BREAD FAULTS

Bread faults can be divided as under:-

1. External faults
2. Internal faults

External Faults: These faults are those faults which could be seen from outside. They are divided into five types:-

a) Faults in Volume
b) Faults in Crust
c) Faults in shell top
d) Irregularity of shape
e) Lack of cleanliness

Internal Faults: These are those faults which can only be seen by cutting the bread.

a) Holes and tunnels
b) Core,seams,streaks , condensation marks
c) Damp,clamy and closed crumb
d) Dryness and rapid staling
e) Crumbliness of the crumb
f) Defects in taste and aroma

Causes	Remarks
a) Faults in Volume (Lack of volume)	
1. Wrong type of flour	In all these conditions gluten could not ripen adequaltely or got over ripened, which canot retain the produced gas.
• Green flour	
• Too old flour	
• Too strong or soft flour	
• Over bleached flour	
• More chemical improvers	
• Excessive diastatic activity	
2. Wrong type of yeast	In all these factors there will be less fermentation resulting into poor volume
• Too much or too less yeast	
• Poor quality or old yeast	
• Yeast added in too cold or too hot water	
3. Gluten affecting factors	
• Excessive salt	Makes gluten harder
• Excessive fat	Fat surrounded to gluten, hence gluten structure could not be framed
• Excessive use of milk powder or milk	Makes gluten stronger
• Under or overmixing	
• Excessive bran quantity in flour	Breaks the gluten cell framework
4. Fermentation not proper	
• Too slack or too stiff	In all these conditions either fermentation will be less, resulting in less gas production
• Too warm or chilled dough	

	ultimately less volume or fermentation
• Insufficient weight for the pan size	
• Improper Proofing	
➢ Stiff batter not allowed to ferment properly	It results in over or under proofing
➢ More or less temperature or humidity in proofing box	
➢ Excessive greasing	
• Skinning during any bread processing operation	It makes the crust harder which does not allow the crumb to rise
• Improper Baking	
➢ Excessive heat during baking	
➢ Improper distance between bread pan	
EXCESSIVE VOLUME	
All the opposite causes those are above mentioned above result in excessive volume	
b) Faults in Crust colour	
1.Lack of crust colour or pale crust colour	
• Low flour	
• Low sugar in formula	
• Over fermentation	
• Excessive dusting flour	
• Insufficient humidity (Skinning of dough)	
• Under baking	
• Cold oven	
• Low top heat in the oven	
2. Dark Crust colour	
• Opposite conditions of the above mentioned causes	
• Excessive milk powder	
• Lack of humidity in oven	
• Flash heat	
3. Cracking of Crust	
• Dough skinning before baking	
• Short process of bread preparation	
• Over proofed dough	
4. Leathery Crust (Wet Crust)	
• Excessive humidity during proofing or baking	In such conditions crust absorbs water and results in leathery crust
• Insufficient cooling before packing	
• Too slack dough	Excess water could not evaporate while baking results in soggy crumb which in turn is absorbed by crust during storage period hence crust becomes leathery.

5. Hard Crust	
• Excessive use of bread improvers or bleaching agent	
6. Thick Crust	
• Too strong or weak flour	
• Low diastatic activity in flour	
• Less sugar and fat in formula	
• Over ferment dough	
• Low humidity in oven	
• Cool oven	
7. Blisters	
• Improper mixing	
• Young dough	
• Improper distribution of baking pan in the oven	
• Rough handling in the oven	
8. Lack of bloom	
• Inferior quality of raw material	
• Imbalanced formula	
• Improper fermentation	
• Improper proofing or baking conditions	
c) Faults in Shell Tops	
1. Under ripened dough	
2. Young dough	
3. Under proofing	
4. Insufficient humidity while proofing	
5. High baking temperature in case of insufficient oven steam	
d) Irregularity of shape	
1. Too strong or weak flour	
2. Less bread improvers	
3. Improper mixing	
4. Too slack or stiff dough	
5. Over ripenend dough	
6. Excess dough as compared to bread pan size	
7. Dough skinning due to insufficient humidity or over proofing	
8. Rough handling of bread	
9. Over loading in oven	
e) Lack of cleanliness	
1. No sieving or cleaning of flour as well as other raw material.	Threads, jute threads of bags, chunks of wood or other impurities present in raw material may get mixed with dough and find in bread.

2. Carelessness while working	Impurities present on table or nearby working place may mixed into dough
3. Excessive fat used for greasing	Some fat may get deposited in bread tin corners resulting into dark spots.
4. Use of unclean working table, machinery, equipments, bread tins or cooling racks etc	
5. Handling of bread with dirty hands	
6. Presence of sugar crystal or lumps of milk powder produces dark spots	This may be caused due to improper dilution of sugar or milk powder.
Internal Faults	
a) Holes and tunnels in bread	
1. Weak Gluten(Old flour, soggy flour)	Weak gluten cannot retain the expanding gas results in breaking of strands
2. Excessive use of yeast for strong flour	It results into inadequate gluten development and excessive production of CO2.The combined effects of both these results into gluten strand breaking.
3. Improper mixing of yeast, fat, milk powder, salt, sugar etc	Wherever the excess or less quantity of such ingredients is present, it breakdown the gluten strands.
4. Over Fermentation	It produces more gas which breaks the gluten strands
i. Excessive yeast	
ii. Less salt	
iii. Soft water	
iv. Slack dough	
v. High diastatic activity	
vi. No knock back	Gas produced during fermentation will not escape hence breaks the gluten strands.
5. Too hot oven	The hot surface may destroy the extensibility of gluten resulting in break down of gluten strands.
6. Excessive fat, improper mixing of fat, addition of fat in the machine during dividing, molding or handing up.	In all those cases, fat covers up the flour particles, which does not allow gluten formation.
b) Core	
1. Under mixing of dough	
2. Raw materials do not mix thoroughly	This may be caused in case of hand mixing
3. Skinning during fermentation, intermediate proofing, moulding	The hard skin of dough pieces mixed while knock back, rounding or molding and may cause core
4. Improper stretching of dough while molding	Some part may stretch less will made dense core
b) Seams	
1. Excess dough in bread tin 2.	

3. Placing cool dough in hot tin or hot dough in cold tin	In this condition fermentation on the dough surface which come in contact with bread tin is arrested, hence that part becomes dense.
4. Improper handling of bread tin after completion of proofing	
b) Streaks	
1. Improper mixing	
2. Excessive dusting flour	
3. Insufficient water	
b) Condensation mark	
1. High maltose flour	
2. High sugar content in the formula	
3. Insufficient dilution of sugar or milk powder	
c) Damp, Clammy and closed crumb	
	Excessive humidity while proofing or baking
1. Less moisture evaporation results in over moist crumb	Insufficient baking
2. The milk protein makes the gluten harder, which do not allow to leaven the dough properly resulting in damp crumb	Insufficient fat compared to milk powder
3. Excess fat do not allow to gluten formation resulting in damp crumb.	Excessive fat in plain white bread
	Excessive use of bread improvers
d) Dryness and Rapid Staling	
1. They are hygroscopic, so less salt and sugar could not retain moisture for longer time	Insufficient salt and sugar
2.	Excessive mineral improver
3. Gluten could not get ripened properly	Insufficient fermentation incase of stiff dough
4. Make gluten harder and water retention power is less hence bread becomes dry quickly.	Imbalanced formula in case of excess milk powder
5. Evaporate more moisture during fermentation as well as it also makes fermentation speedy hence the time required less, so the gluten development will not proper.	High fermentation temperature
6. Results in open grain structure through which moisture escapes speedily, that makes faster drying of the bread.	Over fermentation
7. Much moisture evaporation in oven will result in dryness.	Long baking time
e)Crumbliness of Bread	
1. Insufficient gluten development	Under fermentation

2. Dough becomes weak and loses elasticity	Over fermentation
	Slack dough
	Excess or less salt
	Excess fat
	Slicing of hot bread
	Excess mineral improvers
e) Defects in Taste and Aroma	
1.Such wheat contains off odour which transfer to the flour and finally into the product	Poor or inferior quality wheat used for flour production
2. The strong flavour is transfer to the flour and finally to bread.	Placing flour or other raw material near strongly flavored ingredient

➢ COMMON CAKE FAULTS, REASONS AND REMEDIES

➢ **EXTERNAL APPEARANCE**

- CRACKED TOP

REASONS:

- This usually occurs when the oven temperature is to hot which leads to the crust forming quickly while the cake is still rising which leads to the crust bursting to allow the cake rise. However, there are other culprits like:
- To much rising agents e.g.
- Cake tin too small
- Too much flour

REMEDY

- Check the temperature of your oven
- Insure you are using the right size of pan
- Follow the recipe correctly
-

CAKE FAULT: SUNKEN CAKE :

REASON:

- This usually occurs when the temperature of your oven reduces during baking and this happens when you either open the oven before the cake sets or when the oven goes off before the cake sets. Other factors include;
- Oven temperature too low
- Too much of a particular ingredient e.g. fat, baking powder, sugar etc.
- REMEDY
- Do not open your oven till your cake sets and this usually takes about 30-40 minutes depending on your oven and the size of your cake. another way to know if it has set is if you start perceiving your cake. RESIST THE URGE TO PEAK AT YOUR CAKE!
- Check your oven temperature
- Follow the recipe correctly

SIDE OF THE CAKE CRUNCHY/BURNT

- REASON:
- This usually happens when you leave your cake in the oven for too long. Other factors include:
- Too much fat used to butter pan
- Oven temperature too hot
- Butter not suitable for baking
- Cake tin not sufficiently lined
- REMEDY
- Do not over bake your cakes
- Check your oven temperature
- Butter and flour or line your pan well
- Check your baking ingredients whether it is suitable for baking.

CAKE STUCK TO THE PAN

REASON:

This usually occurs when the pan used is not greased well or when the cake is cooled in the pan for too long.

REMEDY

- Grease your pan well
- Let your cakes cool in the pan for just 15 mins, then turn them over to a cooling rack to complete the cooling process

CAKE TOO DARK

REASON:

- Oven temperature too hot
- Incorrect amount of water/liquid
- Excessive sugar

REMEDY:

- Check your oven temperature
- Follow the recipe correctly

CAKE BURNED ON TOP

REASON

- Oven temperature too hot
- Incorrect amount of water/liquid

REMEDY:

- Check your oven temperature
- Follow the recipe correctly

CAKE SHINY AND STICKY

REASON

- Oven temperature too cool
- Not baked long enough
- Too much sugar in recipe

REMEDY:

- Check your oven temperature
- Make sure your cakes are well-baked
- Follow the recipe correctly

CRUST TOO THICK

REASON:

- Excessive baking time

REMEDY:

- Do not over bake your cakes

CAKE SHRINKS

REASON:

- Excessive liquid
- Oven temperature too hot
- Improper mixing procedure
- Cake baked too long

REMEDY

- Follow the recipe correctly
- Check your oven temperature
- Do not over bake your cake
- Do not over mix the cake
- CAKE ROSE UNEVENLY

REASON:

- Flour was not blended well into the main mixture
- Oven temperature uneven
- Oven temperature too high

REMEDY

- Mix your batter well
- Check your oven temperature
- INTERNAL CAKE APPEARANCE

CAKE VERY DENSE/ DENSE GRAIN

REASON

- Enough air wasn't beaten into the cake
- Eggs added too quickly
- Not enough rising agent
- Excessive liquid
- Improper mixing

REMEDY

- Mix your batter well
- Follow the recipe correctly
- Mix your batter well

COARSE AND IRREGULAR GRAIN

REASON:

- Improper mixing procedures
- Stiff batter
- Oven temperature too cool
- Batter turned too much

REMEDIES

- Mix your batter correctly
- Follow the recipe correctly
- Check your oven temperature

OFF COLOR CAKES

REASON:

- Unclean equipment
- Oven temperature too cool
- Improper mixing procedure

REMEDY

- Check your oven temperature
- Mix your batter well
- Use clean equipment

SUNK FRUITS

REASON:

- Fruits are too large/heavy
- Sugary syrup on outside of fruit was not washed off causing fruits to slide through mixture when heated
- Cake mixture over beaten/ too wet so could not hold fruit in place
- Oven temperature too hot

REMEDY

- Coat your fruits with flour before adding them to your batter
- Check your oven temperature
- If the fruits are too large, cut them to smaller bits before adding to your batter
- Do not over mix your batter
- Wash your fruits properly

BURNT ON TOP, ISN'T COOKED IN THE MIDDLE

REASON:

- Cake tin too small
- Oven temperature too hot

REMEDY:

- Use the right pan size
- check your oven temperature
-

➢ GENERAL FAULTS

BATTER OVER FLOWED

REASON

- Wrong adjustments to recipes
- Cake tin too small

REMEDY:

- Use the right size of pan
- Adjust the recipe properly

POOR FLAVOR

REASON:

- Improper mixing procedure
- Faulty baking conditions
- Improper cleaning of equipment

REMEDY:

- Mix your batter properly
- Check your baking conditions
- Clean your equipment well
- Use pure flavors instead of imitation

CAKE TOO TOUGH

REASON

- Excessive mixing
- Batter too stiff(insufficient water)

REMEDY:

RICE QUALITY CHARACTERS

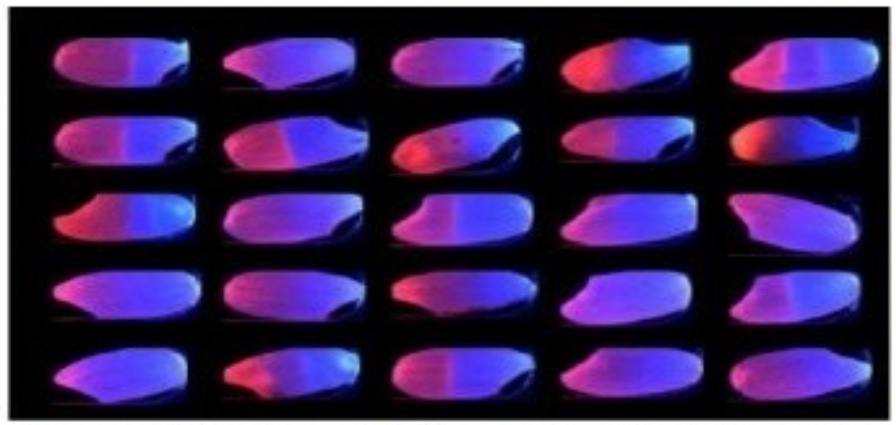
- The **length** and **width** of a rice grain are important attributes that determine the class of the rice. There are three main classes of rice, based on grain length: short, medium and long. In terms of width, Arborio styles are generally the widest, followed by short, medium and long. The ratio of the length and the width is used internationally to describe the shape and class of the variety. The other important aspect of length and width is uniformity all the grains in one sample must look the same

- Cracking decreases head rice yield because cracked grains often break during milling. Most markets require whole or unbroken grain, therefore cracked grain can reduce payments received by the grower and the miller.

- Cracking also decreases the cooking quality of the grain. Grains that are cracked but remain intact during milling are deemed visually undesirable.

- Further, during cooking the starch leaches out of cracked grain and collects as a sticky layer on the bottom of the rice cooker. If rice is cooked by the rapid boil technique, the starch leaches from the rice into the cooking water.

- Crack Detector
  Using the Paddy Crack Detector, count the number of cracked grains in a 100 grain sample then compute the % cracked grains.



Cracks in grains can be detected by red and blue light

The whiteness and translucence of rice is important...

- The whiteness ranges from white to yellow. Yellowness occurs because of aging or higher protein content. The higher protein content changes the cooking properties of rice, particularly increasing the propensity of the rice to undergo retrogradation cooling on cooking.
- Translucence relates to the degree of crystallinity of the starch a function of the structure and packaging of the amylopectin molecules, and to the ability of the light to be refracted without interfering with protein bodies. High protein detracts from quality.

Chalkiness...

- **Chalk** is the opaque area in the rice grain and is undesirable in almost every market. Chalky areas occur because of malformed starch granules with air spaces between them. Chalky areas cook differently from translucent areas, but only a very clever palate could detect the difference. There are small differences in the solubility of the starch and the gelatinization temperature of the chalky and translucent areas, but research has yet to discover why.



A visual rating of the chalky proportion of the grain is used to measure chalkiness based on the standard Evaluation System SES scale presented below:

Scale	% area of chalkiness
1	less than 10
5	10-20
9	more than 20

%chalky grains = wt of chalky grains / wt of milled grains * 100

Cooking and Eating characteristics

Gelatinization temperature

- Unmodified starch granules are generally insoluble in water below 50°C. Over a critical temperature range, the starch granules undergo irreversible process known as gelatinization Temperature (GT).

Amylose content

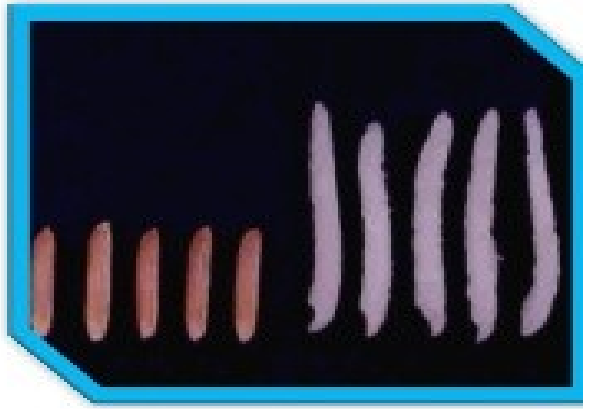
- Amylose content (AC) is the single most important character predicting rice cooking and eating quality features
  - Low amylose varieties are moist, sticky and glossy; when cooked readily split and disintegrate when over cooked.
  - Rice with high amylose, cook dry and fluffy but become hard on cooking.
  - Intermediate types are fluffy but retain soft texture when on cooling.

Gel consistency

- Gel consistency (GC) determines the cohesiveness, tenderness and gloss of cooked rice when the amylose content is high.

Grain elongation and aroma:

- Aromatic long grain basmati rices are known for their pleasant aroma and extra elongation on cooking with least breadth wise swelling.
- Lengthwise expansion without increase in girth is considered a highly desirable trait in some high quality rices such as Basmati rices



- The aroma of rice plays a dominant role in consumer acceptability and it draws premium price in certain speciality markets.



Quality traits	Range	Minimal acceptable range
Hulling %	75 – 80	-
Milling %	70 – 75	65
Head rice recovery %	30 – 60	45
Kernel length (mm)	3.0 – 8.0	>6.61
Kernel breadth (mm)	2.0 – 3.0	<2.0
L/B ratio	1.5 – 3.5	3.50
Amylose (%)	1.0 – 32.0	20-25
Alkali value (GT)	2.0 – 7.0	4-7
Gel consistency (mm)	27 – 100	>40
Kernel colour	Black – Red – Brown – white	-
Transparency	Translucent – chalky	-
White belly	Present occasionally present – Absent	-
Classification	Fine – Medium – Bold	-

Grain shape:

- Follow the procedure of determining grain shape of paddy. Based on the length to width ratio, the shape of the milled rice will be determined. The ISO Classification is as follows:

Scale	Shape	L/W ratio
1	Slender	Over 3.0
3	medium	2.1 – 3.0
5	bold	1.1-2.0
9	round	1.0 or less

- Moisture content Moisture content has a marked influence on all aspects of paddy and rice quality and it is essential that paddy be milled at the proper moisture content to obtain the highest head rice yield. Paddy is at its optimum milling potential at moisture content of 14%. Grains with high moisture content are too soft to withstand hulling pressure without undue breakage and may be pulverized. Grain that is too dry becomes brittle and has greater breakage.
- Moisture content and temperature during the drying process is also critical as it determines whether fissures and/or full cracks are introduced into the grain structure

- Head rice percentage. The head rice percentage is the volume or weight of head grain or whole kernel in the rice lot. Head rice normally includes broken kernels that are 75-80% of the whole kernel. High head rice yield is one of the most important criteria for measuring milled rice quality. Broken grain has normally only half of the value of head rice. To a large extent, the characteristics of the paddy determine the potential head rice yield although the milling process is responsible for some losses and damage to the grain.

Amylose content:

- Amylose content is important because firmness and stickiness are two properties of cooked rice that influence consumer preference for, and use of different classes of rice
- Amylose content has traditionally been assessed by chemical analysis of the rice but technology has produced non-destructive methods using the NIR and the visible regions of the spectrum.

Mill. Amylose content is analyzed using the simplified iodine colorimetric procedure. Samples are categorized into low, intermediate and high based on the following grouping:

-

Category	%Amylose Content
Low	10-20
Intermediate	20-25
High	25-30

Gelatinisation temperature:

- **Gelatinisation temperature** is the temperature at which the starch in rice begins the process of cooking. At this point the starch granules take in water and lose their crystalline nature, a change that is irreversible. Rice starch usually gelatinises between 65*C and 85*C.

- Rice with a gelatinisation temperature at the lower end of the range often cooks to a softer texture and retrogrades less than rice with a gelatinisation temperature at the upper end of the range.

- Gelatinisation is often measured by the alkali spreading method. However technology has improved the measurement of this trait too. Differential scanning calorimetry gives the actual temperature of gelatinization and the energy required for the particular rice to pass through that transition.

- Gelatinization temperature is measured using alkali-spreading value. The alkali digestibility test is employed. Grains are soaked in 1.7% KOH and incubated in a 30°C oven for 23 hours. Measurement ranges based on the following:

Category	Temp ranges (°C)	Alkali Spread
low	55-69	6-7
Intermediate	70-74	4-5
High	75-79	2-3

- Gel consistency Gel consistency measures the tendency of the cooked rice to harden on cooling. Gel consistency is determined by heating a small quantity of rice in a dilute alkali. This test differentiates the consistency of cold 5.0% milled rice paste. Within the same amylose group, varieties with a softer gel consistency are preferred, and the cooked rice has a higher degree of tenderness.
- Harder gel consistency is associated with harder cooked rice and this feature is particularly evident in high-amylose rice. Hard cooked rice also tend to be less sticky

- Gel consistency.
- Two to 10 grains are selected and ground separately in the Wig-L Bug. Gel consistency is measured by the cold gel in a test tube, being held horizontally, for one hour. Measurement ranges and category are as follows:

Category	**Consistency, mm**
Soft	61-100
Medium	41-60
hard	26-40

Viscosity :

- **Viscosity** is a characteristic that indicates some of the cooking properties of rice. The cooking properties of rice are primarily measured by Rapid Visco Analysis (RVA), which mimics the process of cooking and monitors the changes to a slurry of rice flour and water, during the test

- The slurry is stirred constantly with a paddle and heated. Viscosity is measured as the resistance of the slurry to the paddle

TEXTURE:

- **Texture** describes what we might experience in our mouths when eating rice: initial mouthfeel, hardness, adhesiveness, cohesiveness, springiness, resilience, gumminess and chewiness.

Flavour and aroma:

- Basmati and jasmine are classes of fragrant style rice. Fragrant rice contains particular compounds that give the **rice flavour**. Otherwise, slightly perceptible changes in flavour of all rice classes can be caused by aging, storage, the depth of milling (i.e. the amount of polishing), the local environment and probably a number of other things.
- Flavour in fragrant rice is produced by volatile compounds, many of which are volatilised during cooking to produce an aroma
- Environmental conditions can cause a lot of the variation seen in aroma. Aroma is measured by simply sniffing the rice. Otherwise the peaks can be quantified by Gas Chromatography.

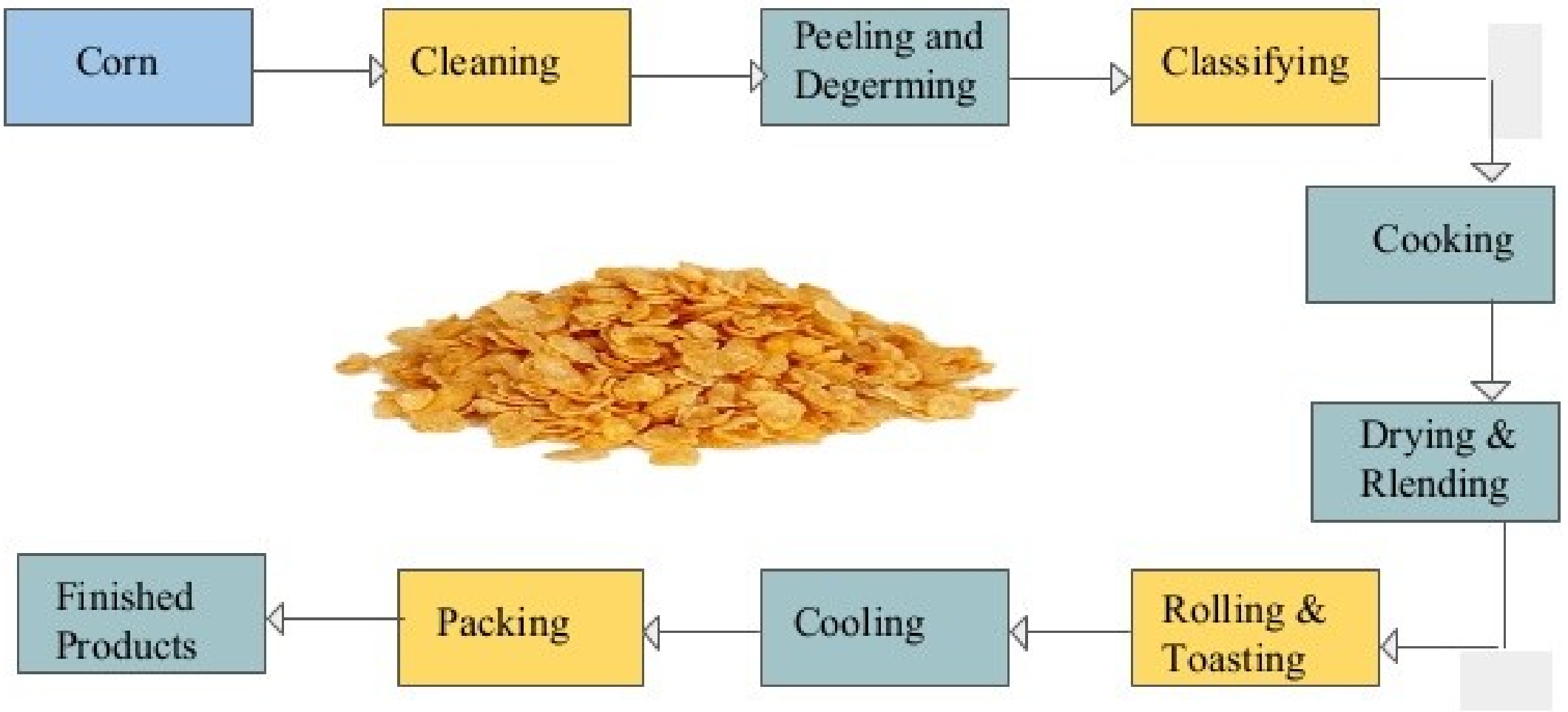
AROMATIC RICE

- Aromatic rice is one of the major types of rice.
- It is a medium to long-grained rice.
- It is known for its nut-like aroma and taste, which is caused by the chemical compound 2-acetyl-1-pyrroline.
- Varieties of aromatic rice include: basmati, jasmine, Texmati, Tulaipanji, Wehani, and wild pecan rice.
- When cooked, the grains have a light and fluffy texture.

Table 1. Codex specification of the particle size of different flours suggested with

Type of flour	Size	M.C (% m/m max)	Type of flour	Size	M.C (% m/m max)
Wheat flour	98% or more of flour shall pass through a 212 micron.	15.5	Corn flour	Not more than 2 % by mass of the material shall be retained on 75-micron IS Sieve and not more than 0.5 % by mass shall be retained on a ISO-micron IS Sieve.	12.5
Durum wheat flour	Durum wheat semolina maximum 79% shall pass through a 315 micron silk gauze.	14.5	Pearl millet flour	100% of flour shall pass through a sieve the dimensions of the mesh being diameter of 0.5 mm for "fine" flour and a diameter of 1 mm for "medium" flour.	13.0
Sorghum flour	100% of flour shall pass through a sieve the dimensions of the mesh being diameter of 0.5 mm for "fine" flour and a diameter of 1 mm for "medium"flour.	15.0	Corn-soy blend (super cereal)	95% of flour shall pass through a 600 microns sieve.100% must pass through a 1,000 microns sieve.	15.0

The Process Of Corn Flakes Is



Quality Control:

- Every step is carefully monitored for quality. Sanitation is necessary. Machines- Stainless Steel, thoroughly cleaned and sterilized with hot steam.
- Grain is inspected for any foreign material when it arrives, and when it is cooked and when it is shaped.
- To ensure the proper cooking and shaping, the temperature and moisture content of vitamins and minerals is measured to ensure the accurate nutrition information. Filled packages are weighed to ensure that the contents of each box is consistent.
- In order to label boxes with an accurate shelf life, the quality of stored cereal is tested over time. In order to be able to monitor freshness over a reasonable period of time, the cereals are subjected to higher than normal temperature and humidity in order to speed up the spoiling process.

QUALITY CONTROL MANAGEMENT IN BEVERAGE INDUSTRY

Maintenance of quality in beverage (Fruit-based and carbonated) not only helps the consumers in getting the desired quality product, but also promotes sales in the competitive markets. This can be achieved by exercising proper quality control measures at the three important stages, namely:

Raw Material control
Process control
Finished product control

Quality of Water In the Beverage Industry

As per the Bureau of Indian Standards 2346-1973, beverages shall mean non-alcoholic beverages containing dissolved carbon dioxide in properly sealed containers or dispensing units in a manner which ensures freedom from spoilage

Beverages are of two types:

a. Carbonated water or soda water with or without flavour.
b. Flavoured and sweetened carbonated water.

The beverages should be prepared from potable water and carbon dioxide confirming to Grade II of the Bureau of Indian Standards 307-1966. And all the ingredients used in the beverages of the carbon-dioxide should be clear, pure and fir for human consumption.

In appearance the beverages should be free from insects and rodent contamination, skins, and practically free from other extraneous matter.

Clean beverages should be of sparkling clarity and should remain so when stored under normal conditions. The cloudy beverage should be stable. The beverages should be carbonated to a pressure in accordance with their character. The beverages should however have a minimum of one volume of carbon-dioxide and a well-balanced and pleasant flavour.

REQUIREMENTS STIPULATED FOR BEVERAGES

Characteristics	Requirements
Arsenic mg/kg	0.25
Lead mg/kg	0.50
Copper mg/kg	1.50
Iron mg/kg	0.50
Total plate count per Ml. Max.	50
Coliform count in 100 ml	0
Yeast and mould carnet per ml. max.	2

Collection of Water Sample for Bacteriological Analysis

Collection of water sample is more important than the test itself since the collection of wrong sample and the results obtained thereon will be misleading and also the time, energy and money spent in collecting and sending the un-representative sample for test would be a sheer waste.

Sample Collection from Tap

First, a tap that is not leaky and which is in regular use should be selected before the sterilised bottle is cut open and kept ready as per the instructions given in the instruction sheet supplied with the bottle. Before collection of sample, the tap should be opened and the water allowed to flow for about 2 to 3 minutes in order to flush out the external contamination with bacteria If any .

Then the tap is closed and the mouth of the tap is sterilised with a spirit lamp or cotton wad soaked in spirit. The tap should then be opened and water allowed to run out for 1 or 2 minutes in order to cool the tap and then regulating the flow, the sample should be collected in the sterilised bottle leaving some air space.

Microbiological Test

1. Total calory count on sugar at 37° c in 24 hours.
2. MPN of coliform organisms at 37°c In 48 hours .
3. Coliform differential tests.

Chemical quality of water used in Beverage Industry

The water used in a beverage industry should have a satisfactory chemical quality similar to the requirement of potable water.

THE SAMPLE FOR CHEMICAL ANALYSIS

Characteristic	Requirement
Dissolved solids	500 mg/lit
PH Value	6.5 to 8.5
Total Hardness as $CaCo_3$	360 mg/lit
Iron as Fe	0.3 mg/lit
Manganese as Mn	0.1 mg/lit
Chlorides as Cl	2.50 mg/lit
Sulphate as So_4	1.50 mg/lit
Fluoride as F	1.2 mg/lit

Correction of Water Defects used in Beverages

Turbidity

Where the turbidity is more then a few part for a million less then 50 ppm. a pressure sand filter is generally employed and with this type of filter alum is used as a coagulant and generally fed to the raw water through a displacement feeder. The alum helps to coagulate the suspended matter on the surface of the sand bad which helps in the removal of very fine particles of suspended matter.

Colour

coagulation plant would be employed using chlorine to oxidise the iron or precipitate it Alum or other coagulants are used to reduce the colour.

Taste and odour

activated carbon purifiers offer the most simple and effective means of removing taste and odour. In others, super chlorination ahead of the purifier may be necessary.

Hardness

Hardness in water is referred to as temporary, when it is due to bicarbonates and carbonates, and as permanent when it is due to salts other than carbonates like chlorides and sulphates.

The first is lime-soda process, the second is the familiar Sodium Zeolite softening. A third method is a relatively new process of demineralization (reverse osmosis technique).

Sweetening Agents

Sugar, liquid glucose, dextrose monohydrate, invert sugar, fructose and honey are either singly or in combination used for sweetening the carbonated waters. It is hardly necessary to discuss the purity of these sweetening agents as they are available in highly refined forms.

As per the P.F.A. Rules 1955 a sweetened carbonated water shall have not less than 5 per cent total sugars, expressed as sucrose. In fruit products like fruit juice, fruit squash, fruit syrup, fruit beverage or fruit drinks, bulk of the added sugar forms the total soluble solid of the finished product.

Saccharin

Saccharin is one of the extensively studied artificial sweetener used in carbonated water .
The use of saccharin is permitted only in carbonated water up to 100 ppm under P.F.A.

Flavouring Agent

The retention of flavours during storage of fruit juice and beverage is of prime importance if they are to find consumer acceptance. Flavouring agents include flavour preparations of natural flavours, nature Identical flavours and artificial flavours which are capable of imparting flavouring properties.

As per Rule 64 BB of P.F.A. Rules 1955 where on extraneous flavouring agent has been added to any article of food, the label should carry the words, CONTAINS ADDED FLAVOURS.

Colouring Agents

Rule 24 requires that extraneous addition of colouring matter should be displayed on label in capital letters as CONTAINS PERMITTED COLOURS.

Preservatives
The principal preservatives in commercial use in beverage Industry are salts of benzoic acid and sulphur dioxide. P.F.A. Rules 1955 permit the use of sulphur dioxide up to 70 P.P.M. or Benzoic Acid up to 120 P.P.M. in sweetened ready to serve beverages .

Impregnation with Carbon-dioxlde
Since carbon-dioxide has an inhibiting action on the growth of moulds, this gas is used in combination with sterilisation, filtration and the like. The purity of carbon-dioxide used is also important. Even minor chemical contaminants are open to course taste deviation.

Metallic Contamination

Metals are wide in the juice industry, not only in the construction of crushers, presses and extractors, pumps, decorators, pasteurizers, coolers and filters, but also in the construction of storage tanks, pipes, hose fittings and the like.
Metallic irons may affect the flavour, colour and appearance of juice in different ways depending on certain conditions, particularly oxygen and the extent and nature of reducing conditions.

It is necessary to use equipment made of glass or steel lined with glass or suitable enamel or to use corrosion resistant metals. Stainless steel is found suitable in most juice factories.
Rule 57 of P.F.A. Rules 1955 prescribes the maximum tolerance limit for poisonous metals like Lead, Copper, Arsenic, Tin, Zinc, Cadmium and Mercury in beverages.

Basic Requirement of Factory Building

The floor should be cemented or tiled, walls should be plastered, smooth Impervious. It should be covered with permanent roof, RCC/Asbestos/GI.

Adequate supply of potable water, adequate drainage to carry-out the waste water and suitable arrangement for disposal of sewage should be made .

Adequate machinery and equipments should be made available which are required for manufacturing the desired items.

The building should have adequate provision for natural light and ventilation to have better working conditions in the factory. Adequate arrangements for workers' utility also should be available.

Specification for Ready-To-Serve Beverage (carbonated or non-carbonated)

(1) Minimum content of fruit ingredients - Any suitable commercially cultivated variety of fruits single or in combination may be used. Minimum percentage of fruit juice/pulp in the final product shall not be less than 10 per cent.

(2) Sugar, Sucrose, dextrose and liquid glucose may be used. Minimum percentage of total soluble solids, in the final product should not be less then 10 per cent. It should show the 10 degree brix when observed under regractometer at 20 degree 'c' and corrected for acidity.

(3) Flavouring Agents: The product should have the characteristic colour, aroma and flavour of the fruit from which it is made.

(4) The product shall be free from burnt and objectionable taints and flavours. Extraneous matter like fruit skin seed bits course, tissue fibrous matter, larva, insect fragment or any foreign matter shall not be present in the product.

Food Additives

Acidifying agents	Citric, malic, tartaric, according to good manufacturing practice.
Anti Oxident	Ascorbic acid not less than 40 ppm if declared as enriched with vitamin C
Coaltar food colours	Permitted food colours, bearing B.I.S. should be used. The maximum limit should not exceed 0.2 gm/kg in the final product

Chemical Preservative

Sulphur Di-oxide and salts thereof	Maximum 70 ppm
Benzonic acid and salts thereof	Maximum 120 ppm

Oils and Fats

Edible fats and oils are foodstuffs defined as which are composed of glycerides of fatty acids. They are of vegetable, animal or marine origin. They may contain small amounts of other lipids such as phosphatides, of unsaponifiable constituents and of free fatty acids naturally present in the fat or oil. Fats of animal origin must be produced from animals in good health at the time of slaughter and be fit for human consumption.

Virgin fats and oils are edible vegetable fats and oils obtained, without altering the nature of the oil, by mechanical procedures, e.g. expelling or pressing, and the application of heat only. They may be purified by washing with water, settling, filtering and centrifuging only.

Cold pressed fats and oils are edible vegetable fats and oils obtained, without altering the oil, by mechanical procedures, e.g. expelling or pressing, without the application of heat. They may have been purified by washing with water, settling, filtering and centrifuging only.

Table 1. Quality parameters of oils and fats.

Parameter	Detail
Fatty acid composition and distribution	Percentage of total; depends on the type of fat or oil.
Relative density	At 20°C or 40°C relative to water at 20°C (<1)
Refractive index	At 40°C
Viscosity	At 20°C
Color	Visual, Lovibond or Colormet
Turbidity	Visual or instrumental
Odor and taste	Sensory evaluation
Saponification value	Mg KOH/g
Iodine value (IV)	g iodine/100-g sample (WIJS method)
Unsaponifiable matter	g/kg
Acid value (AV)	mg KOH/g
Smoke, flash and fire points	°C
Peroxide value (PV)	meq oxygen/100-g sample
Thiobarbituric acid reactive substances (TBARS)	µmol/g
para-Anisidine value (p-Anv)	mg/kg
Volatile mater (%)	At 105°C
Metal ions	mg/kg
Trans-fatty acids	Percentage
Carotenoids and chlorophylls	mg/kg
Synthetic antioxidants	BHA, BHT, TBHQ, PG
Adulterants	Fingerprinting using sterols or other minor components

FOOD ADDITIVES

No additives are permitted in virgin or cold pressed oils covered by this Standard.

Colours

No colours are permitted in vegetable oils covered by this Standard.

Commercial Name	Actual Component	Maximum Level
100	Curcumin or Turmeric	5 mg/kg (calculated as total curcumin)
160a	Beta-carotene	25 mg/kg
160b	Annatto extracts	10 mg/kg

Flavours

Natural flavours and their identical synthetic equivalents and other synthetic flavours, except those which are known to represent a toxic hazard.

REGULATIONS FOR OILS

COCONUT OIL (naryal ka tel)

- Obtained from the kernel of *Cocos mucifera* nuts
- It shall be clear from rancidity, suspended or another foreign matter, separated water, added colouring or flavouring substances, or mineral oils.
- It shall be conform to following standards:

Butyro refractometer reading at 40°C – 34.0 to 35.5

Saponification value – Not less than 250

Iodine value – 7.5 to 10.0

Polenske value – Not less than 13.0

Acid value – Not more than 6.0%

Unsaponifiable Value – Not more than 1.0%

Test for Argemone oil shall be negative.

GROUNDNUT OIL (Moongphali ka tel)

- Oil extracted from clean and sound groundnuts.
- It shall be clear, free from rancidity, suspended or other foreign matter, separated water added colouring or flavouring substances or mineral oil.
- It shall conform to following standards:

Butyro-refractometer – 54.0 to 57.1

Saponification value – 188 to 196

Iodine value – 85 to 99

Unsaponifiable matter – Not more than 1.0%

Acid value – Not more than 6.0%

Bellier test turbidity temperature acetic acid – 39°C to 41°C

Test for Argemone shall be negative.

OLIVE OIL

- Means oil extracted from fruit of olive tree (***O.lea eurpaea sativa***). It shall be of three types:

VIRGIN OLIVE OIL – Oils suitable for consumption in natural state without refining.

- It shall be clear, yellow to green in colour, with specific odour and taste, free from odours or tastes indicating alteration or pollution of oil.
- It shall be free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances or mineral oils.

REFINED OLIVE OIL – Oils obtained from virgin olive, the acid content or organoleptic characteristics of which render it unsuitable for consumption in natural state, by refining methods which do not lead to alternations in initial glyceridic structure.

- It shall be clear, limpid without sediments, yellow in colour, without specific odour or taste and free from odours or taste indicating alteration or pollution of oil.
- It shall be free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances or mineral oils.

REFINED OLIVE POMACE OIL – Oil obtained from olive pomace by extraction by means of solvents and made edible by means of refining methods whci donot lead to alteration in initial glycerdic structure.

- It shall be clear, limpid without sediments, yellow to yello-brown colour, without specific odour or taste and free from odours or taste indicating alteration or pollution of oil.
- It shall be free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances or mineral oils.

MAIZE OIL

- Oil extracted from gram of clean and sounde seeds of ***Zea mays***.
- It shall be free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances or mineral oils.
- It shall conform to following standards:

Butyro-refractometer – 56.7 to 62.5

Saponification value – 187 to 195

Iodine value – 103 to 128

Unsaponifiable matter – Not more than 1.5%

Acid value – Not more than 0.50%

Test for Argemone shall be negative.

REGULATION FOR EDIBLE FATS

BEEF FAT or SUET

- Means fat obtained from a beef carcass. It shall have a Saponification value varying from 193 to 200 and an Iodine value from 35 to 46.

MUTTON FAT

- Means fat obtained from the carcasses of sheep. It shall hav a saponification value varying from 192 to 195 and an Iodine value from 35 to 46.

GOAT FAT

- Means rendered fat from goat. It shall have a saponification value varying from 193 to 196 and Iodine value from 36 to 45.

LARD

- Means the rendered fat from hogs and shall not contain more than 1.0% of substances other than fatty acids and fat. It shall not have a saponification value varying from 192 to 198 and Iodine value from 52 to 65.

COCOA BUTTER

- Means the fat obtained by expression from nibs of beans of ***Theobroma cocoa***. It shall be free from other oils and fats, mineral oils and added colours. It shall conform to following standards:

Butyro-refractometer – 40.9 to 48.0

Saponification value – 185 to 200

Iodine value – 32 to 42

Melting point – 29°C to 34°C

% of free fatty acids – Not more than 1.5

SAPONIFICATION VALUE : The saponification value denotes the weight in mg of potassium hydroxide (KOH) required to saponify one gram of oil.

