.

Many ethanol analyses have done with GC since impurities in ethanol are basically volatile as well as ethanol itself.

A sample is vaporized at an injection port by heat.

The sample vapor is sent to column packed with adsorbent or absorbent

Inside column, each component in sample is separated depending on its physical and chemical property.

The end of column the concentration of each compounds are measured by a detector.

There are many kinds of coatings for column.

A coating should be chosen depending on the target compounds.

Also, there are many kinds of detectors.

Each detector has advantages and disadvantages.

Thus, a detector should also be chosen carefully to detect target compounds.

Gas chromatography-mass spectrometry (GC-MS) is an integrated system of two analytical equipment's.

Gas chromatography separates analytes and mass spectrometry identifies them.

GC-MS accelerates ethanol analysis with its simultaneous separation and identification capavities.

Chemical name	Ethanol
C.A.S. number	64-17-5
Chemical formula	C2H6O
Structural formula	
Formula weight	46.07
Assay	Not less than 94.9% v/v

Materials and method

Materials and Equipment

Methanol	Disposable test tube
Ethanol	Parafilm
1-Propanol	Agilent 6850 Gas Chromatograph (GC)

Phenomenex ZB-WaxPlus capillary column (30 m, 0.53 mm I.D., 1.0 µm thickness)

2 Screw cap test tubes	10 µL capillary syringe
5 mL pipette	10 mL pipette
Vortex mixer	Optional test tube rack

1.2.16 Determining total acidity

The ideal total acidity of a finished wine ranges from about 0.6% to 0.8% , expressed as tartaric acid. A fresh juice should run 0.1% to 0.3% higher because some acidity is lost during the process. This test will permit you to make prudent corrections with unbalanced musts or wines and to indirectly observe the progress of malo-lactic fermentations as well as spoilage by vinegar production. The latter problem is marked by an increase in acidity in the wine.

Equipment needed:

Buret with stand and clamp, 5 mL volumetric pipette, N/10 sodium hydroxide, distilled or boiled tap water and beaker or glass.

Procedure for white Wines or juices

Fill buret with sodium hydroxide. Run enough through the buret so that no air bubbles remain below the pinchcock or stopcock

Using the pipette, add a 5 mL sample of wine or juice to be tested to the beaker or water glass.

Add about 100 mL of distilled water to the wine or juice sample. If using tap water instead, see paragraph 4 below before proceeding

Add about 5 drops of phenolphthalein indicator to the sample.

Place the wine sample container under the buret. Record the sodium hydroxide (NaOH) level in the buret before starting. Begin running NaOH into the sample; this will cause it to turn pink. Upon stirring or swirling the sample the pink color will disappear quickly. As you approach the end point the pink takes longer to fade. The end point is the first faint pink blush what will not fade within 20 seconds.

Upon reaching the end point, record the level the NaOH in the buret. Subtract your first reading from this to determine the mL of NaOH used. Millimeters of NaOH x 0.15 equals percent acidity expressed as tartaric acid. (Example: 4.8 mL x 0.15 = 0.72%)

Procedure for red wines Or juices

Do not immediately add the phenolphthalein indicator as you would with a white wine or must. The red pigments make it difficult to see the end point unless you first titrate without phenolphthalein until the color turns the red to a blue or green. Only then will you add the indicator and then continue to the first pink that persists.

Determine how many mL of NaOH were used and multiply by 0.15 to determine the percent acidity expressed as tartaric acid.

If the sample is deeply pigmented you can dilute it with more distilled water which does not affect the result. A bright light under the sample (or behind it) makes it easier to see the color changes.

Procedure when using tap water

The pH of tap water may vary from pH7.

If you use it instead of distilled water you should use the same volume each time and run a blank test with the water to see what correction you should make.

The amount of NaOH used should be subtracted from the amount used in the test for wine or juice. If the phenolphthalein turns the water pink before any NaOH is added you will not be able to use it.

Figure. 24 PH meter

1.2.17 Calibration of hand refractometer to determine degree brix

Calibration should be made in an ambient environment of 20degree Celsius.

Open the Light Plate & place few drops of calibration fluid ½ fill the prism.

Close the Light Plate. Ensure the water is spread across the entire surface of the Prism. There must not be any bubbles or dry spots on the Prism, which is cause by too little liquid use.

Wait for about 30 seconds, this is to allow the temperature compensation to take place.

Hold the meter in the direction of light source and look into the Eyepiece.

Adjust the Focus Dial until image is clear and sharp. Each person has his own focusing adjustment.

Remove the rubber cap on the Calibration knob, with the use of the provided trimming tool and adjust it until the bottom line of the blue section is at 29.6%.

Calibration Completed. 9. Wipe dries the Light Plate and Prism with soft lint-free clothes before proceeding with measurement

Making Measurement:

Open the light plate & place 2 to 3 drops of the test liquid on the prism.

Close the Light Plate.

Ensure the water is spread across the entire surface of the Prism. There must not be any bubbles or dry spots.

Wait for about 30 seconds, this is to allow the temperature compensation to take place.

Hold the meter in the direction of light source and look into the Eyepiece.

Select the scale, which is the intended unit of measurement.

Take the reading from the scale on the line where the blue and white area meets.

Wipe dry the Light Plate and Prism with a soft lint-free clothe after each and every test and before storing away.

It is important to maintain the Light Plate and Prism dust and stain free in order to have good repeatability measurement.

Precautions in Usage:

Clean the instrument between each measurement and before storage with a soft cloth. Residue of samples stained on the prism could damage the coating on the prism.

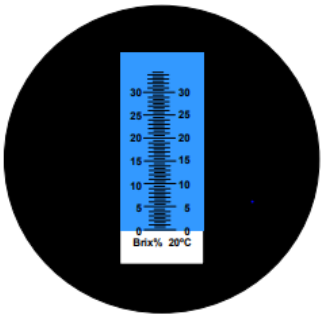
Do not measure with abrasive or corrosive chemicals. This will damage the prism's coating.

Do not immerse the instrument in water. If the view inside the Eyepiece becomes foggy, water has entered into the body.

Do not clean the prism with thinner as this will remove the special coating on the prism and damage the unit.

Do not store the instrument in a damp environment. Store only in a cool and dry environment

This is an optical instrument and requires careful handling and storage.



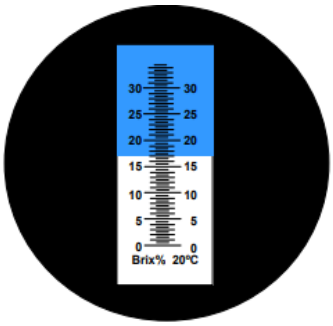


Figure 25. When water

Figure.26 A solution containing sugar will display the percent sucrose in ºBrix units. The sample placed on this prism is displaying 17 ºBrix.

Figure. 27 Types of refractometers

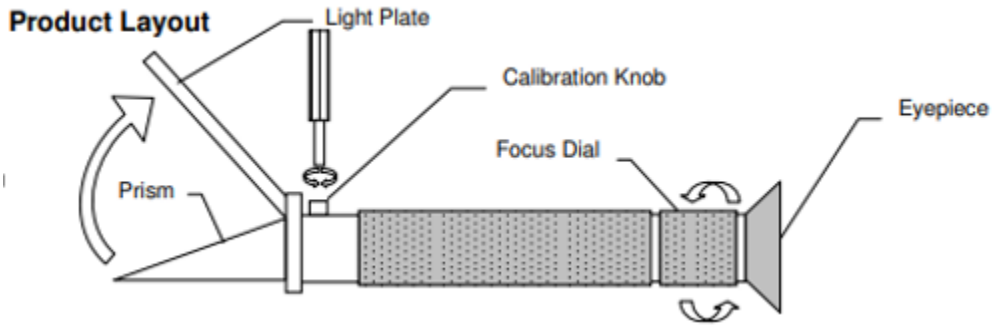


Figure.28 Operation Manual for Hand-held refractometer for Brix measurement 28 to 62%

Specification:

Measuring range: 28-62%

Display Resolution: 0.2%

1.2.18 Total Dissolved Solids

Total dissolved solids (TDS) is defined as all inorganic and organic substances contained in water that can pass through a 2 micron filter. In general, TDS is the sum of the cations and anions in water. Ions and ionic compounds making up TDS usually include;

- Carbonate
- Bicarbonate
- Chloride
- Fluoride
- Sulfate
- Phosphate
- Nitrate
- **Calcium**
- **Magnesium**
- **sodium, and potassium,**
- but any ion that is present will contribute to the total.

The organic ions include;

- pollutants,
- herbicides
- and hydrocarbons.

In addition, soil organic matter compounds such as humic/fulvic acids are also included in TDS. There are a variety of ways to measure TDS.

The simplest is to filter the water sample, and then evaporate it at 180° C in a pre-weighed dish until the weight of the dish no longer changes. The increase in weight of the dish represents the TDS, and it is reported in mg/L. The TDS of a water sample can also be estimated fairly accurately from the electrical conductivity of the sample via a linear correlation equation dependent upon specific conductivity.

Finally, TDS can be calculated by measuring individual ions and simply adding them together.

Apparatus and materials

Analytical balance

Drying oven, 103º

Muffle furnace, 550±50ºC

0.45 µm diameter filter

Filter holder, membrane filter funnel, filteration flask, vacuum pumb

Forceps and Tongs

Evaporating dishes, porcelain, and 100 mL volume.

Heating water bath

Hot-plate

Desiccator

Imhoff Cones

Crucibles, 10 mL volume.

Preparation of evaporating dishes:

If volatile residue is also to be measured, heat the clean dish to 550±50ºC for one hour in a muffle furnace.

If only total dissolved solids are to be measured, heat the clean evaporating dish to 103-105 ºC for one hour.

Cool, desiccate, weigh and store in desiccator.

Assemble the filtering apparatus and begin suction.

Shake the sample vigorously and rapidly transfer 50 mL to the funnel by means of a 50 mL graduated cylinder.