IODINE VALUE : The unsaturated glycerides of an oil have the ability to absorb a definite amount of iodine, especially when aided by a carrier such as bromine, and thus form saturated compounds. The quantity of iodine absorbed is a measure of the unsaturation of an oil or fat. The iodine value is generally expressed as the number of grams of iodine absorbed by 100 g of the oil.

UNSAPOIIFIABLE MATTER

The unsaponifiable matter is defined as the substances soluble in an oil which after saponification are insoluble in water but soluble in the solvent used for the determination. It includes lipids of natural origin such as sterols, alcohols and hydrocarbons as well as any foreign organic matter non-volatile at 100°C (mineral oils) which may be present.

ACID VALUE

PRINCIPLE

The acid value is defined as the weight in milligrams of potassium hydroxide required to neutralize one gram of oil. It is a relative measure of rancidity as free fatty acids are usually formed during decomposition of oil glycerides.

PEROXIDE VALUE

The peroxide value is defined as the amount of peroxide oxygen per 1 kilogram of fat or oil. The sample is added to boiling chloroform-acetic acid containing dissolved potassium iodide. After cooling, the mixture is diluted with water and the liberated iodine titrated with sodium thiosulphate. The amount of iodine liberated by the sample is a measure of the active oxygen present.

TITRE

The **titre** of an **oil or fat** is the solidifying point of the mixed component **fatty acids**. The **titre** temperature is a mean for characterizing **oils and fats** and for assessing the hardness. The titre is the solidification point of the water-insoluble fatty acids, prepared and left to crystallize in a desiccator at laboratory temperature for about 24 hours before completing the determination. Water-insoluble fatty acids are those obtained after saponification of a fat and decomposition of the soap formed according to the method described. Because of the possible presence of fatty acids which are partially soluble in water, the details of this method must be strictly followed.

8. KREIS TEST (RANCIDITY INDEX):

- Due to rancidity, epihydrin aldehyde or malonaldehyde are increased which are detected by Kreis test using phloroglucinol which produces red colour with the oxidized fat.
- It is defined as number of milligrams of potassium hydroxide required to combine with fatty acids which are present in glyceride form in 1 g sample of oil or fat.

9.ESTER VALUE:

- Difference between saponification value and acid value is ester value.

10. REICHERT MESSLE VALUE:

- This value is a measure of volatile water soluble acid contents the fat.
- It is defined as number of milli litres N/10 potassium hydroxide solution required to neutralize the volatile water soluble fatty acids obtained by 5 g fat.

Significance:

- Higher content of volatile fatty acids of butter responsible for its higher reichert-meissl number.
- It is useful in testing purity/adulteration of butter.

11.POLENSKI VALUE:

- It is defined as the number of millitres of N/10 potassium hydroxide solution required to neutralize water-insoluble, steam - distillable acids liberated by hydrolysis of 5 gm of fat.

Significance:

- The Polenski value is an indicator of how much volatile fatty acid can be extracted from fat through safonification.

MEASUREMENT OF SPOILAGE OF FATS AND OIL

- **Rancidity** is a term generally used to denote unpleasant odors and flavors in foods resulting from deterioration in the fat or oil portion of a food.
- Three different mechanisms of **rancidity** may occur.
- These are oxidative, hydrolytic, and ketonic. Oxidative **Rancidity.**

Test for presence of Rancidity:

- In routine work apart from the free fatty acids determination, the analysis should include the determination of **Peroxide Value, Kries Test, Ultra-violet Absorption** at 234 nm and 268 nm to establish rancidity

KRIES TEST

- TWO TESTS

1.Qualitative

2.Quantitative

1.Qualitative

- Shake 5 ml of the oil vigorously with 5 ml of 0.1% phloroglucinol solution in diethyl ether and add 5 ml of conc. hydrochloric acid.
- A pink colour indicates incipient rancidity.

ANIMAL FAT

Animal Fat	Density 20°/20°	Refractive Index	Sapon-ification Value	Iodine Value	Unsapon-ifiable matter (max)	Acid Value mg KOH/g (max)	Peroxide value meq O/kg (max)
Lard (40°-20°)	0.896-0.904	1.448-1.460	192-203	45-70	10	1.3	10
Rendered pork fat (40°-20°)	0.894-0.906	1.448-1.461	192-203	45-70	12	2.5	16
Edible tallow (40°-20°)	0.893-0.904	1.448-1.460	190-202	32-50	12	2.5	16
Premier Jus. (40°-20°)	0.893-0.898	1.448-1.460	190-200	32-47	10	2	10

The titres of animal fats must be within the following ranges:

Fat	Titre
Lard	32 - 45°C
Rendered Pork Fat	32 - 45°C
Edible Tallow	40 - 49°C
Premier Jus	42.5 - 47°C

ADULTERATION IN FATS AND OILS

However detection of adulterant on basis of development of the color, turbidity or precipitate is possible.

1.Detection of sesame oil as adulterant:

- To 2 ml oil, add 1 ml hydrochloric acid containing 1 per cent sucrose and keep aside for 5 minutes.
- The presence of pink colour in the acid layer indicates presence of sesame oil.

2.Detection of cotton seed oil as adulterant by Halphen's test:

- To 2 ml oil, add 2.5ml alcohol and 2.5 ml solution of sulphur in carbon disulphide (1 per cent).
- Heat the mixture Formation of pink or red colour indicates presence of cotton seed oil.

3.Detection of karanja oil as adulterant:

- Take 5 ml of sample oil in a test tube; add 10 ml ethyl alcohol to it followed by addition of 5 drops of ferric chloride solution.
- Shake vigorusly two minutes and allow to stand for two hours.
- The development of light blue to dark colour in the alcoholic layer indicates the presence of karanja oil or any other oil containing phenolic group.

4.Detection of castor oil as adulterant:

- Take 1 ml of the sample to be tested in a clean test-tube and to it add acidified petroleum ether (60- 80°).
- Shake it thoroughly.



- Then to it add a drop ammonium molybdate solution.
- Development of white turbidity indicates the presence of castor oil.

5. **Detection of argemone oil as adulterant:**

- It is an adulterant to mustard oil.
- Ferric chloride reacts with argemone oil in hydrochloric acid medium to produce small needle shaped reddish brown crystals.
- However, if content of argemone oil is less than 1 per cent, needle-shaped cysaican be observed under microscope.

6. **Detection of linseed oil as adulterant**:

- About 1 ml sample is dissolved in 5 ml chloroform in a dry test-tube and one ml liquid bromine is added.
- The tube is stoppered and cooled in ice bat hand to it added 1.5 ml rectified spirit and 10 ml ether.
- It is then shaken thoroughly again for 30minutes.
- The appearance of precipitate (due to formation of hexabromide) indicates presence of linseed oil.

7. **Detection of mineral oil as adulterant**:

- To 1 ml oil or fat under test, add 25 ml alcoholic caustic potash.
- Boil in water bath, till it becomes quite clear.
- Transfer the contents of the flask to a wide mouth test tube and to it, add 25 ml distilled water along the side of the test tube, keeping the tube shaken during addition of water.
- The presence of turbidity indicates presence of mineral oil.

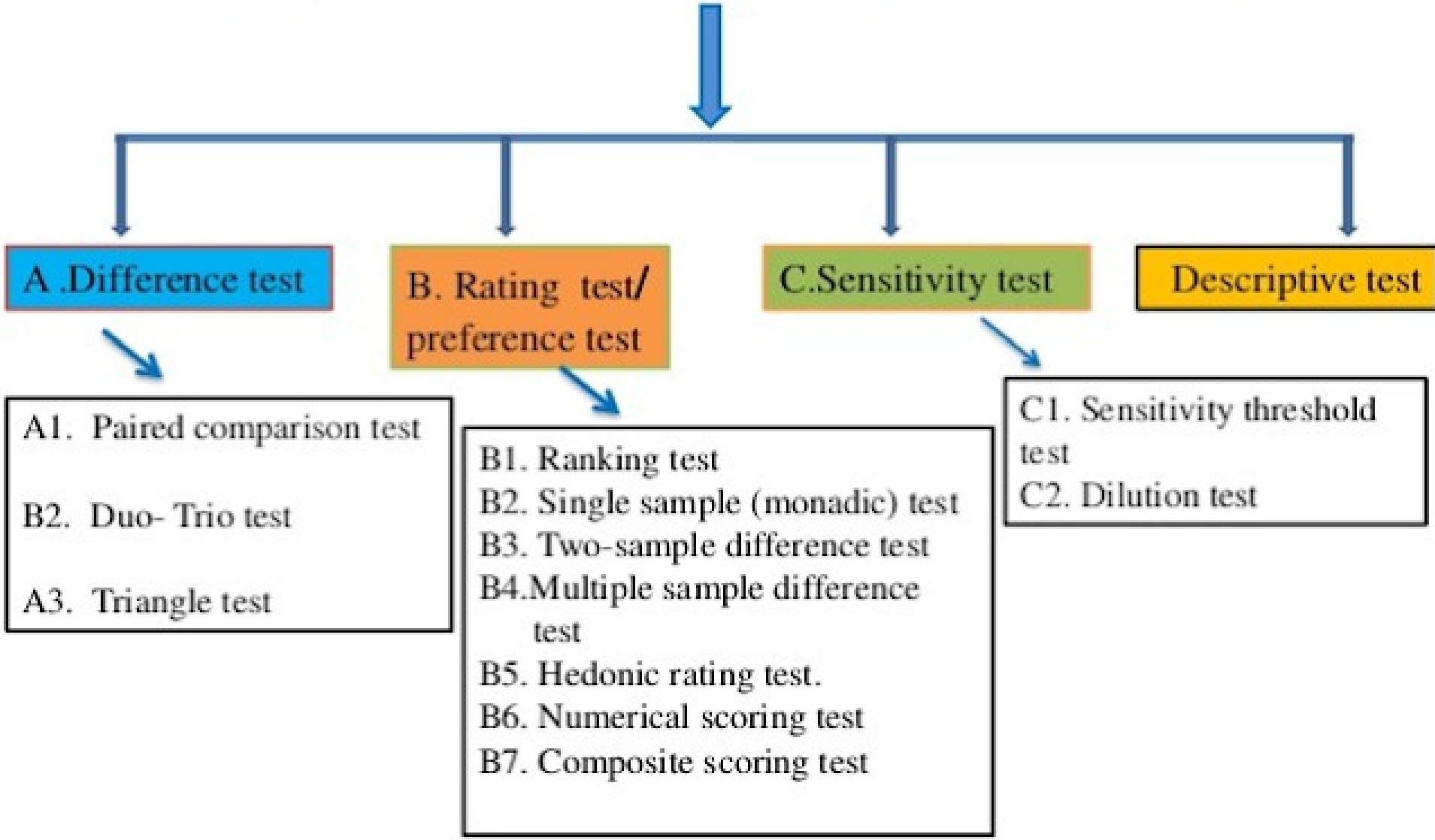
S.No	Food Article	Adulterant	Method for Detection	Remarks
1	Ghee	Vanaspathy or Margarine	Take about one tea spoon full of melted sample of Ghee with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of Vanaspati or Margarine.	If the test is positive i.e. red colour develops only by adding strong Hydrochloric acid (without adding crystals of sugar) then the sample is adulterated with coal tar dye. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present
2		Mashed Potatoes, Sweet Potatoes and other starches.	The presence of mashed potatoes and sweet potatoes in a sample of ghee can easily be detected by adding a few drops of Iodine, which is brownish in colour turns to blue if mashed potatoes/sweet potatoes/other starches are present.	
3	Coconut oil	Any other oil	Place a small bottle of oil in refrigerator. Coconut oil solidifies leaving the adulterant as a Separate layer.	

4	**Butter**	**Vanaspati or Margarine**	**Take about one teaspoon full of melted sample of butter with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of Vanaspati or Margarine.**	**If the testis positive i.e. red colour develops only by adding strong Hydrochloric acid (without adding crystals of sugar) then the sample is adulterated with coal tar dye. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present**
5		Mashed Potatoes and other starches	The presence of mashed potatoes and sweet potatoes in a sample of butter can easily e detected by adding a few drops of iodine (which is brownish in colour), turns to blue.	
6	Edible oil	Prohibited colour	Take 5 ml of sample in a test tube and add 5 ml of concentrated hydrochloric acid. Shake gently, let it stand for 5 minutes. Colour will separate in the upper layer of the solution.	

STATISTICAL ANALYSIS

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Types of sensory testing



NUMERICAL SCORING TEST

- The panellist evaluates each sample on a specific scale for a particular characteristic indicating the rating of the samples
- Certain score is given to each sensory attribute arranged in logical order on a score sheet in this method.
- The weight age is given on the basis of importance of the attribute.
- For example, flavour is considered to be most important and highest score is allotted to this attribute.

Numerical Scoring test

Name.....

Date.....

Product.....

Please rate these samples according to the following descriptions

Score	Quality description
90	Excellent
80	Good
70	Fair
60	Poor

Sample score comments

Signature

Composite Scoring Test

- The rating scale is defined so that specific characteristic o f a product are rated separately.
- The definition of the rating scale is weighed so that the most important characteristics will account for a large part of the total score.
- The resulting scores are compounded for any one panellist to arrive at a composite score.
- This method is helpful in grading products and comparison of quality attributes by indicating which characteristic is at fault in a poor product

Composite Scoring test

Name: …….. Date:……..

Product: Orange Marmalade

Quality	Possible score	Sample scores
Colour	20	___ ___ ___ ___
Consistency	20	___ ___ ___ ___
Flavour	40	___ ___ ___ ___
Absence of defects	20	___ ___ ___ ___

Comments;

Signature

Descriptive Test

- It is Descriptive Analysis for qualitative and quantitative description test for product containing different taste and odour.
- This technique utilizes an unstructured category scale and a panel of not less than six trained panellists.
- Asked to rate intensity for all sensory attributes
- Analysis is done using a t-test or ANOVA to determine if means are statistically different .
- What is the magnitude of these differences?

Scorecard - Descriptive Profiling

Tray number ..... Name .....

You are presented with one coded sample.
Please evaluate the sample and circle the word that best describes each attribute for both the shell and the filling. You may taste the sample more than once.

Attribute	Descriptions for Shell				
Appearance	Appetizing	Dry	Greasy	Crumbly	Flat
Taste/Flavour	Tasty	Salty	Fatty	Burnt	Undercooked
Aroma	Rancid	Aromatic	Musty	Savoury	Mild
Texture	Dry	Chewy	Soft	Hard	Greasy

Attribute	Descriptions for Filling				
Appearance	Appetizing	Dry	Greasy	Moist	Grained
Taste/Flavour	Tasty	Salty	Bland	Savoury	Undercooked
Aroma	Rancid	Aromatic	Musty	Savoury	Mild
Texture	Dry	Chewy	Moist	Tender	Grainy

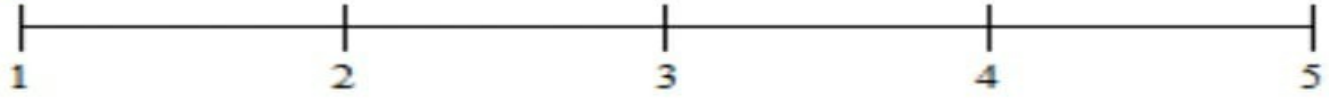
Scorecard
Descriptive Rating Test - one product

Tray number ..... Name .....
You are presented with a sample of Ice Cream.
Please evaluate and rate the sample for each attribute and mark the number that best describes your choice on the accompanying line scale.

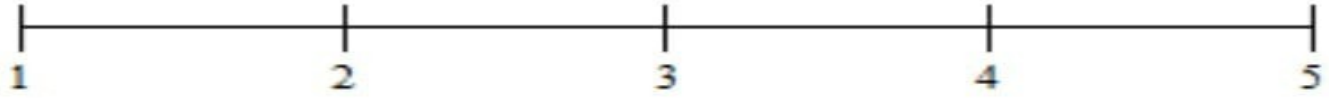
1 = unappealing 2 = needs improvement 3 = Ok 4 = appealing 5 = very appealing

Attributes

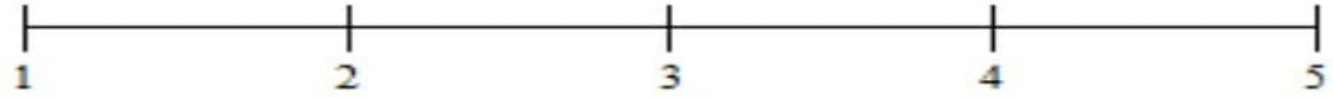
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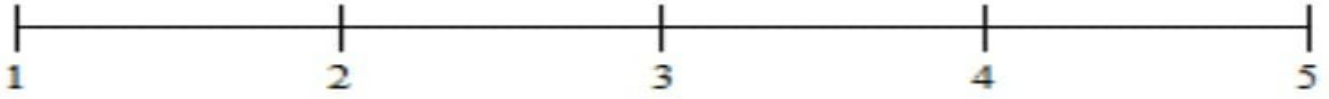
Aroma



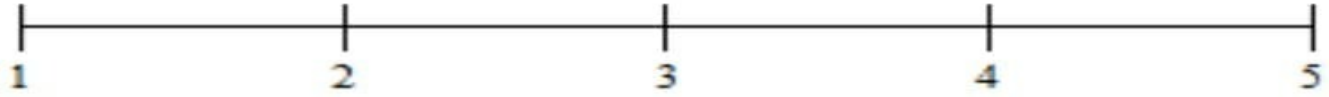
Texture



Sweetness



Flavour



Sensitivity Test

- A sensitivity test is **a measure of sensitivity to a human stimulus** and is expressed as threshold.
- Sensitivity tests are done to assess the ability of i ndividual to detect different tastes, odours and fe el the
  presence of specific factors like astringency or hot ness (pepper).
- These tests are used to select and train
  panel members

Sensitivity-Threshold Test

- Sensitivity tests to measure the ability of an indivi dual to smell, taste or feel specific characteristics in food or beverages or pure substances .
- Also, they are used to establish intensity of sensory response of a food or food components.

- Threshold is defined as a statistically determined point on the stimulus scale at which a transition in a series of sensations or judgements occurs.

- There are mainly three types of threshold as described b elow:

(a)Stimulus detection threshold is that magnitude of sti mulus at which a transition occurs from no sensation to sensation.

(b)Recognition identification threshold is the minimum concentration at which a stimulus is correctly identified.

(c)Terminal saturation threshold is the magnitude of a st imulus above which there is no increase in the perceived intensity of the stimulus.

Sensitivity Threshold Test

Name: ……. Date:.....

Use the following intensity scale.

0=none or the taste of pure water.

?=different from water, but taste quality not identifiable

X= Threshold very weak

1=weak

2=medium

3=strong

4=very strong

5=extremely strong

Set no.	Description of taste and feeling a factor
1	…….
2	…….
3	…….
4	…….
5	…….

Signature

Dilution tests

- Dilution tests are designated to establish the s mallest amount of an unknown material, devel oped as a
  substitute for a standard product that can be d etected when it is mixed with the standard pro duct,

  e.g.,
  margarine in butter, dried whole milk in fresh milk, synthetic orange flavour ingredients with natural flavour

- The quality of the test material is represented by the dilution number which is the percent of the test material in the mixture of t he standard product such that there exists a ju st identifiable difference in odour and taste between them.
- The bigger the dilution number the better is t he quality of the test material.

Limitations of sensory evaluation

1. The result may be highly variable.
2. People with colds or other health problems temporarily lose their maximum effectiveness.
3. Emotional burdens may influence an individual's ability.

UNIT II

STATISTICAL QUALITY CONTROL-

SAMPLING METHODS

SAMPLING

- Sampling involves the selection of a certain portion, number of container and product units from a particular lot of the same food.
- It must be as representative as possible of the whole consignment or from lot.
- An act of obtaining a sample is called **sampling**, which can be done by a person or automatically.
- Samples of material can be taken or provided for testing, analysis, inspection, investigation, demonstration, or trial use.

- **Lot:** A quantity of food or food units produced and handled under uniform conditions.
- **Sample:** A number of food units that resembles the characteristics of the lot
- A **sample** is a limited quantity of something which is intended to be similar to and represent a larger amount of that thing(s).

TYPES OF SAMPLING METHODS

- There are several sampling methods/techniques in common use.

  - Probability Sampling,
  - Non-probability Sampling,

Probability Sampling

- Probability sampling is used when a representative sample is desired, and uses principles of statistical sampling and probability i.e. elimination of human bias.
- It is a random selection approach that tends to give each unit an equal chance of being selected.

Random sampling

- Simple random sampling requires that the number of units in the population be known and each unit is assigned a number. A specific quantity of random numbers between one and total number of population units is selected. Sample size is determined by lot size

Stratified sampling

- Stratified sampling involves dividing the population into overlapping subgroups so that each subgroup is as homogenous as possible. Group means, therefore, differ from each other as much as possible.
- Random samples are then taken from each subgroup.
- The procedure provides a representative sample because no part of the population is excluded and it is less expensive than simple random sampling.

Systematic sampling

- Systematic sampling is used when a complete list of sample units is not available, but when samples are distributed evenly over time or space, such as on a production line. The first sample is selected at random and then every nth unit after that.

Cluster sampling

- Cluster sampling entails dividing the population into clusters or subgroups so that cluster's characteristics are as identical as possible, that is, the means are very similar to each other
- Clusters should be small and having a similar number of units in each cluster.
- This sampling method is more efficient and less expensive than simple random sampling, if populations can be divided into homogenous groups.

Composite sampling

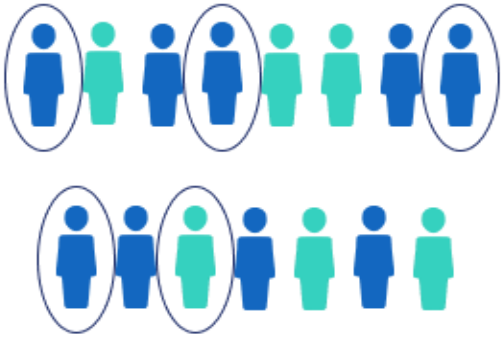
- Composite sampling is used to obtain samples from bagged products such as flour, seeds, and larger items in bulk.
- Two or more samples are combined to obtain one sample for analysis that reduces differences between samples.

Non-probability Sampling

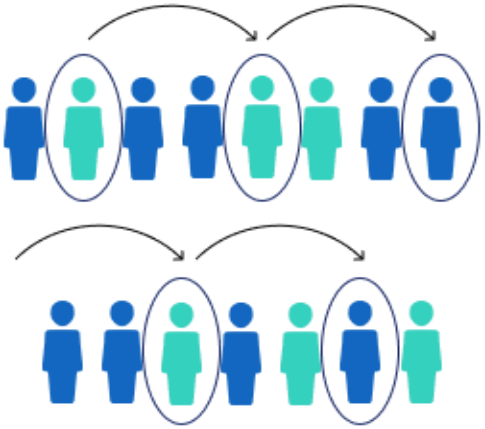
- Non-probability sampling is used when it is not possible to collect a representative sample, or a representative sample is not desired.
- For example, in case of adulteration such as rodent contamination, the objective of the sampling plan may be to highlight the adulteration rather than collect a representative sample of the population.

- **Judgement sampling** is solely at the discretion of the sampler and therefore is highly dependent on the person taking the sample.
- **Convenience sampling**
- **Restricted sampling** may be unavoidable when the entire population is not accessible.
- **Quota sampling**

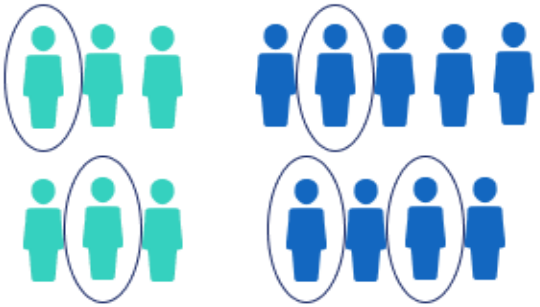
Simple random sample



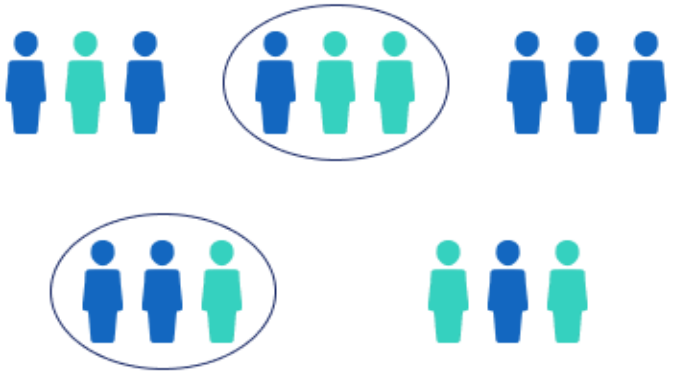
Systematic sample



Stratified sample



Cluster sample



Scribbr

Statistical Quality Control (SQC)

- Statistical Quality Control (SQC) is the use of statistical methods in the monitoring and maintaining of the quality of products and services.
- **Statistics -** is science that deals with the collection, classification, analysis, and making of inferences from data or information.
- **Quality** - is a relative term and is generally explained with reference to the end use of the product.
- **Control -** is a system for measuring and checking or inspecting a phenomenon. It suggests when to inspect, how often to inspect and how much to inspect

BENEFITS OF SQC

- It provides a means of detecting error at inspection.
- It leads to more uniform quality of production.
- It improves the relationship with the customer.
- It reduces inspection costs.
- It reduces the number of rejects and saves the cost of material.
- It provides a basis for attainable specifications.
- It points out the bottlenecks and trouble spots.
- It provides a means of determining the capability of the manufacturing process.
- It promotes the understanding and appreciation of quality control

- SQC can be divided into three main sub-areas, those are:
    1. Off-line quality control,
    2. Statistical process control, and
    3. Acceptance sampling plans

Off-line quality control(Descriptive)

- Its procedure deal with measures to select and choose controllable product and process parameters in such a way that the deviation between the product or process output and the standard will be minimized.
- Much of this task is accomplished through product and process design.

  e.g.The Mean, Range, Standard Deviation

Statistical process control

- SPC involves comparing the output of a process or a service with a standard
- It also involves determining whether a process can produce a product that meets desired specification or requirements.

Acceptance sampling plans

- A plan that determines the number of items to sample and the acceptance criteria of the lot, based on meeting certain stipulated conditions (such as the risk of rejecting a good lot or accepting a bad lot) is known as an acceptance sampling plan.

classification is by Variables and Attributes

- **Variables** are used to monitor characteristics that can be measured

  e. g. length, weight, diameter, time

- **Attributes** are used to monitor characteristics that have discrete values and can be counted,

  e. g. % defective, number of flaws in a shirt, number of broken eggs in a box

ATTRIBUTE SAMPLING PLAN

- Simple to operate. Decision taken merely by gauging and counting defectives.
- Normally, defects of various kinds are clubbed to decide on whether an item is defective or OK.
- This plan calls for larger sample size, hence more amount of inspection

VARIABLE SAMPLING PLAN

- Complex to operate, involves calculation of averages and “factors” related to acceptability criteria for taking decision.
- Each quality characteristic is dealt with separately.
- variable sampling plan calls for smaller sample size hence more suited to destructive tests.

Sampling Plans

Goal of Acceptance Sampling plans is to determine the criteria for acceptance or rejection based on:

- ✓Size of the lot (N)
- ✓Size of the sample (n)
- ✓Number of defects above which a lot will be rejected (c)
- ✓Level of confidence we wish to attain

- There are single, double, and multiple sampling plans
  - ✓Which one to use is based on cost involved, time consumed, and cost of passing on a defective item
- Can be used on either variable or attribute measures, but more commonly used for attributes

Statistical process control

- Statistical process control (SPC) is the application of statistical techniques to determine whether the output of a process conforms to the product or service design.
- It aims at achieving good quality during manufacture or service through prevention rather than detection.
- It is concerned with controlling the process that makes the product because if the process is good then the product will automatically be good.

- There are seven basic techniques employed for SPC. These basic techniques are (i) check sheets, (ii) histograms, (iii) Pareto analysis, (iv) control chart, (v) cause and effect diagram, (vi) stratification, and (vii) scatter diagram.

- **Control chart**s can be used to monitor processes where output is measured as either variables or attributes.
- There are two types of control charts:
  - Variable control chart and
  - Attribute control chart.

1. **Variable control charts:** It is one by which it is possible to measures the quality characteristics of a product.

   The variable control charts are X-BAR chart, R-BAR chart, SIGMA chart

2. **Attribute control chart**: It is one in which it is not possible to measures the quality characteristics of a product, i.e., it is based on visual inspection only like good or bad, success or failure, accepted or rejected.

- The attribute control charts are **p-charts, np-charts, c-charts.**
- It requires only a count of observations on characteristics

  e.g., the number of nonconforming items in a sample.

FOOD QUALITY CONTROL REGULATIONS

SHAIK SHAKEERA
DEPARTMENT OF FOOD TECHNOLOGY

BREAD FAULTS

Bread faults can be divided as under:-

1. External faults
2. Internal faults

External Faults: These faults are those faults which could be seen from outside. They are divided into five types:-

a) Faults in Volume
b) Faults in Crust
c) Faults in shell top
d) Irregularity of shape
e) Lack of cleanliness

Internal Faults: These are those faults which can only be seen by cutting the bread.

a) Holes and tunnels
b) Core,seams,streaks , condensation marks
c) Damp,clamy and closed crumb
d) Dryness and rapid staling
e) Crumbliness of the crumb
f) Defects in taste and aroma

Causes	Remarks
a) Faults in Volume (Lack of volume)	
1. Wrong type of flour	In all these conditions gluten could not ripen adequaltely or got over ripened, which canot retain the produced gas.
• Green flour	
• Too old flour	
• Too strong or soft flour	
• Over bleached flour	
• More chemical improvers	
• Excessive diastatic activity	
2. Wrong type of yeast	In all these factors there will be less fermentation resulting into poor volume
• Too much or too less yeast	
• Poor quality or old yeast	
• Yeast added in too cold or too hot water	
3. Gluten affecting factors	
• Excessive salt	Makes gluten harder
• Excessive fat	Fat surrounded to gluten, hence gluten structure could not be framed
• Excessive use of milk powder or milk	Makes gluten stronger
• Under or overmixing	
• Excessive bran quantity in flour	Breaks the gluten cell framework
4. Fermentation not proper	
• Too slack or too stiff	In all these conditions either fermentation will be less, resulting in less gas production
• Too warm or chilled dough	

	ultimately less volume or fermentation
• Insufficient weight for the pan size	
• Improper Proofing	
➢ Stiff batter not allowed to ferment properly	It results in over or under proofing
➢ More or less temperature or humidity in proofing box	
➢ Excessive greasing	
• Skinning during any bread processing operation	It makes the crust harder which does not allow the crumb to rise
• Improper Baking	
➢ Excessive heat during baking	
➢ Improper distance between bread pan	
EXCESSIVE VOLUME	
All the opposite causes those are above mentioned above result in excessive volume	
b) Faults in Crust colour	
1.Lack of crust colour or pale crust colour	
• Low flour	
• Low sugar in formula	
• Over fermentation	
• Excessive dusting flour	
• Insufficient humidity (Skinning of dough)	
• Under baking	
• Cold oven	
• Low top heat in the oven	
2. Dark Crust colour	
• Opposite conditions of the above mentioned causes	
• Excessive milk powder	
• Lack of humidity in oven	
• Flash heat	
3. Cracking of Crust	
• Dough skinning before baking	
• Short process of bread preparation	
• Over proofed dough	
4. Leathery Crust (Wet Crust)	
• Excessive humidity during proofing or baking	In such conditions crust absorbs water and results in leathery crust
• Insufficient cooling before packing	
• Too slack dough	Excess water could not evaporate while baking results in soggy crumb which in turn is absorbed by crust during storage period hence crust becomes leathery.

5. Hard Crust	
• Excessive use of bread improvers or bleaching agent	
6. Thick Crust	
• Too strong or weak flour	
• Low diastatic activity in flour	
• Less sugar and fat in formula	
• Over ferment dough	
• Low humidity in oven	
• Cool oven	
7. Blisters	
• Improper mixing	
• Young dough	
• Improper distribution of baking pan in the oven	
• Rough handling in the oven	
8. Lack of bloom	
• Inferior quality of raw material	
• Imbalanced formula	
• Improper fermentation	
• Improper proofing or baking conditions	
c) Faults in Shell Tops	
1. Under ripened dough	
2. Young dough	
3. Under proofing	
4. Insufficient humidity while proofing	
5. High baking temperature in case of insufficient oven steam	
d) Irregularity of shape	
1. Too strong or weak flour	
2. Less bread improvers	
3. Improper mixing	
4. Too slack or stiff dough	
5. Over ripenend dough	
6. Excess dough as compared to bread pan size	
7. Dough skinning due to insufficient humidity or over proofing	
8. Rough handling of bread	
9. Over loading in oven	
e) Lack of cleanliness	
1. No sieving or cleaning of flour as well as other raw material.	Threads, jute threads of bags, chunks of wood or other impurities present in raw material may get mixed with dough and find in bread.

2. Carelessness while working	Impurities present on table or nearby working place may mixed into dough
3. Excessive fat used for greasing	Some fat may get deposited in bread tin corners resulting into dark spots.
4. Use of unclean working table, machinery, equipments, bread tins or cooling racks etc	
5. Handling of bread with dirty hands	
6. Presence of sugar crystal or lumps of milk powder produces dark spots	This may be caused due to improper dilution of sugar or milk powder.
Internal Faults	
a) Holes and tunnels in bread	
1. Weak Gluten(Old flour, soggy flour)	Weak gluten cannot retain the expanding gas results in breaking of strands
2. Excessive use of yeast for strong flour	It results into inadequate gluten development and excessive production of CO2.The combined effects of both these results into gluten strand breaking.
3. Improper mixing of yeast, fat, milk powder, salt, sugar etc	Wherever the excess or less quantity of such ingredients is present, it breakdown the gluten strands.
4. Over Fermentation	It produces more gas which breaks the gluten strands
i. Excessive yeast	
ii. Less salt	
iii. Soft water	
iv. Slack dough	
v. High diastatic activity	
vi. No knock back	Gas produced during fermentation will not escape hence breaks the gluten strands.
5. Too hot oven	The hot surface may destroy the extensibility of gluten resulting in break down of gluten strands.
6. Excessive fat, improper mixing of fat, addition of fat in the machine during dividing, molding or handing up.	In all those cases, fat covers up the flour particles, which does not allow gluten formation.
b) Core	
1. Under mixing of dough	
2. Raw materials do not mix thoroughly	This may be caused in case of hand mixing
3. Skinning during fermentation, intermediate proofing, moulding	The hard skin of dough pieces mixed while knock back, rounding or molding and may cause core
4. Improper stretching of dough while molding	Some part may stretch less will made dense core
b) Seams	
1. Excess dough in bread tin 2.	

3. Placing cool dough in hot tin or hot dough in cold tin	In this condition fermentation on the dough surface which come in contact with bread tin is arrested, hence that part becomes dense.
4. Improper handling of bread tin after completion of proofing	
b) Streaks	
1. Improper mixing	
2. Excessive dusting flour	
3. Insufficient water	
b) Condensation mark	
1. High maltose flour	
2. High sugar content in the formula	
3. Insufficient dilution of sugar or milk powder	
c) Damp, Clammy and closed crumb	
	Excessive humidity while proofing or baking
1. Less moisture evaporation results in over moist crumb	Insufficient baking
2. The milk protein makes the gluten harder, which do not allow to leaven the dough properly resulting in damp crumb	Insufficient fat compared to milk powder
3. Excess fat do not allow to gluten formation resulting in damp crumb.	Excessive fat in plain white bread
	Excessive use of bread improvers
d) Dryness and Rapid Staling	
1. They are hygroscopic, so less salt and sugar could not retain moisture for longer time	Insufficient salt and sugar
2.	Excessive mineral improver
3. Gluten could not get ripened properly	Insufficient fermentation incase of stiff dough
4. Make gluten harder and water retention power is less hence bread becomes dry quickly.	Imbalanced formula in case of excess milk powder
5. Evaporate more moisture during fermentation as well as it also makes fermentation speedy hence the time required less, so the gluten development will not proper.	High fermentation temperature
6. Results in open grain structure through which moisture escapes speedily, that makes faster drying of the bread.	Over fermentation
7. Much moisture evaporation in oven will result in dryness.	Long baking time
e)Crumbliness of Bread	
1. Insufficient gluten development	Under fermentation

2. Dough becomes weak and loses elasticity	Over fermentation
	Slack dough
	Excess or less salt
	Excess fat
	Slicing of hot bread
	Excess mineral improvers
e) Defects in Taste and Aroma	
1.Such wheat contains off odour which transfer to the flour and finally into the product	Poor or inferior quality wheat used for flour production
2. The strong flavour is transfer to the flour and finally to bread.	Placing flour or other raw material near strongly flavored ingredient

➢ COMMON CAKE FAULTS, REASONS AND REMEDIES

➢ **EXTERNAL APPEARANCE**

- CRACKED TOP

REASONS:

- This usually occurs when the oven temperature is to hot which leads to the crust forming quickly while the cake is still rising which leads to the crust bursting to allow the cake rise. However, there are other culprits like:
- To much rising agents e.g.
- Cake tin too small
- Too much flour

REMEDY

- Check the temperature of your oven
- Insure you are using the right size of pan
- Follow the recipe correctly
-

CAKE FAULT: SUNKEN CAKE :

REASON:

- This usually occurs when the temperature of your oven reduces during baking and this happens when you either open the oven before the cake sets or when the oven goes off before the cake sets. Other factors include;
- Oven temperature too low
- Too much of a particular ingredient e.g. fat, baking powder, sugar etc.
- REMEDY
- Do not open your oven till your cake sets and this usually takes about 30-40 minutes depending on your oven and the size of your cake. another way to know if it has set is if you start perceiving your cake. RESIST THE URGE TO PEAK AT YOUR CAKE!
- Check your oven temperature
- Follow the recipe correctly

SIDE OF THE CAKE CRUNCHY/BURNT

- REASON:
- This usually happens when you leave your cake in the oven for too long. Other factors include:
- Too much fat used to butter pan
- Oven temperature too hot
- Butter not suitable for baking
- Cake tin not sufficiently lined
- REMEDY
- Do not over bake your cakes
- Check your oven temperature
- Butter and flour or line your pan well
- Check your baking ingredients whether it is suitable for baking.

CAKE STUCK TO THE PAN

REASON:

This usually occurs when the pan used is not greased well or when the cake is cooled in the pan for too long.

REMEDY

- Grease your pan well
- Let your cakes cool in the pan for just 15 mins, then turn them over to a cooling rack to complete the cooling process

CAKE TOO DARK

REASON:

- Oven temperature too hot
- Incorrect amount of water/liquid
- Excessive sugar

REMEDY:

- Check your oven temperature
- Follow the recipe correctly

CAKE BURNED ON TOP

REASON

- Oven temperature too hot
- Incorrect amount of water/liquid

REMEDY:

- Check your oven temperature
- Follow the recipe correctly

CAKE SHINY AND STICKY

REASON

- Oven temperature too cool
- Not baked long enough
- Too much sugar in recipe

REMEDY:

- Check your oven temperature
- Make sure your cakes are well-baked
- Follow the recipe correctly

CRUST TOO THICK

REASON:

- Excessive baking time

REMEDY:

- Do not over bake your cakes

CAKE SHRINKS

REASON:

- Excessive liquid
- Oven temperature too hot
- Improper mixing procedure
- Cake baked too long

REMEDY

- Follow the recipe correctly
- Check your oven temperature
- Do not over bake your cake
- Do not over mix the cake
- CAKE ROSE UNEVENLY

REASON:

- Flour was not blended well into the main mixture
- Oven temperature uneven
- Oven temperature too high

REMEDY

- Mix your batter well
- Check your oven temperature
- INTERNAL CAKE APPEARANCE

CAKE VERY DENSE/ DENSE GRAIN

REASON

- Enough air wasn't beaten into the cake
- Eggs added too quickly
- Not enough rising agent
- Excessive liquid
- Improper mixing

REMEDY

- Mix your batter well
- Follow the recipe correctly
- Mix your batter well

COARSE AND IRREGULAR GRAIN

REASON:

- Improper mixing procedures
- Stiff batter
- Oven temperature too cool
- Batter turned too much

REMEDIES

- Mix your batter correctly
- Follow the recipe correctly
- Check your oven temperature

OFF COLOR CAKES

REASON:

- Unclean equipment
- Oven temperature too cool
- Improper mixing procedure

REMEDY

- Check your oven temperature
- Mix your batter well
- Use clean equipment

SUNK FRUITS

REASON:

- Fruits are too large/heavy
- Sugary syrup on outside of fruit was not washed off causing fruits to slide through mixture when heated
- Cake mixture over beaten/ too wet so could not hold fruit in place
- Oven temperature too hot

REMEDY

- Coat your fruits with flour before adding them to your batter
- Check your oven temperature
- If the fruits are too large, cut them to smaller bits before adding to your batter
- Do not over mix your batter
- Wash your fruits properly

BURNT ON TOP, ISN'T COOKED IN THE MIDDLE

REASON:

- Cake tin too small
- Oven temperature too hot

REMEDY:

- Use the right pan size
- check your oven temperature
-

➢ GENERAL FAULTS

BATTER OVER FLOWED

REASON

- Wrong adjustments to recipes
- Cake tin too small

REMEDY:

- Use the right size of pan
- Adjust the recipe properly

POOR FLAVOR

REASON:

- Improper mixing procedure
- Faulty baking conditions
- Improper cleaning of equipment

REMEDY:

- Mix your batter properly
- Check your baking conditions
- Clean your equipment well
- Use pure flavors instead of imitation

CAKE TOO TOUGH

REASON

- Excessive mixing
- Batter too stiff(insufficient water)

REMEDY:

RICE QUALITY CHARACTERS

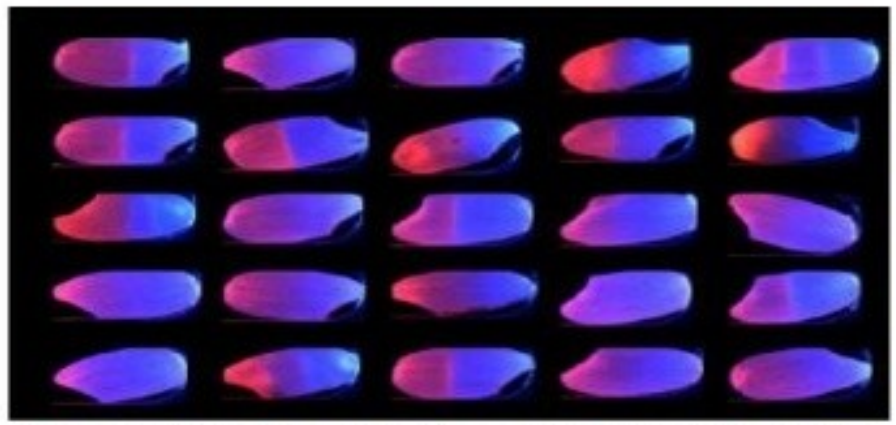
- The **length** and **width** of a rice grain are important attributes that determine the class of the rice. There are three main classes of rice, based on grain length: short, medium and long. In terms of width, Arborio styles are generally the widest, followed by short, medium and long. The ratio of the length and the width is used internationally to describe the shape and class of the variety. The other important aspect of length and width is uniformity all the grains in one sample must look the same

- Cracking decreases head rice yield because cracked grains often break during milling. Most markets require whole or unbroken grain, therefore cracked grain can reduce payments received by the grower and the miller.