Filter the sample through glass fiber filter, rinse with three 10 mL portions of distilled water and continue to apply vacuum for about 3 min. after filtration is complete to remove as much water as possible.

Transfer 50 mL of the filtrate to a weighed evaporating dish and evaporate to dryness on a steam bath.

Dry the evaporated sample for at least one hour at 103-105ºC. Cool in a desiccator and weigh until a constant weight is obtained. Use the following calculation to determine

Elevated TDS adversely affects the palatability of water. In humans, taste panels rated the palatability of water with 300 mg/L as “excellent,” 300-600 mg/L “good,” 600-900 mg/L “fair,” 900-1,200 mg/L “poor,” and greater than 1,200 mg/L “unusable.” Earlier criteria for human health were based upon this fact.649 In livestock, decreased palatability is well-recognized as an important determinant of water consumption and, indirectly, feed consumption and performance

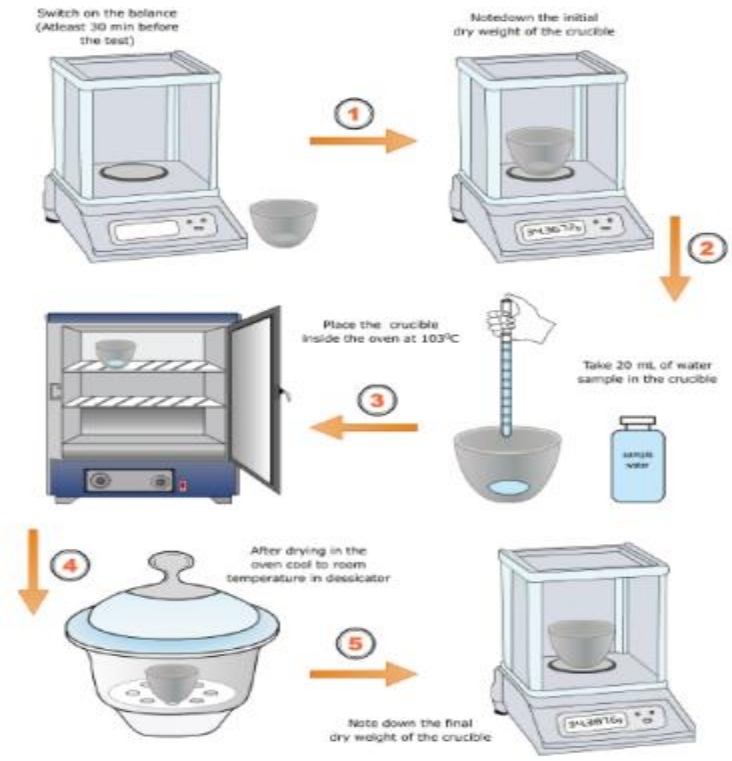


Figure.29 Analysis of total dissolved solid

Use the following calculation to determine TDS:

$$\text{TDS (mg/L)} = \frac{(\text{Re}\,sidue + evaporatingdish)(mg) - Evaporatingdish(mg)}{Samplevolume(mL)} \times 1000(\frac{mL}{L})$$

Self-Check – 4	**Written test**

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Test I: Choose the best answer (18 point)

1, which one of the following physical test parameter?

A. Protein determination C. friability test

B. Moisture content determination. D. all

1. One of the following is common known for its physical test.

A. Turbidity B. flocculation

C. Titration D. all

2. Choose the correct combination

A. Protein –soxhlet (solvent extraction)

B. .acidity _ gravimetric

C. Flocculation – oven

D. Ash - muffle furnace

3. One is commonly identified in the food material by observation

A. Fat content

B. Ash content

C. Taint

D. pH

4. one is not involved in water analysis

A. turbidity meter

B. Kjedhal

C. Muffle furnace

D. None

5. Total dissolved solid is _____

A. Determine by degree

B. Brix

C. Determined by muffle furnace

D. Organic and in organic substance dissolved in water

6. Elevated TDS affects health

A. True B, False

7. Nitrogen is determine and calculated in the process of _____

A. By degree brix

B. Kjeldhal

C. By PH

8. Turbidity meter Degree Brix is measured by _____(3)

A. PH meter

B. Refractomer

C. Turbidity tube

D. Gravimeter

Test II: Short Answer Questions () points each)

1 . Write the steps the of protein analysis? (3)

2 Write down importance of screening.(3)

3 List down the types of sieve.(3)

4 What is the method used to determine technical grade alcohol?

1 Making Measurement for refractometer (any fruit juice)

Open the light plate & place 2 to 3 drops of the test liquid on the prism.

Close the Light Plate.

Ensure the water is spread across the entire surface of the Prism. There must not be any bubbles or dry spots.

Wait for about 30 seconds, this is to allow the temperature compensation to take place.

Hold the meter in the direction of light source and look into the Eyepiece.

Select the scale, which is the intended unit of measurement.

Take the reading from the scale on the line where the blue and white area meets.

Wipe dry the Light Plate and Prism with a soft lint-free clothe after each and every test and before storing away.

It is important to maintain the Light Plate and Prism dust and stain free in order to have good repeatability measurement.

Precautions in Usage:

Clean the instrument between each measurement and before storage with a soft cloth. Residue of samples stained on the prism could damage the coating on the prism.

Do not measure with abrasive or corrosive chemicals. This will damage the prism's coating.

Do not immerse the instrument in water. If the view inside the Eyepiece becomes foggy, water has entered into the body.

Do not clean the prism with thinner as this will remove the special coating on the prism and damage the unit.

Do not store the instrument in a damp environment. Store only in a cool and dry environment

This is an optical instrument and requires careful handling and storage

2. Measuring PH meter procedures and materials

These tools should be considered necessary for a proper pH measurement setup.

- pH meter
- Electrode(s) (aka probe or sensor) (if not integrated or included with meter)
- Electrode fill solution (for re-fillable electrodes)
- Calibration buffer solutions
- Cleaning solution(s)
- Storage solution

Deionized water Kim Wipes

1Optional tools

- These tools should be considered optional.
- They are beneficial, but not strictly necessary.

- Glass beakers; 250-500mL and 50-100mL
- Laboratory wash bottle
- Magnetic stirrer

LAP TEST	**Performance Test**

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

Task1. Perform degree Brix and PH mete fruit juice measurement operation

Sampling is the process of learning about the material on the basis of a sample drawn from it. In sampling test, money and time is saved. Small amount of sample is taken from the bulk the quality experts very few individuals and sample taking technique is in by coding and that helps to prevent biasness.

The quality department is required in comparison to method and the set points.

In this method randomly selected samples are inspected instead of every receiving raw materials and parts. Samples taken from different containers or sacks of the raw material holding equipment's as representatives and the conclusions are drawn on that basis for the entire receiving raw materials specifications.

If the sample proves defective, the entire concerned is to **be rejected**.

Raw material is rejected at inward stage, a rejection is with various reasons for rejection shall be forwarded by the quality control department to **purchase department**. The rejected material shall be stored separately in stores. Rejection of raw materials can be for different changes such physical, chemical, biological, and microbiological during harvesting, processing, packaging, transportation, storage and distribution. Due to these changes the raw materials will be rejected according the company procedures.

The purchase department depending on the nature of defects call the **External Provider** and request the External Provider for the corrective action report against relevant request Decision shall be taken for rectification/re-work or for sending back the material for replacement.

Handling of Returned/Rejected Goods

Responsibility:

- QA Manager
- QC Manager
- Production Manager
- Warehouse Manager

Procedure :

Ensure that all returned products are handled in the following manner:

- ✓ There are no mistakes in identity for products and batch numbers.

- ✓ Defective or substandard products should not get mixed with good products and become liable to be offered for sale.
- ✓ The handling and disposition of returned products should not contravene any statutory requirements.
- ✓ Complete documentation is available on all operations on returned products from receipt to final disposal.
- ✓ Any goods which have returned from the market for any one of the following reasons are treated as a returned good:
- ✓ Returned goods on advice of regulatory authorities from the market customers
- ✓ Returned stock from distribution office, due to:
  - ✓ Date Expired Products
  - ✓ Damaged of Broken Primary Containers
  - ✓ Leaky or Broken Seals of Closures of Primary Containers.
  - ✓ Mutilated or smudged labeling rendering the product unidentifiable of its name, or batch number.
  - ✓ Soiled labeling rendering the products unassailable or un-presentable aesthetically, but otherwise clearly identifiable for product name and batch number.
- Returned goods for any voluntary reason.
- Returned goods for any impairment in analytical report reported by costumer.
  - ✓ The returned goods will be received by Finished Goods Warehouse. The stock will be placed in the Secured area under lock and key which is adequately segregated and labeled with the reason for return as per the reasons mentioned in above, by Assistant-Finished goods Assistant/ Sr. Executive - Production.
  - ✓ A description of the condition in which the goods will be entered in the Returned Good- Assessment Report by Assistant - Finished goods/ Mr. Executive Production.
  - ✓ The returned Good -Assessment Report will be sent to QA Executive. QA Executive will physically inspect the condition of the returned goods and enter

his observations in the returned good - assessment report and send the report to GM - QA.

- ✓ Based on the above observations , GM - QA will decide whether:
- ✓ Re -Analysis is required to consider for reuse or rectification.
- ✓ The material should be destroyed.
- ✓ If re-analysis is required, the QA Executive will send the returned good-Assessment Report to QC Executive for arranging for sampling and analysis of the material.
- ✓ QC will collect sufficient sample (Sufficient to perform 3 analyses) individually from each container if required or a representative sample from all the containers as per the requirement of the parameters to be checked and also send the same sample to the **external authorized autonomous Laboratory**.

✓ The QC will test the material as per the **laid down specifications**.

✓ An analytical Report with relevant details will be prepared by QC Executive as well as by external laboratory to explore the possibilities of consideration for reuse / destruction.

✓ Based on the analytical report, GM - QA decides whether the returned good can be reused or destroyed.

✓ The Return Good - Assessment Report will be approved by GM - QA.

✓ The Report is then sent to the Ware House - Manager who will prepare and co-ordinate for the action plans drawn .The action plan should be approved by GM - QA.

✓ QA will monitor action plan throughout the operations till the returned good is re-worked or disposed off.

✓ In case of destruction, the 'Return good - Disposal record' shall be filled in the format and filed with QA along with Return Good

✓ - Assessment Report.

✓ The Product Assessment Report along with Returned Good Assessment Report should be sent to G. M -Plant for his authorization and the same shall be filed with QA.

Department	**Quality Assurance**	

Subject	Returned Goods Report		
SOP No.		Format No.	

RETURNED / REJECTED GOODS REPORT

Name of Product : _____

Batch Number : _____

_

Mfg. Date : _____

_

Expiry Date : _____

Date of Rejection : _____

Date of Received Goods : _____

Received From : _____

Reason of Rejection : _____

Return Goods Assessment Report : _____

_____

_____

Analysis Report by QC Officer: _____

_____

_____

Return Goods Assessment Report

Approved By QA Executive : □ Yes □ No

Precise Action to be Taken : _____

_____

_____

Remarks by Manager QA : _____

Prepared By by	Analysed by	Authorized
Officer Q.A	Executive Q.A.	Manager Q. A.

Self-Check – 5	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

I. <u>Write short answer/s</u>

2. Write three reasons for material rejection (5 points)
3. Write down the three hierarchy of responsibility in the raw material rejection.
4. .(5points)

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

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

LG #14	LO #2- Weigh and screen accepted raw materials

Instruction sheet

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

- Offloading raw materials from transport and routing to screens
- Passing raw materials through screens
- Monitoring fitness of raw materials
- Following foreign materials control procedures
- Monitoring Equipment
- Passing raw materials through metal removal equipment
- Weighting/measuring raw materials

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 offload raw materials from transport and routing to screens
- Screen raw materials
- Monitor fitness of raw materials
- Follow foreign materials control procedures
- Monitor Equipment
- Pass raw materials through metal removal equipment
- Weighting/measuring raw materials

Learning Instructions:

10. Read the specific objectives of this Learning Guide.

11. Follow the instructions described below.

12. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.

13. Accomplish the “Self-checks” which are placed following all information sheets.

14. Ask from your trainer the key to correction (key answers) or you can request your

trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

15. If you earned a satisfactory evaluation proceed to “Operation sheets
16. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
17. If your performance is satisfactory proceed to the next learning guide,
18. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

1.1 Offload raw materials from transport

Malted barley transfer from truck to **silo**

The arrival and transfer of major ingredients such as malted barley, corn or rice to a brewery can include a number of different types of conveying systems. The mode of transfer of ingredients is dependent upon a wide variety of process parameters,

- including material characteristics
- distance to be transferred,
- required rate of transfer
- and the type of container in which the ingredient is originally received.
- Pneumatic conveying systems are used to transfer dry materials from one process to another via either positive (pressure) or negative (vacuum) modes.
- Typical systems include an air source, a material feed device, a convey line and some type of air/material separator, such as the Coperion K-Tron filter receiver shown in Photo 1.

Figure. 30 Filler receiver

Figure. 31 Scale hopper

Figure. 32 Zero rotary valve

- Pneumatic systems typically operate in a fully enclosed line, which greatly improves hygienic operation and also minimizes product loss.
- Majors such as grains are often received by truck or railcar and then stored in silos prior to usage.
- Truck unloading can be done via positive or negative pressure.
- Pressure Differential (PD) trucks and railcars use positive pressure to **unload material**, whereas other types of delivery to the batching step of process can involve either positive pressure or negative pressure pneumatic conveying.
- Positive pressure conveying systems are typically used to transport product over long distances and at high through puts.
- Applications which involve pressure conveying often include loading and unloading of large volume vessels such as
  - ✓ silos
  - ✓ railcars
  - ✓ trucks
  - ✓ and bulk bags

Pressure differential (PD) transfer

- In cases where PD truck unloading is possible
- A flexible hose is connected from a pressure blower to the PD truck
- upon arrival at the brewery
- and another from the PD truck to the conveying line
- The system operator selects the desired destination (for example, silo 1 for malted barley on the truck unload control panel)
- When the system is started,
- The blower pressurizes the PD truck and conveys material via positive pressure from the truck through the conveying line and directly into the silo.

Many times, an inline **magnet** installed in the conveying line to remove any metal particles which may be present in the conveyed material.

When the high level sensor in the silo is activated, the operator closes the material flow gate on the truck and allows the system to purge the conveying line before finally stopping the operation.

Pneumatic transfer – vacuum vs. pressure

Depending upon the volumes required, other possible sources of ingredient delivery include

- Boxes
- Sacks
- Bulk bags or super sacks.
- In all of the ingredient transfer steps, pneumatic conveying systems can be used to transfer these ingredients.
- These systems can also utilize either positive or negative pressure dilute phase conveying. Vacuum (negative pressure) systems,
  - ✓ Often used for lower volumes and shorter distances.
- One of the advantages of vacuum systems is the inward also suction created by the vacuum blower and reduction of any outward leakage of dust.

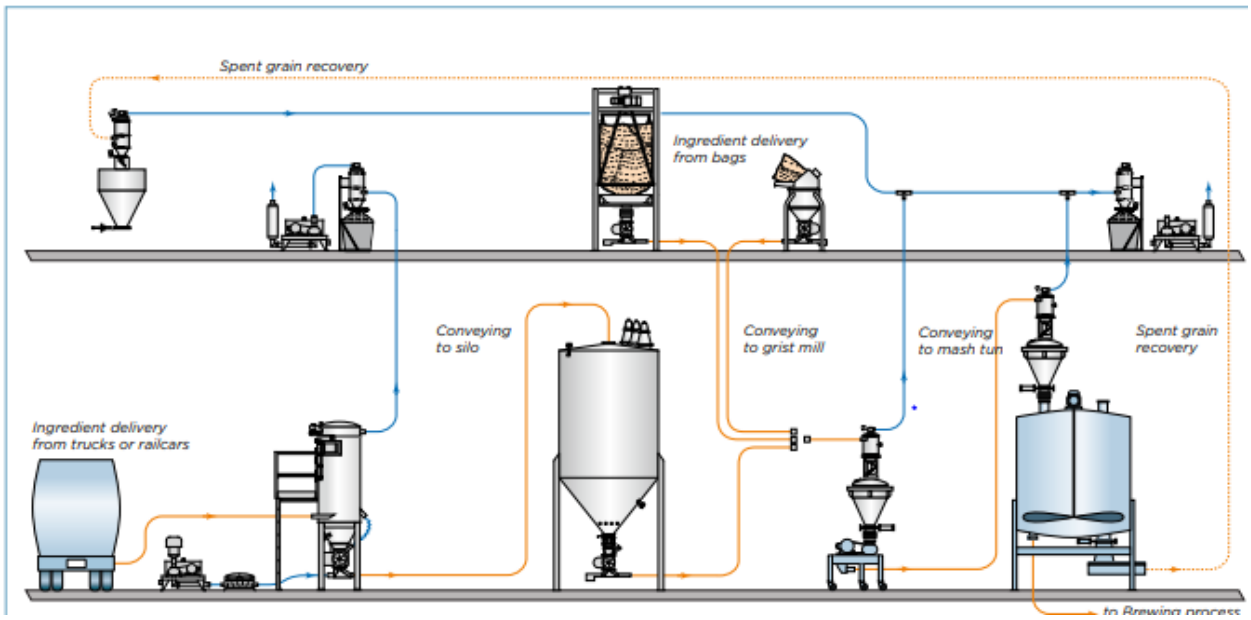


Figure: 33 Brewery process flow, from raw ingredient delivery to mash tun

This is one of the reasons why vacuum systems are often used in higher sanitary or dust containment applications.

Another advantage of vacuum systems is the simple design for multiple pickup points.

It should be noted, however, that the distances and throughputs possible with a vacuum system are limited due to the finite level of vacuum that can be generated.

Often a combination of pressure and vacuum conveying designs are used for a system, with delivery to the mash tun, taking full advantage of the process and efficiencies of each technology.

Robust and safe rotary valves

In either of these types of conveying applications, Coperion K-Tron high efficiency rotary valves can be utilized. These rotary valves can be provided for blow through systems or for discharge valves at the bottom of silos or feed bins.

As an added benefit for brewery safety, the Coperion rotary valves can also be equipped with the innovative Rotor check design option, which detects any **metal to metal** contact in the valve, as a function of electrical resistance between the rotating vanes and housing.

This system is ideal for detection of contaminant metal in the product as a result of wear and can be instrumental to ensure safe operation.

Batching ingredients to brew kettles

In many brewery applications, additional ingredients such as flavors, additives and hops are added directly to the brew kettle.

In order to accurately weigh and meter these ingredients they may be transferred to a batching station prior to the kettle. This station often includes a metering device such as a rotary valve which delivers the product to a scale hopper on load cells.

This method is called Gain-in-Weight (GIW) batching**.**

Batch weighing with scale hoppers

Scale hoppers are receiving hoppers suspended on load cells for ingredient batch weighing.

The material enters the scale hopper until the precise weight and/or combination of materials is achieved. With the scale weighing system, weigh accuracies of +/- 0.5% of the full scale capacity can be expected.

Once the desired weight has been achieved, the kettle then calls for material, the discharge valve is activated and the material in the scale hopper is discharged.

Figure.34 Bag damp station

Multi-destination majors batching

When major ingredient batching requires a single ingredient to be delivered to multiple stations or multiple ingredients delivered to a single destination, scale hoppers with specialty Aeropass™ valves mounted after the scale hopper can be used (see Figure 3). After the fluidized material is discharged from a source such as a silo or bulk bag, it will typically drop into a scale hopper, is weighed, and then conveyed. Once in the convey line, it is then transported to the Aeropass valve, located above the receiving vessel(s) or brew tanks.