- Cracking also decreases the cooking quality of the grain. Grains that are cracked but remain intact during milling are deemed visually undesirable.

- Further, during cooking the starch leaches out of cracked grain and collects as a sticky layer on the bottom of the rice cooker. If rice is cooked by the rapid boil technique, the starch leaches from the rice into the cooking water.

- Crack Detector
  Using the Paddy Crack Detector, count the number of cracked grains in a 100 grain sample then compute the % cracked grains.



Cracks in grains can be detected by red and blue light

The whiteness and translucence of rice is important...

- The whiteness ranges from white to yellow. Yellowness occurs because of aging or higher protein content. The higher protein content changes the cooking properties of rice, particularly increasing the propensity of the rice to undergo retrogradation cooling on cooking.
- Translucence relates to the degree of crystallinity of the starch a function of the structure and packaging of the amylopectin molecules, and to the ability of the light to be refracted without interfering with protein bodies. High protein detracts from quality.

Chalkiness...

- **Chalk** is the opaque area in the rice grain and is undesirable in almost every market. Chalky areas occur because of malformed starch granules with air spaces between them. Chalky areas cook differently from translucent areas, but only a very clever palate could detect the difference. There are small differences in the solubility of the starch and the gelatinization temperature of the chalky and translucent areas, but research has yet to discover why.



A visual rating of the chalky proportion of the grain is used to measure chalkiness based on the standard Evaluation System SES scale presented below:

Scale	% area of chalkiness
1	less than 10
5	10-20
9	more than 20

%chalky grains = wt of chalky grains / wt of milled grains * 100

Cooking and Eating characteristics

Gelatinization temperature

- Unmodified starch granules are generally insoluble in water below 50°C. Over a critical temperature range, the starch granules undergo irreversible process known as gelatinization Temperature (GT).

Amylose content

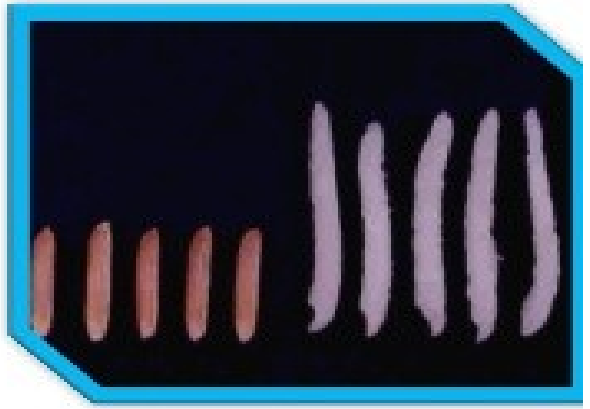
- Amylose content (AC) is the single most important character predicting rice cooking and eating quality features
  - Low amylose varieties are moist, sticky and glossy; when cooked readily split and disintegrate when over cooked.
  - Rice with high amylose, cook dry and fluffy but become hard on cooking.
  - Intermediate types are fluffy but retain soft texture when on cooling.

Gel consistency

- Gel consistency (GC) determines the cohesiveness, tenderness and gloss of cooked rice when the amylose content is high.

Grain elongation and aroma:

- Aromatic long grain basmati rices are known for their pleasant aroma and extra elongation on cooking with least breadth wise swelling.
- Lengthwise expansion without increase in girth is considered a highly desirable trait in some high quality rices such as Basmati rices



- The aroma of rice plays a dominant role in consumer acceptability and it draws premium price in certain speciality markets.



Quality traits	Range	Minimal acceptable range
Hulling %	75 – 80	-
Milling %	70 – 75	65
Head rice recovery %	30 – 60	45
Kernel length (mm)	3.0 – 8.0	>6.61
Kernel breadth (mm)	2.0 – 3.0	<2.0
L/B ratio	1.5 – 3.5	3.50
Amylose (%)	1.0 – 32.0	20-25
Alkali value (GT)	2.0 – 7.0	4-7
Gel consistency (mm)	27 – 100	>40
Kernel colour	Black – Red – Brown – white	-
Transparency	Translucent – chalky	-
White belly	Present occasionally present – Absent	-
Classification	Fine – Medium – Bold	-

Grain shape:

- Follow the procedure of determining grain shape of paddy. Based on the length to width ratio, the shape of the milled rice will be determined. The ISO Classification is as follows:

Scale	Shape	L/W ratio
1	Slender	Over 3.0
3	medium	2.1 – 3.0
5	bold	1.1-2.0
9	round	1.0 or less

- Moisture content Moisture content has a marked influence on all aspects of paddy and rice quality and it is essential that paddy be milled at the proper moisture content to obtain the highest head rice yield. Paddy is at its optimum milling potential at moisture content of 14%. Grains with high moisture content are too soft to withstand hulling pressure without undue breakage and may be pulverized. Grain that is too dry becomes brittle and has greater breakage.
- Moisture content and temperature during the drying process is also critical as it determines whether fissures and/or full cracks are introduced into the grain structure

- Head rice percentage. The head rice percentage is the volume or weight of head grain or whole kernel in the rice lot. Head rice normally includes broken kernels that are 75-80% of the whole kernel. High head rice yield is one of the most important criteria for measuring milled rice quality. Broken grain has normally only half of the value of head rice. To a large extent, the characteristics of the paddy determine the potential head rice yield although the milling process is responsible for some losses and damage to the grain.

Amylose content:

- Amylose content is important because firmness and stickiness are two properties of cooked rice that influence consumer preference for, and use of different classes of rice
- Amylose content has traditionally been assessed by chemical analysis of the rice but technology has produced non-destructive methods using the NIR and the visible regions of the spectrum.

Mill. Amylose content is analyzed using the simplified iodine colorimetric procedure. Samples are categorized into low, intermediate and high based on the following grouping:

-

Category	%Amylose Content
Low	10-20
Intermediate	20-25
High	25-30

Gelatinisation temperature:

- **Gelatinisation temperature** is the temperature at which the starch in rice begins the process of cooking. At this point the starch granules take in water and lose their crystalline nature, a change that is irreversible. Rice starch usually gelatinises between 65*C and 85*C.

- Rice with a gelatinisation temperature at the lower end of the range often cooks to a softer texture and retrogrades less than rice with a gelatinisation temperature at the upper end of the range.

- Gelatinisation is often measured by the alkali spreading method. However technology has improved the measurement of this trait too. Differential scanning calorimetry gives the actual temperature of gelatinization and the energy required for the particular rice to pass through that transition.

- Gelatinization temperature is measured using alkali-spreading value. The alkali digestibility test is employed. Grains are soaked in 1.7% KOH and incubated in a 30°C oven for 23 hours. Measurement ranges based on the following:

Category	Temp ranges (°C)	Alkali Spread
low	55-69	6-7
Intermediate	70-74	4-5
High	75-79	2-3

- Gel consistency Gel consistency measures the tendency of the cooked rice to harden on cooling. Gel consistency is determined by heating a small quantity of rice in a dilute alkali. This test differentiates the consistency of cold 5.0% milled rice paste. Within the same amylose group, varieties with a softer gel consistency are preferred, and the cooked rice has a higher degree of tenderness.
- Harder gel consistency is associated with harder cooked rice and this feature is particularly evident in high-amylose rice. Hard cooked rice also tend to be less sticky

- Gel consistency.
- Two to 10 grains are selected and ground separately in the Wig-L Bug. Gel consistency is measured by the cold gel in a test tube, being held horizontally, for one hour. Measurement ranges and category are as follows:

Category	**Consistency, mm**
Soft	61-100
Medium	41-60
hard	26-40

Viscosity :

- **Viscosity** is a characteristic that indicates some of the cooking properties of rice. The cooking properties of rice are primarily measured by Rapid Visco Analysis (RVA), which mimics the process of cooking and monitors the changes to a slurry of rice flour and water, during the test

- The slurry is stirred constantly with a paddle and heated. Viscosity is measured as the resistance of the slurry to the paddle

TEXTURE:

- **Texture** describes what we might experience in our mouths when eating rice: initial mouthfeel, hardness, adhesiveness, cohesiveness, springiness, resilience, gumminess and chewiness.

Flavour and aroma:

- Basmati and jasmine are classes of fragrant style rice. Fragrant rice contains particular compounds that give the **rice flavour**. Otherwise, slightly perceptible changes in flavour of all rice classes can be caused by aging, storage, the depth of milling (i.e. the amount of polishing), the local environment and probably a number of other things.
- Flavour in fragrant rice is produced by volatile compounds, many of which are volatilised during cooking to produce an aroma
- Environmental conditions can cause a lot of the variation seen in aroma. Aroma is measured by simply sniffing the rice. Otherwise the peaks can be quantified by Gas Chromatography.

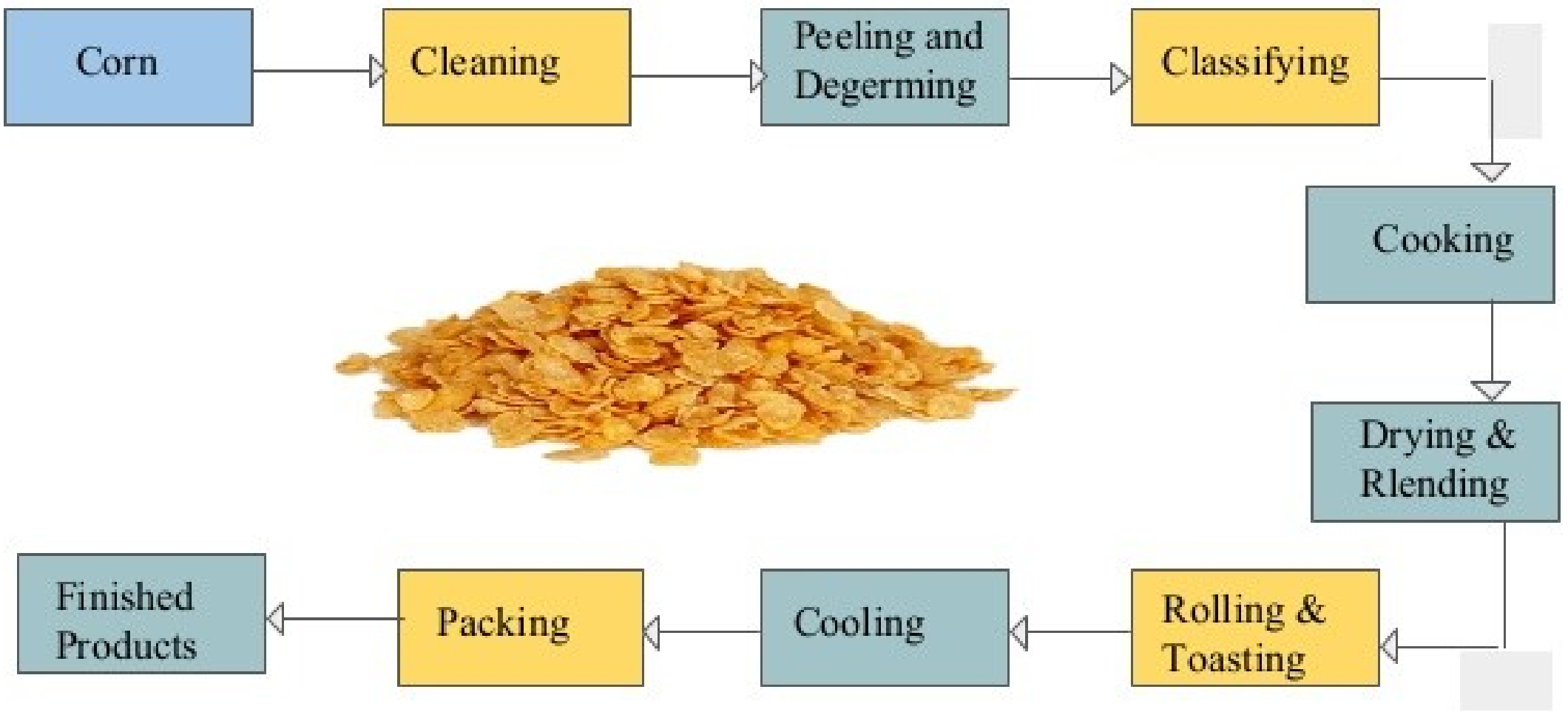
AROMATIC RICE

- Aromatic rice is one of the major types of rice.
- It is a medium to long-grained rice.
- It is known for its nut-like aroma and taste, which is caused by the chemical compound 2-acetyl-1-pyrroline.
- Varieties of aromatic rice include: basmati, jasmine, Texmati, Tulaipanji, Wehani, and wild pecan rice.
- When cooked, the grains have a light and fluffy texture.

Table 1. Codex specification of the particle size of different flours suggested with

Type of flour	Size	M.C (% m/m max)	Type of flour	Size	M.C (% m/m max)
Wheat flour	98% or more of flour shall pass through a 212 micron.	15.5	Corn flour	Not more than 2 % by mass of the material shall be retained on 75-micron IS Sieve and not more than 0.5 % by mass shall be retained on a ISO-micron IS Sieve.	12.5
Durum wheat flour	Durum wheat semolina maximum 79% shall pass through a 315 micron silk gauze.	14.5	Pearl millet flour	100% of flour shall pass through a sieve the dimensions of the mesh being diameter of 0.5 mm for "fine" flour and a diameter of 1 mm for "medium" flour.	13.0
Sorghum flour	100% of flour shall pass through a sieve the dimensions of the mesh being diameter of 0.5 mm for "fine" flour and a diameter of 1 mm for "medium"flour.	15.0	Corn-soy blend (super cereal)	95% of flour shall pass through a 600 microns sieve.100% must pass through a 1,000 microns sieve.	15.0

The Process Of Corn Flakes Is



Quality Control:

- Every step is carefully monitored for quality. Sanitation is necessary. Machines- Stainless Steel, thoroughly cleaned and sterilized with hot steam.
- Grain is inspected for any foreign material when it arrives, and when it is cooked and when it is shaped.
- To ensure the proper cooking and shaping, the temperature and moisture content of vitamins and minerals is measured to ensure the accurate nutrition information. Filled packages are weighed to ensure that the contents of each box is consistent.
- In order to label boxes with an accurate shelf life, the quality of stored cereal is tested over time. In order to be able to monitor freshness over a reasonable period of time, the cereals are subjected to higher than normal temperature and humidity in order to speed up the spoiling process.

QUALITY CONTROL MANAGEMENT IN BEVERAGE INDUSTRY

Maintenance of quality in beverage (Fruit-based and carbonated) not only helps the consumers in getting the desired quality product, but also promotes sales in the competitive markets. This can be achieved by exercising proper quality control measures at the three important stages, namely:

Raw Material control
Process control
Finished product control

Quality of Water In the Beverage Industry

As per the Bureau of Indian Standards 2346-1973, beverages shall mean non-alcoholic beverages containing dissolved carbon dioxide in properly sealed containers or dispensing units in a manner which ensures freedom from spoilage

Beverages are of two types:

a. Carbonated water or soda water with or without flavour.
b. Flavoured and sweetened carbonated water.

The beverages should be prepared from potable water and carbon dioxide confirming to Grade II of the Bureau of Indian Standards 307-1966. And all the ingredients used in the beverages of the carbon-dioxide should be clear, pure and fir for human consumption.

In appearance the beverages should be free from insects and rodent contamination, skins, and practically free from other extraneous matter.

Clean beverages should be of sparkling clarity and should remain so when stored under normal conditions. The cloudy beverage should be stable. The beverages should be carbonated to a pressure in accordance with their character. The beverages should however have a minimum of one volume of carbon-dioxide and a well-balanced and pleasant flavour.

REQUIREMENTS STIPULATED FOR BEVERAGES

Characteristics	Requirements
Arsenic mg/kg	0.25
Lead mg/kg	0.50
Copper mg/kg	1.50
Iron mg/kg	0.50
Total plate count per Ml. Max.	50
Coliform count in 100 ml	0
Yeast and mould carnet per ml. max.	2

Collection of Water Sample for Bacteriological Analysis

Collection of water sample is more important than the test itself since the collection of wrong sample and the results obtained thereon will be misleading and also the time, energy and money spent in collecting and sending the un-representative sample for test would be a sheer waste.

Sample Collection from Tap

First, a tap that is not leaky and which is in regular use should be selected before the sterilised bottle is cut open and kept ready as per the instructions given in the instruction sheet supplied with the bottle. Before collection of sample, the tap should be opened and the water allowed to flow for about 2 to 3 minutes in order to flush out the external contamination with bacteria If any .

Then the tap is closed and the mouth of the tap is sterilised with a spirit lamp or cotton wad soaked in spirit. The tap should then be opened and water allowed to run out for 1 or 2 minutes in order to cool the tap and then regulating the flow, the sample should be collected in the sterilised bottle leaving some air space.

Microbiological Test

1. Total calory count on sugar at 37° c in 24 hours.
2. MPN of coliform organisms at 37°c In 48 hours .
3. Coliform differential tests.

Chemical quality of water used in Beverage Industry

The water used in a beverage industry should have a satisfactory chemical quality similar to the requirement of potable water.

THE SAMPLE FOR CHEMICAL ANALYSIS

Characteristic	Requirement
Dissolved solids	500 mg/lit
PH Value	6.5 to 8.5
Total Hardness as $CaCo_3$	360 mg/lit
Iron as Fe	0.3 mg/lit
Manganese as Mn	0.1 mg/lit
Chlorides as Cl	2.50 mg/lit
Sulphate as So_4	1.50 mg/lit
Fluoride as F	1.2 mg/lit

Correction of Water Defects used in Beverages

Turbidity

Where the turbidity is more then a few part for a million less then 50 ppm. a pressure sand filter is generally employed and with this type of filter alum is used as a coagulant and generally fed to the raw water through a displacement feeder. The alum helps to coagulate the suspended matter on the surface of the sand bad which helps in the removal of very fine particles of suspended matter.

Colour

coagulation plant would be employed using chlorine to oxidise the iron or precipitate it Alum or other coagulants are used to reduce the colour.

Taste and odour

activated carbon purifiers offer the most simple and effective means of removing taste and odour. In others, super chlorination ahead of the purifier may be necessary.

Hardness

Hardness in water is referred to as temporary, when it is due to bicarbonates and carbonates, and as permanent when it is due to salts other than carbonates like chlorides and sulphates.

The first is lime-soda process, the second is the familiar Sodium Zeolite softening. A third method is a relatively new process of demineralization (reverse osmosis technique).

Sweetening Agents

Sugar, liquid glucose, dextrose monohydrate, invert sugar, fructose and honey are either singly or in combination used for sweetening the carbonated waters. It is hardly necessary to discuss the purity of these sweetening agents as they are available in highly refined forms.

As per the P.F.A. Rules 1955 a sweetened carbonated water shall have not less than 5 per cent total sugars, expressed as sucrose. In fruit products like fruit juice, fruit squash, fruit syrup, fruit beverage or fruit drinks, bulk of the added sugar forms the total soluble solid of the finished product.

Saccharin

Saccharin is one of the extensively studied artificial sweetener used in carbonated water .
The use of saccharin is permitted only in carbonated water up to 100 ppm under P.F.A.

Flavouring Agent

The retention of flavours during storage of fruit juice and beverage is of prime importance if they are to find consumer acceptance. Flavouring agents include flavour preparations of natural flavours, nature Identical flavours and artificial flavours which are capable of imparting flavouring properties.

As per Rule 64 BB of P.F.A. Rules 1955 where on extraneous flavouring agent has been added to any article of food, the label should carry the words, CONTAINS ADDED FLAVOURS.

Colouring Agents

Rule 24 requires that extraneous addition of colouring matter should be displayed on label in capital letters as CONTAINS PERMITTED COLOURS.

Preservatives
The principal preservatives in commercial use in beverage Industry are salts of benzoic acid and sulphur dioxide. P.F.A. Rules 1955 permit the use of sulphur dioxide up to 70 P.P.M. or Benzoic Acid up to 120 P.P.M. in sweetened ready to serve beverages .

Impregnation with Carbon-dioxlde
Since carbon-dioxide has an inhibiting action on the growth of moulds, this gas is used in combination with sterilisation, filtration and the like. The purity of carbon-dioxide used is also important. Even minor chemical contaminants are open to course taste deviation.

Metallic Contamination

Metals are wide in the juice industry, not only in the construction of crushers, presses and extractors, pumps, decorators, pasteurizers, coolers and filters, but also in the construction of storage tanks, pipes, hose fittings and the like.
Metallic irons may affect the flavour, colour and appearance of juice in different ways depending on certain conditions, particularly oxygen and the extent and nature of reducing conditions.

It is necessary to use equipment made of glass or steel lined with glass or suitable enamel or to use corrosion resistant metals. Stainless steel is found suitable in most juice factories.
Rule 57 of P.F.A. Rules 1955 prescribes the maximum tolerance limit for poisonous metals like Lead, Copper, Arsenic, Tin, Zinc, Cadmium and Mercury in beverages.

Basic Requirement of Factory Building

The floor should be cemented or tiled, walls should be plastered, smooth Impervious. It should be covered with permanent roof, RCC/Asbestos/GI.

Adequate supply of potable water, adequate drainage to carry-out the waste water and suitable arrangement for disposal of sewage should be made .

Adequate machinery and equipments should be made available which are required for manufacturing the desired items.

The building should have adequate provision for natural light and ventilation to have better working conditions in the factory. Adequate arrangements for workers' utility also should be available.

Specification for Ready-To-Serve Beverage (carbonated or non-carbonated)

(1) Minimum content of fruit ingredients - Any suitable commercially cultivated variety of fruits single or in combination may be used. Minimum percentage of fruit juice/pulp in the final product shall not be less than 10 per cent.

(2) Sugar, Sucrose, dextrose and liquid glucose may be used. Minimum percentage of total soluble solids, in the final product should not be less then 10 per cent. It should show the 10 degree brix when observed under regractometer at 20 degree 'c' and corrected for acidity.

(3) Flavouring Agents: The product should have the characteristic colour, aroma and flavour of the fruit from which it is made.

(4) The product shall be free from burnt and objectionable taints and flavours. Extraneous matter like fruit skin seed bits course, tissue fibrous matter, larva, insect fragment or any foreign matter shall not be present in the product.

Food Additives

Acidifying agents	Citric, malic, tartaric, according to good manufacturing practice.
Anti Oxident	Ascorbic acid not less than 40 ppm if declared as enriched with vitamin C
Coaltar food colours	Permitted food colours, bearing B.I.S. should be used. The maximum limit should not exceed 0.2 gm/kg in the final product

Chemical Preservative

Sulphur Di-oxide and salts thereof	Maximum 70 ppm
Benzonic acid and salts thereof	Maximum 120 ppm

Oils and Fats

Edible fats and oils are foodstuffs defined as which are composed of glycerides of fatty acids. They are of vegetable, animal or marine origin. They may contain small amounts of other lipids such as phosphatides, of unsaponifiable constituents and of free fatty acids naturally present in the fat or oil. Fats of animal origin must be produced from animals in good health at the time of slaughter and be fit for human consumption.

Virgin fats and oils are edible vegetable fats and oils obtained, without altering the nature of the oil, by mechanical procedures, e.g. expelling or pressing, and the application of heat only. They may be purified by washing with water, settling, filtering and centrifuging only.

Cold pressed fats and oils are edible vegetable fats and oils obtained, without altering the oil, by mechanical procedures, e.g. expelling or pressing, without the application of heat. They may have been purified by washing with water, settling, filtering and centrifuging only.

Table 1. Quality parameters of oils and fats.

Parameter	Detail
Fatty acid composition and distribution	Percentage of total; depends on the type of fat or oil.
Relative density	At 20°C or 40°C relative to water at 20°C (<1)
Refractive index	At 40°C
Viscosity	At 20°C
Color	Visual, Lovibond or Colormet
Turbidity	Visual or instrumental
Odor and taste	Sensory evaluation
Saponification value	Mg KOH/g
Iodine value (IV)	g iodine/100-g sample (WIJS method)
Unsaponifiable matter	g/kg
Acid value (AV)	mg KOH/g
Smoke, flash and fire points	°C
Peroxide value (PV)	meq oxygen/100-g sample
Thiobarbituric acid reactive substances (TBARS)	µmol/g
para-Anisidine value (p-Anv)	mg/kg
Volatile mater (%)	At 105°C
Metal ions	mg/kg
Trans-fatty acids	Percentage
Carotenoids and chlorophylls	mg/kg
Synthetic antioxidants	BHA, BHT, TBHQ, PG
Adulterants	Fingerprinting using sterols or other minor components

FOOD ADDITIVES

No additives are permitted in virgin or cold pressed oils covered by this Standard.

Colours

No colours are permitted in vegetable oils covered by this Standard.

Commercial Name	Actual Component	Maximum Level
100	Curcumin or Turmeric	5 mg/kg (calculated as total curcumin)
160a	Beta-carotene	25 mg/kg
160b	Annatto extracts	10 mg/kg

Flavours

Natural flavours and their identical synthetic equivalents and other synthetic flavours, except those which are known to represent a toxic hazard.

REGULATIONS FOR OILS

COCONUT OIL (naryal ka tel)

- Obtained from the kernel of *Cocos mucifera* nuts
- It shall be clear from rancidity, suspended or another foreign matter, separated water, added colouring or flavouring substances, or mineral oils.
- It shall be conform to following standards:

Butyro refractometer reading at 40°C – 34.0 to 35.5

Saponification value – Not less than 250

Iodine value – 7.5 to 10.0

Polenske value – Not less than 13.0

Acid value – Not more than 6.0%

Unsaponifiable Value – Not more than 1.0%

Test for Argemone oil shall be negative.

GROUNDNUT OIL (Moongphali ka tel)

- Oil extracted from clean and sound groundnuts.
- It shall be clear, free from rancidity, suspended or other foreign matter, separated water added colouring or flavouring substances or mineral oil.
- It shall conform to following standards:

Butyro-refractometer – 54.0 to 57.1

Saponification value – 188 to 196

Iodine value – 85 to 99

Unsaponifiable matter – Not more than 1.0%

Acid value – Not more than 6.0%

Bellier test turbidity temperature acetic acid – 39°C to 41°C

Test for Argemone shall be negative.

OLIVE OIL

- Means oil extracted from fruit of olive tree (***O.lea eurpaea sativa***). It shall be of three types:

VIRGIN OLIVE OIL – Oils suitable for consumption in natural state without refining.

- It shall be clear, yellow to green in colour, with specific odour and taste, free from odours or tastes indicating alteration or pollution of oil.
- It shall be free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances or mineral oils.

REFINED OLIVE OIL – Oils obtained from virgin olive, the acid content or organoleptic characteristics of which render it unsuitable for consumption in natural state, by refining methods which do not lead to alternations in initial glyceridic structure.

- It shall be clear, limpid without sediments, yellow in colour, without specific odour or taste and free from odours or taste indicating alteration or pollution of oil.
- It shall be free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances or mineral oils.

REFINED OLIVE POMACE OIL – Oil obtained from olive pomace by extraction by means of solvents and made edible by means of refining methods whci donot lead to alteration in initial glycerdic structure.

- It shall be clear, limpid without sediments, yellow to yello-brown colour, without specific odour or taste and free from odours or taste indicating alteration or pollution of oil.
- It shall be free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances or mineral oils.

MAIZE OIL

- Oil extracted from gram of clean and sounde seeds of ***Zea mays***.
- It shall be free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances or mineral oils.
- It shall conform to following standards:

Butyro-refractometer – 56.7 to 62.5

Saponification value – 187 to 195

Iodine value – 103 to 128

Unsaponifiable matter – Not more than 1.5%

Acid value – Not more than 0.50%

Test for Argemone shall be negative.

REGULATION FOR EDIBLE FATS

BEEF FAT or SUET

- Means fat obtained from a beef carcass. It shall have a Saponification value varying from 193 to 200 and an Iodine value from 35 to 46.

MUTTON FAT

- Means fat obtained from the carcasses of sheep. It shall hav a saponification value varying from 192 to 195 and an Iodine value from 35 to 46.

GOAT FAT

- Means rendered fat from goat. It shall have a saponification value varying from 193 to 196 and Iodine value from 36 to 45.

LARD

- Means the rendered fat from hogs and shall not contain more than 1.0% of substances other than fatty acids and fat. It shall not have a saponification value varying from 192 to 198 and Iodine value from 52 to 65.

COCOA BUTTER

- Means the fat obtained by expression from nibs of beans of ***Theobroma cocoa***. It shall be free from other oils and fats, mineral oils and added colours. It shall conform to following standards:

Butyro-refractometer – 40.9 to 48.0

Saponification value – 185 to 200

Iodine value – 32 to 42

Melting point – 29°C to 34°C

% of free fatty acids – Not more than 1.5

SAPONIFICATION VALUE : The saponification value denotes the weight in mg of potassium hydroxide (KOH) required to saponify one gram of oil.

IODINE VALUE : The unsaturated glycerides of an oil have the ability to absorb a definite amount of iodine, especially when aided by a carrier such as bromine, and thus form saturated compounds. The quantity of iodine absorbed is a measure of the unsaturation of an oil or fat. The iodine value is generally expressed as the number of grams of iodine absorbed by 100 g of the oil.

UNSAPOIIFIABLE MATTER

The unsaponifiable matter is defined as the substances soluble in an oil which after saponification are insoluble in water but soluble in the solvent used for the determination. It includes lipids of natural origin such as sterols, alcohols and hydrocarbons as well as any foreign organic matter non-volatile at 100°C (mineral oils) which may be present.

ACID VALUE

PRINCIPLE

The acid value is defined as the weight in milligrams of potassium hydroxide required to neutralize one gram of oil. It is a relative measure of rancidity as free fatty acids are usually formed during decomposition of oil glycerides.

PEROXIDE VALUE

The peroxide value is defined as the amount of peroxide oxygen per 1 kilogram of fat or oil. The sample is added to boiling chloroform-acetic acid containing dissolved potassium iodide. After cooling, the mixture is diluted with water and the liberated iodine titrated with sodium thiosulphate. The amount of iodine liberated by the sample is a measure of the active oxygen present.

TITRE

The **titre** of an **oil or fat** is the solidifying point of the mixed component **fatty acids**. The **titre** temperature is a mean for characterizing **oils and fats** and for assessing the hardness. The titre is the solidification point of the water-insoluble fatty acids, prepared and left to crystallize in a desiccator at laboratory temperature for about 24 hours before completing the determination. Water-insoluble fatty acids are those obtained after saponification of a fat and decomposition of the soap formed according to the method described. Because of the possible presence of fatty acids which are partially soluble in water, the details of this method must be strictly followed.

8. KREIS TEST (RANCIDITY INDEX):

- Due to rancidity, epihydrin aldehyde or malonaldehyde are increased which are detected by Kreis test using phloroglucinol which produces red colour with the oxidized fat.
- It is defined as number of milligrams of potassium hydroxide required to combine with fatty acids which are present in glyceride form in 1 g sample of oil or fat.

9.ESTER VALUE:

- Difference between saponification value and acid value is ester value.

10. REICHERT MESSLE VALUE:

- This value is a measure of volatile water soluble acid contents the fat.
- It is defined as number of milli litres N/10 potassium hydroxide solution required to neutralize the volatile water soluble fatty acids obtained by 5 g fat.

Significance:

- Higher content of volatile fatty acids of butter responsible for its higher reichert-meissl number.
- It is useful in testing purity/adulteration of butter.

11.POLENSKI VALUE:

- It is defined as the number of millitres of N/10 potassium hydroxide solution required to neutralize water-insoluble, steam - distillable acids liberated by hydrolysis of 5 gm of fat.

Significance:

- The Polenski value is an indicator of how much volatile fatty acid can be extracted from fat through safonification.

MEASUREMENT OF SPOILAGE OF FATS AND OIL

- **Rancidity** is a term generally used to denote unpleasant odors and flavors in foods resulting from deterioration in the fat or oil portion of a food.
- Three different mechanisms of **rancidity** may occur.
- These are oxidative, hydrolytic, and ketonic. Oxidative **Rancidity.**

Test for presence of Rancidity:

- In routine work apart from the free fatty acids determination, the analysis should include the determination of **Peroxide Value, Kries Test, Ultra-violet Absorption** at 234 nm and 268 nm to establish rancidity

KRIES TEST

- TWO TESTS

1.Qualitative

2.Quantitative

1.Qualitative

- Shake 5 ml of the oil vigorously with 5 ml of 0.1% phloroglucinol solution in diethyl ether and add 5 ml of conc. hydrochloric acid.
- A pink colour indicates incipient rancidity.

ANIMAL FAT

Animal Fat	Density 20°/20°	Refractive Index	Sapon-ification Value	Iodine Value	Unsapon-ifiable matter (max)	Acid Value mg KOH/g (max)	Peroxide value meq O/kg (max)
Lard (40°-20°)	0.896-0.904	1.448-1.460	192-203	45-70	10	1.3	10
Rendered pork fat (40°-20°)	0.894-0.906	1.448-1.461	192-203	45-70	12	2.5	16
Edible tallow (40°-20°)	0.893-0.904	1.448-1.460	190-202	32-50	12	2.5	16
Premier Jus. (40°-20°)	0.893-0.898	1.448-1.460	190-200	32-47	10	2	10

The titres of animal fats must be within the following ranges:

Fat	Titre
Lard	32 - 45°C
Rendered Pork Fat	32 - 45°C
Edible Tallow	40 - 49°C
Premier Jus	42.5 - 47°C

ADULTERATION IN FATS AND OILS

However detection of adulterant on basis of development of the color, turbidity or precipitate is possible.

1.Detection of sesame oil as adulterant:

- To 2 ml oil, add 1 ml hydrochloric acid containing 1 per cent sucrose and keep aside for 5 minutes.
- The presence of pink colour in the acid layer indicates presence of sesame oil.

2.Detection of cotton seed oil as adulterant by Halphen's test:

- To 2 ml oil, add 2.5ml alcohol and 2.5 ml solution of sulphur in carbon disulphide (1 per cent).
- Heat the mixture Formation of pink or red colour indicates presence of cotton seed oil.

3.Detection of karanja oil as adulterant:

- Take 5 ml of sample oil in a test tube; add 10 ml ethyl alcohol to it followed by addition of 5 drops of ferric chloride solution.
- Shake vigorusly two minutes and allow to stand for two hours.
- The development of light blue to dark colour in the alcoholic layer indicates the presence of karanja oil or any other oil containing phenolic group.

4.Detection of castor oil as adulterant:

- Take 1 ml of the sample to be tested in a clean test-tube and to it add acidified petroleum ether (60- 80°).
- Shake it thoroughly.



- Then to it add a drop ammonium molybdate solution.
- Development of white turbidity indicates the presence of castor oil.

5. **Detection of argemone oil as adulterant:**

- It is an adulterant to mustard oil.
- Ferric chloride reacts with argemone oil in hydrochloric acid medium to produce small needle shaped reddish brown crystals.
- However, if content of argemone oil is less than 1 per cent, needle-shaped cysaican be observed under microscope.

6. **Detection of linseed oil as adulterant**:

- About 1 ml sample is dissolved in 5 ml chloroform in a dry test-tube and one ml liquid bromine is added.
- The tube is stoppered and cooled in ice bat hand to it added 1.5 ml rectified spirit and 10 ml ether.
- It is then shaken thoroughly again for 30minutes.
- The appearance of precipitate (due to formation of hexabromide) indicates presence of linseed oil.

7. **Detection of mineral oil as adulterant**:

- To 1 ml oil or fat under test, add 25 ml alcoholic caustic potash.
- Boil in water bath, till it becomes quite clear.
- Transfer the contents of the flask to a wide mouth test tube and to it, add 25 ml distilled water along the side of the test tube, keeping the tube shaken during addition of water.
- The presence of turbidity indicates presence of mineral oil.

S.No	Food Article	Adulterant	Method for Detection	Remarks
1	Ghee	Vanaspathy or Margarine	Take about one tea spoon full of melted sample of Ghee with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of Vanaspati or Margarine.	If the test is positive i.e. red colour develops only by adding strong Hydrochloric acid (without adding crystals of sugar) then the sample is adulterated with coal tar dye. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present
2		Mashed Potatoes, Sweet Potatoes and other starches.	The presence of mashed potatoes and sweet potatoes in a sample of ghee can easily be detected by adding a few drops of Iodine, which is brownish in colour turns to blue if mashed potatoes/sweet potatoes/other starches are present.	
3	Coconut oil	Any other oil	Place a small bottle of oil in refrigerator. Coconut oil solidifies leaving the adulterant as a Separate layer.	

4	**Butter**	**Vanaspati or Margarine**	**Take about one teaspoon full of melted sample of butter with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of Vanaspati or Margarine.**	**If the testis positive i.e. red colour develops only by adding strong Hydrochloric acid (without adding crystals of sugar) then the sample is adulterated with coal tar dye. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present**
5		Mashed Potatoes and other starches	The presence of mashed potatoes and sweet potatoes in a sample of butter can easily e detected by adding a few drops of iodine (which is brownish in colour), turns to blue.	
6	Edible oil	Prohibited colour	Take 5 ml of sample in a test tube and add 5 ml of concentrated hydrochloric acid. Shake gently, let it stand for 5 minutes. Colour will separate in the upper layer of the solution.	

FQCR IV UNIT

Ms. Shaik Shakeera
Department of Food Technology

Cleaning and disinfection programmes are essential for the production of safe food

Only the regular performance of cleaning (and, if necessary, disinfection) programmes will ensure that a food business produces food that is safe and of high quality.

Cleaning operations are a key component of any food safety system. Maintaining a food production site at high sanitary levels requires time, adequate financing and careful training of personnel.

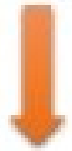
Regular cleaning can prolong the shelf life of a product and will pay off for a business in the long run.





Levels of "CLEAN"

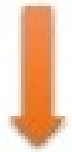
- **Cleaning** — Removal of Visible physical dirt and stains



- **Disinfection** — Removal of harmful bacteria / microbes



- **Sanitation** — Process in which most or nearly all micro organisms (whether or not pathogenic)



- **Sterilization** — Total Germ Kill live (including spores)

Cleaning and disinfection steps have separate goals

Cleaning removes

- soils (e.g. food and mineral residues)
- dust
- dirt/waste

Disinfection is only done after soils have been removed in order to inactivate remaining microorganisms!

Soils have to be regularly removed

Cleaning is an essential part of any food production. Correctly carried out, cleaning operations

- prevent the build-up of dirt and soils that stick to surfaces and thus reduce the time necessary for each cleaning step;
- remove food and hiding spaces for pests and reduce the bacterial load and thus improve levels of hygiene;
- protect surfaces from corrosion through soils, food and detergent/disinfectant residues;
- prevent contamination of foods with allergens;

Removing soils without using water

Dry cleaning methods are used for low-moisture foods, and in particular with foods that are hygroscopic.

Examples are: Bakery goods, nuts and seeds, candy, grains, snack foods, dried foods (milk powder, etc.)

Dry cleaning essentially consists of the mechanical removal of soils using sweeping, brushing, wiping and vacuuming with the aim to minimise the spread of 'dust' from one area to another.

Disinfection following dry cleaning is done by applying 70% ethanol and allowing it to dry off before equipment is reassembled.



Unhygienic accumulation of dust in a rice mill

Surfactants improve the cleaning

Surfactants (often referred to as detergents) are neutral cleaners and are used in hand washing soaps.

The presence of surfactants enables cleaning chemicals to reach the soil through

- wetting (reduction of surface tension);
- foaming (e.g. improved adherence to walls);
- spreading (e.g. entering small gaps);
- emulsification (e.g. making fats soluble in water);

The quality of water (i.e. hardness, pH, impurities such as minerals etc.) influences the effect of detergents.

Sequestrants bind metals and thus can remove mineral hardness from water and make it softer for improved cleaning.

EDTA (ethylene diamine tetra acetic acid) and polyphosphates are known examples of widely used sequestrants. It should be noted that these chemicals have been overused and are now considered environmental pollutants.

Depending on the level of water hardness in a plant the use of sequestrants could be reduced if they have not been included by default in commercially available detergents.

Overview of food soils and recommended cleaners

Soil type	Solubility characteristics	Recommended cleaning agent
Sugars, organic acids, salts (i.e. fruit and vegetables)	water-soluble	mild alkali
Foods high in protein (meat, poultry, fish, eggs)	alkali-soluble (only water soluble when denatured)	Alkali
Starchy foods (e.g. potatoes)	Partly water-soluble, alkali-soluble	mild alkali
Fatty foods (e.g. butter, oil, meat fats)	alkali-soluble or soluble in water hotter than 40°C	Mild-strong alkali
Minerals (e.g. milk stone, protein scale, beer stone)	Only acid soluble	Acid

4 factors affect the efficiency of cleaning processes

time – cleaning efficiency can be improved by increasing the application time

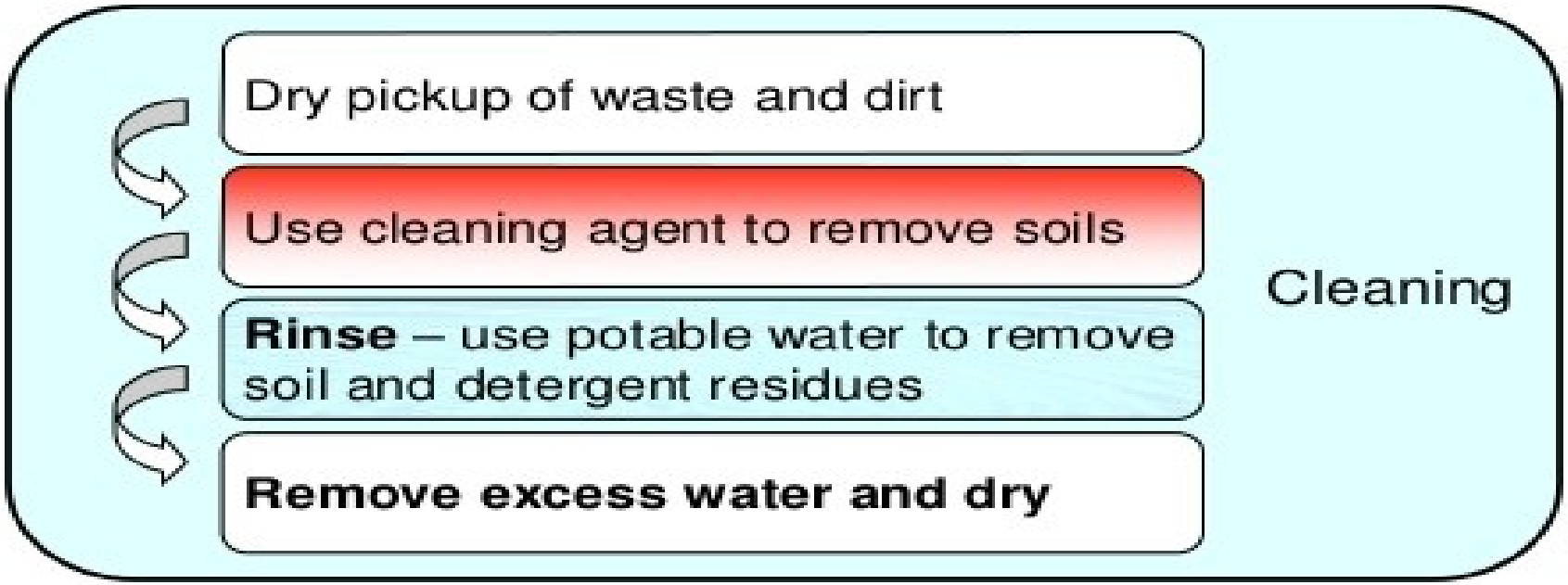
type of cleaner – needs to be selected for type of soil and water properties

mechanics – increased turbulence or force of scrubbing provides for more effective removal of soils.

temperature – higher temperatures lead to increased reaction rates. Effective cleaning starts at 40-45°C (melting of fat)

Rinsing and drying are part of each cleaning process

Residues of cleaning chemicals can contaminate foods and therefore careful rinsing after the use of cleaning chemicals is necessary.



Fungi can grow in water droplets and it is therefore essential to dry equipment and surfaces after cleaning!

Disinfection is the step that comes after cleaning

Disinfection inactivates microorganisms only if soils have first been removed.

Two main methods of disinfection exist:

- physical (e.g. heating, applying pressure, using UV); and
- chemical (e.g. chlorine, ethanol, ozone).

Evaluation of most effective method of disinfection

Often, disinfectants in use do not target the microorganisms of concern or then are applied wrongly and have no effect.

Deciding on the appropriate disinfectant and/or disinfection method for a specific food production facility needs careful evaluation.

Prior to deciding on which disinfectant to use a food business should consult with more than one supplier and carefully check the promises made by sales people.

Cleaning Materials

Cleaning agents must be:

- Safe for employee use
- Stable and noncorrosive

When using them:

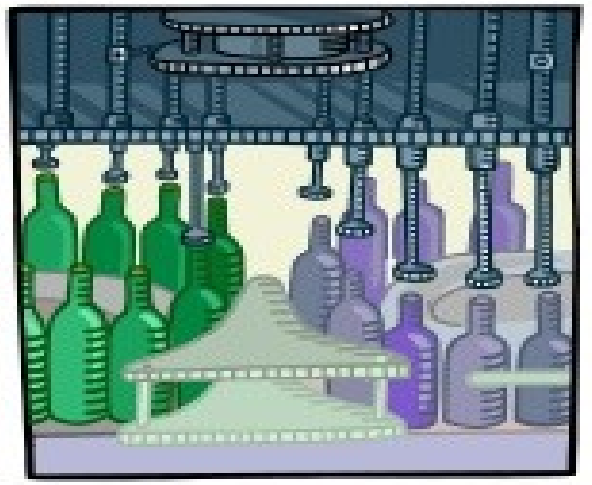
- Follow manufacturers instructions carefully – *especially if cleaning equipment that requires specific brand of cleaner*
- Never combine cleaners or attempt to make up cleaning agents - potentially dangerous
- Do not substitute one type of detergent for another unless the intended use is stated clearly on the label

An example of a physical disinfection method

Disinfection with steam or hot water in closed production processes is widely used in food production.

Steam and/or boiling water are effective disinfectants as:

- they penetrate into corners and small spaces;
- leave no residues:
- Attack all types of microorganisms;



Bottling lines can be effectively disinfected with steam/hot water

The temperature of the water determines the time of exposure needed to ensure the desired reduction of microorganisms.

Careful: if water hardness exceeds 60 mg/l, water scale is deposited and needs to be removed!

Two different types of chemical disinfectants are mainly used in the food industry

Depending on the targeted type of microorganism and the surface/equipment that needs to be disinfected different types of chemical disinfection methods will be used.

Redox agents that
- inactivate microorganisms quickly
- leave no residues (are "used up")
- are highly sensitive to dirt

Examples are chlorine releasing compounds and ozone.

Nitrogen compounds that
- inactivate microorganisms slowly
- leave residues
- are less sensitive to dirt
- are preferred for use on open spaces (e.g. walls)

An example would be QACs (Quaternary Ammonium Compounds).

An example of a chemical disinfectant: Chlorine

Chlorine compounds are often preferred over other disinfection compounds because they:

- are fast-acting;
- kill all types of vegetative cells (not spores);
- are usually low-cost;
- do not require rinsing if the concentration is 200 ppm or less;
- are available as liquid or granules;
- are less affected by water hardness;

The effectiveness of chemical disinfectants is influenced by a number of factors

Concentration

- Interfering substances, primarily organic matter such as residual soil (including high microbial loads) react with disinfectant and thus reduce their concentration to ineffective levels.
- Each disinfectant has an optimal concentration at which it inactivates bacteria.

pH

- Even small changes in acidity or alkalinity can affect the activity of sanitizers
- Chlorine and iodine compounds should be used at pH values of around 7.0.

Temperature

- Chemical reactions occur more rapidly at higher temperatures.

Contact time

- Nitrogen compounds are slow-acting whereas redox agents are fast acting.

Water hardness

- Hard water makes disinfectants less effective (if the water hardness exceeds 200 ppm of calcium, a sequestering agent is necessary).

Desired Characteristics in a Sanitizer[1,17]		
Ease of application	Low toxicity	Non-corrosive
Good penetrative power	Fast acting	No harmful or offensive odour
Stability (long shelf life for concentrate)	Not adversely affected by organic matter	Active before and after dilution with hard water
Compatibility with other chemicals and material of construction	Broad spectrum of activity towards gram-positive and gram-negative bacteria, fungi, and viruses	Not persistent in the environment
Demonstrate residual activity	Economy (cost-effective performance)	

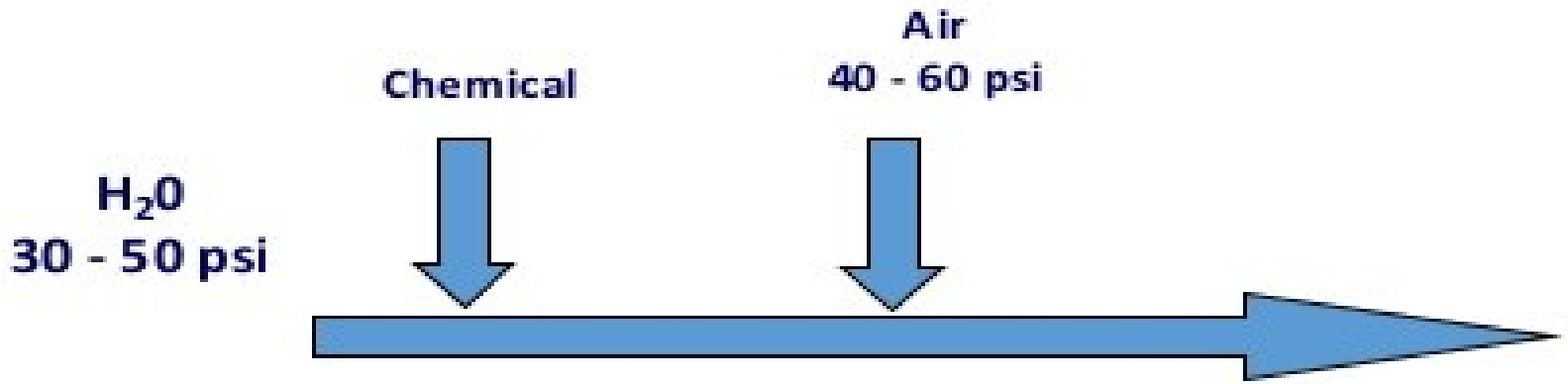
Cleaning Techniques

1. Mechanical Cleaning and Sanitation

a. Mechanical Wet Cleaning - Foam / Gel Technology

- Use of high foaming solution to increase the retention time on the vertical surfaces
- Gels are used to further increase over foam the retention time on the vertical surface

This is how Foam is Generated



Foam Cleaning - Cling Time

Foaming Techniques

- Pre-rinse to remove loose soil and residues.
- Foam up, rinse down.
- Work in small sections.
- Allow foam to remain on surface 10 to 15 min.
- Be aware of surfaces susceptible to corrosion.
- No advantage in foaming hot solutions.
- Wear protective equipment (goggles, gloves, suit and boots).

b. Mechanical – Dry Cleaning

- Manual or Automated
- Use of Brooms/ Shovels
- Use of automated Vacuum cleaners
- Process used where wet cleaning is not possible
- Areas manufacturing water sensitive products

2. Immersion Cleaning

- This is the type of cleaning in which the parts to be cleaned are placed in the cleaning solutions to come in contact with the entire surface of the parts.

- Immersion cleaning is preferred for parts that must be placed in baskets and for processes requiring a long soaking time because of the type of contamination to be removed or the shape of the parts to be cleaned.

3. COP (Cleaning Out Of Place – Mechanical)

- Cleaning Out of Place is defined as a method of cleaning equipment items by removing them from their operational area and taking them to a designated cleaning station for cleaning.
- It requires dismantling an apparatus, washing it in a central washing area using an automated system, and checking it at reassembly.

4. CIP (Cleaning in place – Mechanical)

- Clean-in-place: Cleaning internal surfaces of production equipment without disassembly
- Cleaning in place can be described as the cleaning of equipment and vessels at the same place without movement of them to a different place.
- The cleaning agents can be transferred to the vessel or equipment types either thorough fixed piping or flexible hoses.

Definition of CIP

General definition of CIP:

- Cleaning of complete items of plant or pipeline circuits without dismantling or opening of the equipment, and with little or no manual involvement on the part of the operator

CIP Process Description (3)

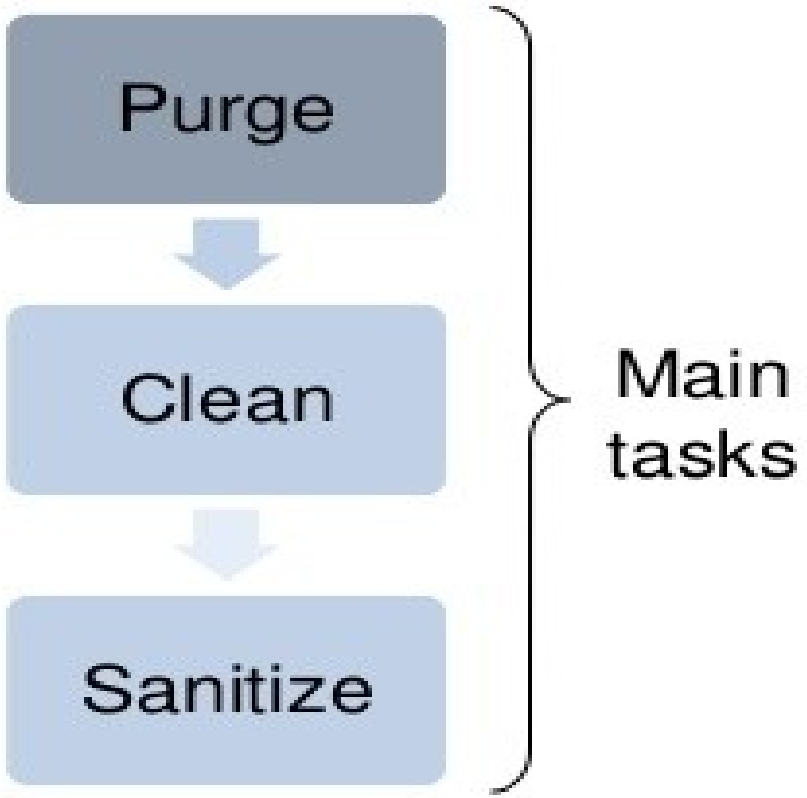
CIP cycles generally consist of a combination of the following steps:

Purge/Pre-rinse
- Product recovery
- Mechanical removal of soil

Detergent
- Removal of remaining soil
- Either caustic, acid or both

Final rinse
- Flush out residual detergent/soil

Sterilant/Sanitizer
- Destruction of residual organisms
- Either cold or hot



CIP Process Description (5)

Example of a CIP cycle from the dairy industry:

1. Product recovery using fresh purge water
2. Initial rinse (3-5 min) using recovered water to drain
3. Caustic wash at 75ºC (10-20 min) with recovery
4. Final rinse (3-5 min), fresh water to recovery tank
5. Cold sanitation (3-5 min)
6. Flush with fresh water and drain or leave full and drain the following day (depending on sanitizer used)
7. Additional procedures once a week to remove deposits from rinsing water (intermediate rinse, acid wash)

5. High Pressure cleaning (Mechanical)

- Useful for walls, floors, large equipment and tables.
- Spray can form aerosols mist from irritating chemicals.
- Atomization can spread soil and microorganisms.
- Pressures used:

  - Low Pressure: <15 bar
  - Medium Pressure: 15 to 30 bar
  - High Pressure: 30 to 150 bar

  - Recommended: < 45 bar

Quality Concerns in Dairy Processing

Processors must contend with the following problems on a daily basis :

- ***High bacterial loads in raw milk are reducing product shelf life;***
- ***High bacterial counts in raw milk are a direct cause of reduced quality in dairy products***
- ***Antibiotic residues prevent efficient yogurt and cheese production***
- ***Antibiotic and pesticide residues do not meet regional trade standards and thereby restrict export trade***
- ***A lack of cold chain in collection systems reduces quality***
- ***A lack of cold chain at retail reduces distribution efficiency and causes products to spoil quickly***
- ***Consumers have inaccurate perceptions about poor milk quality, even with processed products.***

Contamination and Control Measures at Farm Level

Contamination of milk can occur at the following levels:

- *Animal shed and environment*
- *The Animal , its health and management*
- *Milker and milking routine*
- *Milking equipment*
- *Storage and transport*

Quality Measures In Milk Collection Systems

Animal Shed

- *The animal shed is one of the main sources of contamination.*
- *Mud, urine and feed residues should regularly be removed from the shed.*
- *The shed should have proper drainage, sufficient light and ventilation.*
- *In very wet areas, sprinkling slaked lime over the surface will help to dry it out quickly.*
- *The milking area of the shed needs special hygienic attention.*
- *The floor of the milkshed should be swept with clean water, and disinfected with one-percent bleaching powder solution.*

Animal Health Care

- Milk from diseased animals should be kept separate and disposed of safely.
- Animals suffering from any contagious disease, including mastitis, should be segregated from the healthy ones.
- The skin of the animal provides a large surface for possible contamination.
- Long hairs on the flanks, hind legs, tail and udder should be clipped at frequent intervals.
- If washing of animals is not practiced regularly as is observed in most cases, at least grooming of the animals should be done to keep the hair and dust away from milk.
- The udder is the part of the animal nearest to the milk and needs to be washed before each milking, and dried with a clean cloth or towel.

Quality Measures at Collection Point

- *Creating a record keeping system that documents each member/supplier*
- *Testing each batch received (no matter how small) and recording the results by member*
- *Using multiple tests, such as cryoscopy and/or lactometer for adulteration, titratable acidity test for bacteria load, and mastitis detection*
- *Rejecting milk that falls below specified standards*
- *Taking corrective action when a member repeatedly delivers milk below quality standards.*

QUALITY ASSURANCE FOLLOWS TWO STEPS

- RECEPTION

a) Milk Sampling
b) Labeling And Records of the Sample
c) Organoleptic Tests
d) Clot on Boiling (COB)
e) Alcohol Test

- LAB TESTS

LAB TESTS: GERBER BUTTERFAT TEST

Done for checking the fat level in milk.

- 10.75-11 ml of milk warmed at 27°C.
- 1ml of Amyl Alcohol
- Centrifuge machine.
- Minimum reading of fat should be 5.





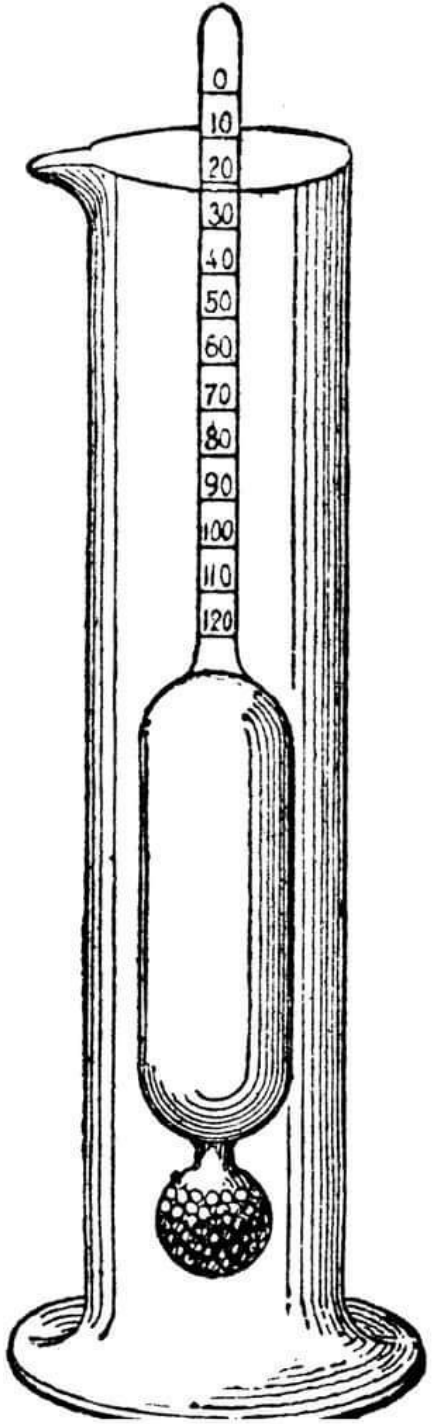
Lactometer is a cylindrical vessel made by blowing a glass tube.

One side of glass tube looks like a bulb filled with mercury and another side is thin tube with scale.

For milk testing, lactometer is dipped in milk which we are testing. In lactometer, the point up to which it sinks in the pure milk is marked after that put in water and marked at the point up to which it sinks in water.

It sinks less in milk than water because as we know milk is denser than water. In the lactometer there are two portions i.e. ‘M ‘and ‘W’ which is divided in three parts and marked as 3, 2 and 1.

That indicates the level of the purity in milk.



Detection of Addition of Starch in Milk

Relevant information:

Iodine solution gives intense blue colour with starch due to formation of an unstable complex starch compound.



1.Take about 3 ml of pure milk sample, rice flour mixed milk sample & defected milk sample in three different test tubes.

2.Boil the milk over a Burner.

3.Cool & add few drops of iodine solution.

4.Adulterated milk will turn blue.

Detection of addition of cane sugar in milk

Principle:

Resorcinol products red colour solution with sucrose in acidic media



1)Take 10.0ml of milk in a test tube.

2)Add 1.0ml of concentrated hydrochloric acid & mix well.

3)Add 0.1 gm of resorcinol powder and mix thoroughly

4)Place the tube in boiling water bath for 5 min.

5)Observe the colour of the contents.

6)Development of red colour indicates presence of cane sugar in milk.

Detection of Addition of urea in milk

Procedure:

1)Take 2 ml of milk in test tube.

2)Add 2ml of urea reagent i.e. para- dimethyl amino benzaldehyde.

3)Shake it well.

Observed dark yellow color =urea present

Light yellow color= urea absent

THIS IS HOW YOU SPOT



	NATURAL	SYNTHETIC
Taste	Slightly sweet	Bitter
Colour	White	White
Texture	No Soapy feeling if rubbed between fingers	Soapy feeling if rubbed between fingers
Effects of heating	No changes, remains white	Turns yellowish when boiled
Effect on storage	No change in colour	Turns yellowish after a while
If urea present	Weakly positive (light yellow)	Highly positive (intense yellow)

S. No.	Food Article	Adulterant	Method of detection	Remarks
1	Milk	Water	The presence of water can be detected by putting a drop of milk on a polished slanting surface. The drop of pure milk flows slowly leaving a white trail behind it, whereas milk adulterated with water will flow immediately without leaving a mark.	
2		Starch	Add a few drops of Iodine solution. Formation of blue colour indicates the presence of starch.	Iodine solution is easily available in the medical stores
3		Urea	Take a teaspoon of milk in a test tube. Add half teaspoon of soybean powder, Mix up the contents thoroughly by shaking the test tube. After 5 minutes, dip a red litmus paper in it. Remove the paper after half a minute. A change in colour from red to blue indicates the presence of urea in the milk.	
4		Detergent	Shake 5-10 ml of sample with an equal amount of water. Lather indicates the presence of detergent	

5		Synthetic milk	Synthetic milk has bitter after taste, gives a soapy feeling on rubbing between the fingers and turns yellowish on heating	Synthetic milk is made by adding while colour water paint, oils, alkali, urea and detergent, etc.
6		Test for Glucose / Invert sugar	Take a strip of Diacetic strip and dip in to the milk for 30 sec to 1 min. If the strip changes the color then it shows the sample of milk contains glucose .If there is no change in the color of the strip , then glucose is absent.	Glucose inverts sugar syrup is added to the milk increases the consistency.

WHAT THE HYGIENE MEANS?

Hygiene is a set of practices performed for the preservation of health.

According to the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases." Some regular hygienic practices may be considered good habits by a society while the neglect of hygiene can be considered disgusting, disrespectful or even threatening.

Plant hygiene can be further divided into three——

- Equipments hygiene
- Processing hygiene
- Personal hygiene

Equipment hygiene directly related to cleaning of equipments or machineries. Whereas, processing hygiene related to handling of equipments, function of machines and so on. It also relates with cleaning. So cleaning is important to maintain plant hygiene.

Cleaning assumes a key role in the obligatory hygiene measures performed in dairy processing plants. The undesirable substances include milk residues, microorganisms, and other contaminations such as allergens or chemical residues should be cleaned. The legislator has focused on avoiding adverse sensory, spoilage causing or even pathogenic germ

Furthermore, process relevant factors in connection with cleaning are also significant for production plants. For example, regular and correctly performed cleaning protect machinery and equipment for instance against corrosion or the deterioration in efficiency that always occurs when heart-exchanging systems develop a coating. Cleaning adapted to cope with the residue and process situation helps plants to tackle

RULES AND NORMS

To maintain hygiene these rules are should be followed —

- ***Warring of clean apron, masks, gloves, cap during work.***
- ***Reinforced safety shoes or boots should used.***
- ***Good Manufacturing Process(GMP) should be done.***
- ***No jewallary (i.e. rings, ear rings, nail polices) are allowed in production place.***

- Frequently check out of outlet batch products quality.
- Automatic can washer should be used.
- Sufficient water supply.
- Floor should not always flooded with water and should be cleaned.
- Drainage system in processing area, should be maintained properly.

Personal hygiene is related to all type of hygiene practices maintain in a dairy plant. It deals with laboratory hygiene practices, plant hygienic condition and general hygiene awareness. This is also known as public hygiene.

In a dairy plant, not only the raw materials or equipments but microbial contamination, dirt and dust also could be spread from working parsons. Personal hygiene should be maintain to prevent such types of contamination.

PERSONAL HYGIENE RELATED ITEMS:-

❖HAIR :

Hair is an extraneous matter hazard and must be kept out of the product.

- ✓ *Hair must be neatly combed.*
- ✓ *A head covering to contain the hair, as completely as possible, in the form of hairnet or cap provided by the dairy, must be wore at all times. If the hair is not enclosed by a cap, then a hairnet must be wore.*
- ✓ *No hair pins, bobby pins, hair clips or any other similar clip is allowed to keep a head covering in place. They must be enclosed in the hairnet. Hair extending over the ears or beyond the top of the shirt collar must be protected by a hairnet.*



- *No person should comb their hair at the work place.*
- *Men shall preferably be clean shaven. The mustache should be properly covered so that chances of hairs failing in the products do not arise.*
- *The mustache is no wider than around outer edge of mouth and extends no longer than the bottom of the mouth. Handlebar style moustache will not be permitted.*
- *The sideburns are trimmed no longer than the lobe of the ear. Curved sideburns extending towards the corner of the mouth will not be permitted.*
- *Beards are an extraneous matter hazard. Because of the risk of hair loss, any beard must be completely covered and enclosed with a clean, disposable mask.*

❖ HANDS :

- ✓ *Wash hands thoroughly in a hand-washing facility before commencing work and after each absence from the work area.*
- ✓ *Keep hands and finger nails clean. Keep finger nails properly trimmed. Long finger nails are unsuitable in a dairy.*
- ✓ *After visiting the rest rooms, toilet, after smoking and at any other time when hands have become soiled or contaminated, employees must wash their hands before returning to their work area.*
- ✓ *Perfumed hand lotions and hand soaps are not permitted.*



- ✓ *In areas designated as critical hygiene areas, hands must be sanitized in the solution provided upon entering the area.*
- ✓ *Any person with cuts or unprotected sores on fingers must not start work, but must report to their supervisor and then to the medical centre.*
- ✓ *Cuts and open sores on fingers must be covered by a colored band-aid type dressing applied by the authorized Medical Officer or an authorized person. Standard flesh colored band-aids or dressings are not acceptable.*

CLOTHING :

Clothing is provided to protect the product from contamination. Clothing must be clean at the start of production and kept clean during production.

- ✓ Where clothing becomes soiled rapidly, disposable or plastic aprons should be worn over it and changed frequently for additional protection against product contamination.
- ✓ Work in a very dirty or contaminated area, such as effluent disposal area, before entering the plant, change into clean clothes.
- ✓ Pockets above the waist are not allowed. Pockets must be removed or sewn shut to prevent use and to eliminate a product contamination risk.
- ✓ Do not use decorative buttons on shirt or apron. They may fall in product accidentally.

- ✓ Do not carry pens, pencils, thermometers, spectacles, tools, etc., in shirts, coats etc., above the belt or waistline, or behind the ear. This would prevent articles from falling into the product.
- ✓ Maintain gloves used for handling food and food contact packaging supplies intact and in sanitary condition. Gloves shall be of food grade material. If gloves are worn for handling food and food packaging they must be kept clean and only worn for this purpose. Gloves shall be rinsed in sanitizing solution before handling any product. Hands must be washed and sanitized even though gloves are worn.
- ✓ When sweaters are needed, they must be worn under the outer garment to avoid product contamination with loose fibers. Sweaters should be 'short haired (smooth)' close knit and lint free.

JEWELLERY :

Rings, ear rings, badges, watches and other jewellery must not be worn while on the job because:

- ✓ Hand jewellery cannot be adequately sanitized against bacteria transmission.
- ✓ Jewellery may fall into product. It is also a safety hazard with machinery.

And if there is a real necessary of it, then must go for:

- ✓ Small plain sleeper ear rings.
- ✓ A necklace or chain under a shirt or T- shirt.
- ✓ A plain wedding band which cannot be removed.

Shoes :

Keep shoes clean, neat and in good condition. Safety boots and shoes should be worn only at the work place and not in any other place to avoid contamination. In critical aseptic areas footbaths must be used by all personnel whenever they are provided. They are an essential part of sanitation procedure.

Other Habits :

Smoking is permitted only in authorized areas. Hands must be washed after smoking and before re-entering the production area. Chewing of betel leaves, pan masala and tobacco is permitted only outside the factory premises. Mouth and hands must be washed after chewing and before re-entering the production area.

Food hygiene is concerned with the hygiene practices that prevent food poisoning. According to WHO, the five key principles of food hygiene are:

- *Prevent contaminating food with mixing chemicals.*
- *Separate raw and finished product to prevent contamination.*
- *Heat the raw materials for the appropriate period of time and at the appropriate temperature to kill pathogens.*
- *Store food at the proper temperature and desired condition.*
- *Use safe water for cleaning.*

Labeling of food is also done to indicate when it was produced (i.e. food manufacturer date, best before period) or prices, nutritive value etc. for consumers' awareness and satisfaction.

Water is the most important material related to Dairy Industry. Water is mainly used for cleaning and sanitizing purpose as it is a good solvent and easily available in nature. About 4-5 liters of water is required per liter of milk handled depending on the type of plant before laying out the water supply system. An ideal water is one that is regular, adequate, soft cold and free from all impurities used in dairy industry.

Dairy waste water are highly biodegradable, they can be effectively treated with biological waste water treatment systems, but can pose a potential environment hazard if not treated properly. So the Environmental Protection Agency (EPA) establishes general regulations concerning discharges to surface waters and groundwater. Each plant must have a discharge permit for each outfall discharging to surface waters.

The limits within that permit depend on the flow and type of surface water into which the treated waste-water is discharged.
Dairy plant operators may choose from a wide variety of methods for treating dairy wastes from their plants. This may range from land application for small plants to operation of biological waste-water treatment systems for larger plants. Here some of them given below:-

- **Aerobic Treatment of Dairy Waste Water:** This treatment is done in ponds or lagoons.
- **Activated sludge:** The process consists of aerobic oxidation of organic matter to CO_2, H_2O, NH_3 and cell biomass followed by sedimentation of activated sludge.
- **Biological filtration:** Biofilm is used to filter the waste water.
- **Anaerobic Digestion:** It has been designed to treat high-strength dairy wastes.









PLANT LAYOUT

The ideal layout permits production of new product or modification in production system at the least possible expense and interruption in production schedule. Good plant layout has short pipeline, least number of bends. As far as possible, sequencing of equipment should follow the process layout. Plant machinery should be placed apart at sufficient distance to allow movement for cleaning, operation and monitoring. Minimum holding of product during production is another aspect of consideration. Least possible stock of intermediary or in-process and finished item should be present on the production floor

Development of good layout should fulfil following objectives:

a. Improve or facilitate production operation,
b. Minimize material handling,
c. Have flexibility of operation for alterations and expansions,
d. Minimize investment in equipment,
e. Economize use of floor area,
f. Make labour utilization effective,
g. Make effective utilization of by-products,
h. Provide convenience and comfort for employees,
i. Ensure proper cleaning, operation and monitoring of processes, and
j. Prevent cross contamination

Advantages of a good plant layout

1. A good layout reduces
a. the effort in normal material handling of a worker.
b. cost of handling by direct labour and hence increased productivity per man hour and
c. indirect manufacturing cost by decreasing spoilage under difficult handling situation

2. It uses only essential space required and eliminate congestion and accident, permits flexibility for methods improvement and future expansion besides making supervision easier.

3. It also facilitates scheduling and despatching operation.

Disinfectants

Washing Soda:

- Washing soda **(NaHCO3)** dissolved in water (4 % solution) is powerful disinfectant.

Lime:

- Fresh lime when sprinkled over the floors, walls, ground; as soil becomes unfavorable for germs growth in farm. **1 Kg of lime** is dissolved in **25 kg of water**.

- **$KMNO_4$:**
  $KMNO_4$ is a good disinfectant. It is cheap. It has also antiseptic properties.
- **Mercuric Chloride:**
  Very strong disinfectant but corrosive to metal and secondly it is poisonous. So use carefully.

- **Phenol** (**Carbolic acid**):

  5 % solution of phenol is good disinfectant.

- **Formalin:**

  5 % solution is good disinfectant. This sprayed in at least 10 hours complete air tight condition (closed vicinity).

- **Bleaching Powder:**

  This is **calcium hypochloride**. It contains up to **39%** available chlorine which has high disinfecting activity.

- **Iodine:**

  This is commercially available as **iodophores** and contains between 1 and 2% available Iodine which is an effective germicide..

The choice of sanitizer

Four factors that impact the choice of sanitation

- The type or **nature of the soil** to be removed different soils require different cleaners
- More than **99%** of the cleaning solution is water so it is important to understand how **water quality** can impact the cleaner.

- The surface or material to be cleaned what the material is composed of, plastic, rubber, stainless steel and the surface condition (smooth, rough, pitted) will need consideration.
- Detergent application method.

Methods of Application

There are three methods of cleaning

1. Manual or hand cleaning
2. High pressure spray cleaning
3. Foam cleaning.

Quality control in Animal Based Food Processing Sector

Good Agricultural Practices Farm level

- Keep food animals free of diseases through regular vaccination and treatment.
- Prevent accumulation of chemical residues by feeding animals with clean feed (free pathogens, aflatoxins, heavy metals and other toxicants)
- Prudent use of veterinary drugs and observing withdrawal periods before animal slaughter.
- Providing animals with clean water and appropriate housing conditions.
- Minimize non-therapeutic use of antibiotics or hormones

Good hygiene practices at the lairage

- Facilities must be available for the isolation and removal of any animals showing signs of illness.
- Pressurized water is preferred to wash animals prior to slaughter
- Animals must be adequately rested before slaughter for 12hrs.
- Food should be withheld 12hrs before slaughter.
- Ante-mortem inspection must be diligently carried out to detect sick animals.

Good Hygiene Practices during Slaughtering

- Slaughtering should be done on tables or on hanging rail to reduce contamination by regurgitation
- The slaughtering knife should be cleaned and sterilized between each carcass at 82°C.
- The head should be removed and after skinning washed separately from the carcass.

- After the initial cut through the skin, sterilize the knife in water at 82°c and then make all other cuts from the inside out.
- No hair or skin pieces should be left on the skinned carcass.
- No excess blood should appear on the skin of the carcass.
- Prevent contact of dirt from hides and skin to the meat surface.
- Prevent contamination of the carcass with dirty hooks, knives and protective clothes.

GHP during evisceration

- Do not puncture the viscera (alimentary tract), uterus, urinary bladder and gall bladder during separation cuts.
- Prevent contact of viscera with floors, walls or stands.
- Regularly wash hands/aprons and sterilize knives, especially after any time contamination occurs.
- Careless evisceration must be avoided to prevent contamination of the carcass with gut contents.

GHP during Post-mortem inspection

- During post-mortem meat inspection, palpation and incision of lymph nodes, infected tissues or tissues with abnormalities can give rise to cross contamination.
- Incision should therefore be avoided where possible, and palpation of organs should be minimal.

Personnel Hygiene of S/workers

- Appropriate protective clothing should be worn and replaced each day or when heavily soiled.
- They should be of light color, preferably white and be clean and tidy.
- Hands and arms should be washed and knives and equipments regularly sterilized using hot water.

GHP of Slaughterhouse personnel

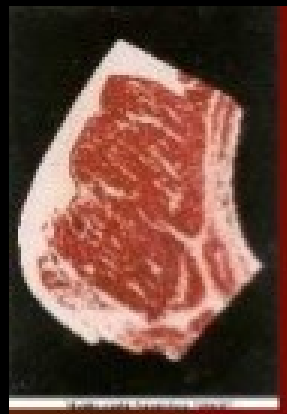
- Workers should not use heavy perfumes, lipstick, false eyebrows and eye shadows.
- Washing facilities should be provided where workers can wash before leaving and a canteen where they could take refreshment and rest during breaks.
- Workers must go for medical check-up after every 6 months

Slaughterhouse workers



Slaughterhouse cleaning

- Proper cleaning and sanitation of the slaughter floor, walls and equipment should occur daily and frequently during the day.
- Sanitary Standard operation procedures (SSOPs) for cleaning and sanitation of all parts of the plant should be in-place and well-implemented.



QUALITY GRADE

Quality grades indicate the factors related to the sensory characteristics of tenderness, flavor, color, texture and juiciness. The quality grade is intended to reflect the cooked product's overall acceptability.

- The USDA quality grades for steer and heifer carcasses are prime, choice, good, standard, and utility. These grades are determined by balancing maturity and degree of marbling.

Carcass Grading

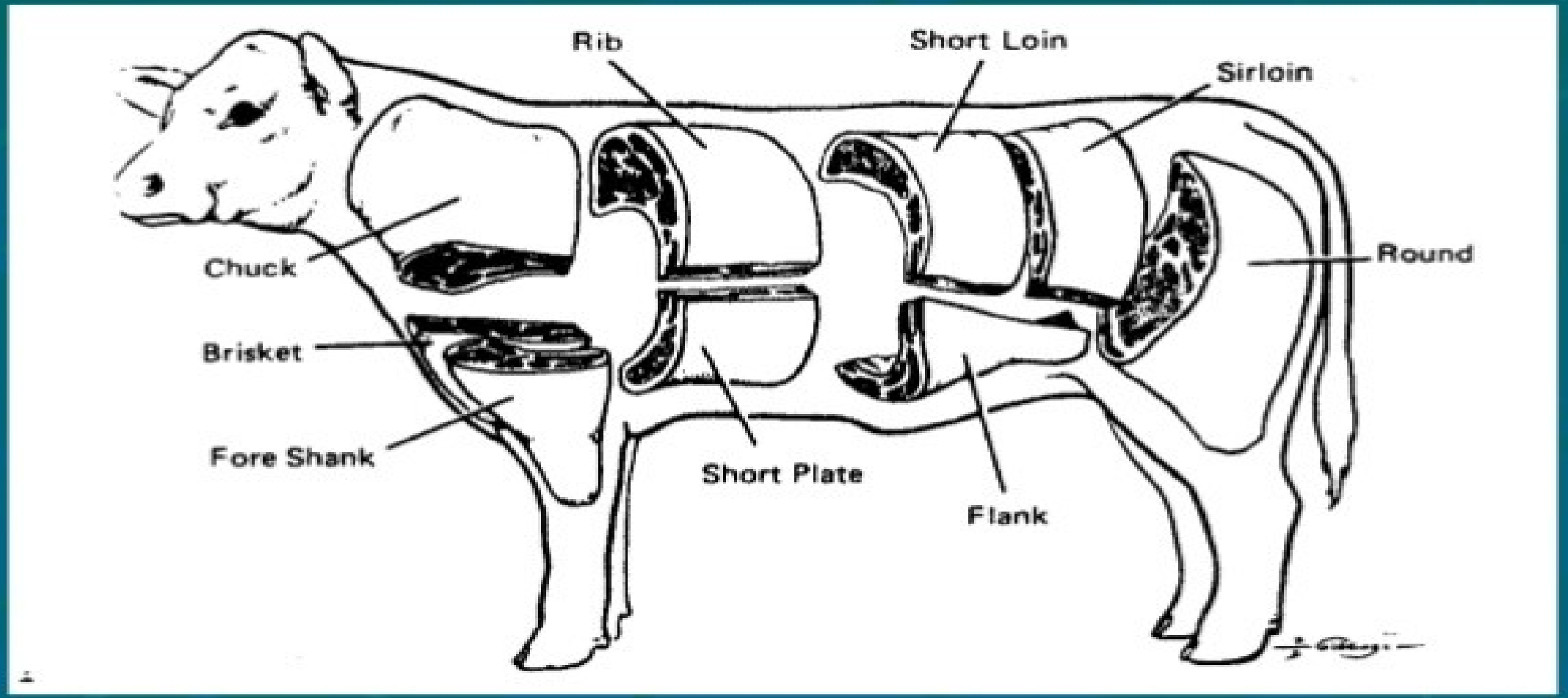
- Yield grade
- Quality grade

YIELD GRADES

- Yield grades estimate the quantity or the amount of closely trimmed boneless retail cuts from the loin, round, chuck and rib.
- There are five USDA yield grades, 1 through 5.
- Yield grade 1 carcasses have the highest yield of retail cuts and yield grade 5, the lowest

PRIMAL CUTS



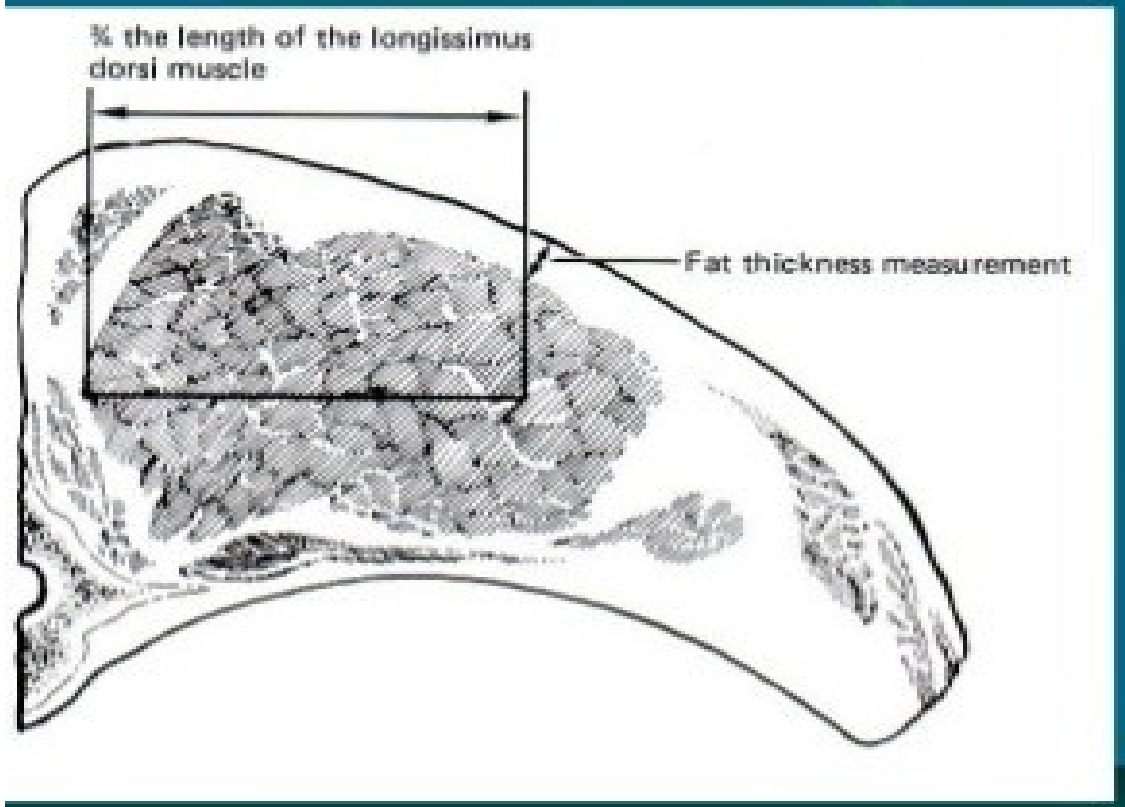

Rib
Short Loin
Sirloin
Chuck
Round
Brisket
Fore Shank
Short Plate
Flank

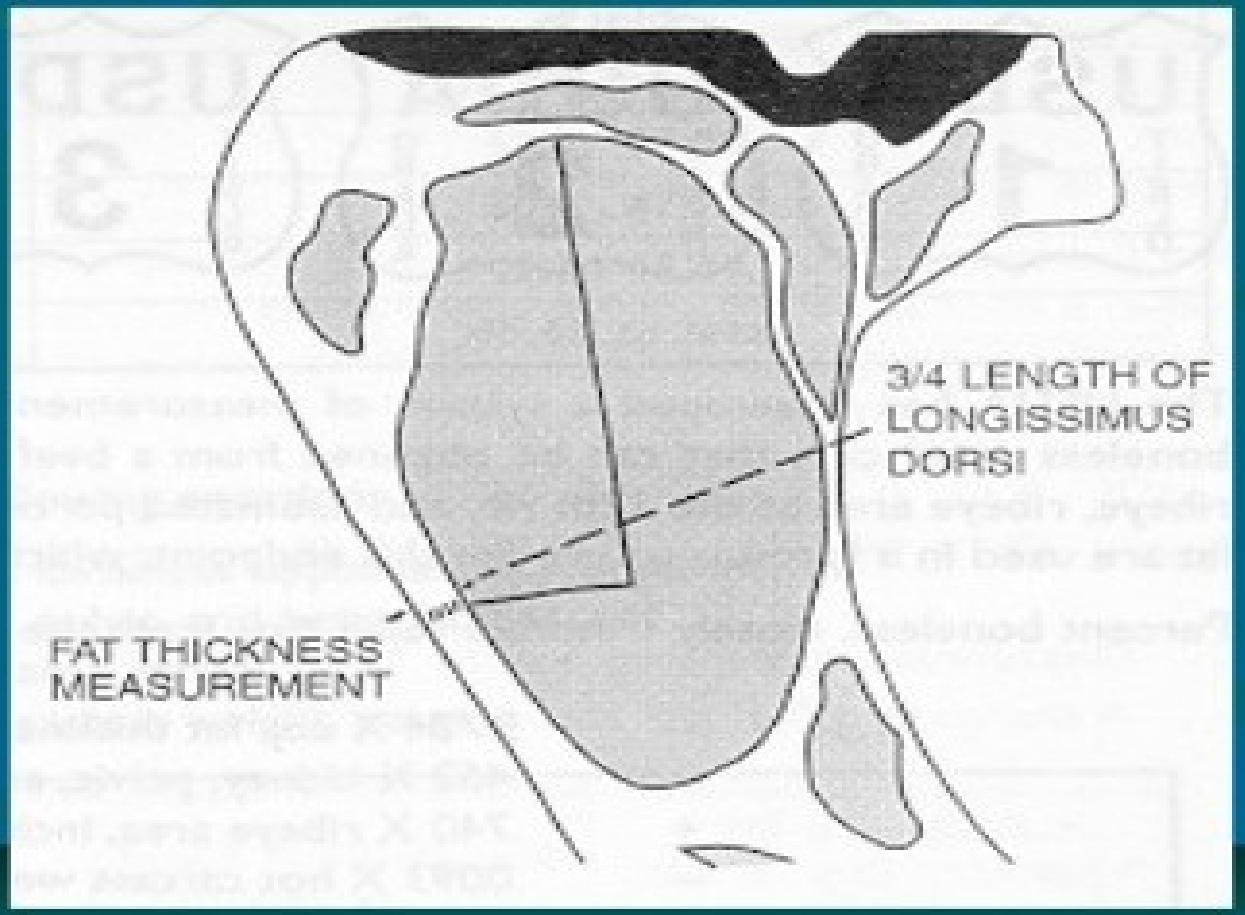
Yield grade

- **YIELD GRADE** = 2.50 + 2.50 (INCHES OF FAT AT 12-13 TH RIB
  + 0.20 (% KPH)
  + 0.0038 (LBS HOT CARCASS WEIGHT)
  - 0.32 (SQUARE INCHES OF REA)
- Score → 1-5