Figure. 38 Cleaned malt

Aeropass principle of operation

The Aeropass valve operates on a diverter type principle and is ideal for diverting material directly into a hopper from a conveying line.

Due to the valve's low-clearance height, it is ideal when requiring inline diverters in tight spaces. As shown in the diagram, the valve includes an internal wafer type device which allows for the discharge of material into the hopper below when activated in the correct discharge position.

After the **weighed** material is discharged into the first brew kettle, the Aeropass valve can be immediately switched to allow for the transfer of the material in the conveying line either to the next process, or back into the original source.

This closed loop design results in a more efficient method of product transfer with higher product yields.

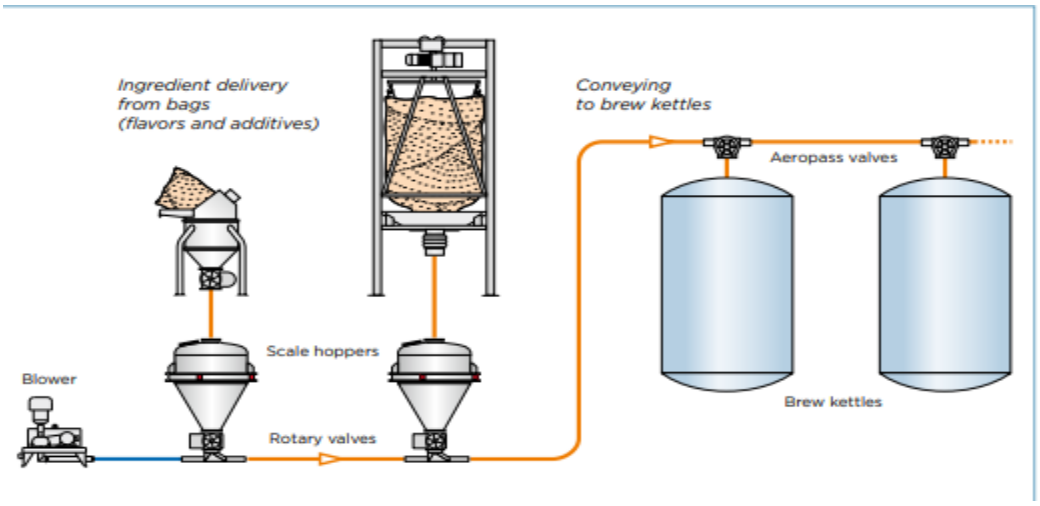


Figure. 38 Batch weighing of ingredients and flavors to the brew kettles

It should be noted however, that there are cases where both modes can be used in a system together. This may be the case, for example, when headroom

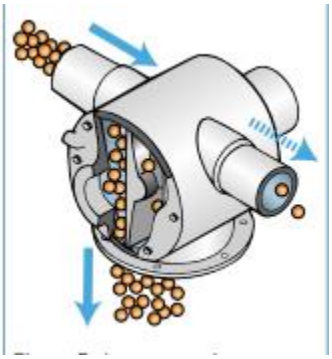


Figure .40 Aeropass valve

Above the brew kettle or tank to transfer of ingredients is an issue. In this case, materials may be transferred for the bulk of the distance via pneumatic transfer, and then sent to a receiver or batch weigher above a mechanical screw. The screw then transfers the final ingredients direct to the kettle.

It is important when evaluating different modes of transfer that manufacturers work with system engineers such as those at Coperion K-Tron who are experienced in a variety of options, so that the most efficient operation be chosen for the brewery application

Self-Check – 1	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

II. <u>Write short answer/s</u>

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

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

Definition: Screening is a unit operation that separates materials in and/or on water (found in different sizes) from water and from entering water treatment facilities and mains.

1.1 malt screening

Good malting requires;

- plump,
- even sized corns
- must be covered by an even husk without gape or splitting.
- Water uptake into the grain must be at an even rate and amount;
- to ensure that germination all takes place at the same time and with equal vigour. Variation in husk thickness, or incomplete husk coverage will affect water uptake. Small or under-sized grains will not perform as well as ideal corns, so standards are set, based upon the percentage of grains retained over a screen.
- The standard of most countries, is 90% retained over a 2.5mm screen.
- Trade malting barley on the 2.5mm standard
- The standard is different for barley purchased in where maltsters normally accept 94% retained over a 2.25mm screen.
- Most maltsters are willing to accept a small excess of screenings, with an appropriate price adjustment.

1.2 Screening water

The unit involved is called a screen.

Definition: Screening is a unit operation that separates materials in and/or on water (found in different sizes) from water and from entering water treatment facilities and mains.

Opening size [Coarse, medium and fine] – Configuration (bar Screens and mesh screens])

- Method used to clean the entrapped materials (manually, mechanically, raked or water-jet cleaned)
  - ✓ Fixed or moving screen surface.

Classifications - Coarse Bar Racks – remove coarse debris (twigs, branches, rags, etc)

- Spacing coarse 2 – 6 in medium 0.8
- Fine Screens - 3/8 to ½ in. (up to 10 mm or less,

Types of Screens –

- Hand clean coarse screens
- mechanically cleaned bar screens

Types of Screens

- Moving
- Fixed

There are many types of screens that can be used in water and wastewater treatment processes of which:

- Bar or rack screens: Bar screens composed of parallel bars. Bars usually vertical or inclined
- Band screens: Consists of a perforated belt passes over an upper and lower roller
- Perforated plate screen: Consists of a fixed band of perforated screens
- Wing screens: It has radial vanes which rotate on a horizontal axis
- Disk screens: Circular perforated disk with or without supporting bars
- Grating screens: Consists of two sets of parallel bars.
- Mesh screens:
  - ✓ Mesh screens composed of a fabric with mesh size depend on floating and suspending matter.

Bar Screens

- Design Criteria of a Bar Screen :
  - ✓ Approach Velocity
  - ✓ Optimum Velocity : 0.6 m/s (through the screen opening)
  - ✓ Maximum Velocity: 0.75 - 1.0 m/s (to prevent entrapped materials being forced through the bars).
  - ✓ Minimum Velocity: 0.4 m/s to prevent deposition of solids.
  - ✓ Typical Range: 0.6 - 1.0 m/s

Band or Belt Screens

- Flexible woven wire mesh screens normally installed for a river supply. – Consists of sections of perforated mild steel plates connected together in a form of a band which is revolved by an electric motor.
- Water passes inward through the screens and solid matter is washed off by high pressure water jets directed from inside of the screen.
- Disk Screens and Drum Screens Similar in principle to band screens, differing only in the form of the moving screen.
    - ✓ Rotating metallic disc - partially immersed.
    - ✓ Solid caught in the screen are taken to the top, where they are scrapped by the moving screen.
    - ✓ Diameter: 2 to 5 m
    - ✓ Speed 0.05 m/s
    - ✓ Hollow drum.
    - ✓ One end of the drum is closed.
    - ✓ Water enters through the other end and passes out through the perforation.
    - ✓ Water jet is used for cleaning

Disposal of Screenings

- Screenings is the waste materials collected from screens.
- Screenings should be properly disposed.
- Various methods of screening disposal were used such as: -
    - ✓ burning,
    - ✓ burying,
    - ✓ digestion
    - ✓ and shredding and returning it to wastewater collection or treatment system.

Inland burying is efficient in small treatment plants, while burning is best for medium and large treatment plants. Other methods cause problems and may need subsequent treatment.

Digestion is used for large systems and in combination with the treatment of the organic portion of municipal solid waste.

Design of Coarse screens

Factors to consider - clear openings between bars: opening needed

- typically less than 2 ins., at 22 - 45 ^{o} incline
- Location: installed ahead of grit chambers, may also be installed ahead of equalization tanks, if present.
- approach velocity: at least 0.4 m/s to prevent deposition of solids, and should not exceed 0.9 m/s at peak flow rate
- Head loss through screens - limited to 150 mm (6 in.)
- screens handling and disposal
- quantity of screenings depends on the type of wastewater, geographic location, screen size and weather
- screenings - vary from 3.5 - 80 m3/106 m3, about 80% moisture and density of 960 kg/m3 – controls
- operation cycle about 15 minutes for mechanically raked screens
- Fixed Screens: Bar Screens
- Bar racks (also called bar screens) are composed of larger bars spaced at 25 to 80 mm apart. The arrangement shown in the figure is normally used for shoreline intakes of water by a treatment plant.
- The rack is used to exclude large objects;
- The traveling screen following it is used to remove smaller objects such as leaves, twigs, small fish, and other materials that pass through the rack.
- The arrangement then protects the pumping station that lifts this water to the treatment plant. Bar Screens
- Coarse screens or bar racks (< 2.5 inch openings) :
    - ✓ removes large objects, rags, debris ;
    - ✓ protects downstream pumps, valves, pipelines ;
    - ✓ cleaning may be accomplished manually or mechanically ;
    - ✓ mechanically cleaned bar racks (5/8 inch - 1-3/4 inch) typically used instead of coarse manually cleaned screens;
    - ✓ bar rack is inclined to facilitate, cleaning ;
    - ✓ approach velocities should ensure self-cleaning, but not dislodge solids;
    - ✓ typical design: maximum velocity of 2.5 ft/sec through bar rack opening

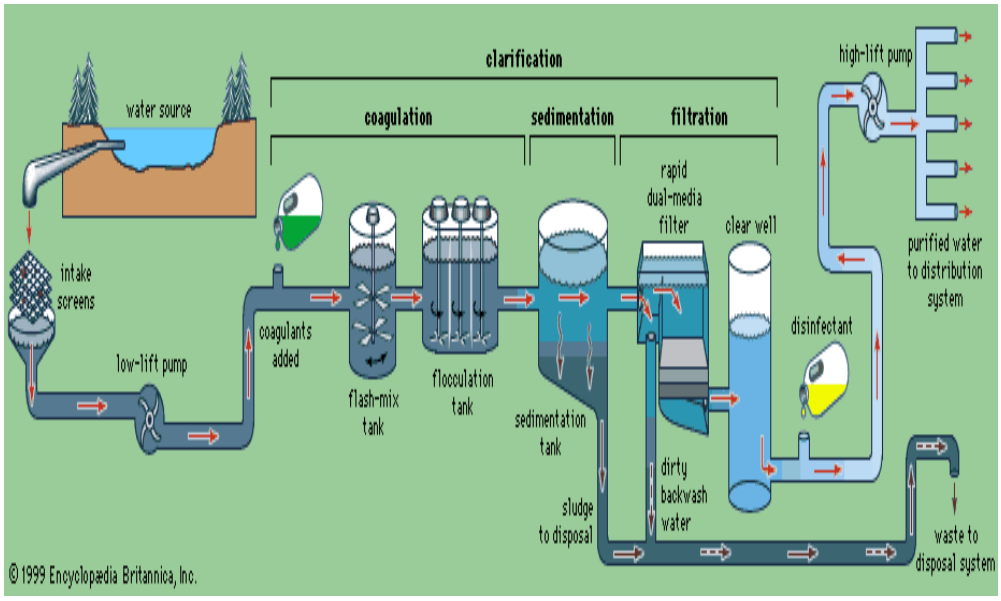


Figure. 41 Typical layout of a water treatment plant

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: Choose the best answer (2 point)

1 what is the advantage of coarse screens or bar racks (< 2.5 inch openings) :

A. **It removes very fine elements**

B. removes large objects, rags, debris

C.