12-13 TH RIB FAT

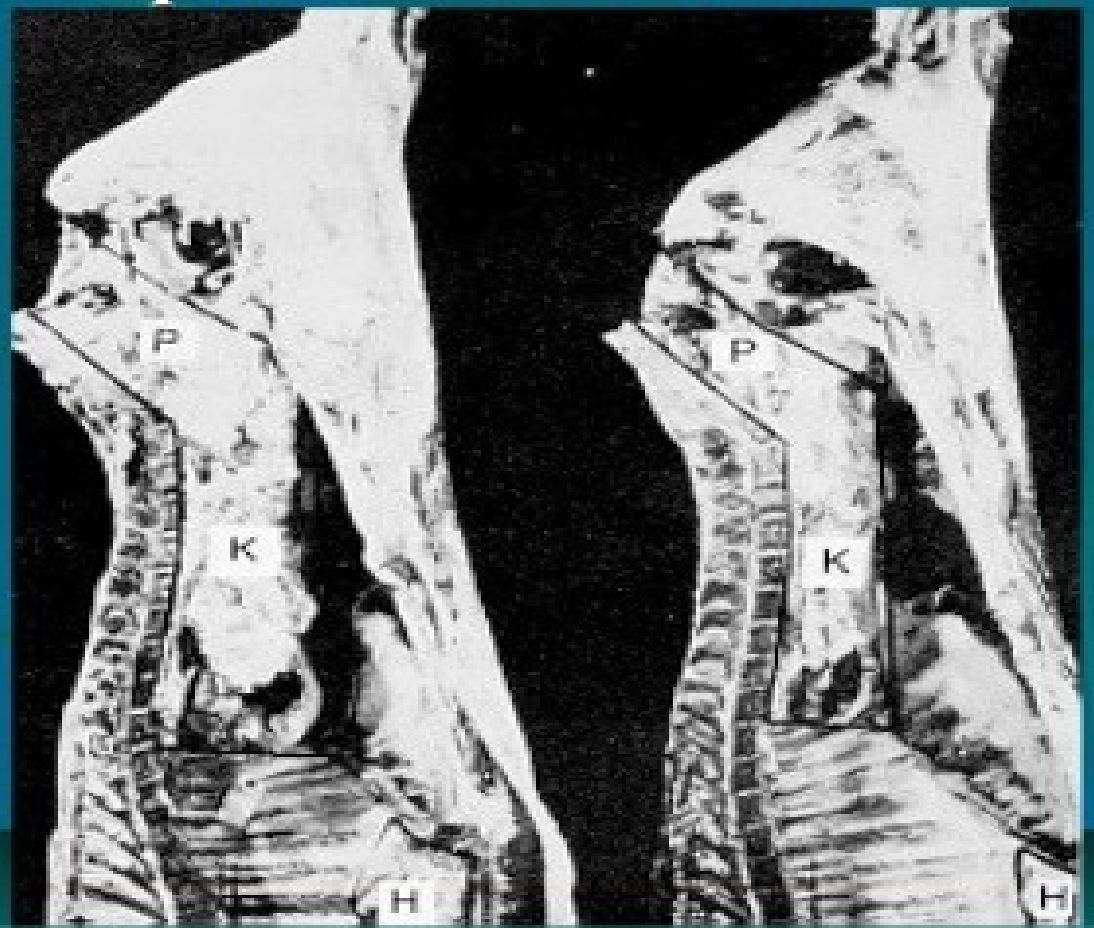
- measured at the 12th rib perpendicular to the outside fat at a point 3/4 the length of the rib eye (longissimus) muscle





% KPH

- **The amount of kidney, pelvic and heart fat is fat accumulated in the body cavity of the carcass. The weight is reported as a percent of the carcass weight** (1-8%)

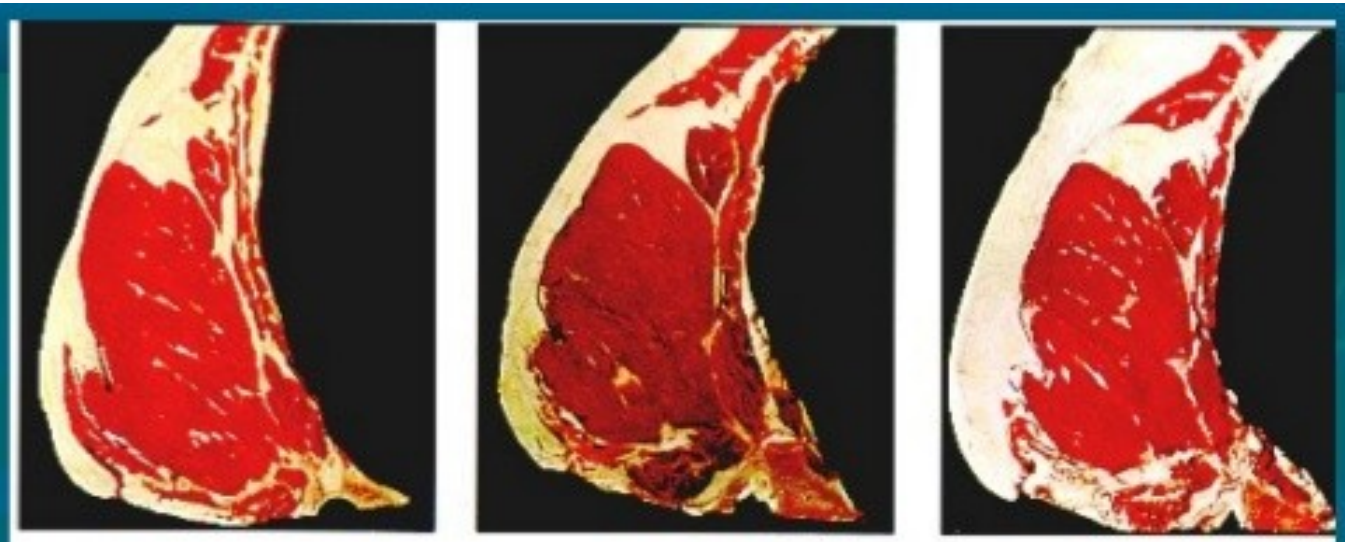


HOT CARCASS WEIGHT

- the weight of the carcass after slaughter

USDA YG and expected yield of boneless, closely trimmed retail cuts from the rib, loin, chuck and round

USDA Yield Grade	Expected Yield
1	52.3% or more
2	50-52.3%
3	47.8-50.0%
4	45.4-47.7%
5	Less than 45.5%



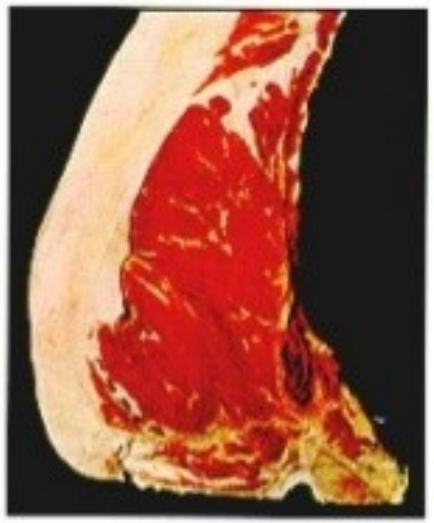
YIELD GRADE 1

YIELD GRADE 2

YIELD GRADE 3



YIELD GRADE 4



YIELD GRADE 5

Quality Grade

- Quality grades indicate the factors related to the sensory characteristics of tenderness, flavor, color, texture and juiciness. The quality grade is intended to reflect the cooked product's overall acceptability

- USDA quality grade → prime, choice, good, standard, commercial, utility, cutter, canner

- Determined by :
  - Maturity
  - Marbling

QUALITYGRADE DEPEND ON	CARCASS MATURITY AGE	MARBLING SCORE
• Carcass maturity age • Marbling score Carcass maturity depend upon bone ossification in sacral, lumber ,thoracic region	A=9 to30 months B=30 to42 months C=42to72 months D=72 to96 months E=more than 96 months	• abundant • moderately abundant • slightly abundant • moderate • modest • small • slight • traces • practically devoid • devoid

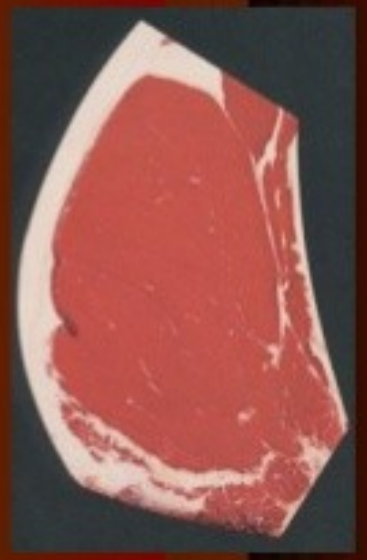
- **Prime, Choice, Select and Standard**
  - **Are the grades for young cattle Under 42 months of age (A and B maturity)**
- **Commercial, Utility, Cutter and Canner**
  - **Are the grades for aged cattle (C, D, & E)**



PRIME



CHOICE



SELECT

- **Marbling**
  - **Marbling is fat within the muscle (intramuscular fat) and is evaluated in the rib eye between the 12th and 13th ribs.**
  - **Beef cuts with high levels of marbling are more likely to be tender, juicy and flavorful than the cuts with very low levels of marbling**

10 USDA degree of marbling

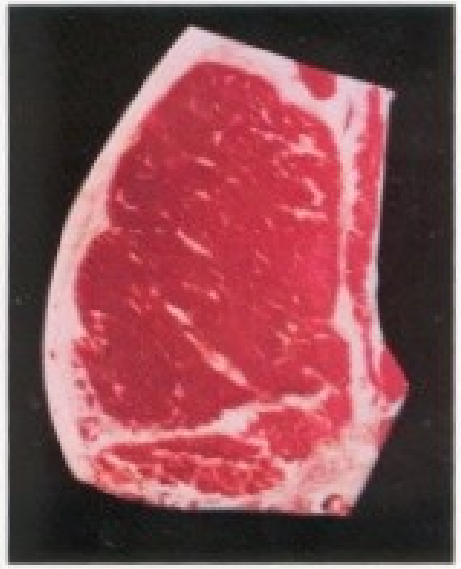
1. ABUNDANT
2. MODERATELY ABUNDANT
3. SLIGHTLY ABUNDANT
4. MODERATE
5. MODEST
6. SMALL
7. SLIGHT
8. TRACE
9. PRATICALLY DEVOID
10. DEVOID



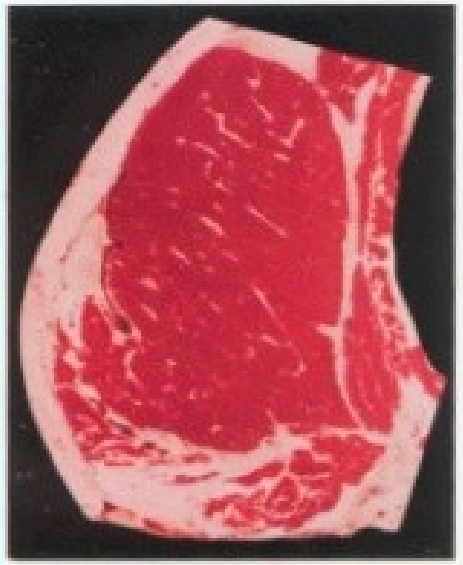
Moderately Abundant



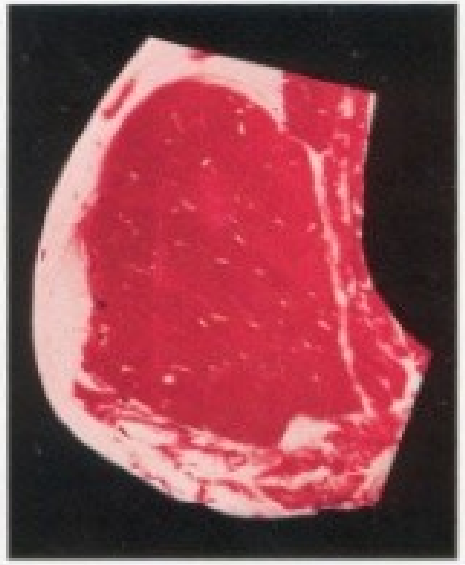
Slightly Abundant



Moderate



Modest



Small



Slight

Standards Used for Quality Grade Determination

GRADE	MARBLING*	MATURITY**	MEAT COLOUR	FAT COLOUR	MUSCLING	MEAT TEXTURE*
CANADA*						
Prime	Slightly abundant	Youthful	Bright red only	No yellow fat permitted	Good musculing or better	Firm only
AAA	Small	Youthful	Bright red only	No yellow fat permitted	Good musculing or better	Firm only
AA	Slight	Youthful	Bright red only	No yellow fat permitted	Good musculing or better	Firm only
A	Trace	Youthful	Bright red only	No yellow fat permitted	Good musculing or better	Firm only
UNITED STATES*						
Prime	Slightly abundant	Maturity class A & B	Light red	Yellow fat permitted	No minimum requirement	Moderately firm
Choice	Small	Maturity class A & B	Dark cutters permitted	Yellow fat permitted	No minimum requirement	Slightly soft
Select	Slight	Maturity class A	Dark cutters permitted	Yellow fat permitted	No minimum requirement	Moderately soft
Standard	Practically devoid	Maturity class A & B	Dark cutters permitted	Yellow fat permitted	No minimum requirement	Soft

* Minimum marbling and meat texture permitted for quality grade class.
** Maturity categories reflect domestic requirements.
*** Standards as of June 2006.

Factors affecting Meat Grading

- The grade of meat is vary depend the type of animals
- Factors such as the breed, maturity, color of the meat, and the fat intramuscular and connective tissue distribution of the meat(marbling)

Breed

- Livestock breed can affect the quality characteristics of the meat produced, either because the breed has naturally adapted to stressful environment conditions or because two or more breeds have been purposefully crossbred to increase prevalence of desirable qualities
- Eg :Brahman cattle are used in southwestern United State because resistance to adverse environment condition but Brahman carcasses has tenderness issue. But Japanese Wagyu breed can produces highly marbled tender meat.
- By cross breeding the Brahman cattle and Japanese Wagyu cattle producing a Waguli cattle that have high degree of marbling and low calpastatin (protein found in liver and erythrocytes of mammals) activity in the tissue. As a result we have more tender meat immediately after slaughtering.

Maturity

- Maturity of animal influenced the quality of meat
- 5 classification for beef there are A, B, C, D and E
- A- is for cattle aged 9-10months, A is for cattle aged 12-30months, B is for cattle aged 30-50 months, C is for cattle aged 60-70 months, D is for older cattle and E is for oldest cattle

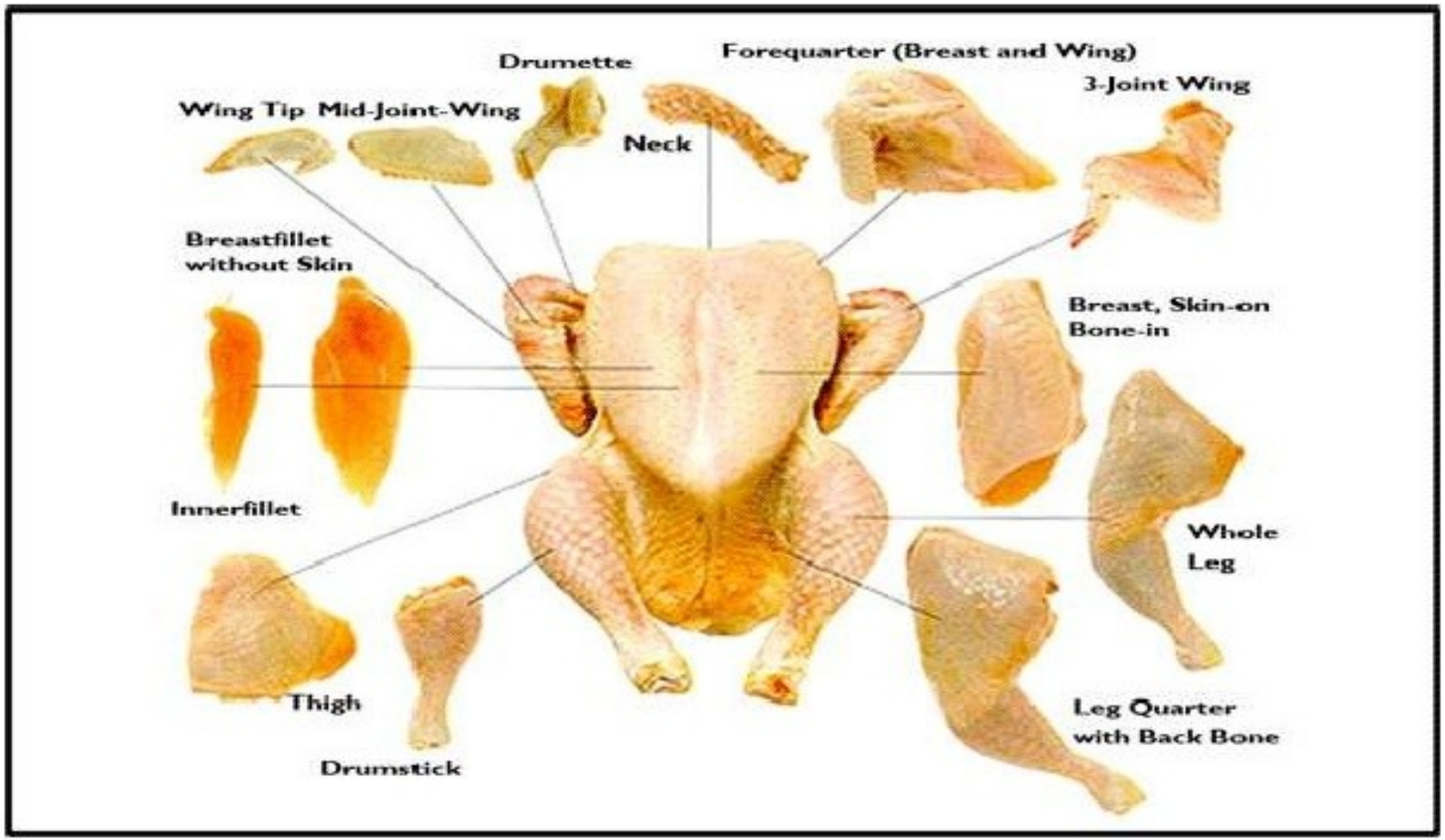
Meat Color

- Meat color can be affected by the concentration of heme pigments like myglobin, haemoglobin , their chemical states and the light- scattering properties of the meat(Lawrie 2002)
- At high pH, the heme iron is predominantly in the ferrous state(Fe^{2+}), while at low pH accelerates ferrous iron conversion to the ferric state (Fe^{3+})
- Oxygen can bind to heme iron only if it is in the ferrous state(Fe^{2+})
- Water can bind to myglobin (Mb) only if the iron is in the ferrous form.

Marbling

- Marbling is correlated to the distribution of fat deposit (intramuscular fat) on connection tissue of perimysiumand endomysiumparts
- A certain level of marbling is necessary to assure palatability, in term of juiciness and flavor
- The degrees of Marbling are abundant, moderately abundant, slightly abundant, moderate, modest, small and slight
- Additional degrees: very abundant, traces and practically devoid

Cuts of Poultry



The two distinct differences in poultry forms are white meat and dark meat. Each type of meat holds different nutrition values.

White meat is from the areas of the fowl where little muscle use takes place, such as the breast:

White meat is low in calories and fat content and cooks faster.

Dark meat is from areas where the bird's muscles are used more heavily, such as the leg and thigh region:

Dark meat is higher in calories and fat.

Dark meat also tends to be the richer, more flavorful meat.

USDA Poultry Grades

- ***Grade A***
  - The highest quality and the only grade that is likely to be seen at the retail level
- ***Grades B and C***
  - Usually used in further-processed products where the poultry is cut up, chopped, or ground

B- Egg quality

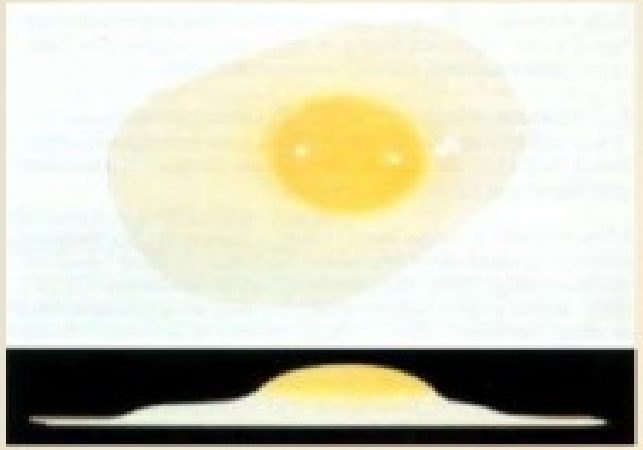
- **Egg quality standards are based on:**
- Shell cleanliness.
- Shell soundness.
- Shell texture.
- Shell shape.

External

- Relative viscosity of albumen.
- Freedom from foreign matter in albumen.
- Shape and firmness of yolk.
- Freedom from yolk defects.

Internal

What is Egg Quality?





- **Exterior egg quality** – shell quality based on shell cleanliness, shell soundness, shell texture, shell shape.
- **Interior egg quality** – based on relative viscosity of the albumen, freedom from foreign matter in the albumen, shape and firmness of the yolk, and freedom from yolk defects.

Judging Egg Quality

- **External quality:**

Shell stability faults

Cleanliness

Appearance faults

Grades- A, B, Loss

- **Factors that influence egg size:**
- Protein Intake, esp. Methionine and Lysine
- Breed
- Caloric intake
- Linoleic acid levels in the feed
- Body weight at the onset of production.

Egg grading - exterior

- **Grade A** – Clean, unbroken, practically normal shape. Ridges and rough spots that do not materially detract from the appearance of the egg are ok.
- **Grade B** – Unbroken, clean to moderately stained (1/32 of surface if localized, or 1/16 of surface if scattered). Maybe somewhat unusual to misshapen, or show pronounced ridges or thin spots.
- **Dirty – Unbroken**. Adhering dirt or foreign material, prominent stains, or moderately stained if in excess of B grade.

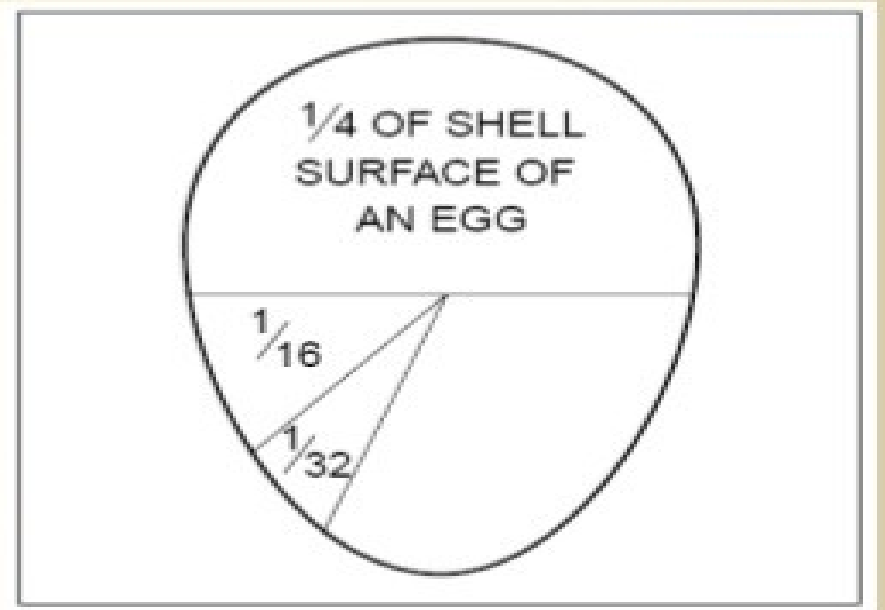
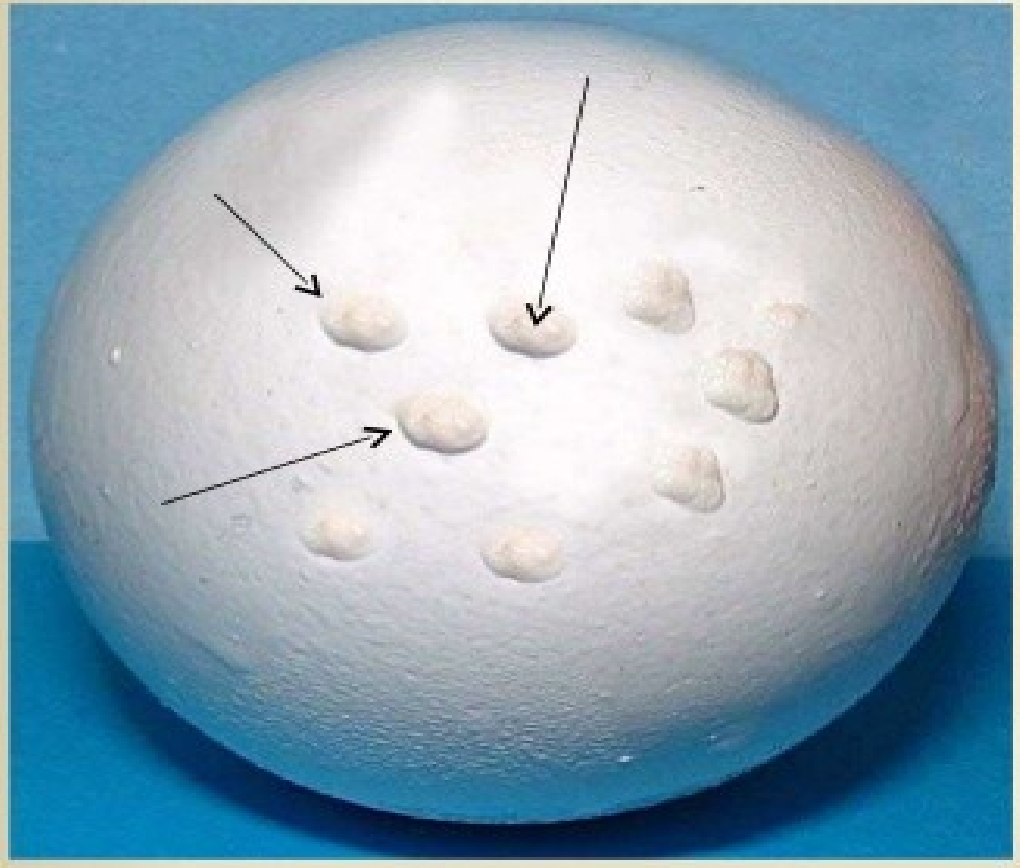


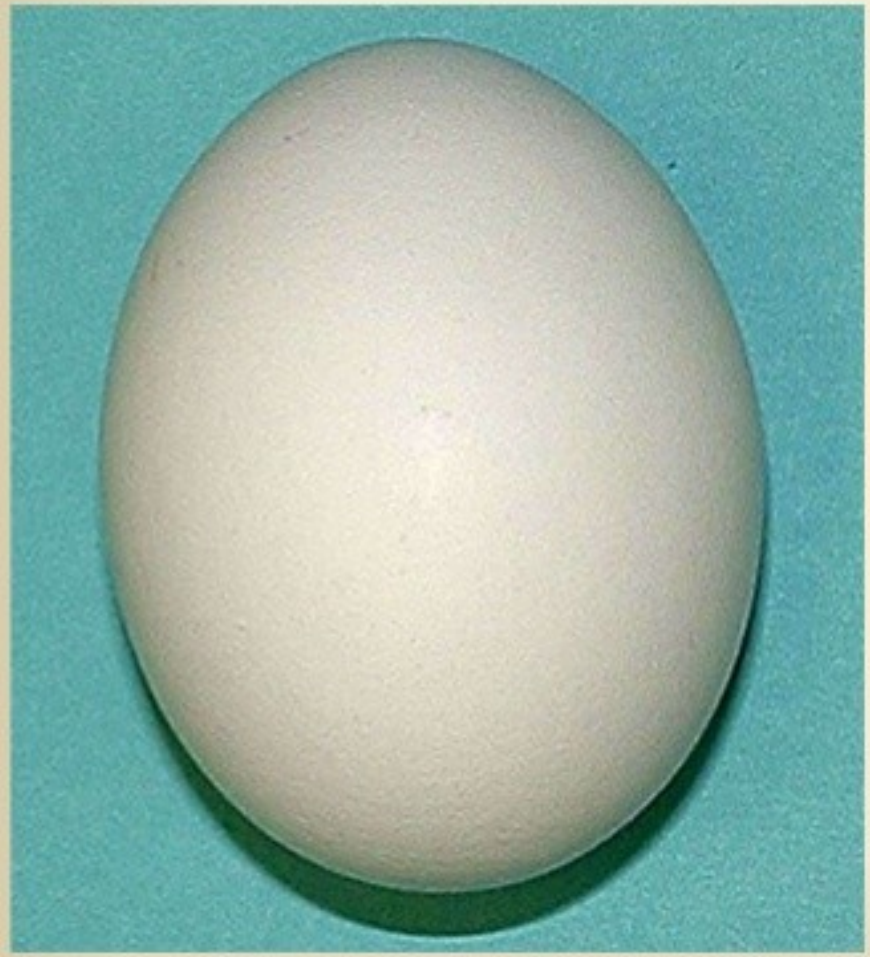
Figure 36. One thirty-second, one-sixteenth, and one-fourth of the shell surface of an egg (areas shown are approximate).



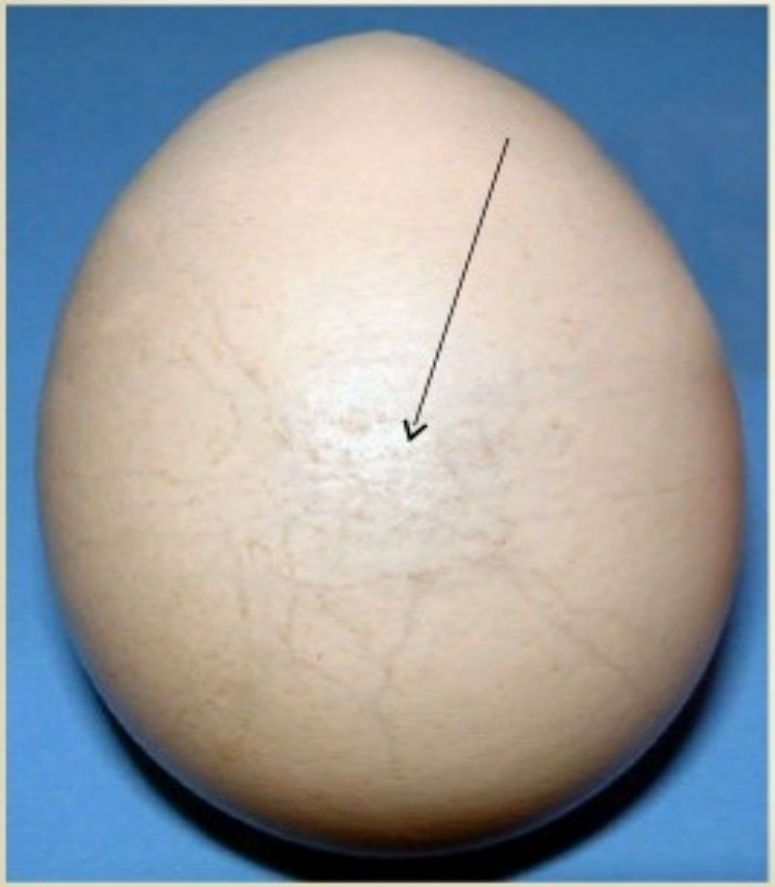




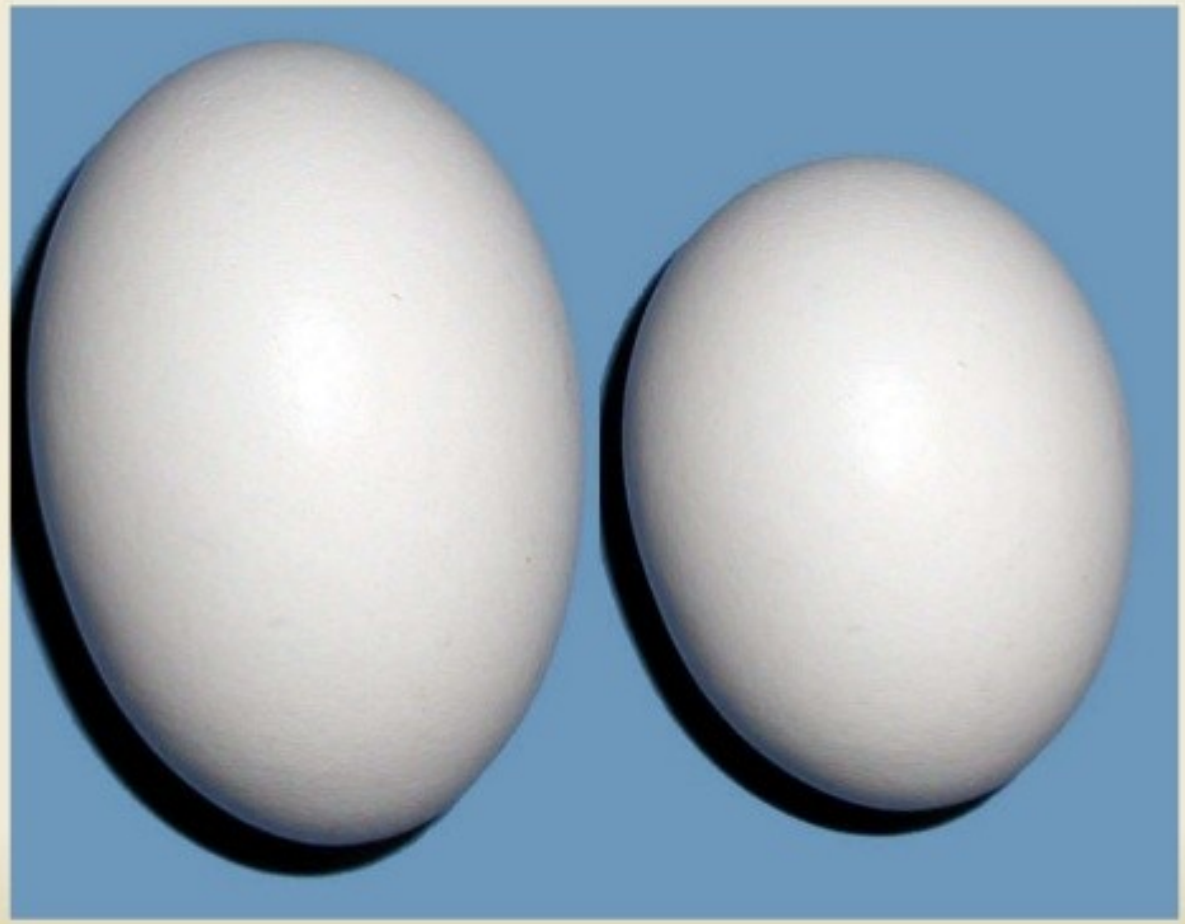












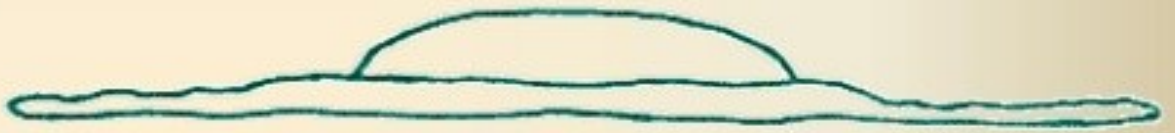
Egg grading - interior

Quality factor	Grade AA	Grade A	Grade B
Air cell	1⁄8 inch or less depth	3⁄16 inch or less depth	Over 3⁄16 inch depth
White	Clear and firm	Clear and reasonably firm	Weak and watery. Small (< 1/8 inch diameter) blood and meat spots may be present
Yolk	Outline slightly defined	Outline fairly well defined	Outline plainly visible, enlarged and flattened. May have clearly visible germ development but no blood.

A Grade AA egg will stand tall. The yolk is firm and the area covered by the white is small. There is a large proportion of thick white to thin white.



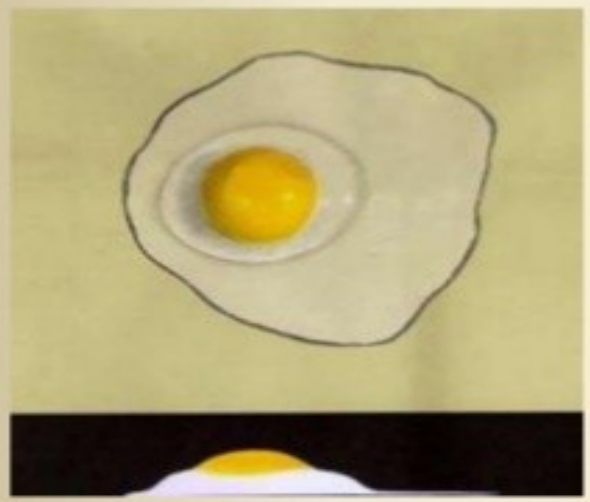
Grade A egg covers a relatively small area. The yolk is round and upstanding. The thick white is large in proportion to the thin white and stands fairly well around the yolk



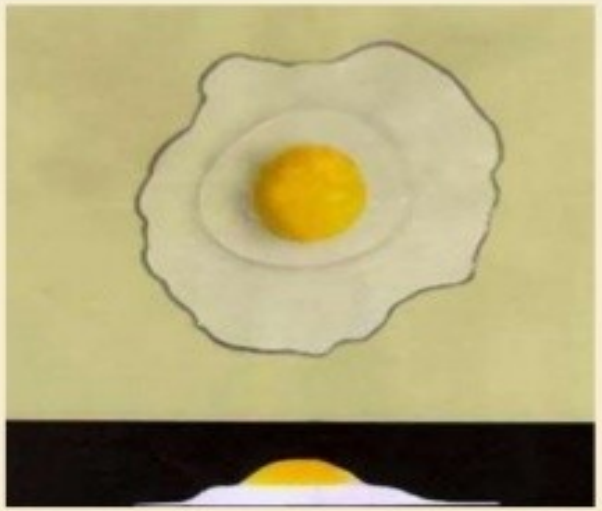
A Grade B egg spreads out more. The egg yolk is flattened and there is about as much (or more) thin white as thick white



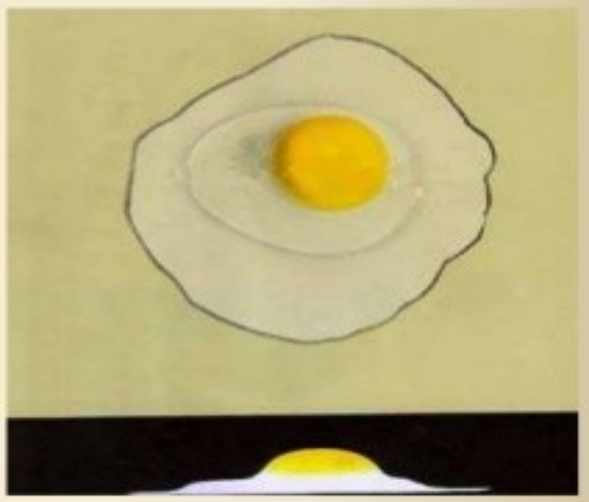
AA Quality



High AA



Average AA



Low AA


"candling an egg"

The components of environment

- 1. climate
- 2. nutrition
- 3.shelter/housing
- 4.level of health
- 5.management

All the above factors combining affect the egg production

1.Breed:

The breed of the laying bird influences egg production.

Management and feeding practices , however, are the key determining features for egg production.

2.Mortality rate:

mortality rate may raise due to disease, predation or high temperature.

- The mortality rate of small chicks (up to 8 weeks of age) is about 4 %;
- that of growers (between 8 & 20 weeks of age) is about 15%;
- and that of layers (between 20 &72 weeks of age) is about 12%.

3. Age:

birds typically begin production eggs in their **20 or 21 week** and continue for slightly over a year.

This is best laying period and eggs tend to increase in size until the end of the egg production cycle.

Chick factors

- Layers are usually kept for 52 weeks. After this period, they undergo a stage called moulting where they lose their feathers and stop producing eggs. Egg production will start again in the second laying period after moulting, but the eggs will be bigger, shells thinner and production lower.
- Older birds produce eggs with thin shells.
- Indigenous chickens do not lay as many eggs when compared to commercial layers.

4. Body weight:

- in general, optimum body weight during the laying period should be around 1.5 kg , although this varies according to breed.
- Underweight as well as overweight birds lay eggs at a lower rate.
- Proper management and the correct amount of feed are necessary in order to achieve optimum body weight.

5.Laying house:

the laying house should be built according to local climatic conditions and farmer's finances.

A good house protects laying birds from theft, predation, direct sunlight, rain, excessive wind, heat and cold, as well as sudden changes in temperature and excessive dust.

if the climate is hot and humid, for example, the use of an open house construction will enable ventilation. the inside of house should be arranged so that it requires minimum labor and time to care for the birds.

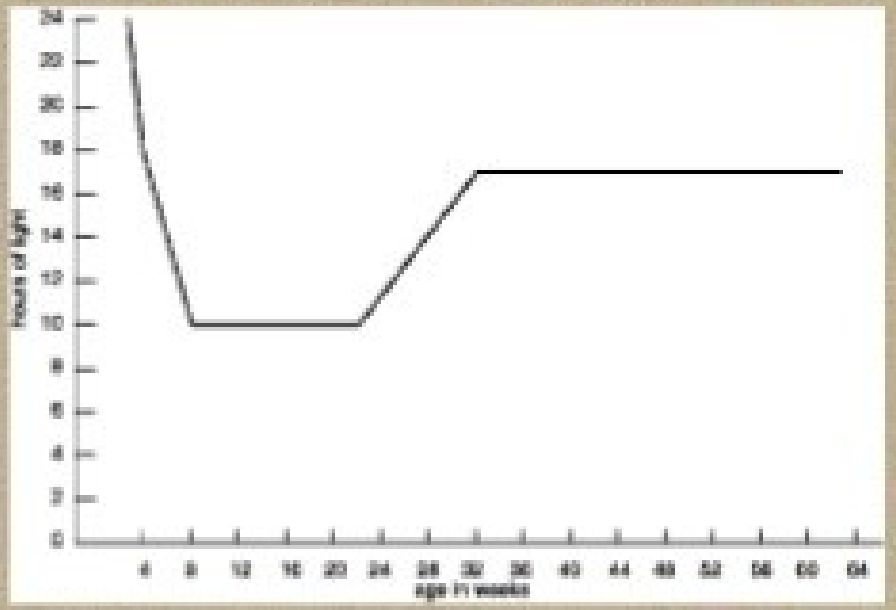




6.Lighting schedule:

- egg production is stimulated by daylight; therefore, as the days grow longer production increases.
- In open houses , found commonly in the tropics, artificial lighting may be used to increase the laying period. When darkness falls artificial lighting can be introduced for 2 to 3 hours, which may increase egg production by 20 to 30 %.
- In closed house , where layers are not exposed to natural light, the length of the artificial day should be increased either in one step, or in a number of steps until the artificial day reaches 16 to 17 hours, which will ensure constant and maximized egg production.

Figure 1 - Lighting schedule

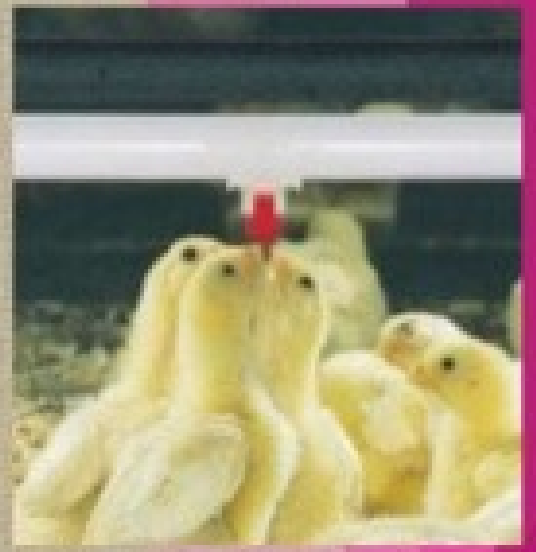


- Effective day light should never decrease during the laying period.
- When the lights are off, chickens do not eat and this results in low egg production. Lights should be checked regularly and cleaned so that they do not get dimmer.
- Bulbs should be changed when necessary
- Exposure to light for less than the minimum time required results in a drop in egg production.
- When chickens are exposed to too much light, they reach sexual maturity at an early stage and they lay very small eggs.



7.FEED

- feed-range hens will produce more meat and eggs with supplemental feed, but only if they are improved breeds or crossbreeds. The selection of local hens is done on the basis of resistance and other criteria rather than feed utilization for production.
- Fresh and clean water should always be provided, as a layer can consume up tone-quarter of liter a day.



FEED-RELATED PROBLEMS

Not enough drinking water

Clean and cool water must always be available to avoid heat stress. Lack of water results in reduced egg production.

No feed or decreased feed intake

Chickens tend to eat less when the feed is not tasty or when they are stressed because of environmental temperatures, especially when it gets too hot. Feed should be available at all times.
When chickens are not well fed, egg production decreases



8.Culling:

culling is the removal of undesirable(sick and /or unproductive) birds, from the flock. There are two method of culling:

. Mass culling, when the entire flock is removed and replaced at the end of the laying cycle; and

. Selective culling, when farmer removes individual unproductive or sick birds.

Culling enables a high level of egg production to be maintained, prevents feed waste on unproductive birds and may avert the spreading of diseases.

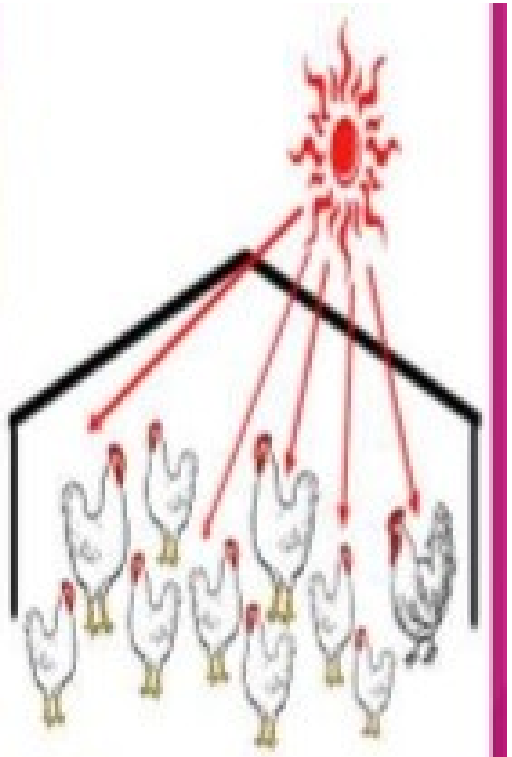


9. Climate: the optimal laying temperature is between 11 and 26 degree centigrade.

A humidity level above 75% will cause a reduction in egg production in egg laying.

Temperature and its effects on egg production

Temperature (C)	effects
11-26	Good production
26-28	Some reduction in feed intake
28-32	Feed consumption reduced and water intake increased , Eggs of reduced size and thin shell
32-35	Slight panting
25-40	Heat prostration sets in ,measures to cool the house must be taken
40 and above	Mortality due to heat stress.



When the temperature raises above 28° C degree centigrade the production and quality of eggs decrease.
Seasonal temperature increases can reduce egg production by about 10%.

Food Quality Control Regulations

Ms. Shaik Shakeera
Department of Food Technology

Composition of Egg

%	Water	Protein	Fat	Ash
whole egg	74	13	11	1
white	88	11	0	0
yolk	48	17	13	1

Component	%
shell	9
yolk	29
albumen	62
fat/complete yolk	33.0
protein/complete yolk	15.7
yolk solids	51.0
albumen protein	10.5
albumen solids	11.8

Objective for egg powder

- Egg is a very nutritious product rich in vitamins, minerals and proteins. It is also a rich source of energy.
- Because eggs cannot be kept for long time, one of the methods of egg processing is egg powder or dried eggs.
- The weight per volume of whole egg equivalent and the storage space needed are reduced but the shelf life of the product is increased.
- Fresh eggs are however, difficult to transport because of their bulkiness, fragility, and highly perishable nature. Egg in powder form, provides a near complete solution to these problems.
- Eggs are dried to preserve the surplus eggs to avoid spoilage

Drying methods of egg powder

- The processes employed in the production of dried egg include
- Pan drying
- Foam-drying
- Freeze-drying
- Oven drying
- Spray-drying*

* frequently used

Pan drying method

- Two ways: cook dry and wet dry method
- In cook dry method:

✓ Whip up eggs using a blender, in a non-stick frying pan, cook the egg solution like making scrambled eggs

✓ Place cooked eggs onto a drying rack in dehydrator and set the temperature to about 145 degrees Fahrenheit

✓ Let dry for around 4 hours until completely brittle throughout

✓ Chop dried chunks in a blender until it has a fine powdery constancy. Bag it and store it away

- Quickness of the drying time
- when reconstituting and cooking them like scrambled eggs, have a grainy texture, taste dry and stale, also do not fluff up like normal eggs when cooked in a pan, lack of "rising" would not work to well in baked goods that require this "leavening" property

- In wet dry method:

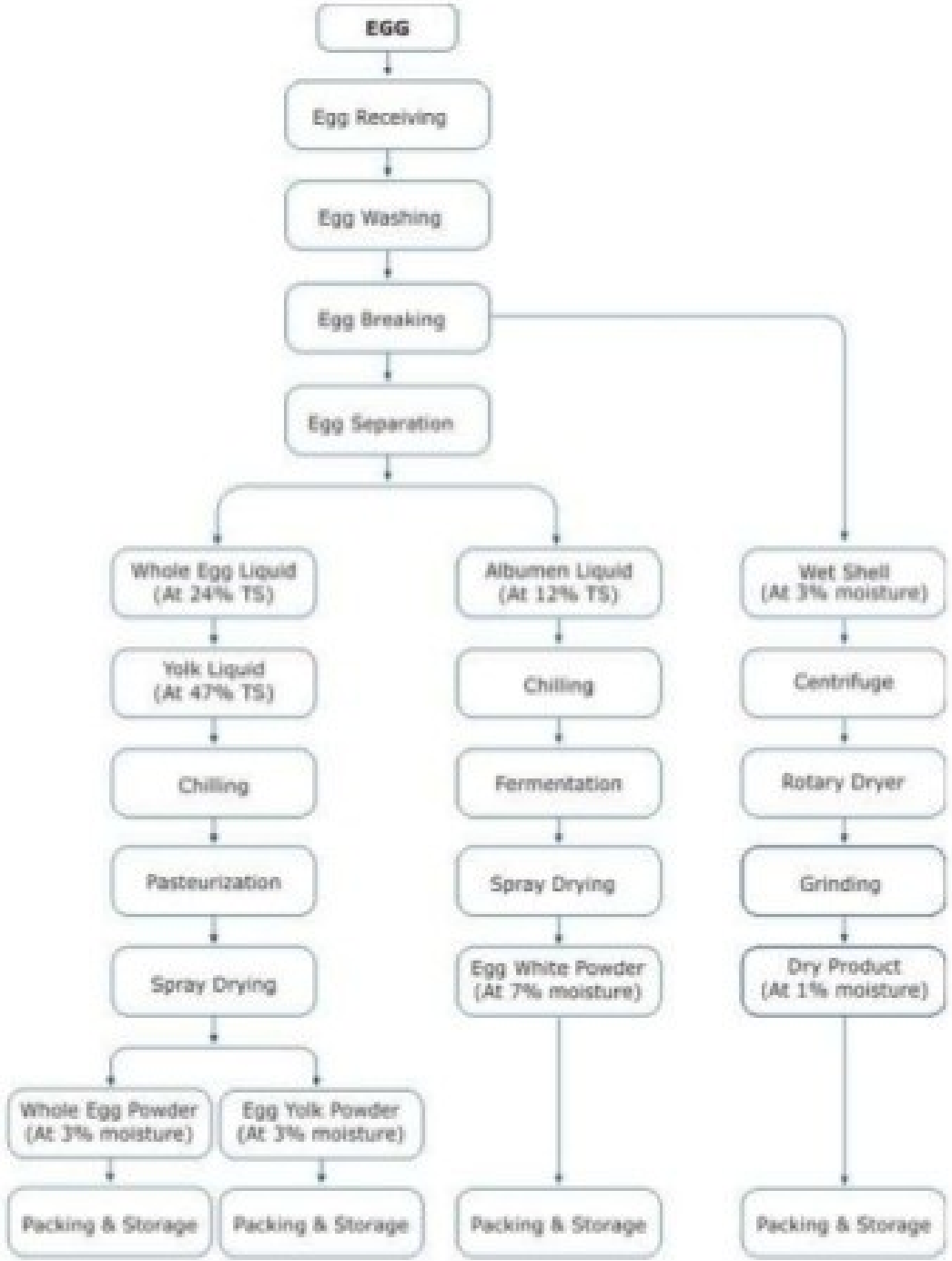
✓ Lightly grease a fruit roll sheet (it comes with the dehydrator) with a paper towel

✓ Whip up eggs using a blender, pour the egg slurry into the fruit-roll sheet and set the temperature to about 145 degrees Fahrenheit.

✓ Let dry for around 16 hours until completely brittle throughout

✓ Place dried chunks in a blender until it has a fine powdery constancy. Bag it and store it away.

- Powder turns initially orange, when reconstituted and cooked like scrambled eggs, the orange turns to yellow and they taste, look, and feel just like non-dehydrated eggs. They also maintain the "leavening" property and fluff up which is important for baking.


EGG
Egg Receiving
Egg Washing
Egg Breaking
Egg Separation
Whole Egg Liquid (At 24% TS)
Albumen Liquid (At 12% TS)
Wet Shell (At 3% moisture)
Yolk Liquid (At 47% TS)
Chilling
Centrifuge
Chilling
Fermentation
Rotary Dryer
Pasteurization
Spray Drying
Grinding
Spray Drying
Egg White Powder (At 7% moisture)
Dry Product (At 1% moisture)
Whole Egg Powder (At 3% moisture)
Egg Yolk Powder (At 3% moisture)
Packing & Storage
Packing & Storage
Packing & Storage
Packing & Storage

- Eggs are taken from the cold storage and weighed. Dirty eggs are sent to a washing machine before they are broken. Rotten eggs are removed by candling. Egg breaking can be done manually or by using continuous egg breaking & separation machine.
- For processing egg whites, efficient separation of egg whites from yolks is of great importance as no yolk must contaminate the whites. Even a small amount of yolk oil in albumen greatly reduces the quality of the product. Modem machines can achieve the limits of yolk oil in egg white to the extent of $\leq 0.02\%$, which is acceptable.
- In the production process of whole-egg or egg-yolk powder, whole eggs/egg yolks are homogenized, filtered to remove membranes, chalazae and fragments of shell pieces. Pasteurization will be done at 64 to 66°C, with a holding time of 2 to 4 min. This ensures inactivation of most of the microbes such as E. coli and Salmonella which can cause ill health, if not inactivation.
- After pasteurization whole eggs and egg yolk (solids content 24-45%wb) or egg white (solids content 10-12%wb), due to high viscosity and foaming ability, are fed to the spray dryer. The drying-air inlet temperature ranges between 150°C and 200°C and outlet 80-90°C. Final powder has a moisture content of 2 to 4% and bulk density of 0.3-0.35 g/cm³. The powder is then packed suitably after subsequent cooling. The average yield is approx. 80%.

Pretreatment of egg white

- *Fermentation and ammonium treatment of eggs*
- The pre-treatment of albumin pulp include a fermentation and ammonium treatment. The fermentation serves to break down the glucose in the egg pulp because the glucose is detrimental to the quality of the dried egg products.
- In the storage, heating, and drying stages the glucose will react with the protein in the so-called "Maillard Reaction". This reaction will cause a brownish color and some insoluble compounds. Furthermore, the amount of glucose affects the whipping properties of powdered egg white and the keeping quality of the powdered product. As a rule of thumb, shelf life of the egg powder is doubled if made from fermented products.

- As for the albumin, it is important to preserve its whipping properties and the albumin is therefore always fermented before drying. The albumin is transferred to a tank; ammonia water is added, until the pH-value has risen to at least 10.3, carried out at a temperature of 15 °C for about 24 hours. This treatment is to be followed by pasteurization at 51-52 °C for three minutes. Because of the low temperature, there will be no coagulation of the serum proteins. This method will give by far the best end product - an egg albumin powder with preserving whipping properties.
- Fresh albumin only contains a few percent of fat, but during storage of shell eggs some part of the yolk fat blend with the albumin. Some small parts of yolk may also be found in the albumin after the breaking and add to the fat content in the albumin. The fermentation process also serves to remove extra fat from the albumin.
- Salt is added to egg white to avoid heat damage to the protein during spray drying

Oven drying

- The obtained product of egg white, egg yolk and whole egg should keep inside the cross-grilled trays of vacuum oven, the temperature and pressure of the vacuum system should be controlled and set optimum (temperature: 50ºC, pressure pump should be adjusted to a limit of 700 atm (bar)). As soon as the pressure is attained, the obtain product dry for another 4-5 hours of complete vacuum drying with temperature of around 50ºC. The dehydrated product achieve and send for blending into powder.

Problems in drying of egg powder

- Heat can damage the product if contact with high temperature drying air is long, denaturing the egg yolk lipoproteins, a problem occurs poorer emulsifying properties.
- The filtered drying air is heated by steam and then introduced to the drying chamber by a specially designed venturi. The product is finally atomized into the hot inlet air. Due to flash drying the hot air rapidly reduces in temperature, thus giving minimum product damage.
- Pumping of fresh egg yolk is very difficult because of the large amount of agglomerates and gel formation. The yield is low because of the rapid agglomeration of semi-dried droplets.
- Diluting the egg yolk in distilled water solve this problem. The higher the dilution the greater the yield and the easier the drying operation.

Use of Egg Powders

- Because of its ease of storage and transportation, the main users of egg powders are bakeries, confectionery, macaroni and noodle manufacturers, the meat handling industry, large scale catering, hotels, defense establishments, etc.
- Albumen flakes are free from cholesterol and have also application in printing and other natural protein applications

APPLICATIONS	TYPES OF WHOLE EGG POWDER
Bakery, ready meals, meat products	Whole Egg Powder, Standard
Bakery, ready meals, meat products	Whole Egg Powder, Heatstable
Bakery, biscuits, cakes, etc.	Whole Egg Powder, Sugared
Bakery, biscuits, cakes, etc.	Whole Egg Powder, Sugared, 33% Glucose
Bakery, ready meals, meat products	Whole Egg Powder, with 1% FFA
Bakery, biscuits, cakes, etc.	Whole Egg Powder, Sugared

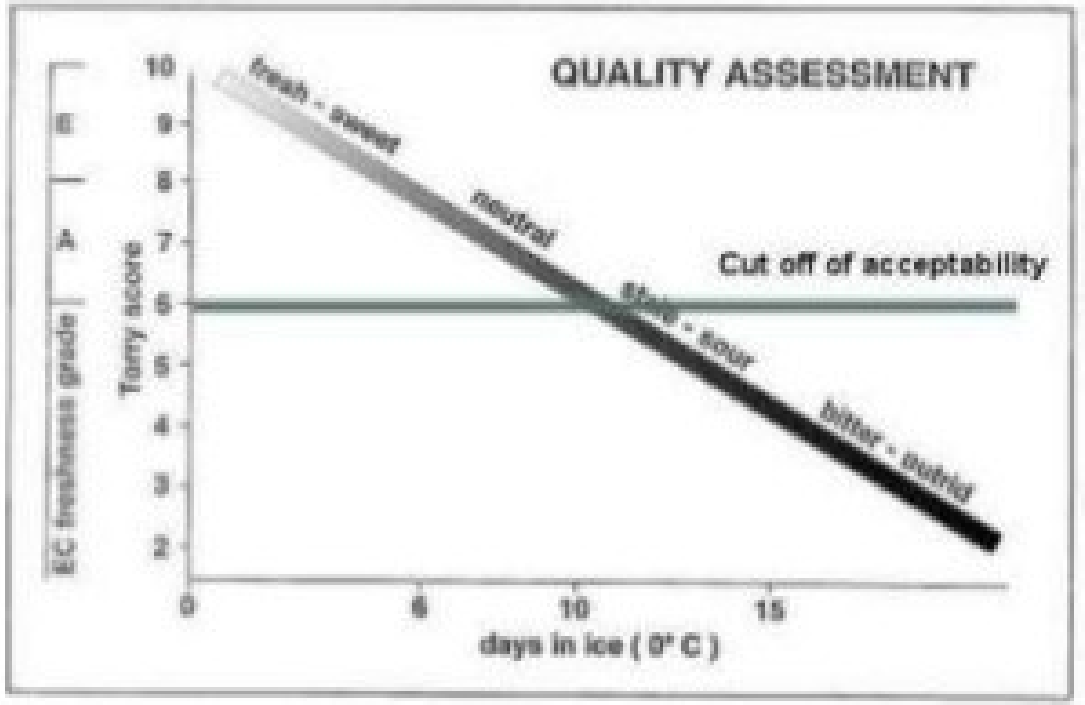
EGG BREAKING



Fish Quality Control

SENSORY METHOD

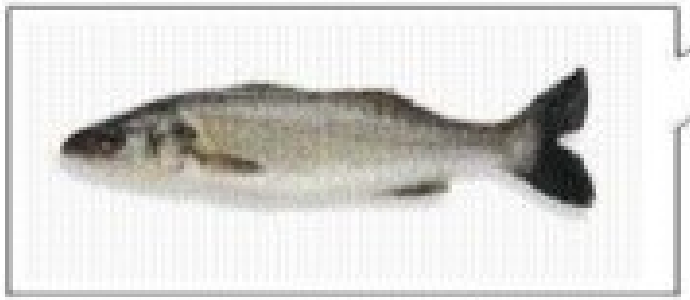
- Based on changes in appearance, odour, colour, flavour and texture.
- Fast, simple, sensitive and objective.
- It rely on human judgment and proper training of panels.
- Instrument like Instron, Bohlin Rheometer for measuring texture and other rheologic properties are used and articial nose to evaluate odour.
- Some sensory methods used are
  - QUALITY INDEX METHOD (QIM)
  - TORRY SENSORY ASSESMENT SCHEME



	CRITERIA			
	Freshness Category			Not Admitted
	Extra	A	B	
Skin	Bright, iridescent pigment or opalescent ,no discolouration	Pigmentation bright but not lustrous	Pigmentation in the process of becoming discoloured and dull	Dull pigmentation
Skin mucus	Aqueous, transparent	Slightly cloudy	Milky	Yellowish, grey, Opaque mucus
Eyes	Convex, black, bright pupil, transparent cornea	Convex and slightly sunken, black, dull pupil	Flat, opalescent cornea, opaque pupil	Concave in the centre ,grey pupil, milky cornea
Gills	Bright colour, no mucous	Less coloured, transparent mucus	Brown/green becoming discoloured, thick opaque mucus	Yellowish, milky mucus
Peritoneum on gutted fish	Smooth, bright, difficult to detach from flesh	Slightly dull, can be detached from flesh	Speckled, comes away from flesh	Does not stick
Smell of gills and abdominal activity	Seaweedy smell	No smell of seaweed, neutral Smell	Fermented ,slightly sour	Sour
Flesh	Firm and elastic, smooth surface	Less elastic	Slightly soft, less elastic	Soft, scales easily detached from skin, surface rather wrinkled

Table 01 : Criteria of EU scheme

QIM-scheme for Sea bass









Quality parameter		Description	Score
Skin	Colour/ appearance	Bright, iridescent pigmentation	0
		Rather dull, becoming discoloured (head)	1
		Green, yellowish, mainly near the abdomen	2
	Odour	Fresh seaweedy, neutral	0
		Cucumber, metal, hey	1
		Sour, dish cloth	2
		Rotten	3
	Texture	In rigor	0
		Finger mark disappears rapidly	1
		Finger leaves mark over 3 seconds	2
Eyes	Pupils	Clear and black, metal shiny	0
		Grey	1
		Mat, grey	2
	Form	Convex	0
		Flat	1
		Sunken	2
Gills	Colour	Blood red/orange	0
		Pale red, pink/light brown	1
		Grey-brown, brown, grey	2
	Mucus	Transparent	0
		Milky, clotted	1
		Brown, clotted	2
	Odour	Fresh, seaweed, neutral	0
		Metal, grass	1
		Sour, mouldy,dish cloth	2
		Rotten	3
Flesh, fille	Colour	Translucent, bluish	0
		Waxy, milky	1
		Opaque, yellow, brown spots	2
Viscera	Solution	Whole	0
		Beginning to dissolve	1
		Viscera dissolved	2
Quality Index			0-22

a. Biochemical methods

A variety of chemical compounds or groups of compounds accumulate post-mortem fish muscles. These chemicals are either intermediate or end products of biochemical changes occurring in the muscles of fish after death.

Proximate composition: Because of influence of chemical composition on keeping quality, proximate chemical composition like moisture, lipid, protein and ash contents of fish samples from the time or day of harvest to different storage periods or conditions are often investigated. Proximate composition may vary with species, sex, season, place of harvest, feeding condition, etc. So, conclusive results are very difficult to obtain.

Hypoxanthin value: As a consequence of post-mortem changes, breakdown of ATP to ADP, AMP, IMP and finally to hypoxanthin takes place. Hypoxanthin content of muscle increases on storage of fish. Estimation of hypoxanthin is an objective test of freshness of fish. However, the estimation of hypoxanthin is too cumbersome and it is seldom employed in practice. Fish with a hypoxanthin value of 7-8 micro moles/g is considered spoiled.

Histamine content: Histamine develops in freshly caught fish after 40-50 hours of death, if the fish is not properly iced. To avoid histamine formation in tuna, skipjack and mackerel, care is taken to ice or freeze fish as quickly as possible. Histamin is a major problem in warm water pelagic species that causes a form of food poisoning known as scombroid poisoning, as the name derived from the family name of tuna and mackerel, scombroidae. The term is also applied to other family members too. The symptoms of scombroid poisoning are facial flushing, rashes, headache and gastro-intestinal disorders.

Histamin is produced from histidine which is one of the constituents of muscle protein of all fishes. Generally, pelagic fishes contain sizable amount of histidine in free state as well as bound state within protein. Upon death, histidine in fish muscle is converted to histamine by bacterial enzymes. Histamin content over 20mg/100g in canned fish is prohibited by the US-FDA standard.

pH: Change in pH of the fish muscle is an usual good index for freshness assessment.

Trimethylamine: Marine fish contains sizable amount of trimethylamine oxide (TMAO) which is reduced to trimethylamine (TMA) during the spoilage of fish. TMA determination is a useful index to measure the quality of stored fish Fish with a level of 1.5 mg TMA nitrogen/100 g fish is considered acceptable, while 10-15 mg/100 g limit is set for moderately spoilt fish and beyond this range is set for highly spoilt fish.

Ammonia: Bacteria can generate small amounts of ammonia in spoiling fish, mainly from free amino acids; the amount of ammonia can give an indication, though not a particularly accurate one, of the extent of spoilage. Much larger amounts of ammonia are produced during spoilage of the elasmobranch fishes, skate and dogfish for example, because they have large amounts of urea in their flesh. Shellfish, also, may develop more ammonia than most marine fish and at an earlier stage. There are several chemical and enzymic methods for measuring ammonia.

Peroxide value: Oxidative rancidity developed in fish tissue is determined by the estimation of peroxide value. Good quality fish should have a peroxide value quite less than 10. Peroxide value above 20 for any fish is considered rancid.

b. Biological method

Total plate count (TPC): Total number of microbial flora is changed with the time in fish or fish products. The numbers per gram of fish or fish products or per square centimeter of the surface area indicate the quality of fish from the microbiological view point. Total plate count or viable bacterial count is determined by the culture of bacteria present in fish sample using a suitable bacteriological media that could recover maximum number of bacteria in fish tissue. A known weight of fish sample is minced aseptically and serial decimal dilutions are pour-plated with the media. For marine fish agar agar and for processed fish products tryptone glucose beef extract agar media are commonly used. Inoculated plates are incubated at 37^{o}C for 24 hours and the bacterial colonies are counted. From the colony counts, TPC is calculated by multiplying with appropriate dilution factor. TPC does not strictly indicate the edibility of the fish. Fish with low TPC may bear pathogen that would have more dangerous if consumed. Therefore, qualitative analysis is done to determine the presence of any pathogenic or health hazard bacteria. Different types of selective or ordinary media are used for the identification of pathogenic organisms in fish. For example, SS-agar or XLD agar medium are used to detect coliform bacteria like *Salmonella, Shigella, E. coli*

c. Physical methods

The electrical properties of fish skin and muscle change systematically after death and can be used as the basis of an instrument; a few models are commercially available, including the Torrymeter.

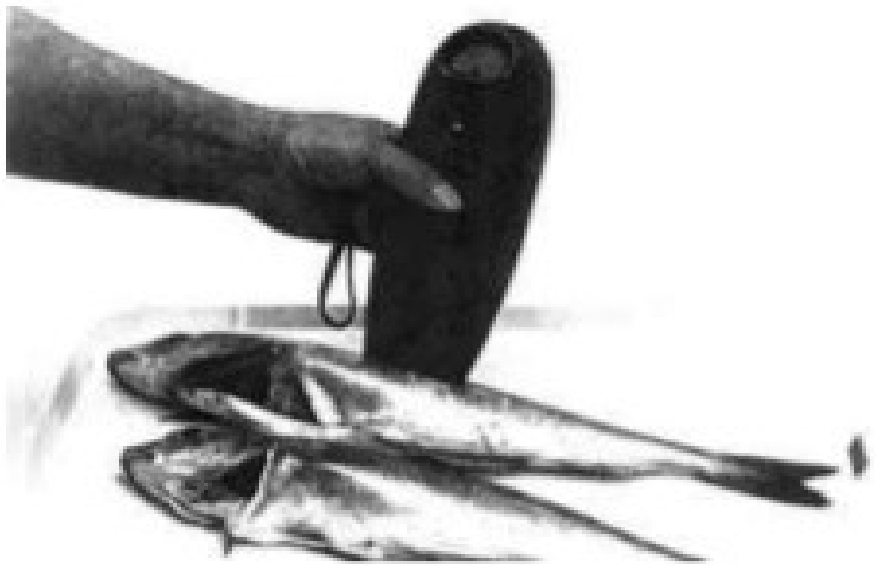


Figure 05 : Physical method

The change in electrical properties is not caused directly by bacterial action or other spoilage mechanism, but the instrumental readings on iced fish can be correlated with the stage ,of spoilage, as measured by sensory methods or by one of the non-sensory methods already described. The instruments can be used only on whole fish or fillets with skin. Frozen fish, when thawed, give no response to the meter and this can be used as a basis for checking whether fish have been previously frozen.

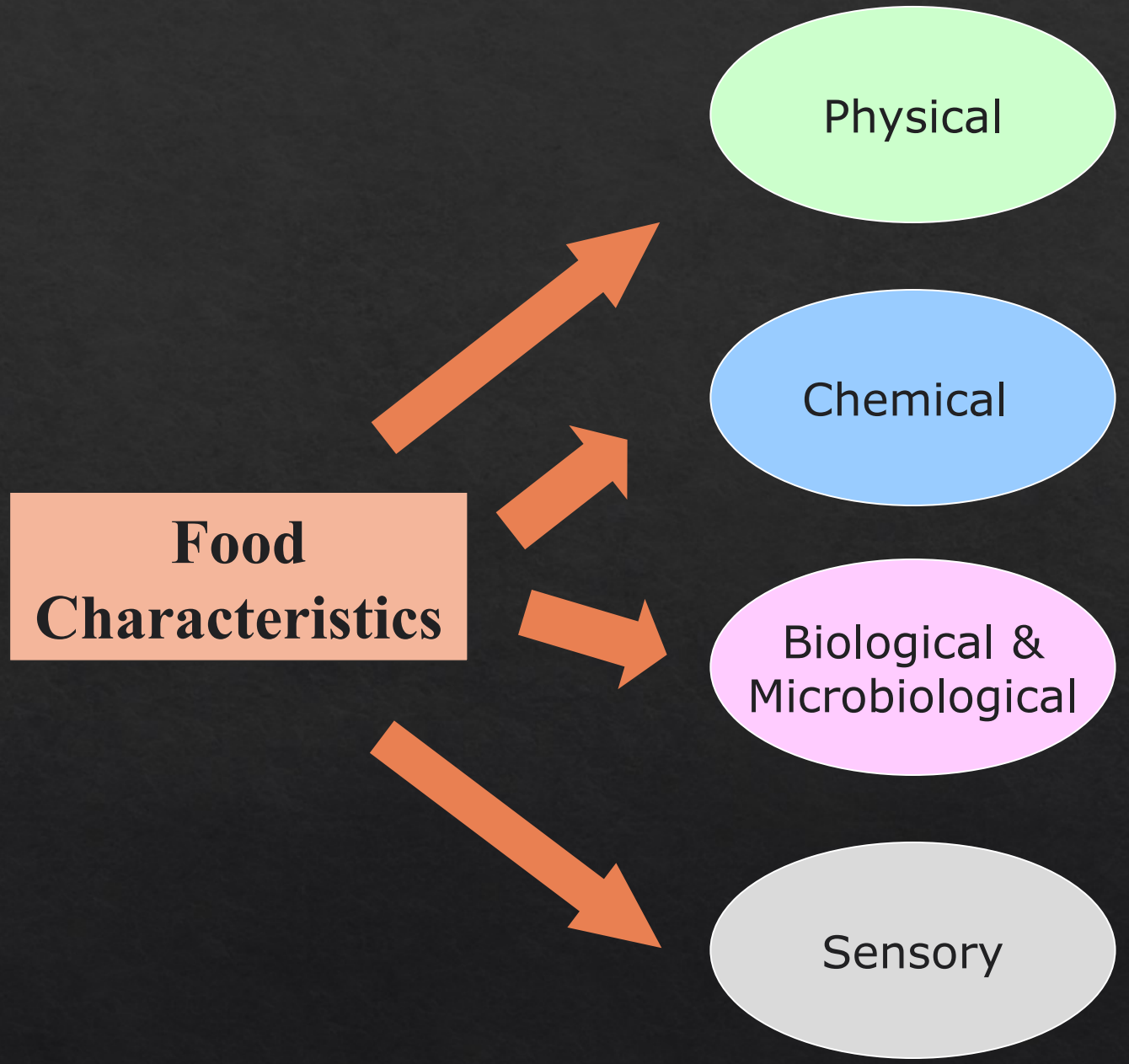
Torrymeter measure's fish freshness based an Organoleptic Chart which provide an easy to see 0 – 16 scale of fish freshness. 16 being extremely fresh to under 4 being spoiled.

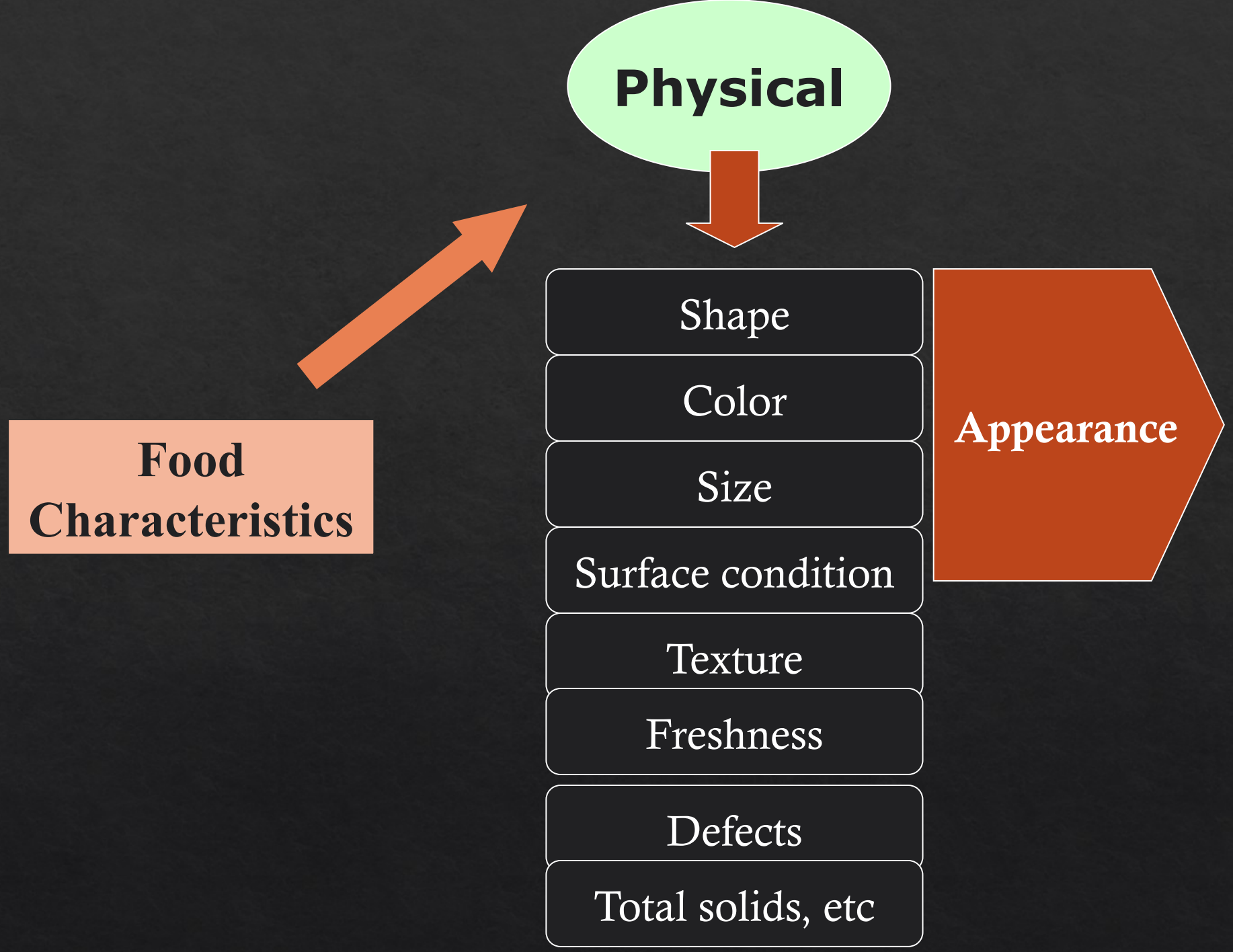
It measures conductance, capacitance and q-factor of the fish flesh and muscle structure. As the fish spoils and as bacteriological activity increases, there is a redistribution of intra– cellular and extra-cellular electrolytes. This redistribution changes the capacitance and resistance of the flesh and muscle structure. These changes in value allow us to calibrate the freshness meter’s response.

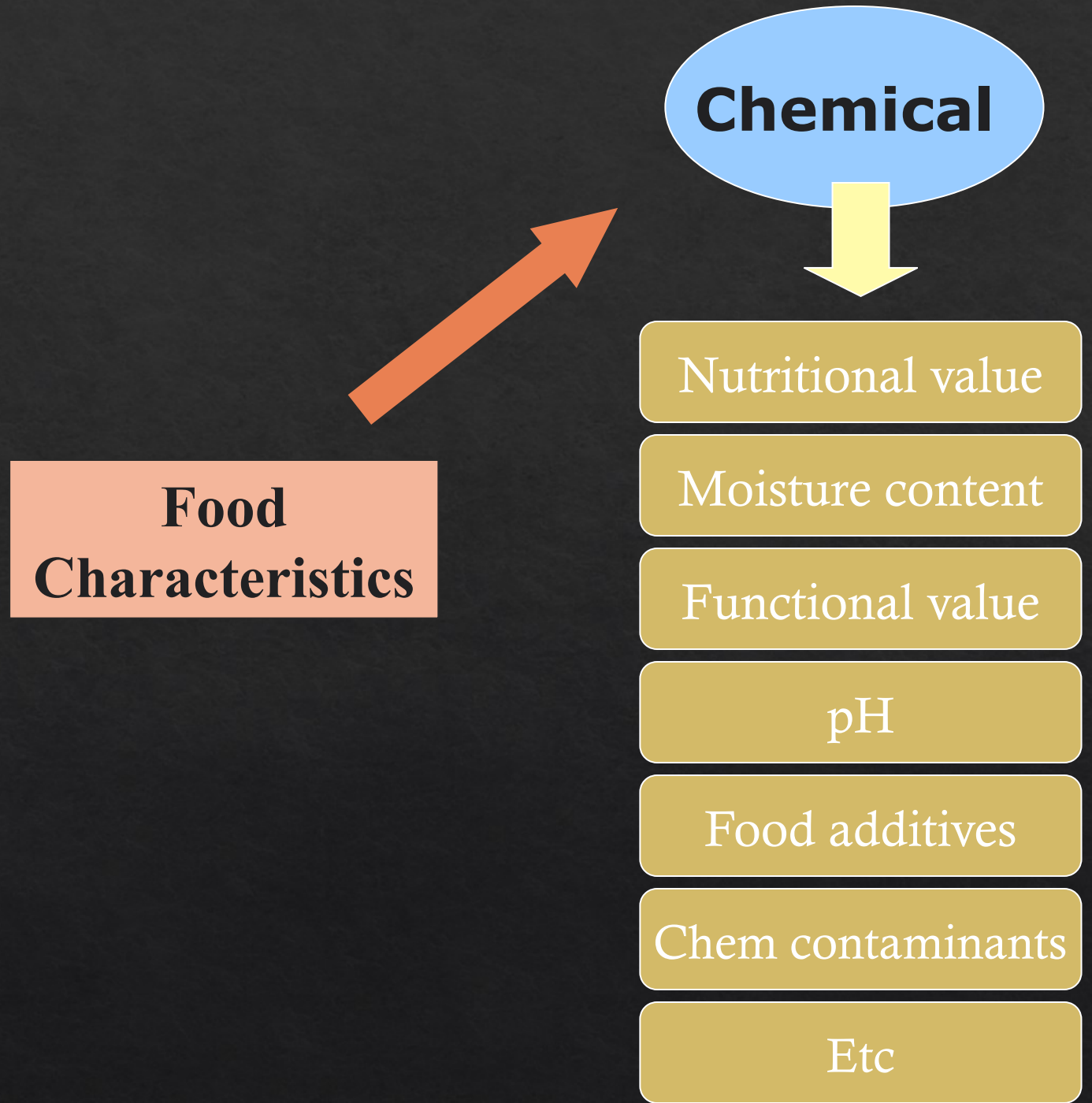
FACTORS CONTRIBUTING TOWARDS QUALITY OF FOOD

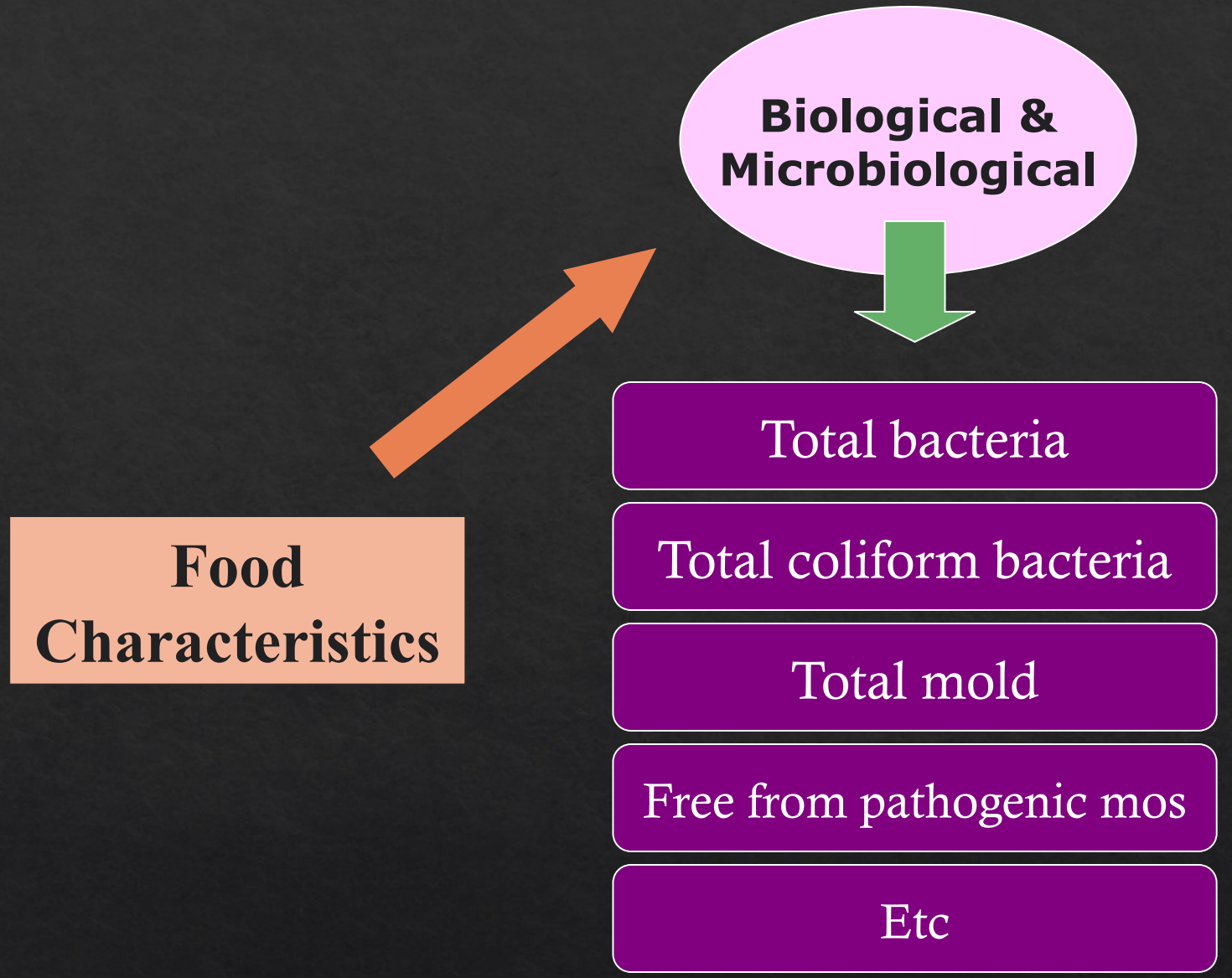
- The various factors contributing towards quality of food are :
- Appearance
- Color
- Taste
- Odor
- Nutritional value
- Adulterants
- Contaminants (Physical, Chemical & Microbiological

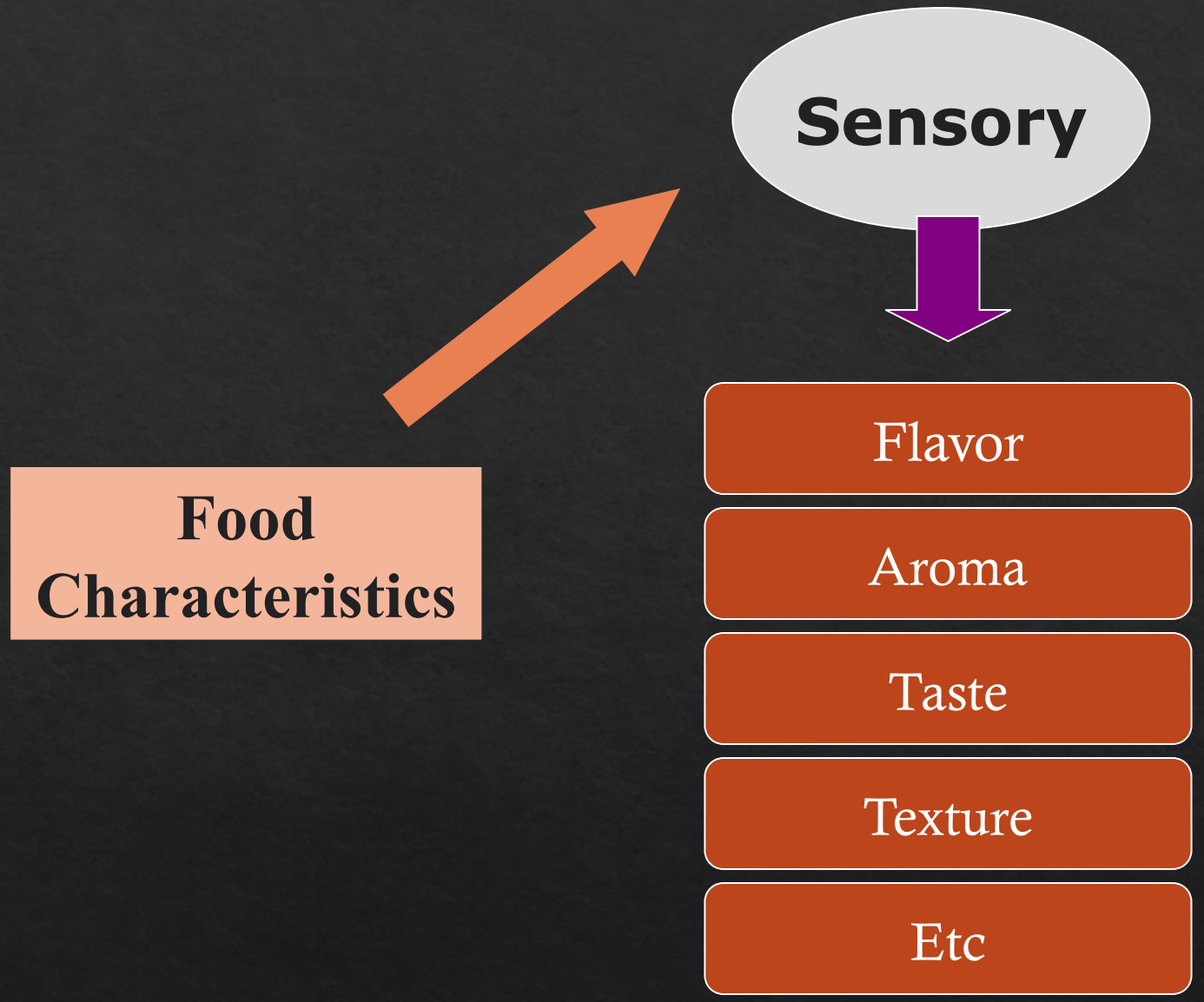
- To know the quality of raw materials and final products.
- To understand occurrence of any physicochemical changes during processing or storage.
- To ensure purity, freshness and safety of the food products at the time of consumption.