Test II: Short Answer Questions (point each)

Information Sheet 3- Monitoring fitness of raw materials

1.1 Introduction

In practice, processors define their requirements in terms of raw material specifications for any process on arrival at the factory gate.

Acceptance of, or price paid for the raw material depends on the results of specific tests. The raw material are tested before their fitness to meet the company specification. The raw materials test and type of food to be produced is different.

Susceptibility of the raw materials to deterioration depends on the nature the food source. Animal sources are the most susceptible products to deteriorate, i.e. they are highly notorious and sensitive and prone to invade by foreign microorganisms. The food materials are spoiled due to foreign matter, microbial invasion, biological reaction, environmental condition and nature of the food itself during harvesting, transportation, processing packaging, storage and distribution. To avoid the invasion of microorganisms human being has been invented different mechanisms to different food material prevent the invasion of the microbes. A random core sampling is taken from all food raw materials.in food and beverage industry to assess the raw material fitness for purpose (quality)

For the alcohol and non-alcohol beverages to produce different types of beverages and the raw material sampling test is taking place to meet the processors specifications and tolerances to cover the size of units, the presence of extraneous matter, foreign bodies, levels of specific defects, e.g. **moisture content, ash content, taint, turbidity, firmness insect** damage etc., as well as specific functional tests. Guidelines for sampling and testing many raw materials for processing are available from the food and beverage processing industries. Increasingly, food processors and retailers may impose demands on raw material production which go beyond the properties described above. These may include 'environmentally friendly' crop management schemes in which only specified fertilisers and insecticides are permitted, or humanitarian concerns, especially for food produced areas.

Monitor incoming raw materials

The quality and safety of incoming goods and raw materials could mean the difference between finished products being safe to eat. For this reason, it is of paramount importance that an adequate system is in place to monitor all incoming raw materials and goods that will have an impact on the safety and quality of your finished food product.

What are the parameters to be monitored?

Overall food safety and quality assessed based on the physical, chemical and biological properties of the raw material.

- Presence of microbiological contamination eg. Salmonella, E.Coli,
- Any visual contaminates on the external surfaces eg. dirt, dust, bird droppings
- The overall condition of packaging eg. are there any rips, breaks, torn and broken sections.
- Compliance to the raw material specification eg. quality attributes of size, colour, weight, count and moisture content

Undertaking monitoring activities

There will be different methods of monitoring based on what it is you are going to monitor. Some of the more common methods used to monitor the overall food safety and quality of incoming raw materials include:

Visual Assessment – this involves physically and visually looking at the raw material for any obvious defects.

This method works well for assessing the level of visual or physical contaminates.

A visual assessment can also be undertaken when assessing quality attributes of;

- colour,
- turbidity
- broken kernel,
- taint
- Size and count (thousand kernel) against the raw material specification and also the shelf life / traceability coding of the raw material.

Laboratory testing (in conjunction with a hold and release program) – this involves taking a sample of the raw material and testing it for the targeted hazards. The most common testing completed on raw materials includes;

- Salmonella, E.Coli,
- various allergens
- Pesticides
- protein
- moisture content
- And illegal preservatives.

Indicator testing – undertaking a physical temperature check of potentially hazardous raw materials may indicate a potential for microbiological contamination.

Frequency of Monitoring

Completing a frequency risk assessment is useful in this situation as long as it includes the compliance history of the raw material.

- Need to check what certification standards and governing food safety legislation requires. For example,

✓ Temperature monitoring may need to be completed for every product that comes into business.

.

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 (2 point)

Test II: Short Answer Questions (point each)

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

Foreign material of any kind can potentially introduce a physical hazard in a food product. These range from natural sources such as rocks, wood, or product components such as shells or bones, to processing components such as metal shavings, equipment parts, or glass pieces from packaging materials

Cleaning is the removal of all visible soil in an approved way with the use of mechanical and chemical action or both, so that all areas are cleaned and sanitized to a high standard. Cleaning is an investment in the assets of a building. Cleaning also the complete removal of food soil using appropriate detergent chemicals under recommended conditions. It is important that personnel involved have a working understanding of the nature of the different types of food soil and the chemistry of its removal.

There are other tools to remove foreign materials, including;

- air blowers
- flumes
- sizers
- Reels
- and screens
- sieves and
- Filters.

The type of intervention employed depends on the product and type of foreign material the processor wishes to remove. For example, if a raw agricultural commodity is loaded with **chaff or other light materials, air blowers** might be utilized. The tomato processing industry makes extensive use of **flumes**.

Fluming washes the tomatoes but also removes rocks and stones, plus some defective fruit.

Figure. 42 Flumes

Physical contaminants in food processing and manufacturing plants can pose serious health hazards to consumers.

Common physical contaminants include;

- metal
- stainless steel
- Glass
- Plastic
- Wood
- Stone, and natural fragments such as bone, seeds and pits. If accidentally ingested, these contaminants could cause dental damage, laceration of the mouth or throat, laceration or perforation of the intestine, and other serious injuries. Contaminated food products could cost millions in wasted product, recalls, lawsuits, and loss of sales due to damaged reputation. Fortunately, there are many cost-effective **foreign material control solutions for food manufacturers** to use for detecting and removing physical contaminants from food products. These approaches can include:
  - ✓ Magnets
  - ✓ Sieves and screens
  - ✓ Metal detectors
  - ✓ X-ray machines

Magnets

Industrial-strength magnets are one of the oldest and simplest methods for removing metal foreign materal from food products. Magnets are particularly effective in facilities that have a high risk of ferrous and non-ferrous metal contaminants. Stainless steel is often non-magnetic, depending on the quality and type of material used to manufacture it, so magnets are not a good solution in facilities where stainless steel is a contamination risk.

Figure. 43 Sieves and Screens

Screens are flat panels made of wire mesh that filter foreign material from liquid products.

Sieves are machines that shake dry ingredients, such as

- flour or
- Spices, through one or more screens.

Since screens and sieves don't rely on magnetism, they can filter out any kind of contaminant, including

- metal
- glass
- wood, and others.

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 (4point)

1. _____ are machines used to shake flour and spices, through one or more screens
   A. Flumes
   B. Sieves
   C. Magnets
   D. all
2. one of the following equipment is designed only to remove the lighter foreign materials
   A. Sieves C. sizers
   B. blowers D. all

Test II: Short Answer Questions (point each)

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

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

1.1 Tools, equipment activities to be monitor in the food and beverage industry

The tools and equipment needed during receiving, storing and processing in food process industry grains may include the following:

- Conveyer
- Elevator
- Dryer
- Moisture tester
- Weighbridge/weighing balance
- Silo
- Screener
- Tanks
- transfer equipment
- filtration equipment
- crushing and pressing equipment
- fermentation vessels
- stills and retorts
- separators
- decanter
- barrels
- process control equipment
- IT equipment
- bottling and packaging equipment
- Pneumatic conveyer
- Scale hopper
- Packaging
- Boilers
- Germination tank
- Fermenters

- Steeper kilner
- Laboratory equipment and PPE and etc
- Winemaking Kit
- Crushing and Pressing
- Pumping and Transferring
- Fermenting and Racking
- Bulk Containers
- Barrels
- Alternatives Analysis and Testing
- Lab ware
- Filtering and Clarifying
- Bottling and Corking
- Cleaning and Sanitizing Champagne Supplies
- Beer Making Supplies
- Food Grade Paints and Coatings
- Vineyard Supplier
- Shipping Information.
- Sample tests

Schedules and procedures including assignment of responsibility should be established for the preventative maintenance of equipment.

Written procedures should be established for cleaning of equipment and its subsequent release for use in the manufacture of intermediates. Cleaning procedures should contain sufficient details to enable operators to clean each type of equipment in a reproducible and effective manner. These procedures should include:

- Assignment of responsibility for cleaning of equipment;
- Cleaning schedules, including, where appropriate, sanitizing schedules;
- A complete description of the methods and materials, cleaning agents used to clean equipment;

When appropriate, instructions for disassembling and reassembling each article of equipment to ensure proper cleaning;

- Instructions for the removal or obliteration of previous batch identification;
- Instructions for the protection of clean equipment from contamination prior to use;
- Inspection of equipment for cleanliness immediately before use, if practical; and
- Establishing the maximum time that may elapse between the completion of processing and equipment cleaning, when appropriate
- Equipment and utensils should be cleaned, stored, and,
- Sanitized or sterilized to prevent contamination or carry-over of a material that would alter the quality of the product.
- Where equipment is assigned to continuous production or campaign production of successive batches of the same product equipment should be cleaned at appropriate intervals to prevent build-up and carry-over of contaminants (e.g. degradants or objectionable levels of micro-organisms).
- Non-dedicated equipment should be cleaned between production of different materials to prevent cross-contamination

Acceptance criteria for residues and the choice of cleaning procedures and cleaning agents should be defined and justified.