Food Characteristics
Physical
Chemical
Biological & Microbiological
Sensory


Physical
Food Characteristics
Shape
Color
Size
Surface condition
Texture
Freshness
Defects
Total solids, etc
Appearance


Chemical
Food Characteristics
Nutritional value
Moisture content
Functional value
pH
Food additives
Chem contaminants
Etc


Biological &
Microbiological
Food
Characteristics
Total bacteria
Total coliform bacteria
Total mold
Free from pathogenic mos
Etc


Sensory
Food Characteristics
Flavor
Aroma
Taste
Texture
Etc

COLOR

- Color may be defined as the impact of the wavelengths of light in the visual spectrum from 390-760 nm on the human retina.
- The retinal cells may be sensitive to black and white only or to red, green and blue (RGB) wavelengths of light.
- The correct interpretation by the brain in terms of color depends on the adequacy of signals.

Color scales

- There are two popular L, a, b color scales in use today – Hunter L, a, b, and CIE $L*$, $a*$, $b*$.
- They are similar in organization, but will have different numerical values.
- Hunter L, a, b and CIE $L*$, $a*$, $b*$ scales are both mathematically derived from X, Y, Z values.
- Hunter scale is over expanded in blue region of color space, while CIE scale is over expanded in yellow region. The current recommendation of CIE is to use $L*$, $a*$, $b*$.

Size

- Size is very important feature since it can determine the loss of products during processing and the final product yields.
- Size can be measured in three dimensions such as volume in the real world. However, it is usually reduced to one or two dimensional measurements.
- Size features include weight, volume, diameter, area, surface area, perimeter, length, skeleton length and width.

Size

- Area has become a very popular measurement for the quality evaluation of fruit and vegetables such as the determination of tomato ripeness.
- Length measurements might also be used especially for those long shape food products such as cucumber, banana, which usually measured by skeleton length, mid-line of the products.



Size

- In meat industry, the calculation of surface area and volume of ellipsoid meat joints can be used to determine shrinkage during processing.
- The measurement of area is also important in meat --- the area of marbling/intramuscular fat and the overall area to determine the marbling score.

Texture

- Texture can be generally correlated to the sensory properties of food products.
- Texture can also be used to determine chemical or physical properties of food products --- contain more information about chemical or physical properties than color and size.
- Textural properties of food product will be change during storage.
- The importance of texture in the overall acceptability of foods varies widely, depending upon the type of food:

Texture

- Relation between textural parameters and popular nomenclature:
  - Mechanical characteristics

Primary parameters	Secondary parameters	Popular terms
Hardness		Soft – firm – hard
Cohesiveness	Brittleness Chewiness Gumminess	Crumbly – crunchy – brittle Tender – chewy – tough Short – mealy – pasty – gummy

Texture

Primary parameters	Secondary parameters	Popular terms
Viscosity		Thin - viscous
Elasticity		Plastic – elastic
Adhesiveness		Sticky – tacky - gooey

Texture

- Geometrical characteristics

Primary parameters	Secondary parameters	Popular terms
Particle size and shape		Gritty, grainy, coarse, etc
Particle shape and orientation		Fibrous, cellular, crystalline, etc.

Texture

- Other characteristics

Primary parameters	Secondary parameters	Popular terms
Moisture content		Dry – moist – wet - watery
Fat content	Oiliness Greasiness	Oily Greasy

Source: Bourne (2002)

INTRODUCTON

- Sensory evaluation is a scientific discipline that analyses and measures human responses to the composition of food and drink, e.g. appearance, touch, odour, texture, temperature and taste.
- DEFINITION :‘A scientific discipline used to evoke, measure, analyze and interpret reactions to those characteristics of food and materials as they are perceived by senses of sight, smell, taste, touch and hearing. ’

Development of Sensory Testing

Primary function of sensory testing:

To conduct valid and reliable tests, which provide data on which sound decision can be made.

The role of sensory evaluation is to….

provide valid and reliable information to R&D, production, and marketing for management to make sound business decisions about the perceived sensory properties of products.

Sensory Evaluation as a Scientific Method

- Incorporates the following:
  - Identification of a problem
  - The statement of a hypothesis
  - An experimental strategy to investigate the problem
- Strategy accomplished through data collection and analysis and a conclusion is reached that answers the original question

IMPORTANCE :



- To detect the similarities /differences
- To evaluate an existing food product against benchmark sample.
- To analyze for further improvements based on market feed back.
- To elicit specific response to a food sample: whether acceptable or not by consumers.
- To study a particular property in an ingredient or a food product.
- To evaluate if a ready food product meets its original specification / standard sample.
- To obtain feedback data in order to make decisions and carry out suitable modification in a food product.

PROCEDURES BE FOLLOWED

Controlled conditions

- Check that everyone is able to test the products
- Everyone should use clean spoons and separate dishes.
- Do not allow people who are unwell
- Serve all food samples in the same way
- Label the foods with random letters or numbers
- Only allow tasters to test up to six samples at a time
- Have water available to sip or a dry biscuit to taste between tastings as this will help clear the palate and make tastings more effective on a number of samples.
- Complete the tasting and record on sheets after each person tastes the food.
- Use separate booths for each taster to ensure no influence from other tasters.

SENSORY EVALUATION



: PLAN

- Define the overall project objective
- Define the test objective.
- Screening the samples.
- Selection of the test method and panel.
- Conducting the test.
- Analyzing the data
- Reporting the results.
- Corrective action , if required.

REQUIREMENT



- Sophisticated Sensory booths/Rooms :
- Laboratory for physical, chemical analysis of raw and prepared foods.
- Suitable area for preparation of food samples for evaluation.
- Suitable coding of samples : usually 3 digit coding is done.
- Appropriate method of sample presentation.
- Sensory panel members suitable for evaluation.
- Specialized software for statistical evaluation of sensory

SENSORY PANEL ROOM



- Sensory Panel Room with controlled temperature (20°C – 22°C) and RH at 40±5%.
- Booths are widely used to provide an environment that prevents panellists from being distracted and interacting with other panellists unbiased evaluation
- Suitable Lighting in booths White or Masked.





- Utensils / glass wares suitable for different foods.
- Check that you have enough glasses of water for the people taking part.
- Noise level should be kept low
- Room should be free of foreign doors

- Testing area should be easy to clean and disinfect
- The room where food products are prepared for The room where food products are prepared for sensory testing is generally separated from the testing area testing area

BEST TIME FOR SENSORY EVALUATION

- The best time of day for sensory testing is morning 10.00 am to 12 noon and 3-5pm
- Judgement should be done quickly , but not hurriedly

TRAINING AND SELECTION OF SENSORY EVALUATION PANELISTS

- No smoking , drinking habit
- Ability to discriminate & describe product
- Ability to discriminate & scale attribute
- Availability and promptness
- Curiosity
- Required to disclose
- Religious. Moral, political beliefs
- Marital, income status
- Educational level
- TV viewing habits
- Health status

CONSUMER PANELS:

- Ways to recruit : contact various groups organizations
- use newspaper advertisements only if necessary
- Explain the program's intent, time commitments
- and compensation fully explained to participants

Positives of panel	Negatives
Good attitude Interested in work Consider work important Have the time Great source preference information	not enough training use preference in evaluations not available at short notice participants may want to impress and please will often be overly positive in assessment of your brands money / product compensation

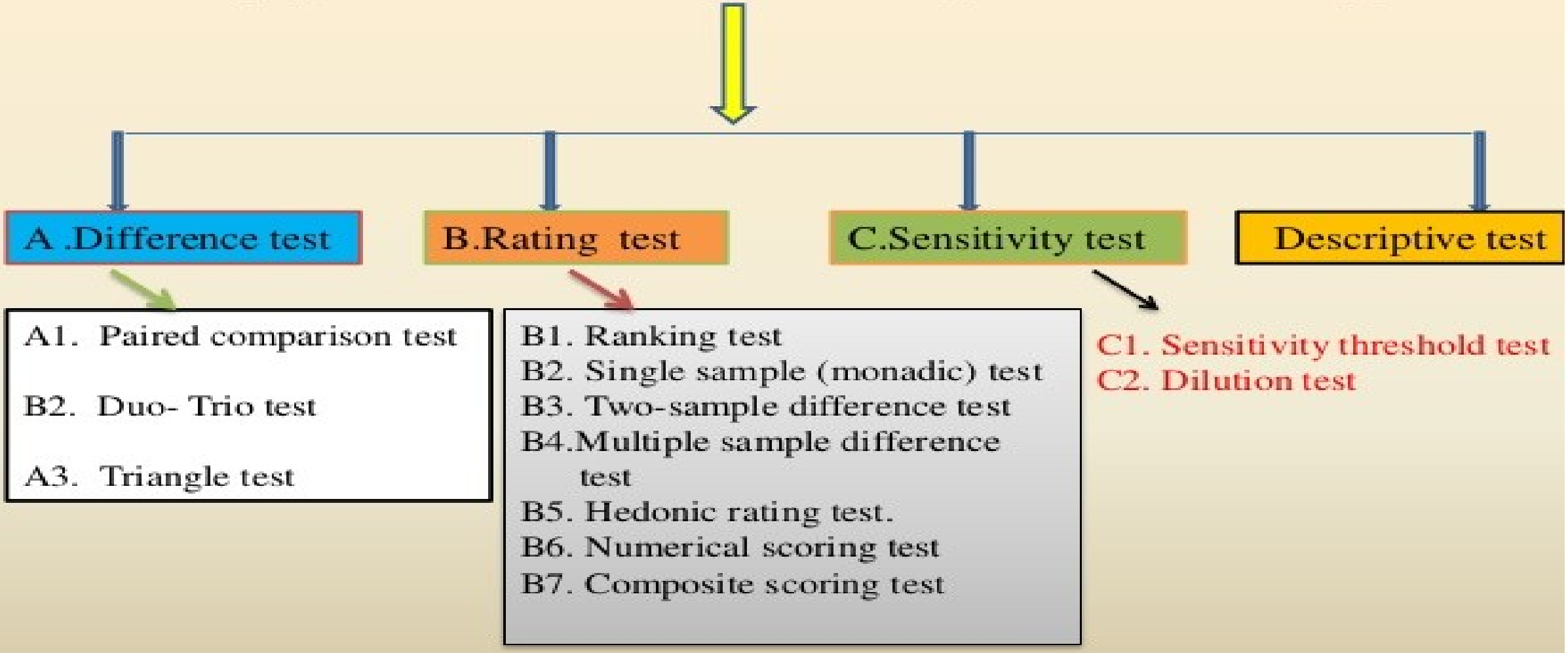
Types of sensory testing

Different sensory tests are employed for food evaluation. The tests are grouped into four types.

A DIFFERENCE TEST
B RATING TEST
C SENSITIVITY TEST
D DISCRIPTIVE TEST



Types of sensory testing

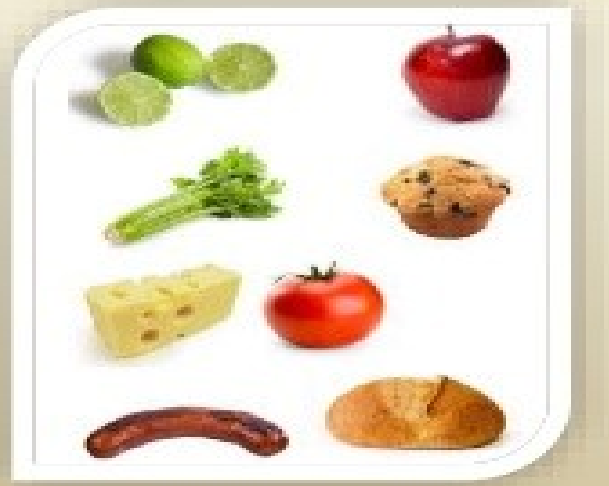


1.A DIFFERENCE TEST
A1.Paired comparison test

❖Prepare two different samples of the food product you wish to test.

❖Compare one attribute, e.g. which one is smoother?

❖ Record the response from the tasters.



Paired comparison test

- Name…….. Date……
- Product……
- you are given one or several pairs of sample. Evaluate the two samples in the pair for…….is there any difference the two samples in the pair?

Code No. of pairs	Yes	No
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Signature

A2. DUO-TRIO-TEST

- Prepare three food samples, two of which are the same.
- Using one of the two identical samples as control, as the taster to decide which of the other two remaining sample as the control.
- Record the tasters' responses.

Duo-trio-test

Name:..... Date:.....

Product:.....

- The first sample 'R' given is the reference sample
- Taste it carefully.

  From the pair of coded samples next given, judge which sample is the same as 'R'

Set No	code no of pairs	same as 'R'
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____

Signature

A3.Triangle Test

- ✓ Prepare three food samples, two of which are the same.
- ✓ Arrange the samples in a triangle.
- ✓ Ask the tasters to decide which of the samples is the odd one out.
- ✓ Record the responses from the tasters
- ✓ Two Samples A and B can be presented in two combinations AAB and BBA and for replication in six different- AAB,ABA,BAA,BAB,ABB and BBA.

Triangle test

Name..... Date.....

Product.....

Two of the samples are identical. Determine the odd samples.

Set No	code no of samples	code no of odd samples	comment on odd samples
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____

Signature

2B.Rating test

B1. **Ranking test**

- Used to determine how several samples differ on the basis of a single characteristic.
- Panellist are presented all samples with code number and are asked to rank.
- The Panellist are asked to rank the coded samples according to there preference.

Ranking test

Name.....

Date.....

Product.....

- Please rank the samples in numerical order according to your preference or intensity of aroma/taste characteristic of the product.

Intensity/preference	sample code
1	_____
2	_____
3	_____
4	_____

Signature

B2.Single sample test

- ✓ The panellist is asked to indicate the presence or absence and/or intensity of a particular quality characteristic. with trained panellist.
- ✓ Analyses of two or more samples evaluated at different times,
- ✓ By a different set of untrained panellists can be compared.

Single sample test

Name..... Date.....

Product.....

- Please taste and rank the samples carefully. can you detect any off-flavour in the product? Circle one

Yes NO

If you detect any off-flavour Please it below;

Intensity	comments
Trace	off-flavour is due to-
Moderate	off-odour
Strong	off-taste
	residual taste
	other defects

Signature

B3.Two sample difference test

- This test is variation of the paired test and measure the amount of difference.
- Each taster is served four pairs of samples.
- In two pairs duplicate samples. other two pairs test samples the test variable.
- To judge the independently difference between the test sample a standard on a scale ‘0’ representing no difference to ‘3’ representing extreme difference.
- The panellist is not guess and he is guessing through the coded duplicate standard in two pairs.

Two sample difference test

Name..... Date.....

Product.....

1.Compare the coded samples in each of the four pair given, test may or may not be different from the reference sample.

2.Determine the degree and direction scale

Degree		Direction	
No difference	0	Super to standard	S
Very slight difference	1	Equal to standard	E
Moderate difference	2	Inferior to standard	I
Large difference	3		

3.Comment on what the difference is based on;taste,odour or both.

sample code no,	Degree difference	Direction	Comment
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Signature

B4.Multiple sample difference test

- Each panellist is served 3-6 samples.
- One sample is a known standard, panellist compares each coded sample with the known standard.
- One coded sample is a duplicate of the sample.
- The panellist is not to guess. Direction and degree of difference is also to be judged.

Multiple sample difference test

Name..... Date.....

Product.....

- Taste it carefully for the quality characters to be evaluated to the reference sample for odour and flavour.
- Rate in each sample degree of difference and the direction of quality.

Degree of difference Direction of quality

Rating	Difference from standard	
0	None	E Equal
1	slight	I Inferior
2	moderate	S Superior
3	large	

sample code no	odour			flavour		
	Degree	Direction	comments	Degree	Direction	comments

Signature

B5.Hedonic test

- ✓ Prepare the food samples.
- ✓ Ask each taster to taste each sample in turn and tick a box, from '1 Dislike Very Much' to '5. Like Very Much' to indicate their preference. This is a 5-point-scale. Sometime a 9-point-scale is used.
- ✓ The taster may also wish to make remarks about the products' appearance, taste, odour and texture.
- ✓ Analyze the results. Which sample received the highest/lowest scores? Which sample was preferred.

B5.Hedonic Rating test

Name:..... **Date:**.....

Product:.....

- Taste these samples and checking how much you like or dislike each one
- Use the appropriate scale to show your attitude by checking at the point that best describe your feelings about the sample.

	code	code	code
Like extremely	_____	_____	_____
like very much	_____	_____	_____
like moderately	_____	_____	_____
like slightly	_____	_____	_____
like or dislike	_____	_____	_____
Dislike slightly	_____	_____	_____
Dislike very much	_____	_____	_____
Dislike moderately	_____	_____	_____
Dislike extremely	_____	_____	_____

Reason

Signature

B6.Numerical Scoring test

- One or more samples are represented to each panellist.
- Panellist evaluates each samples on a specific scale for a particular characteristics indicating the rating of sample.
- The panellists are trained to follow the sensory characteristics corresponding to the agreed quality descriptions and scores.

Numerical Scoring test

Name.....

Date.....

Product.....

Please rate these samples according to the following descriptions

Score	Quality description
90	Excellent
80	Good
70	Fair
60	Poor

Sample score comments

Signature

B7. Composite Scoring Test

- The rating scale is defined so that specific characteristic of a product are rated separately.
- This method is helpful in grading products and comparison of quality attributes by indicating which characteristic is at fault in a poor product.
- It gives more information than the straight numerical method.

Composite Scoring test

Name: ..... Date:.....

Product: Orange Marmalade

Quality	Possible score	Sample scores			
Colour	20	___	___	___	___
Consistency	20	___	___	___	___
Flavour	40	___	___	___	___
Absence of defects	20	___	___	___	___

Comments;

Signature

C. Sensitivity Test

- Sensitivity tests are done to assess the ability of individual to detect different tastes, odour and feel the specific factors like hotness.
- These tests are used to select and train panel members for evaluating the quality of products containing spices, salt and sugar.

  Eg., tomato ketchup or sauce.

C1. Sensitivity Threshold Test

- Threshold test: Is defined as a statistically determined point on the stimulus scale at which a transition in a series of sensations or judgments occur.
- There are mainly three types of threshold tests as mentioned below:
  I. Stimulus Detection Threshold
  II. Recognition Identification Threshold
  III. Terminal saturation Threshold
- These tests are also used where a minimum detectable difference of an additive or of an off flavour are to be established.

C2. Dilution tests

- These tests are designated to establish the smallest amount of an unknown material developed as a substitute for a standard product.
- The quality of the test material is represented by the dilution number.
- The bigger the dilution number the better is the quality of the test material.

Sensitivity Threshold Test

Name: ..... Date:.....

Use the following intensity scale.

0=none or the taste of pure water.

?=different from water, but taste quality not identifiable

X= Threshold very weak

1=weak

2=medium

3=strong

4=very strong

5=extremely strong

Set no.	Description of taste and feeling a factor
1	.....
2	.....
3	.....
4	.....
5	.....

Signature

D.Descriptive flavour profile method

- This is a qualitative and quantitative description method for flavour analysis in product containing different tastes and odour.

flavour profile analysis of tomato ketchup

Aroma		Taste		Mouth feel	Texture
Garlic	1	Sour(T)	1	Chilies(1)	Smoothness(3)
Pepper	2	Sweet (S)	2		
Onion	3	Salt	1		
Cinnamon	2				
Cloves	1				

Number of Panel members and samples required for sensory test

Sl.No.	Method	Panellists		No. of sample tests
		Type	Number	
A.	Difference			
1.	Paired Comparison	Trained Untrained	5-12 72-80	2
2.	Duo-Trio	Trained	5-12	3(2identical and 1 different)
3.	Triangle	Trained	5-12	3(2identical and 1 different)
B.	Rating			
1.	Ranking	Trained Semi-Trained Un-Trained	5-12 10-15 72-80	2-7
2	Single sample	Trained Un-Trained	6-25 72-80	1
3.	Two sample difference	Trained	6-25	4 pairs of Unknown and control sample
4.	Multiple sample and	Trained	6-25	3-6

Contd...

Sl.No.	Method	Panellists		No. of sample tests
		Type	Number	
5.	Hedonic	Semi-Trained	10-25	5-10
6.	Numerical scoring	Un- Trained Trained	72-80 5-12	1-4 1-6 5-10
7.	Composite	Trained	5-12	1-4
C.	Sensitivity			
1.	Threshold	Un- Trained	--	5-10
2.	Dilution	Trained	12-24	5-10
D	Descriptive			
	Flavour Profile	Trained	3-6	1-5
		Specially in the technique		

What is Statistical Quality Control??

- A method of quality control which uses statistical methods.
- a collection of strategies, techniques, and actions taken by an organization to ensure they are producing a quality product or providing a quality service.
- The objective of statistical quality control is to monitor production through many stages of manufacturing
- The general category of statistical tools used to evaluate organizational quality.

➢ Statistics:

Statistics means the good amount of data to obtain reliable results. Its techniques find extensive applications in quality control, production planning and control, business charts, linear programming etc.

➢ Quality:

Quality is a relative term and is generally explained with reference to the end use of the product. **Quality is thus defined as fitness for purpose (defined by Juran)**

➢ Control:

Control is a system for measuring and checking or inspecting a phenomenon. It suggests when to inspect, how often to inspect and how much to inspect, how often to inspect

SQC : Three broad categories

- **Descriptive statistics** Statistics used to describe quality characteristics and relationships.

- **Statistical process control (SPC)** A statistical tool that involves inspecting a random sample of the output from a process and deciding whether the process is producing products with characteristics that fall within a predetermined range.

- **Acceptance sampling** the process of randomly inspecting a sample of goods and deciding whether to accept the entire lot based on the results.

Sampling is the act, process, or technique of selecting a suitable sample, or a representative part of a population for the purpose of determining parameters or characteristics of the whole populations.

- ✓ Sampling before typically is done to supplier material
- ✓ Sampling after involves sampling finished items before shipment or finished components prior to assembly

➢ Used where inspection is expensive, volume is high, or inspection is destructive

Importance of Sample Collection

- Sample collection is very important to ensure that analytical data is reliable and to draw a representative sample.
- 3 activities in analysis
  - Collection of representative sample
  - Sample preparation
  - Analysis using proper methods & instruments
- Potential sources of variation for above activities to be identified and minimized or avoided
- Proper sample size, suitable containers for sampling or use of appropriate preservatives to prevent spoilage /damage before analysis.

Sampling Plans

Goal of Acceptance Sampling plans is to determine the criteria for acceptance or rejection based on:

- ✓Size of the lot (N)
- ✓Size of the sample (n)
- ✓Number of defects above which a lot will be rejected (c)
- ✓Level of confidence we wish to attain

- There are single, double, and multiple sampling plans
  - ✓Which one to use is based on cost involved, time consumed, and cost of passing on a defective item
- Can be used on either variable or attribute measures, but more commonly used for attributes

Sampling Methods

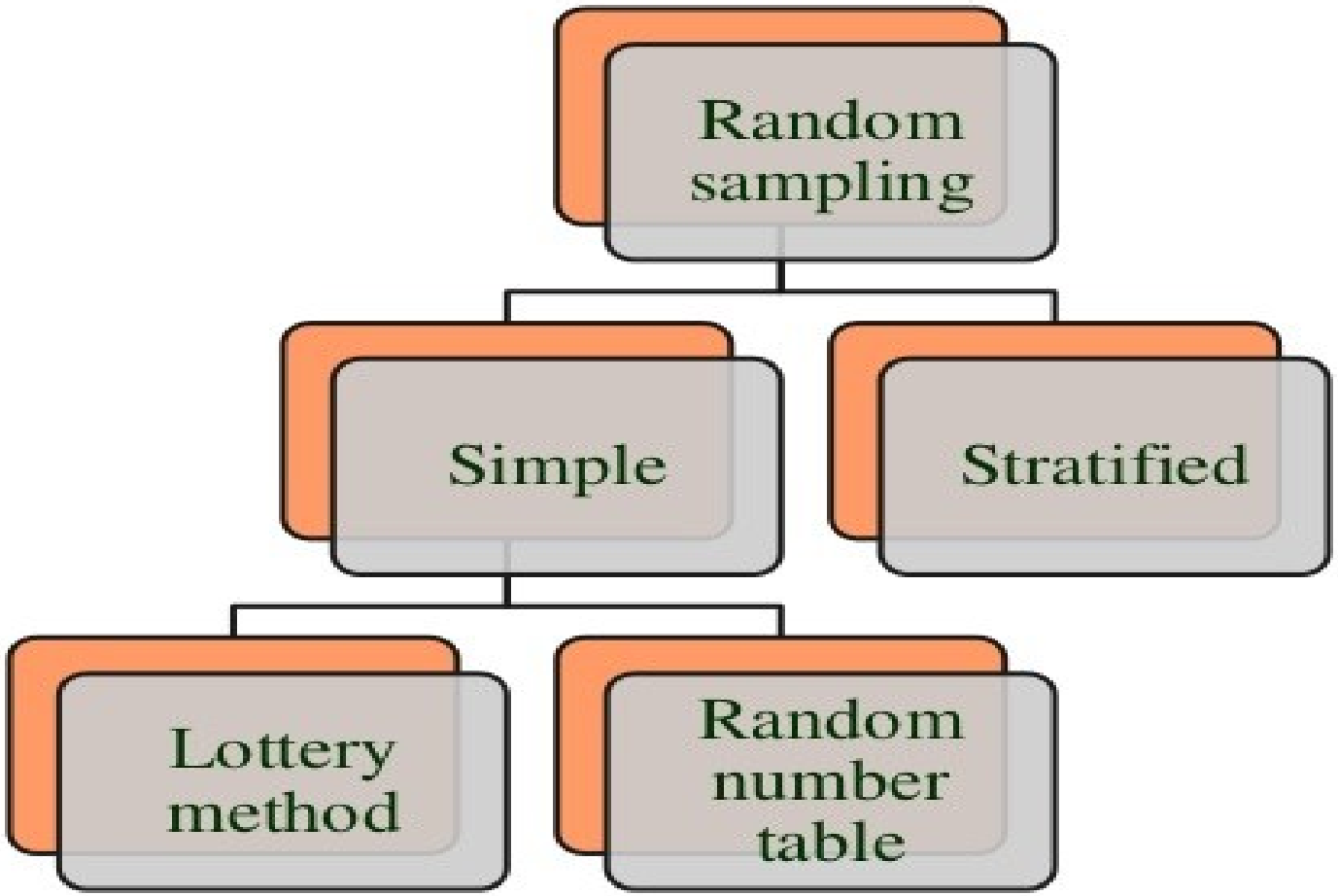
(A) Random sampling
- ✓ Simple random sampling
- ✓ Stratified random sampling

(B) Systemic sampling

(C) Multistage sampling

(D) Cluster sampling

(A) Random sampling



Simple random sampling

- In this method, the sample is being selected in such a way that *each unit of the population has an equal chance of being included* in sample.

- A simple random sample can be selected by two methods.

  (i) Lottery method

  (ii) Random number tables

(i) Lottery method

Simplest method of selecting a random sample

- Suppose, we have 500 units in population and we wish to select 50 units out of them.
- So assign the numbers 1 to 500 units of population.
- Prepare slips bearing numbers 1 to 500.
- The slips should be homogeneous in shape, size, colour etc.
- These slips are shuffled and put in box.
- 50 slips are selected.
- The units with the numbers on the slips selected will constitute a random sample.

(ii) Random number tables

- Used as device to choose samples which included in survey, a quality control inspection sample, or to assign experimental units to treatments such as assigning patients to drug treatments.

- It is most practical and inexpensive method of selecting a random sample.

(B) Systemic sampling

- This technique is used when *complete and up-to-date* list of all units in the population is available.

- First unit is selected by method of random sampling and the remaining units are selected according to some predetermined pattern involving regular spacing of units.

(C) Multistage sampling

- This method is useful in many *large scale surveys* where the preparation of the list of all units in the population is difficult.
- In this method, random selection is primary, intermediate and final (or the ultimate) units from a given population.
- Thus, the area of investigation is restricted to a small number of final units.
- This will reduce the cost compared with simple random sampling from the whole population.

CLUSTER SAMPLING

- Cluster sampling is an example of 'two-stage sampling' .
- First stage a sample of areas is chosen;
- Second stage a sample of respondents *within* those areas is selected.
- Population divided into clusters of homogeneous units, usually based on geographical contiguity.
- Sampling units are groups rather than individuals.
- A sample of such clusters is then selected.
- All units from the selected clusters are studied.

Single Sampling Plan

- Inspect a sample “n” place from the lot “N”.
- If the number of defects found in sample does not exceed “c” (accep. No.) the lot is accepted.
- If the number of defects found in sample exceed the value “c” all the pieces in the reminder of lot inspected.

Double Sampling Plan

- In this sampling : after test three conditions arises
- Accept lot
- Reject lot
- No decision : in this case second sample is taken and the to combine result of both the sample and made final decision

Multiple Sampling Plans

- A ***Multiple Sampling Plan*** is similar to the double sampling plan in that successive trials are made, each of which has acceptance, rejection and inconclusive options.

- ***Which Plan you choose*** depends on



Cost and time

Number of samples needed and number of items in
ch sample

Sampling Plan is used for

- In Starting materials
- Finished products
- Packaging materials

Sampling Plan for Starting Materials

- “n- plan”
- “p- plan”
- “r- plan”

1- The ‘n-plan’

- Only used when material is consider *uniform* and from a *recognized source.*

  $n = 1 + \sqrt{N}$

- N = sampling units in the consignment (e.g individual package, drum or container)
- Calculate “n” (n = units to be sampled)
- Select at random “n” units from N.
- Take a sample from these units.
- QC lab checks appearance + identify of each sample.
- If results concordant => combine samples into a single final sample .
- Take “analytical sample” for full testing
- Keep the test as “retention sample.”

Value of n, p or r	Value of N		
	n plan	p plan	r plan
2	Up to 3	Upto 25	Upto 2
3	4-6	26 - 56	3 - 4
4	7-13	57 - 100	5 - 7
5	14-20	101 - 156	6 -11
6	21-30	157 - 225	12 - 16
7	31-42		17 -22
8	43-56		23 - 28
9	57-72		29 - 36
10	73-90		37 - 44
e.g. N = 40 = > n =7 (units to be sampled)			

II- The '*p*-plan'

- May be used when material is consider *uniform*, from a *recognized source* and the main purpose is to *test for identity*.
- $p = 0.4\sqrt{N}$
- N = sampling units in the consignment (e.g individual package, drum or container)

- Sample each of the N sampling units
- QC lab checks appearance + identify of each sample.
- If results concordant => p final samples are formed by appropriate pooling
- Keep the p samples for retention (or full testing if required)

Value of n, p or r	Value of N		
	n plan	p plan	r plan
2	Up to 3	Upto 25	Upto 2
3	4-6	26 - 56	3 - 4
4	7-13	57 - 100	5 - 7
5	14-20	101 - 156	6 -11
6	21-30	157 - 225	12 - 16
7	31-42		17 -22
8	43-56		23 - 28
9	57-72		29 - 36
10	73-90		37 - 44
e.g. N = 40 = > p =3 (final samples after testing + pooling)			

III- The ‘r-plan’

- May be used when material is consider *non-uniform* and/or obtained from a *not well know source*.
- Can be used *herbal medicinal products* used as starting materials $r = 1.5\ \sqrt{N}$
- N = sampling units in the consignment (e.g individual package, drum or container)

- Sample each of the N sampling units
- QC lab checks appearance + identify of each sample.
- If results concordant => *r* final samples are randomly selected.
- R Samples individually fully tested.
- If results concordant = > combine the r samples for the retention sample.

Value of n, p or r	Value of N		
	n plan	p plan	r plan
2	Up to 3	Upto 25	Upto 2
3	4-6	26 - 56	3 - 4
4	7-13	57 - 100	5 - 7
5	14-20	101 - 156	6 -11
6	21-30	157 - 225	12 - 16
7	31-42		17 -22
8	43-56		23 - 28
9	57-72		29 - 36
10	73-90		37 - 44
e.g. N = 40 = > p =3 (final samples after testing + pooling)			

Sampling Plan for Finished Products

- The minimum size of the samples to be taken is determined by the requirements of the analytical procedure used to test the product (tests of unit dosage forms for uniformity of weight, volume or content, or sterility tests can require a large number of samples).

- Sampling and testing may be adjusted according to the experience with the source of the product, e.g. manufacturer or supplier.

Sampling Plan for Finished Products
&
Packaging Material

5.2 Sampling plans for packaging materials should be based on defined sampling standards, for example, British Standard BS 6001-1, ISO 2859.

5.3 As for packaging materials, sampling plans for finished products should be based on defined sampling standards such as BS 6001-1, ISO 2859 or ANSI/ASQCZ 1.4-1993. or ANSI/ASQCZ1.4-1993.

ISO 2859 Sampling Standard

Batch quantity	Sample size		AQL											
	Grade I		0.01		1		1.5		2.5		4		6.5	
			Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
2 ~ 8	A	2	↓		↓		↓		↓		↓		0	1
9 ~ 15	A	2											0	1
16 ~ 25	B	3									0	1	↑	
26 ~ 50	C	5							0	1	↑		↓	
51 ~ 90	C	5					↓		0	1				
91 ~ 150	D	8			↓		0	1	↑		↓		1	2
151 ~ 280	E	13			0	1	↑		↓		1	2	2	3
281 ~ 500	F	20			↑		↓		1	2	2	3	3	4
501 ~ 1,200	G	32			↓		1	2	2	3	3	4	5	6
1,201 ~ 3,200	H	50			1	2	2	3	3	4	5	6	7	8
3,201 ~ 10,000	J	80			2	3	3	4	5	6	7	8	10	11
10,001 ~ 35,000	K	125			3	4	5	6	7	8	10	11	14	15
35,001 ~ 150,000	L	200			5	6	7	8	10	11	14	15	21	22
150,001 ~ 500,000	M	315			7	8	10	11	14	15	21	22	↑	
500,001 and above	N	500	0	1	10	11	14	15	21	22	↑			

↓ use the first sampling plan followed. If sample size is equal or more than batch quantity, doing 100% inspection.

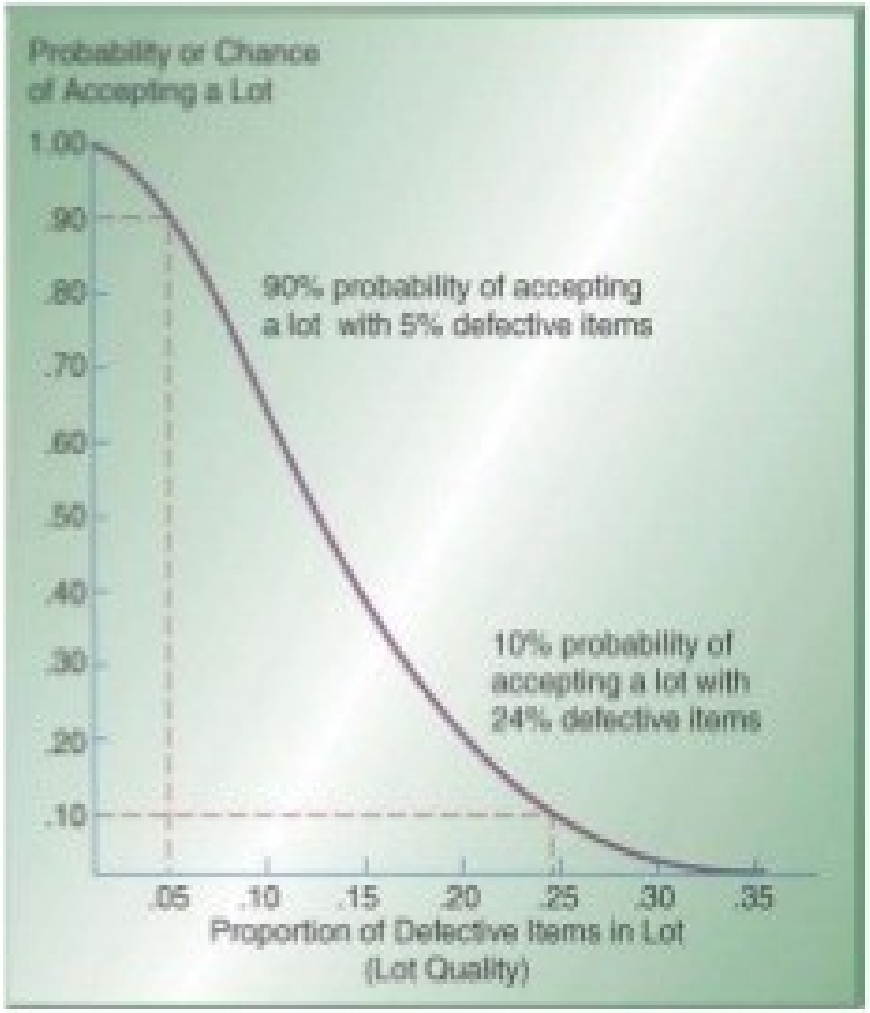
↑ use the first sampling plan above.