Equipment should be identified as to its contents and its cleanliness status by appropriate means.

Calibration;

- Control
- Weighing
- Measuring
- Monitoring and test equipment that is critical for assuring the quality and safety of products or should be calibrated according to written procedures and an established schedule.
- Equipment calibrations should be performed using standards traceable to certified standards, if existing.
- Records of these calibrations should be maintained.

- The current calibration status of critical equipment should be known and verifiable.
- Instruments that do not meet calibration criteria should not be used.
- Deviations from approved standards of calibration on critical instruments should be investigated to determine if these could have had an impact on the quality of products

Personal Protective Equipment (PPE)

In the manufacturing Hard hats can protect workers' heads from being hit by objects or coming in contact with electricity.

Workers can use different types of personal protective equipment to prevent the types of hazard during working hours.

- The safety shoes, leggings, and foot guards help protect workers from falling objects, sharp objects, wet and slippery surfaces, hot surfaces, and electrical hazards.
- Face shields, goggles, and safety glasses with side shields can protect workers from liquids and solids that can get into their eyes.
- Earplugs or earmuffs can help prevent damage to hearing.
- Exposure to high noise levels can cause irreversible hearing loss as well as physical and psychological stress.
- Gloves can protect workers' hands from chemicals, hot and cold temperatures, vibration and sharp objects.
- Gloves must fit properly and be the right kind of material for the job.
- Instructors Note: It is important to be aware that different types of glove materials will protect against different types of chemicals.
- For example a nitrile glove will provide better protection against solvents than a latex glove will.

Respirators.

Employers must first try to remove breathing hazards.

If they can't, workers may have to wear respirators.

The kind of respirator required depends on the kind of hazard the worker is exposed to. For example, dust masks do not protect against chemical vapors.

Respirators must also fit correctly in order to prevent illness.

Worker has to wear a respirator, it is the employer's responsibility to provide the employee with a medical evaluation to make sure they are healthy enough to work safely in a respirator.

Full body suits.

In some cases workers must protect most or all of their bodies against heat, cold, radiation, hot metals and liquids, body fluids, or hazardous materials.

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 (6 point)

1. _____ **is an action done to check the rightness or wrongness of equipment**
   A. Weighing balance C. PPE
   B. Calibration D. all
2. One of the following PPE is rendering infectious air borne diseases
   A. Hat C. Face mask
   B. Eye goggle D. respiratory
3. The equipment used to prevent damage of sense organ by halting above threshold sound is_____
   A. Face mask C. earmuffs
   B. Eye goggle D. all

Test II: Short Answer Questions (point each)

1. Write two points the purpose of personal equipment (3 points)
2. List at least 5 equipment used in process of beverage (5points)

1.1 <u>Metal detectors</u> can be placed over;

- Conveyer belts,
- Pipelines, and other areas where product is present.

These devices generate an electromagnetic field, and whenever a metal object passes under it, the object disturbs the field and generates a signal.

Metal detectors are highly effective at detecting both ferrous and non-ferrous metals but cannot detect all types and grades of stainless steel.

Metal detectors can't detect

- Glass
- Wood
- Plastic
- or other non-metal contaminants.

X-Ray Machines

X-ray machines are particularly useful in facilities that have a high risk of multiple types of contamination.

X-ray machines can detect most types of foreign materials, including

- metals,
- stainless steel
- Wood
- Glass
- Plastic
- And natural contaminants.

These machines are well-suited to check final packaged products because they can also detect if a package is not properly filled.

Before selecting a **foreign material prevention method**, facilities should first determine which contaminants are most likely to occur. If a facility uses wooden pallets often, a metal detector may not be the best choice. If a facility is only concerned about **ferrous and non-ferrous metal fragments,** simple industrial strength magnets may be a good choice. In any case, testing procedures must be in place to ensure that

all hazard controls are in proper working order and to ensure that all employees are trained on how to operate and maintain them.

Generic Cleaning flow principle

- Dust/chaff removal Size- coarse tolerance
- Density
- Length
- Width
- Shape

Grain cleaning reduces bulk.

- Explosion risk,
- Sanitation risk
- Health and safety risk.
- Greatly improves equipment efficiency.
- Grain Dust Explosion Risk.

Magnetic Separator

- Tramp iron or Tramp metal is metal brought in with grain at receiving.
- Tramp metal is removed at grain unloading.
- Magnets within the milling process are designed to remove metal generated from equipment failure.
- Rare Earth Magnets are called ferro magnets because they attract ferrous metals.
- Ferrous metals are made from iron, (Fe) and iron alloys (contain iron).

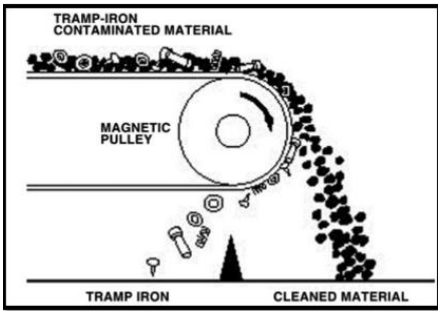


Figure.44 tramping iron

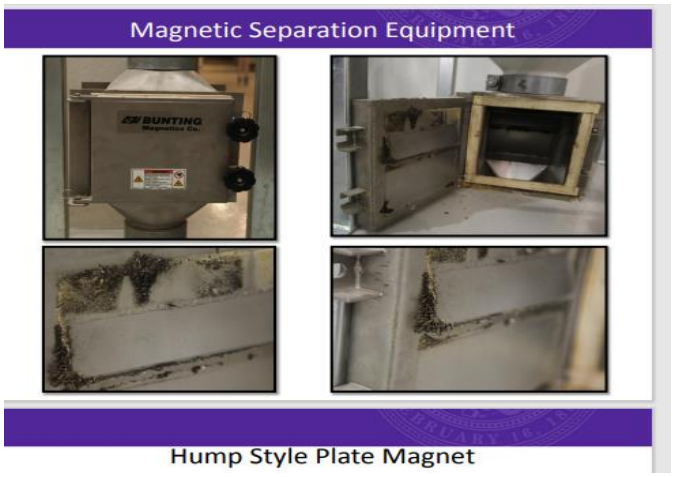


Figure.45 Magnetic separation

Magnets must be cleaned regularly to remove attracted ferrous metal.

Magnets have a limited ability to hold ferrous metal. Once overloaded, metal contamination will pass by without being removed.

Magnet pull strength should be measured and recorded on a routine basis (once per year).

Magnets with lost strength should be replaced

Figure. 46 Plate Magnet-Mill

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 (4 point)

1. One of the following contaminant cannot be detect by X- ray machines
   A. Wood C. broken glass
   B. Metal D. none
2. One of the following cannot be detect by magnetic detector
   A. Ferrous metal C. metal fragment
   B. Glass D. all

Test II: Short Answer Questions (point each)

1. List down the generic cleaning flow principle (5points)
2. Write down at least 5 advantages of bulk cleaning (5poits)

Weighing or measuring raw materials

Weighing or measuring is done by manually, automated or combined

Weigh room design

In food and beverage industry the manufacturing plant features an area in which raw materials are weighed and transferred to clean containers. This are goes by various names, including Weighing, weighing room, central weigh

Weigh-room for raw material

Raw material and work –in- process staging should be directly adjacent to the weigh-room thus reducing the requirement for transition spaces. When weighing is complete, there may be material left in the containers received from the client. Large quantities are usually returned to the ware house. The weighing room is automated with panel board coded in number each of the raw materials represented in number and this allowed to ordered by designated personnel. The weighed raw material is transferred from the silos, containers, to the millers, mixers, boilers, fermenters purifiers by different types of conveyer pipe

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: Choose the best answer (2 point)

Test II: Short Answer Questions (point each)

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

Note: **Satisfactory rating 8 points**	**Unsatisfactory below 8 points**

LG #15	LO #3- Store intake raw materials

Instruction sheet

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

- Determining different content of raw materials
- Routing screened raw materials to batch bins or other containers

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:

- Determining different content of raw materials
- Routing screened raw materials to batch bins or other containers
-

Learning Instructions:

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

1.1 **Measure Brix in wine grapes**

Knowing the level of sugars is important throughout winemaking,

One of the best ways to gauge when to harvest grapes (along with visual clues and taste) is measuring the sugar levels of grapes.

Brix can roughly be multiplied by 0.55 to determine the amount of alcohol the resulting wine will have if fermented to dryness.

White grapes are generally harvested between 20–24 °Brix, which will yield a wine of 11–13.3% alcohol by volume (ABV).

Red wines, which are usually slightly higher in alcohol, are often made from grapes harvested from 22–26 °Brix, yielding wines in the range of 12.1–14.3% ABV.

If a grape's Brix is too low the resulting **wine will be:**

- low in alcohol and higher in **acidity**
- whereas too high of a Brix reading will result in unbalanced wines in the other direction and potentially lead to fermentation problems if the yeast cannot handle such high alcohol levels.
- Harvest decisions should never be made on Brix alone, but having an understanding of the potential alcohol is a key factor in making the decision on when to pull the trigger on harvest.

Once grapes are harvested, measuring Brix in your fermenting must is just as important as a way to track fermentation progress.

- As more sugars are consumed by yeast, the Brix reading will decrease.
- When a wine is fermented to dryness;
  - ✓ the Brix reading will be below 0,
  - ✓ Alerting that fermentation is complete.
- When Brix readings a **day or two apart during** fermentation are unchanged, this is a sign that fermentation could be **stalled a**nd that it is time to intervene to get it going again (more on dealing with a stuck fermentation can be found here.

1.2 Cereal grains

All cereal grains have high energy values, mainly from the starch fraction, but, also from the fat and protein portions.

Apart from moisture content and inedible substances such as cellulose, cereal grains contain carbohydrates- mainly starches (comprising 65 to 75% of their total weight), as well as proteins (6 to 12%) and fat (1 to 5%) along with traces of minerals and vitamins. Wheat grains are generally oval shaped, although different wheats have grains that range from almost spherical to long, narrow and flattened shapes. The grain is usually between 5 and 9mm in length, weighs between 35 and 50mg and has a crease down one side where it was originally connected to the wheat flower. The wheat grain (Fig 1) contains 2-3% germ, 13-17% bran and 80-85% mealy endosperm (all constituents converted to a dry matter basis) (Belderok et al., 2000) The protein content of wheat grains may vary between 10% - 18% of the total dry matter.

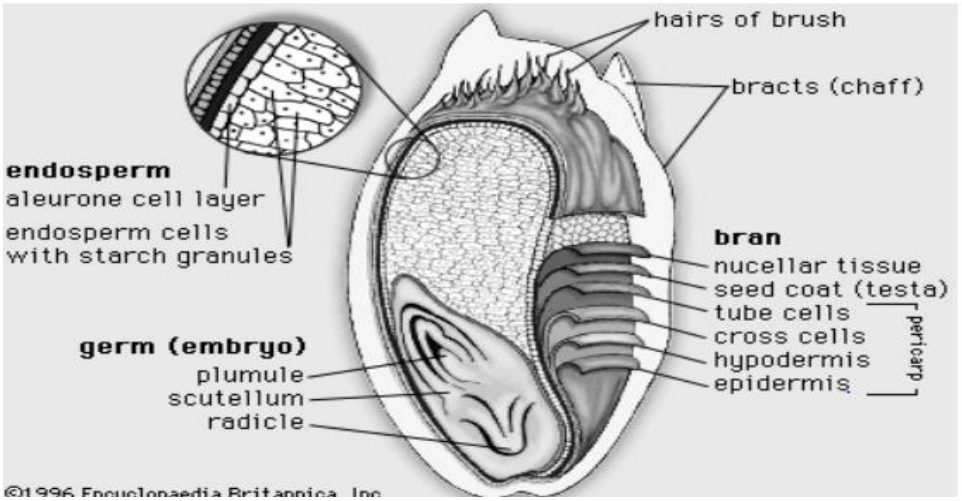


Fig. 47 Wheat grain anatomy

Sequential extraction of ground wheat grain results in the following:

- protein fractions:
- albumins, which are soluble in water;
- globulins are insoluble in pure water
- but soluble in dilute NaCl solutions, and insoluble at high NaCl concentrations;
- gliadins
- soluble in 70% ethyl alcohol
- glutenins are soluble in dilute acid or sodium hydroxide solutions.
- Albumins are the smallest wheat proteins followed in size by globulins.

Sorghum

produces approximately 70 million metric tons of grain from about 50 million hectares of land.

It is the dietary staple of more than 500 million people in more than 30 countries. Only rice, wheat, maize, and potatoes surpass it in feeding the human race

It is primary food for millions of Africans, Asians, and Latin Americans, sorghum is low in protein digestibility.

It must be properly processed to improve its digestibility.

It is perhaps for this reason that much of Africa's sorghum is subjected to fermentation before it is eaten.

Carbohydrates

- With starch making up from 32 to 79 percent of its weight.
- The remaining carbohydrates are largely sugars and
- Quite high in certain rare varieties of sorghum grains.

The starches in most sorghums occur in both;

- Polygonal and spherical granule
- Ranging in diameter from about *5μ* to 25*μ* (average 15*μ*).

Chemically, the starch is made up of;

- 70-80 percent branched amylopectin (a nongelling type) and
- 20-30 percent amylose (a gelforming type).
- some sorghum starches contain as much as 100 percent amylopectin;
- Others, as much as 62 percent amylose.

In its properties, sorghum starch resembles maize starch, and the two can be used interchangeably in many industrial and feed applications.

When boiled with water, the starch forms an opaque paste of medium viscosity.

On cooling, this paste sets to a rigid, nonreversible gel.

The gelatinization temperature ranges from 68° to 75°.

Protein

Sorghum's protein content is more variable than that in maize and can range from 7 to 15 percent.

The kernel contains about 12 percent, which is 1-2 percentage points higher than maize.

The protein's amino-acid composition is much like that of maize protein.

Lysine is the first limiting amino acid, followed by **threonine.**

Tryptophan and some other amino acids are a little higher than in maize.

The protein contains no gluten.

A large proportion of it is prolamine, a cross-linked form that humans cannot easily digest.

In fact, prolamine makes up about 59 percent of the total protein in normal sorghum.

This is higher than in other major cereals, and it lowers the food value considerably.

In the long term, sorghums that have less prolamine may come available for routine use.

A few of these more nutritious types have already been found: two in Ethiopia and one in the Sudan for instance.

Until such quality-protein sorghums are perfected, however, sorghum grain needs to be processed if its full protein value is to be realized.

Fat

Sorghum contains about 1 percent less fat than maize. Free lipids make up 2-4 percent of the grain and bound lipids 0.1-0.5 percent.

- The oil's properties are similar to those of maize oil.
- The fatty acids are highly unsaturated.
- Oleic and linoleic acids account for 76 percent of the total.

Vitamins

Compared to maize, sorghum contains higher levels of;

- the B vitamins pantothenic acid
- niacin
- Folate
- and biotin; similar levels of
- riboflavin and pyridoxine; and
- Lower levels of vitamin A (carotene).

Most B vitamins are located in the germ.

Pellagra—a disease caused by too little niacin in the diet—is endemic among certain sorghum eaters (as it is among some maize eaters).

Minerals

The grain's ash content ranges from about 1 to 2 percent. As in most cereals, **potassium and phosphorus** are the major minerals.

The calcium and zinc levels tend to be low.

Sorghum is good source of more than 20 micronutrients

Compositionally, cereals consist of 12-14 percent water, 65-75 percent carbohydrates, 2-6 percent lipids and 7-12 percent protein. Cereals are quite similar in gross composition being low in protein and high in carbohydrates.

Oats and maize however contain relatively large amounts of lipids.

Oats contain at least 10 percent lipids, one-third of which are polar lipids (phospho- and galacto-lipids).

The lipid content of maize ranges between 0.4 percent and 17 percent, most of which are triacylglycerides.

Different cultivars of a given type of cereal exhibit compositional variability.

The chemical components of cereals are not uniformly distributed in the grain

Hulls and bran are high in cellulose, pentosans and ash.

The aleurone layer of wheat contains 25 times more minerals than the endosperm; whereas the lipids are generally concentrated in the aleurone and germ.

The endosperm, which contains mostly starch, has a lower protein content than the germ and the bran, and is low in fat and ash.

Proteins

Early workers divided the proteins of wheat into four solubility classes called Osborne fractions: albumins, which are water soluble; globulins, which are soluble in salt solutions, but insoluble in water; gliadins, which are soluble in 70-90 percent alcohol; and glutenins, which are insoluble in neutral aqueous solutions, saline, solutions, or alcohol. The respective protein fractions from wheat are also applicable to other cereals and are generally known as albumins, globulins, prolamines, and glutelins. The distribution of these protein fractions varies among different cereals. There is considerable variation in the solubility classes among the cereals and also to some extent within each species of cereal. Albumins range from 4 percent in maize to 44 percent in rye, globulins from 3 percent in maize to 55 percent in oats, prolamins from 2 percent in rice to 55 percent in maize, and the glutelins from 23 percent in oats to 78

Table 2. Proximate composition of cereal grains

CEREAL	CRUDE PROTEIN	CRUDE FAT	ASH	CRUDE FIBRE	AVAILABLE CARBOHYDRATE
Brown Rice	7.3	2.2	1.4	0.8	64.3
Sorghum	8.3	3.9	2.6	4.1	62.9
Rye	8.7	1.5	1.8	2.2	71.8
Oats	9.3	5.9	2.3	2.3	62.9
Maize	9.8	4.9	1.4	2.0	63.6
Wheat	10.6	1.9	1.4	1.0	69.7
Barley	11.0	3.4	1.9	3.7	55.8
Pearl Millet	11.5	4.7	1.5	1.5	63.4

Self-Check – 1	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

III. <u>Write short answer/s</u>

2 Write the importance of documenting materials.(5 points)

3 What are the things be documented and checked during oil seed storage.(5points)

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

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

1.1 Raw Material

Raw materials (food grade) at the site includes fresh whole milk, skimmed milk, butter oil, sugar, and cocoa mass the latter being heated to ensure that it remains a liquid for ease of distribution throughout the facility.

Bulk raw material is stored in a number of silos located at the intake area which is in the immediate vicinity of the production buildings. From here the raw materials are pumped to the crumb factory for processing.

A register of Tanks and Silos is appended as attachment H1.1. H1.2

- Intermediate Products
- Finished Products

Intermediate product such as sweet condensed milk is also stored in the **immediate vicinity** of the production buildings. All product packaging is stored in the powder stores.

Depending on the mode of transport used to ship final product produced, finished product is stored in different areas of the plant as follows:

- Bulk crumb – Crumb silos
- Bagged crumb – Crumb stores

Self-Check – 2	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

IV. Write short answer/s

4 Write the importance of documenting materials.(5 points)

5 What are the things be documented and checked during oil seed storage.(5points)

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

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

LG #16	LO #4-Record information

Instruction sheet ::

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

- Recording workplace information
- Signing all records
- Communicating information records
- Keeping workplace information records

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

- Record workplace information
- Signing all records
- Communicate information records
- Keep workplace information records

Learning Instructions:

10. Read the specific objectives of this Learning Guide.
11. Follow the instructions described below.
12. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
13. Accomplish the “Self-checks” which are placed following all information sheets.
14. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
15. If you earned a satisfactory evaluation proceed to “Operation sheets
16. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
17. If your performance is satisfactory proceed to the next learning guide,
18. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Recording workplace information

Records are 'information created, received, and maintained as evidence and information by an organization or person, in pursuance of legal obligations or in the transaction of business activity are generated and reflect what was communicated or decided or what action was taken.

Ethical requirements

Ethical principles and codes of practice must also be followed when collecting and processing workplace information.

Organisational policies and procedures will outline consequences, such as disciplinary action, when ethical principles and codes of practice are not followed. Below is a list of some ethical principles and codes of practice that may apply in the workplace.

Records Management is 'the efficient and systematic control of the creation, receipt, maintenance, use and disposal of records, including processes for capturing and maintaining evidence of and information about business activities and transactions in the form of records'

Records are retention for periods of time a specified period for which a record must be kept before it may be destroyed.

Detailed records are taken of all tests results, and the information is used to select the raw materials of beverage industry.

Recording the sampling test parameters during the receiving and test of raw materials in beverage industry specified/ like: grain and perform size and weight protein

- moisture
- nitrogen
- pests
- taint
- weather damage e.g., sprouting, black-tip
- metal and other foreign objects
- total fermentable sugar
- reducing sugar
- acidity
- colour
- turbidity
- ash
- floc test
- extract
- Calcium & magnesium as sulphate
- Brix (Total dissolved solid content)
- Sieving test
- Thousand kernel weight
- Hectolitre weight
- Germinating capacity
- Technical alcohol grade
- PH

Self-Check – 1	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

V. <u>Write short answer/s</u>

6 Write the importance of documenting materials.(5 points)

7 What are the things be documented and checked during oil seed storage.(5points)

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

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

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Information Sheet 2- Signing all records

All the record you put

Accurately locate the appropriate recording mechanism for the information you need to record

Where records do not currently exist, set them up, or work with the appropriate people to get them set up. Make entries into records that are accurate, complete and, in the case of written records, legible

- Record information within required timescales
- Store updated records accurately in the correct location
- Follow procedures when records are transferred to another location
- Maintain security and confidentiality of information recorded, in accordance with requirements
- Take the appropriate action to resolve or report any **errors or omissions** that are discovered in the records, or any problems with maintaining, storing or retrieving records

The systems for record keeping and storage used within the organization;

- The records which you are required to update and where they are located
- The correct format in which records must be completed
- When records should be completed
- The limits of your responsibility for handling and using records
- our responsibility under relevant legislation
- What the records are used for and the importance of accurate record keeping
- **Procedures for transferring records**
- Records that are confidential or commercially sensitive and how to deal with these

Types of records

- Paper-based records are one of the most common ways of dealing with information. Examples of paper-based records include:
  - ✓ reports
  - ✓ magazines
  - ✓ journals and newspapers
  - ✓ project files
  - ✓ Contracts
  - ✓ minutes of meetings
  - ✓ business letters

- ✓ email messages and memos
- ✓ faxes
- ✓ Forms
- ✓ diaries and other note-taking method

File and store information

When you process information, you may be required to catalogue items in the filing system after you have collected, updated or modified them. You'll need to know:

- What information to keep
- the legal requirements of keeping the information
- your organization's filing procedures
- The security issues surrounding the information.

Collection of information in laboratory sample examination

Name of raw material : _____

Lot number : _____

Sample Date : _____

Testing method : _____

Date of acceptance/rejection : _____

_

Date of Received Goods : _____

Received From : _____

Reason of acceptance /rejection : _____

Goods Assessment Report : _____

_____

_____

Analysis Report by QC Officer: _____

_____

_____

Accept/Return Goods Assessment Report

Approved By QA Executive : □ Yes □ No

Precise Action to be Taken : _____

Remarks by Manager QA : _____

Prepared By	Analysed by	Authorized by
Officer Q.A	Executive Q.A.	Manager Q.

Figure.48 Recording files

All Activities Being Recorded Sign. An All Activities Being Recorded Sign has effective messages to address security policy and protection concerns. An All Activities Being Recorded Sign is a helpful tool to help protect the health and safety of personnel, and is not a replacement for required protective measures for lessening or removing hazards. All activities which are undertaken starting from preparation of storage area to storing the raw materials should be recorded and signed by the concerned personnel.

Workplace information is recorded clearly and accurately in the format and at the time required by the organization. Records provide the industry manager with data, information and knowledge.

Self-Check – 2	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

VI. Write short answer/s

8 Write the importance of documenting materials.(5 points)

9 What are the things be documented and checked during oil seed storage.(5points)

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

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

Self-Check – 1	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

VII. Write short answer/s

10 Write the importance of documenting materials.(5 points)

11 What are the things be documented and checked during oil seed storage.(5points)

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

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

Information Sheet 3- Communicating information records

1.1. Communicating information records

If work is being taken over by the next shift or another crew, a handover should occur. This involves discussing the stages, **testing sample have been taken (e.g. turbidity,**

PH, alcoholic test, acidity, TDS, microbiological test etc.) the work is at and changing over locks and personal danger tags.

The only worker who should remove personal danger locks and tags is the person who put them in place. A procedure should be available which first considers all options to allow the person who placed the lock and tag to personally remove them, consider emergencies and/or if the worker is unable to remove the lock. If the worker cannot remove the lock and tag, the employer should ensure:

- ✓ **a senior person is accountable for the lock and tag**
- ✓ **the situation is assessed to be safe before removing the lock and tag**
- ✓ **Ensure the removal is validated and signed off by two or more people.**

To do any activity ,technician should communicated with concerned body via necessary communication channels ,which may be up ward and down ward or horizontally these may leads to avoid unnecessary production down time and other related messes. And after all you have to get a confirmation to go ahead maintenance activity, unless never do maintenance activity by yourself.

Self-Check – 3	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

VIII.Write short answer/s

12 Write the importance of documenting materials.(5 points)

13 What are the things be documented and checked during oil seed storage.(5points)

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

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

Information Sheet 4- Keeping workplace information records

Keeping track of information

Storing information in a centralised area allows everyone to access information easily, whether it is paper-based or in electronic form.

However, systems must be in place to control the movement of information so everyone knows where a file is at any moment.

- In some organisations, file security is extremely important.
- These include:
  - ✓ organizations that keep sensitive information about their customers such as insurance companies,
  - ✓ legal firms and government departments
  - ✓ **organisations developing new products where information revealed to competitors may disadvantage the organisation**
  - ✓ organisations that do politically sensitive work.
  - ✓ Files that are confidential, or have restricted access, are generally kept separate from the main filing system.
  - ✓ Sometimes they are tagged to indicate their security rating (for example, general, personal, restricted, confidential, secret and top secret).
  - ✓ Electronic files are more difficult to store separately,
  - ✓ especially with a networked computer system,
  - ✓ So other measures are used such as password protection.

Methods used to keep confidential or restricted files secure include:

- keeping hard-copy files locked
- requiring signed authorisation from a manager for access to files
- using passwords to access restricted computer files
- storing confidential computer files on a CD or other storage device rather than on the hard drive (the CD can then be stored in a locked cupboard)
- Using encryption, a method in which the computer file is coded and requires a decoding key to open and translate the file.
- If you require access to confidential or restricted files, you will need help to make sure you completely understand the policies and procedures for accessing such files.

It is particularly important that the movement of these files is accurately recorded to ensure they are not accidentally released into the wrong hands or lost. It is equally important to look after the organisation's files while you are using them. When files are out of the filing system, they should be kept in a safe place and treated with care.

Don't leave documents lying unprotected on your desk, especially overnight.

Place them in a folder, a desk drawer or a file.

Be careful not to damage or remove material from a file.

If something must be removed from a file temporarily (for example, to photocopy it) it should be recorded by using a marker, such as an out card, and returned to exactly the same place in the file.

Maintaining information and filing systems

Maintaining an information system means keeping records up to date.

- All information within the system should be current and easy to access.
- Updating records is a day-to-day task for any organisation.
- The specific procedures for doing this may vary from place to place.
- Keeping records up to date might include **modifying particular records** by changing information or adding information to them.
- For example, updating:
  - ✓ **raw material sample taking procedures**
  - ✓ **Sample test procedures**
  - ✓ **Standards and specifications (set points)**
  - ✓ **Sample test reports**
  - ✓ **stock records to make sure they match the actual number of stock items**
  - ✓ sales records to make sure they match the number of sales made
  - ✓ customer and supplier details to make sure the details are correct
  - ✓ account details to make sure the amounts owed by customers, and to suppliers, are correct
  - ✓ technical information to ensure it is current
  - ✓ Daily, weekly or monthly sales targets, to reflect current goals regular specials lists or offers. Some records need to be updated when policies, procedures, legislation or regulations are changed.
  - ✓ Part of your job may be to replace old information in the organisation's files with updated information.

- ✓ You need to do this correctly, so your organisation can easily access up-to-date information and carry out procedures in a lawful way.

Inaccurate records can be worse than having no records at all.

- Imagine what would happen if:
- Coding /lot was wrong
- Testing procedure document was wrongly written
- Name of sample tested raw materials was recorded incorrectly on the database
- a customer's address or telephone number was recorded incorrectly on the database
- a wrong 'received' date was stamped on an invoice sent to your organization
- an invoice sent to one of your customers was recorded differently in the company records from the amount appearing on the invoice
- a file number was recorded incorrectly on the file index.
- Inaccurate records cause problems and confusion.
- If somebody looks at a record and the information is inaccurate or missing, at best they may need to spend time sorting out what the correct information is. At worst, it may affect the organisation's reputation; for example, customers may be upset
- Or accounts may not be paid on time.

When updating a file, always double check: file codes the index to the filing system

- dates
- Supplier name
- Type sample testing
- Raw material name
- names, titles and addresses of supplier
- Telephone
- Fax
- email and website addresses

Self-Check – 4	**Written test**

Name…… ID……Date……

Directions: Answer the questions listed below.

IX. Write short answer/s

14 Write the importance of documenting materials.(5 points)

15 What are the things be documented and checked during oil seed storage.(5points)

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

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