Ac : acceptable number Re : rejection number

ISO 2859 or ANSI/ASQC Z 1.4-1993. BS 6001-1,

Operating Characteristics (OC) Curves

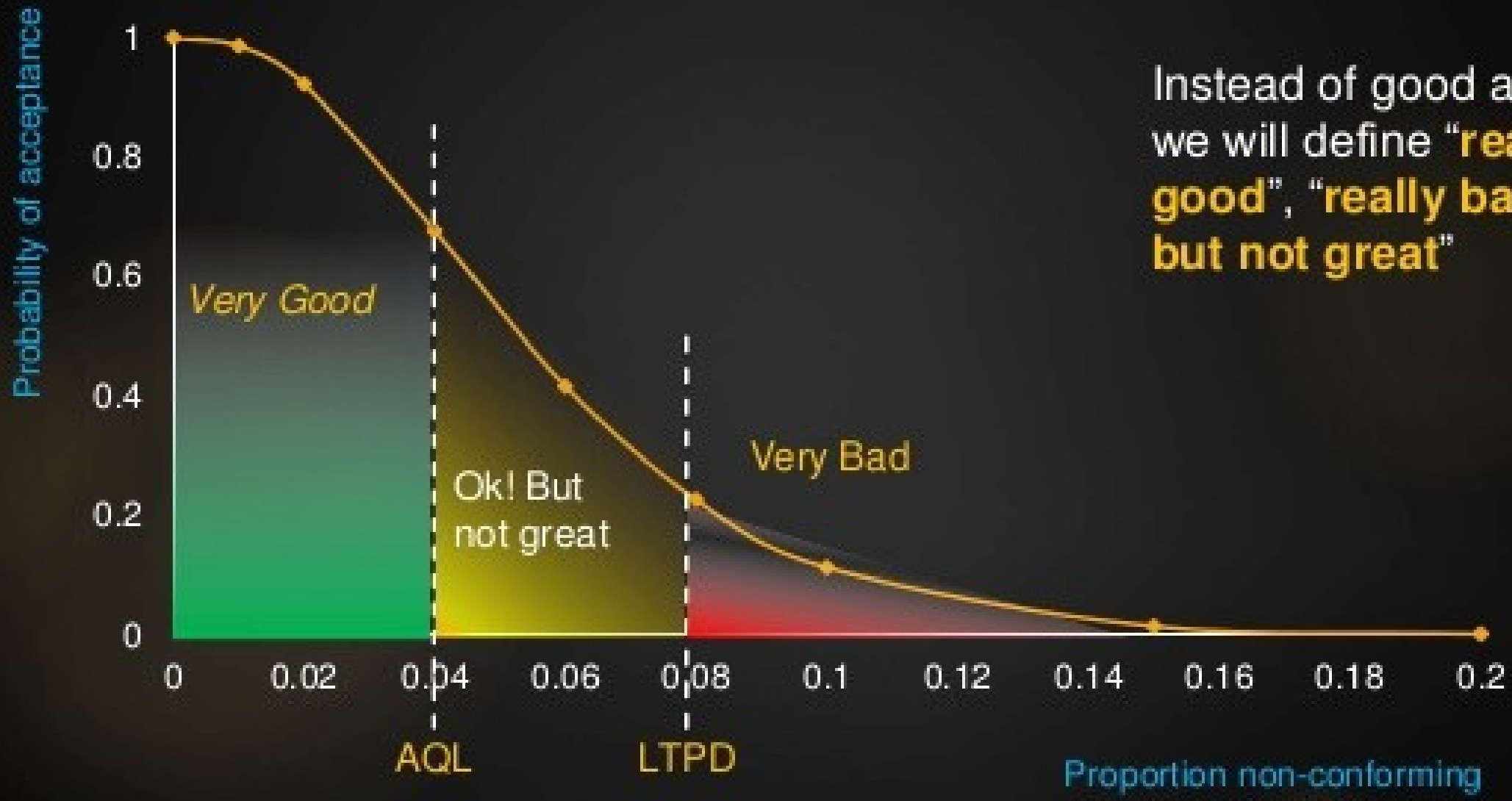
- OC curves are graphs which show the probability of accepting a lot given various proportions of defects in the lot
- X-axis shows % of items that are defective in a lot- "lot quality"
- Y-axis shows the probability or chance of accepting a lot
- As proportion of defects increases, the chance of accepting lot decreases
- Example: 90% chance of accepting a lot with 5% defectives; 10% chance of accepting a lot with 24% defectives



Customers Acceptance Levels

- Most customers understand that 100% inspection is impractical and are generally willing to accept that a certain level of defectives will be produced.
- The ***Acceptable Quality Level (AQL)*** is the percentage level of defects at which a customer is willing to accept as lot as "good".
- The ***Lot Tolerance Percent Defective (LTPD)*** is the upper limit on the percentage of defectives that a customer is willing to accept.
- Customers want lots with quality better than or equal to the ***AQL*** but are willing to live with some lots with quality as poor as the ***LTPD***, but prefer not to accept lots with quality levels worse than the ***LTPD***.

Defining good and bad lot

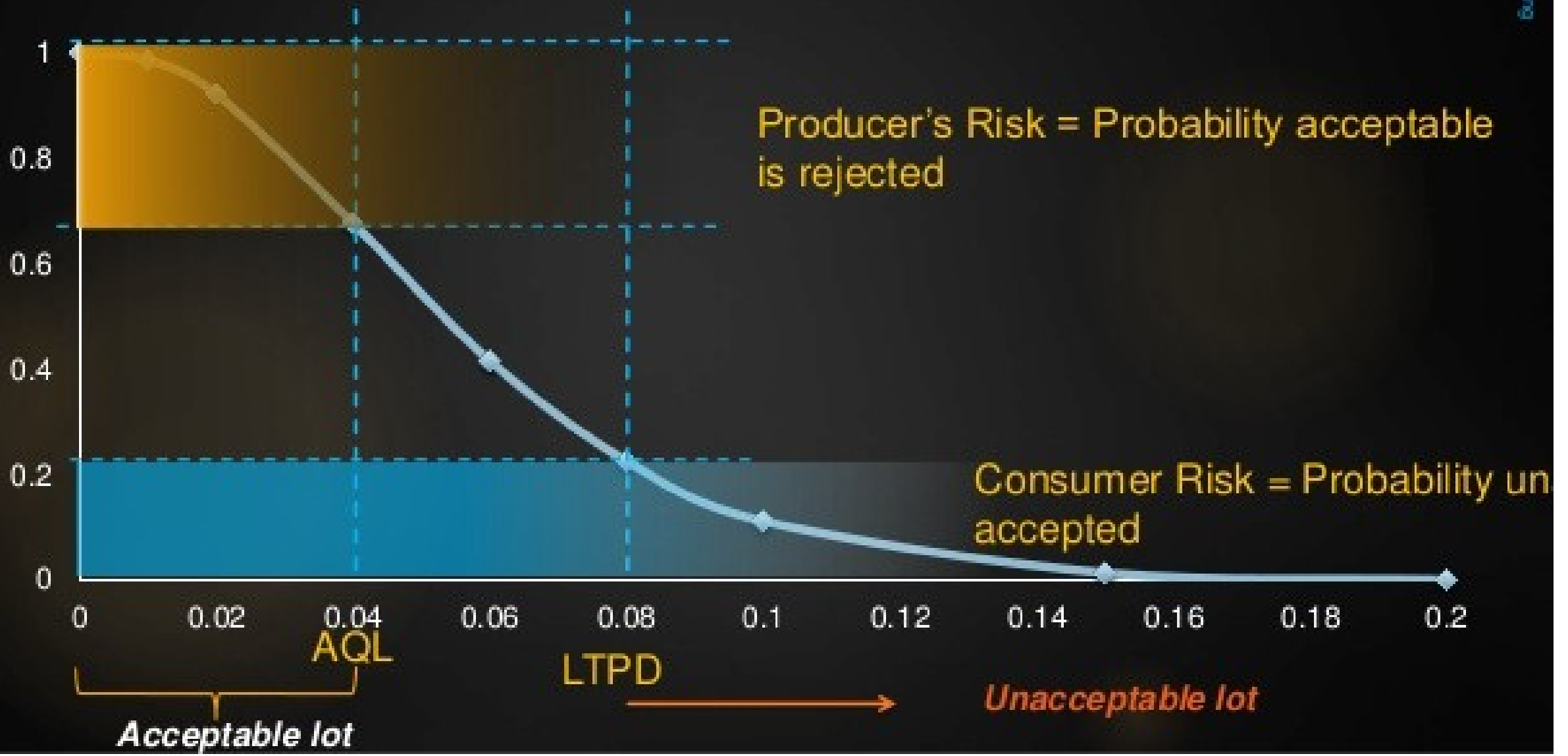


Instead of good and bad we will define "**really good**", "**really bad**", "**ok, but not great**"

Customers Acceptance Levels…

- Therefore the sampling plan must be designed to assure the customer that they will be receiving the required ***AQL*** and ***LTPD***.
- The ***Consumer's Risk*** is the probability that an unacceptable lot (e.g. above the ***LTPD***) will be accepted.
- The ***Producer's Risk*** is the probability that a "good" lot will be rejected.

Sampling Risks



Average Quality Of Inspected Lots

The result of acceptance sampling ***(assuming rejected lots are 100% inspected)*** is that the level of inspection automatically adjusts to the quality of the lots being inspected.

The ***Average Outgoing Quality (AOQ)*** is the average of rejected lots (100% inspection) and accepted lots (a sample of items inspected).

$$AOQ = P_{ac} \times p \frac{(N-n)}{N}$$ where;

P_{ac} = Probability of accepting a lot

p = Fraction defective

N = Lot size

n = Sample size

The maximum outgoing quality level is referred to as the AOQL

CONTROL CHART.

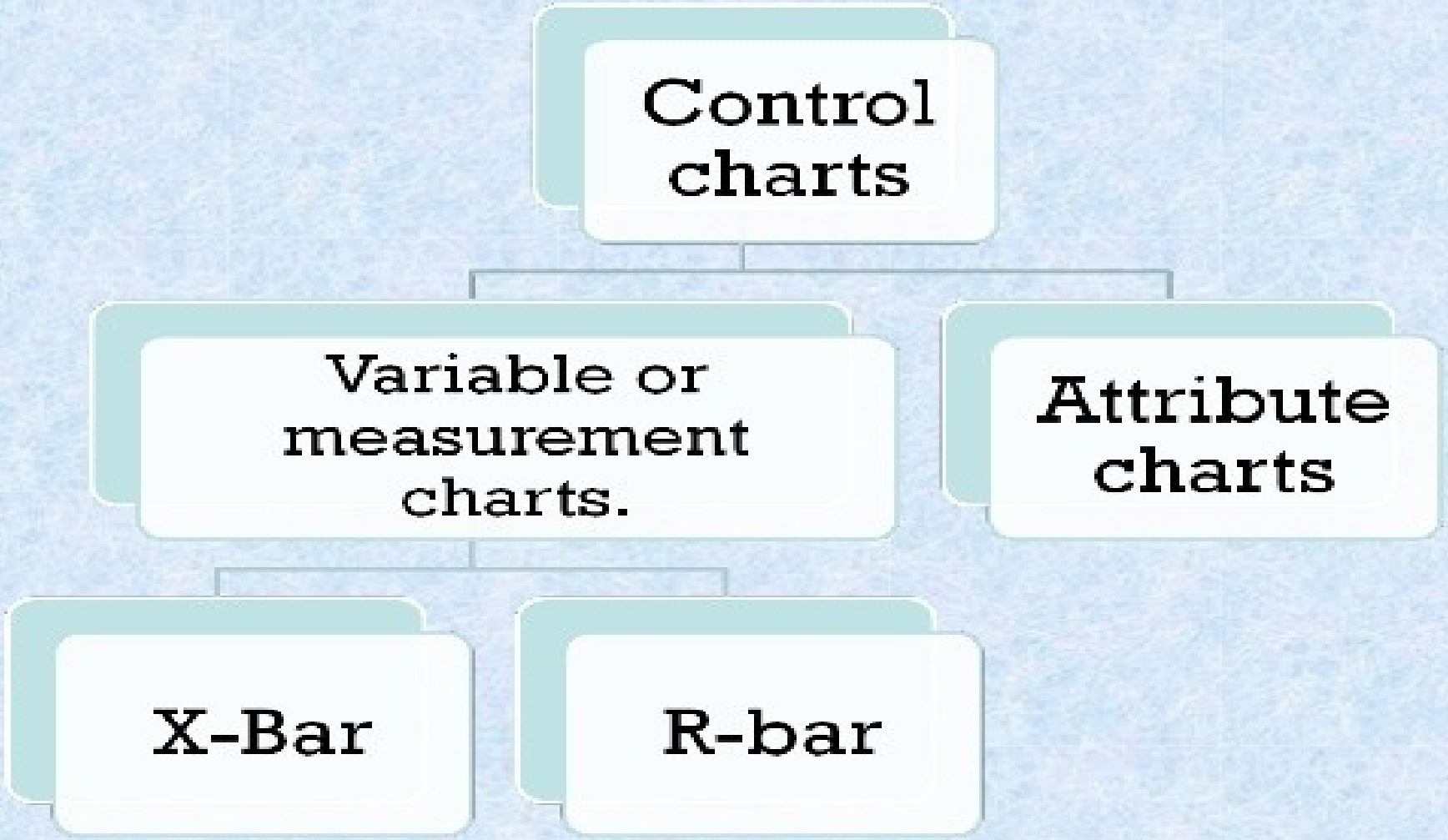
- Control chart is graphical representation of the collected information.

- It pertains to the measured or otherwise judged quality characteristics of the items or samples.

What do these charts do.

- It detects variations in the processing and warns if there is any departure from the specified tolerance limits.
- It is primarily a diagnostic technique.
- It depicts whether there is any change on the characteristics of items since the start of the production run.

TYPES OF CONTROL CHARTS.



X-BAR CHART.

1. It shows changes in process and is affected by changes in process variability.
2. It is a chart for the measure of central tendency.
3. It shows erratic or cyclic shifts in the process.
4. It detects steady progress changes, like tool wear.
5. It is most commonly used variables chart.

X-BAR CHART.

6. When used along with R-bar chart :
   i. it tells you when to leave the process.
   ii. It secures information in establishing or modifying processes, inspection procedures.
   iii. It controls the quality of incoming material.

7. X-bar and R-bar chart when used together form a powerful instrument for diagnosing quality problems.

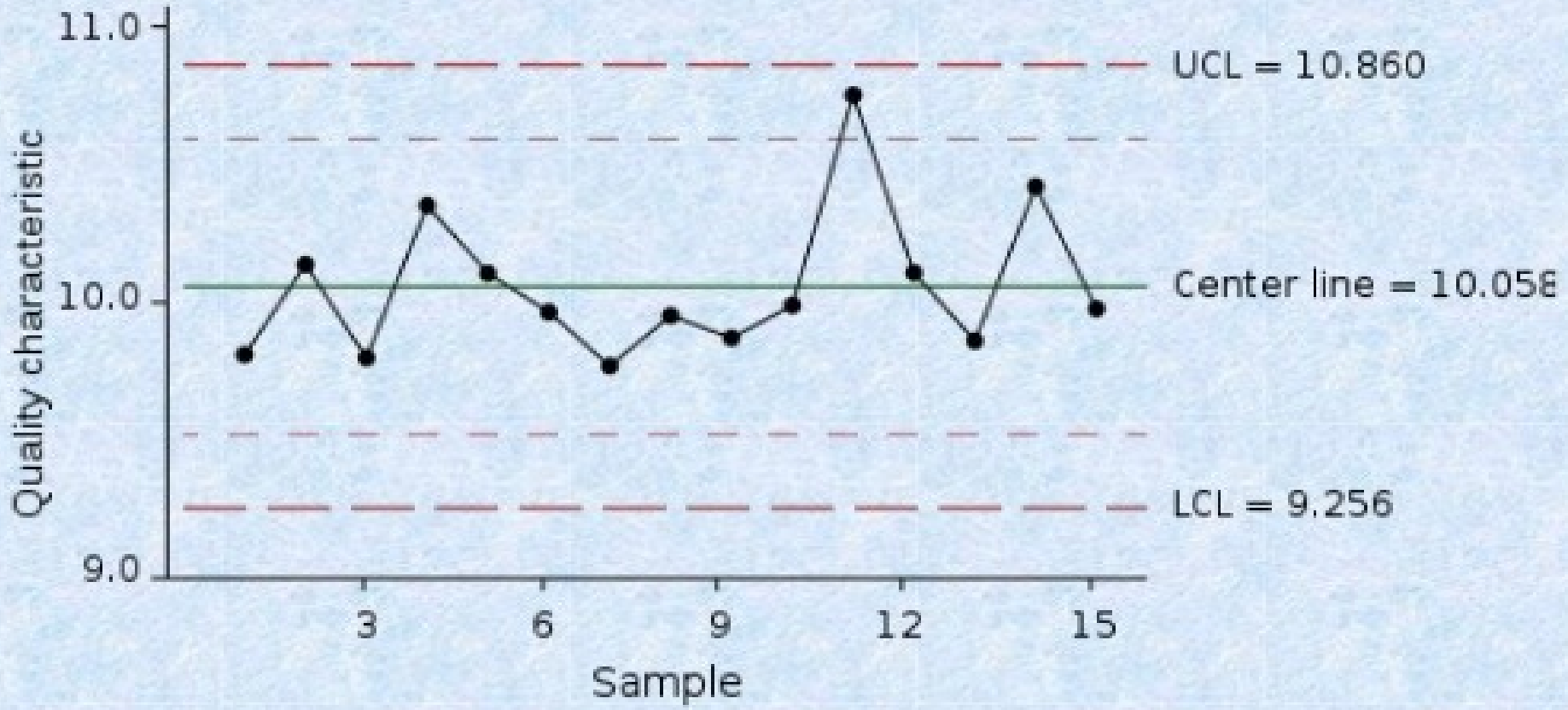
R-BAR CHART.

1. It controls general variability of the process and is affected by changes in process variability.

2. It is a chart for measure of spread.

3. It is used generally along with X-bar chart.

CHART DETAILS



FOOD PROCESSING AND PLANT SANITATION

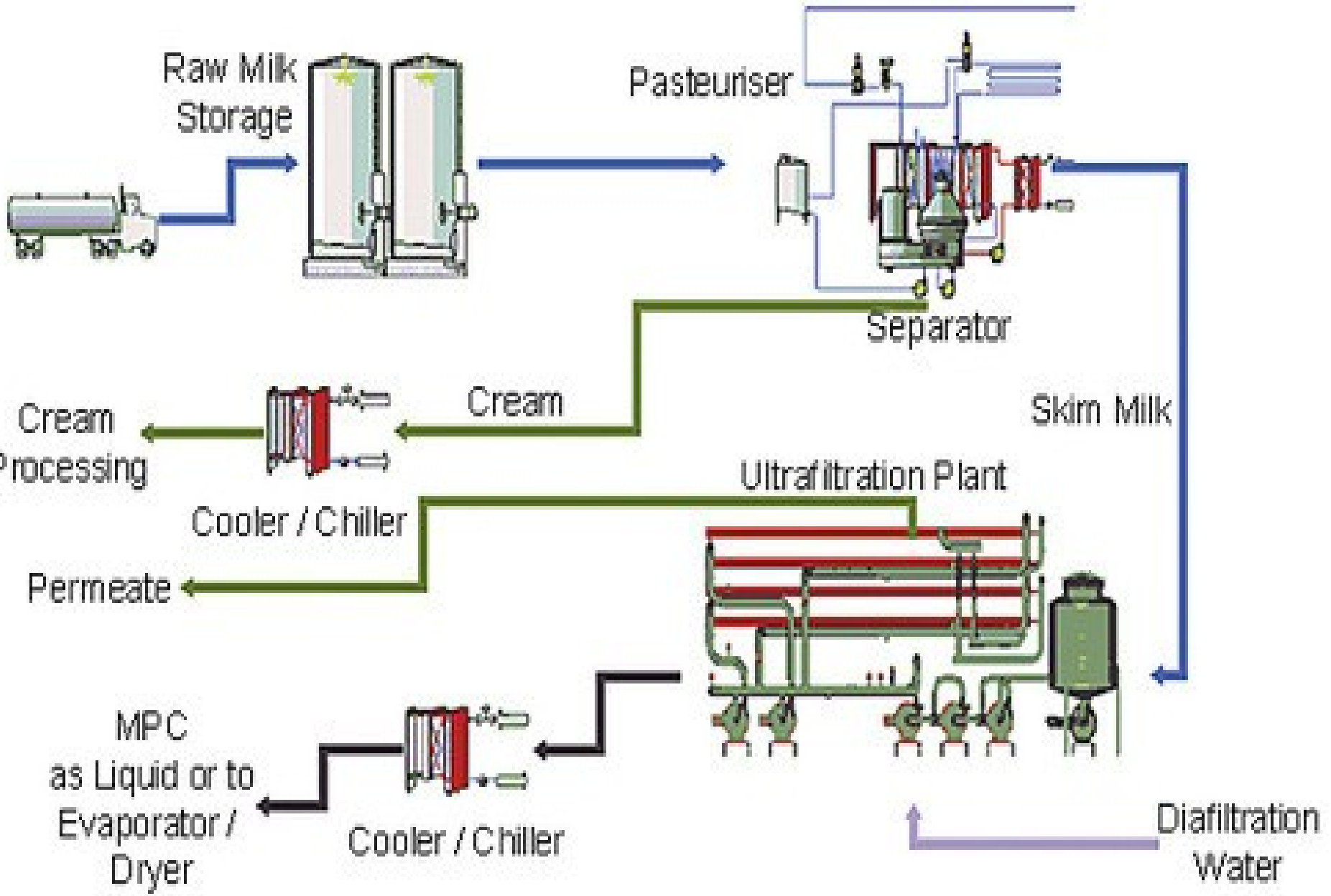
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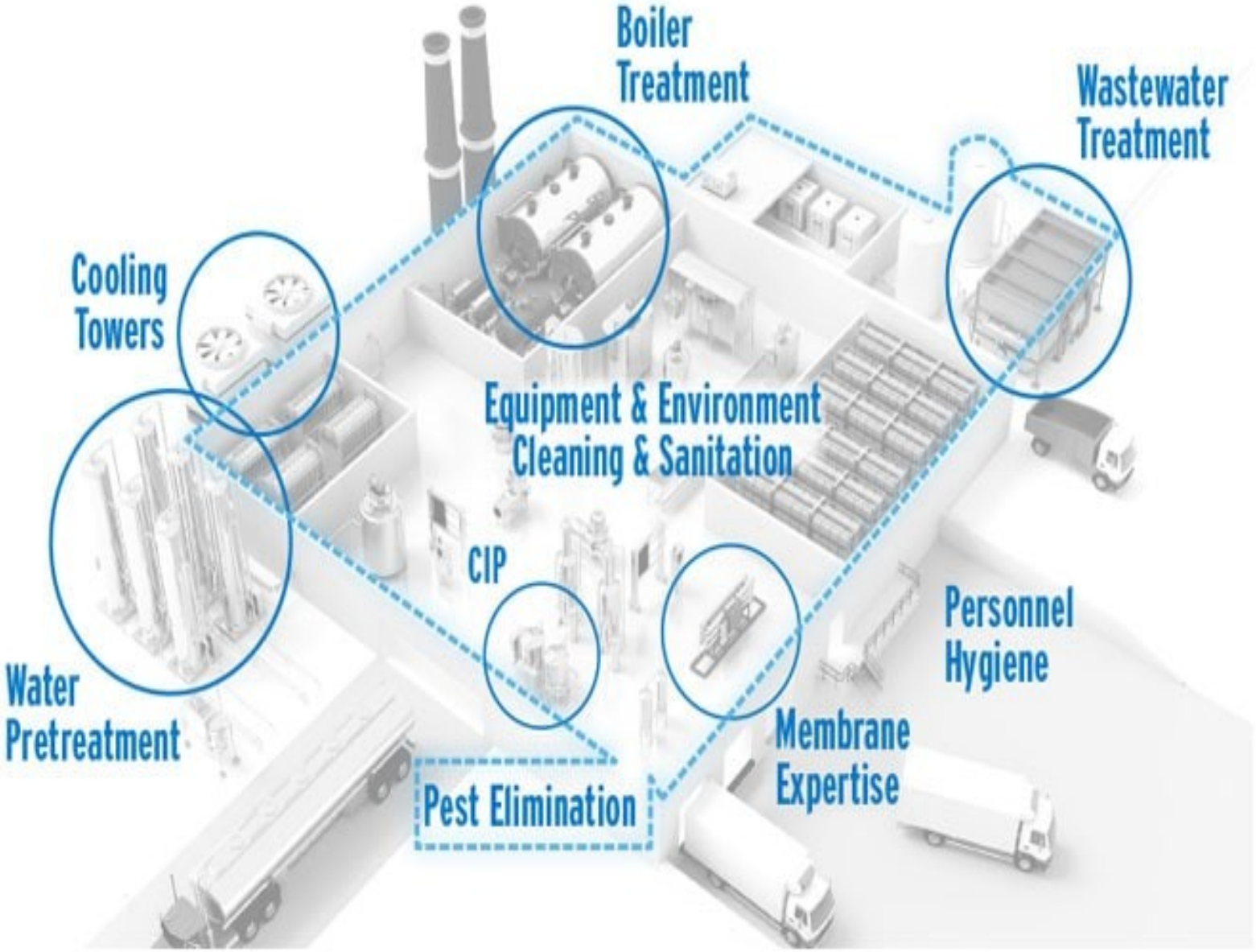
- Milk is an excellent medium for growth of microorganisms.
- If produced un-hygienically, and handled carelessly, it gets contaminated very easily leading to its earlier spoilage.
- To prevent this, production of clean milk is emphasized.

- The prerequisite for production of a high quality product is the cleaning and sanitization of the milk and milk product contact surfaces, which contributes to 60% of the total contamination.

- Not only the dairy equipment should be clean but also the dairy plant atmosphere should be free from pathogens.

Process Flow Chart




Boiler
Treatment
Wastewater
Treatment
Cooling
Towers
Equipment & Environment
Cleaning & Sanitation
CIP
Personnel
Hygiene
Water
Pretreatment
Membrane
Expertise
Pest Elimination

Buildings:

- Maintenance of hygiene in the plant depends upon the design of the building.
- Floor should be impervious and sloped for efficient drainage of water.
- In walls, 2m height should be tiled, help in efficient cleaning.
- Doors and windows should be self-closing type.
- A distance of 3m between walls and the equipment and a minimum of 42cm to 52cm between the bottom of equipment and floor is necessary for proper cleaning.
- Proper ventilation is essential to remove odour, heat, moisture and to minimize condensation on cooled surfaces.
- The light requirement in storage areas, boiler room and compressor room is 13w/sq. m.; 21w/sq. m. on processing equipment like homogeniser and pasteurizers and 41w/sq. m. in laboratory and packaging areas for efficient cleaning and sanitization.

Equipment, materials and design

- Stainless steel and aluminium alloys are widely used for equipment and utensils in dairy industry.
- The equipment surface should be free from dents, pits, rough spots, crevices and also it should be nontoxic, non-corrosive and non taintable.
- For effective cleaning, length of pipes when dismantled should not be more than 2m.
- Gaskets, stationary ring, dead ends inaccessible to mechanical cleaning should be designed specifically for CIP (cleaning in place).



Cow



Double Filter



Plate Cooler



Milk Silo



Milk Homogenizer



Plate Milk Pasteurizer

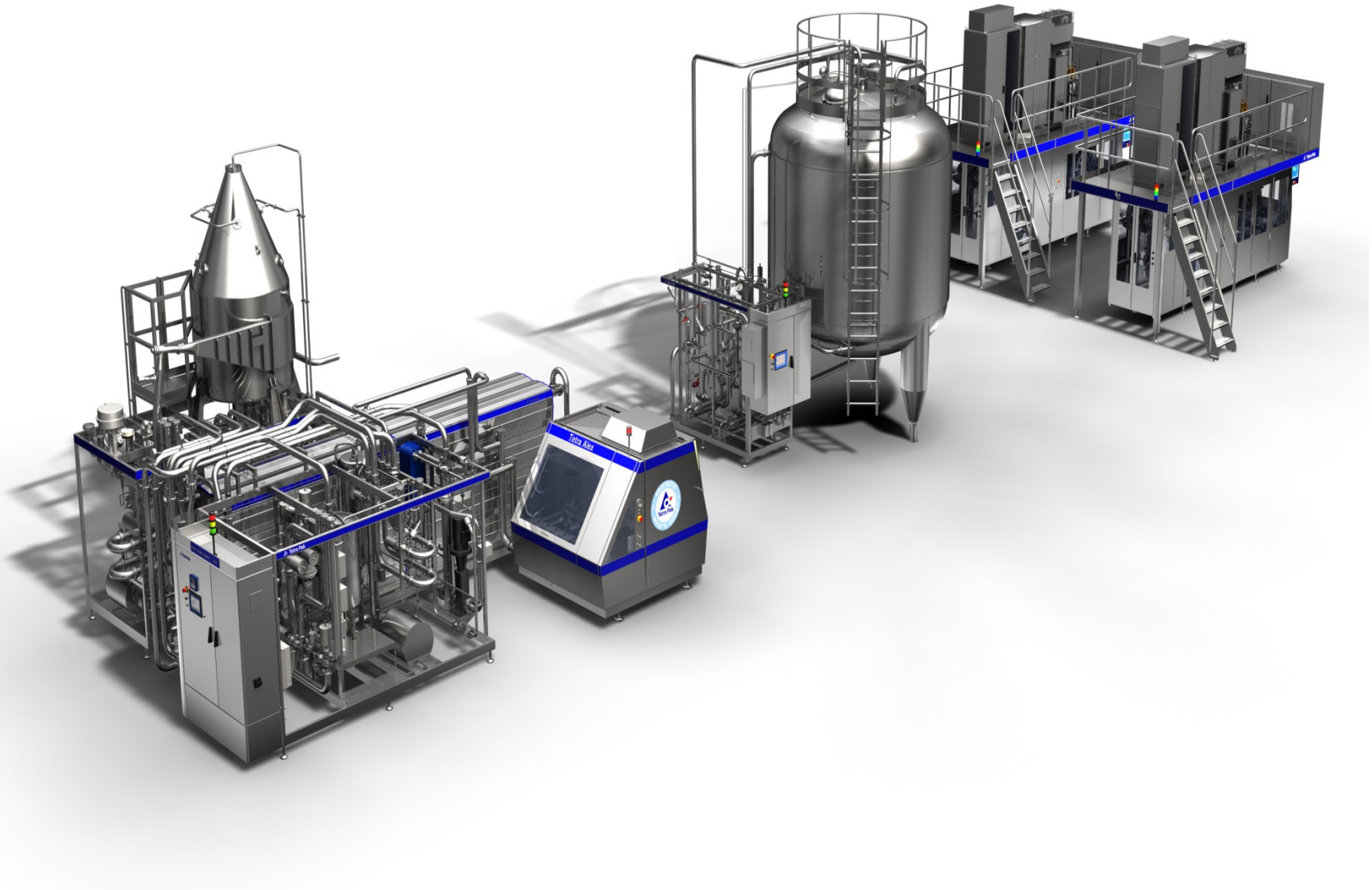


Bag Filling Machine



Pasteurized Milk




Tetra Alex

Utensils

- Microbial contamination of milk with dust at the time of milking can be minimized by using small topped containers.
- Milking pails and utensils should be cleaned and sterilized regularly to avoid contamination.
- Use of strainer to remove large sized objects.
- Freshly drawn milk has a temperature of approximately 38^0C which is highly suitable for bacterial growth.
- Hence milk should be cooled to less than 10^0C as quickly as possible after milking.

Milker's hygiene:

- Persons working in the dairy plant should be educated on hygienic handling of milk and milk products.
- They should wear washable clean white cloths and caps.
- The milker should be clean and he should avoid sneezing, coughing, smoking as well as chewing of tobacco just before and during milking.
- Milker should be free from contagious diseases like cholera, typhoid, diphtheria and tuberculosis and should be monitored for these diseases rigorously on regular basis.

- Milkers should thoroughly clean their hands and arms before milking.
- Fingernails should be kept trim.
- Soap and clean towels should always be provided for the milkers.
- Milker should avoid the wrong milking practice like knuckling and incomplete milking, which leads to multiplication of organisms in the left over milk.


1
2
3
4
5
6



Water supply:

- Uninterrupted
- Uncontaminated
- Non-chlorinated
- Potable
- Soft water with hardness not exceeding 112 mg/litre is essential.



Laboratory control:

- Efficiency of cleaning and sanitization has to be tested for residual sanitizers and contamination in the laboratory from time by swab method or rinse method.


Gloves
Protective Clothing
Protective Footwear
Eye or Face Protection
Respiratory Protection
Eyewash
Safety Shower
First Aid
Flammable
Corrosive
FLAMMABLE GAS 2
Flammable Gas
NON-FLAMMABLE GAS 2
Nonflammable Gas
Compressed Gas
Toxic
Harmful/ Irritant
Prohibition
Do Not Touch
No Open Flames
Do Not Enter
Non Potable Water
Don't Use Mobile Phone
No entry
No Smoking
Fire Extinguisher
Emergency Call Button
Explosive
Do Not Eat or Drink

Air quality:

- Contamination of air in the plant can be controlled by spraying sanitizers at a level of 0.048 mg/litre.
- Irradiations are used to sanitize the air in culture transfer room and packaging materials.
- Common sanitizers used in dairy industry are hot water, steam, chlorine (200 mg/litre), iodophor (25 mg/litre) and quaternary ammonium compounds (200 mg/litre).
- Among these, commonly chlorine is used in the dairy industry as it is considered better than other sanitizers due to its ideal qualities.

Cleaning:

- Cleaning of dairy equipment refers to removal of soil which includes milk residues, water deposits, detergent and sanitizer residues, dust, sediments or any foreign matter.

- **Cleaning is chiefly dependant-upon:**

  - The type of soil,
  - Hardness of water,
  - Surface of dairy equipment (contamination by micro-organism like coliforms, Bacillus etc.)







- Pre-draining:

  Draining should be carried out thoroughly to minimize product loss, reduce the load on the sewage and thereby helps in cleaning.

- Pre-rinsing with water:

  Pre- rinsing helps for flushing of milk residues, prevents drying and sticking of milk to the surface.

  Lukewarm water should be used for pre-rinsing and temperature should not exceed 60^0C to avoid coagulation of proteins.

- Cleaning with detergent:

➢ Blended detergents at an optimum temperature and mechanical scrubbing helps in removal of soil from the surface.

➢ Common alkaline detergents used in dairy are sodium carbonate, caustic soda,sodium bicarbonate, sodium sulphate at a concentration of 0.2 – 2.0% while sodium silicate is used as a protective agent for aluminium.

➢ Acid detergents widely used include nitric acid 0.5% and phosphoric acid at 2.0%.

➢ Acid detergents help to remove the milk stones and water scale.

- **Hot water rinsing (post-rinsing):**

  Post – rinsing with lukewarm water removes all traces of detergents, displaced dirt and prevent deposition of line scale.

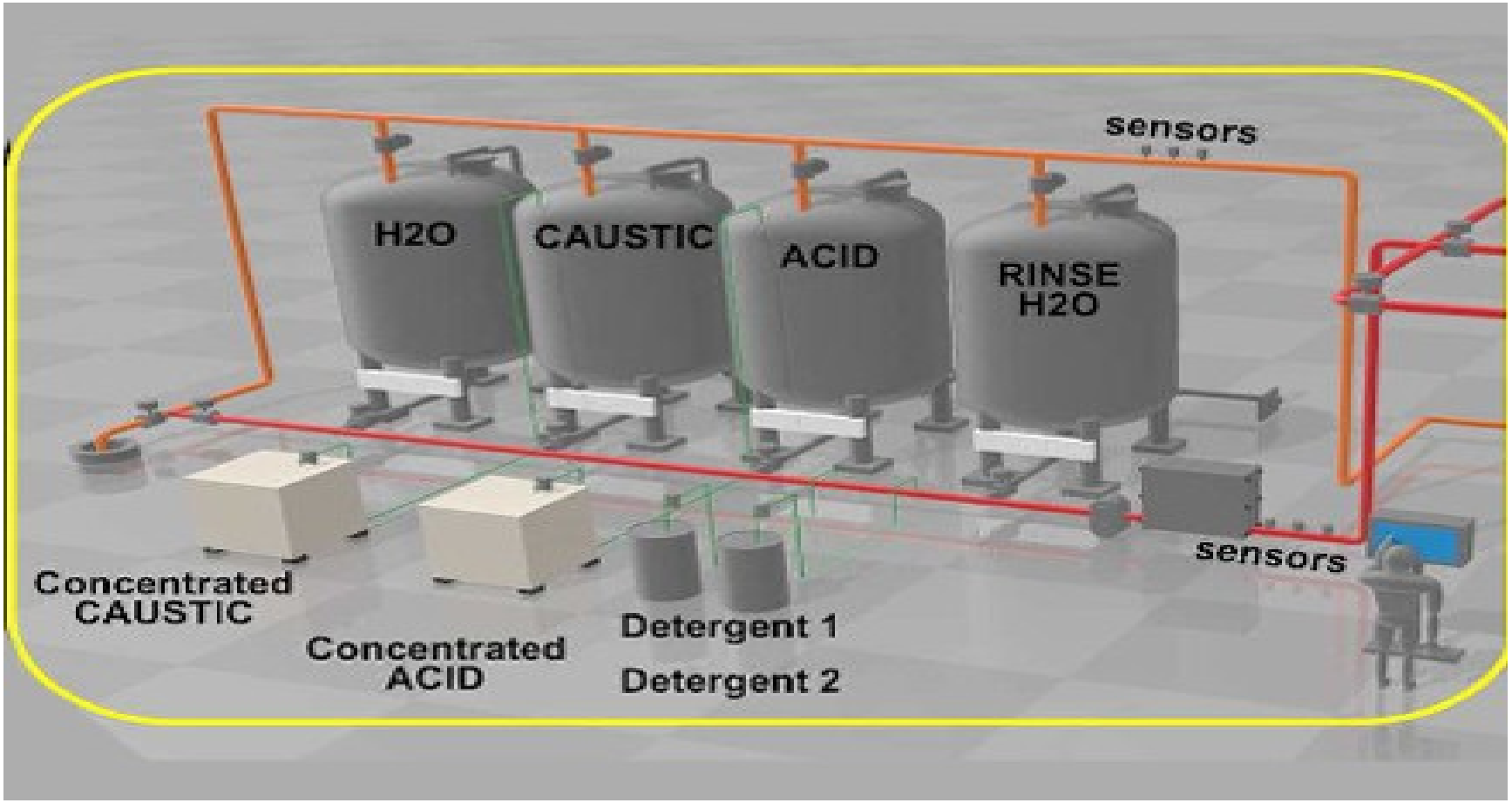
- **Sanitizing:**

  It involves effective bactericidal treatment with chemical/thermal agents to reduce the bacterial count including pathogens to a safe level on the utensils and equipment.

  Sanitizing solution used are hypochlorites, organic solution of chlorine with 100-200 mg/litre of available chlorine, mixed halogens – 25 mg/litre of available iodine.

- **Post- draining and drying:** This is to prevent contamination of milk the residual sanitizer.

CIP


sensors
H2O
CAUSTIC
ACID
RINSE
H2O
sensors
Concentrated
CAUSTIC
Concentrated
ACID
Detergent 1
Detergent 2

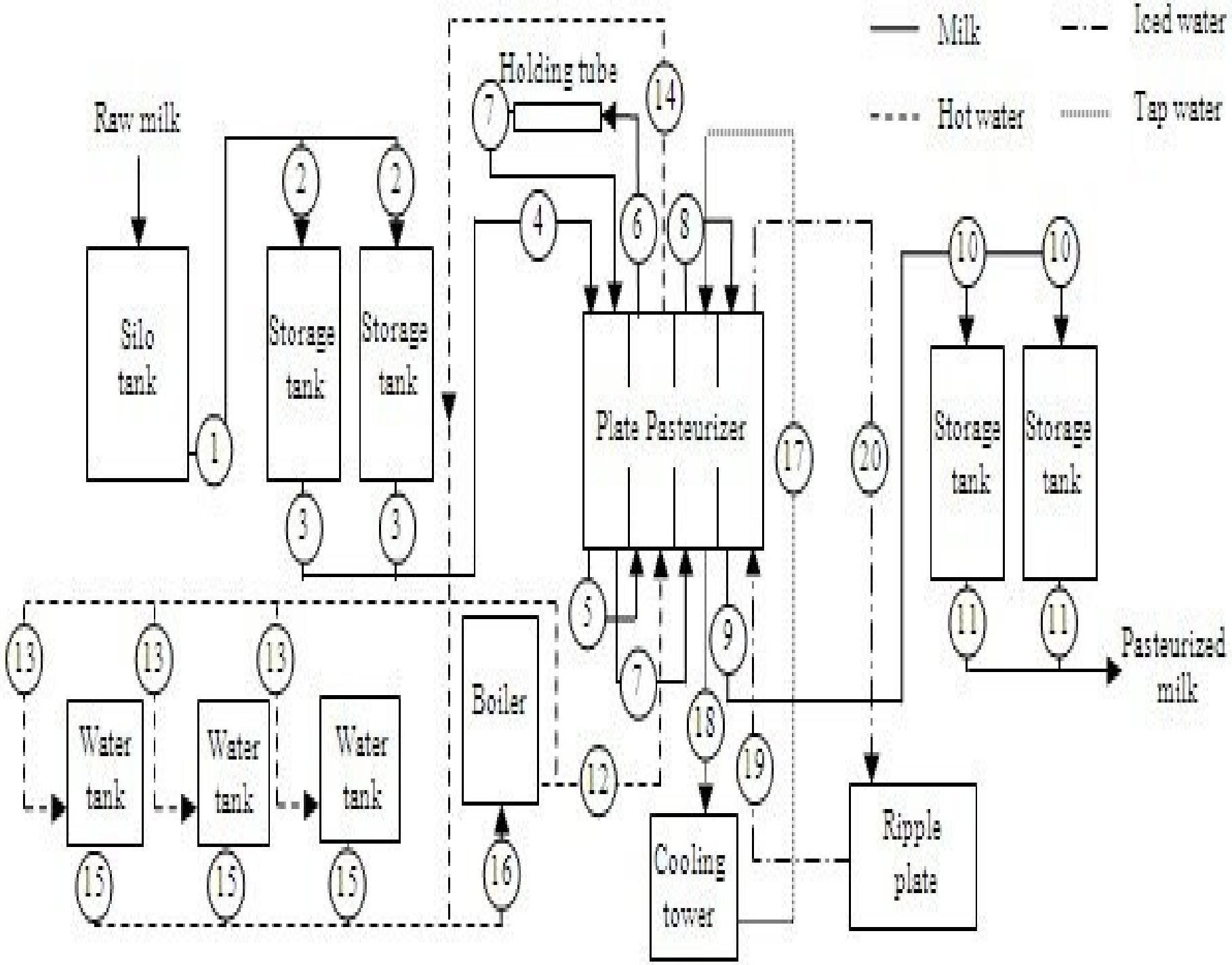
Hazard Analysis & Critical Control Point





The HACCP system is solely related to FOOD SAFETY and not PRODUCT QUALITY


Conduct a Hazard Analysis
Identify the Critical Control Points
Establish Critical Limits
Establish Monitoring Procedures
Establish Corrective Actions
Establish Record Keeping Procedures
Establish Verification Procedures
HACCP


Milk
Iced water
Hot water
Tap water
Raw milk
Holding tube
Silo tank
Storage tank
Storage tank
Plate Pasteurizer
Storage tank
Storage tank
Pasteurized milk
Water tank
Water tank
Water tank
Boiler
Cooling tower
Ripple plate
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HACCP FOR MILK PASTEURIZATION

Product	Hazrads	CCP	Critical limit	Monitoring	Corrective Actions	Verification
Homogenized Milk	Microbial	Pasteurization temperature	76-80°C	Pasteurized milk& pasteurizatio n Temperature	Sent for re-pasteurizatio n, effective monitoring, study thermographs	Proper temperature control and working of pasteurizer
Homogenized Milk	Microbial	Working of UV light	Non-Working of UV light	Working of UV light	Re-processing of whole lot and repair of UV light	Microbial load & working of UV tubes during packing
Homogenized Milk	Physical	Pasterization time	15-20 sec	Correct for product in use	Sent for re pasteurizatio n	Holding time accuracy

Introduction to Industrial Hygiene

Ms. Shaik Shakeera
Department of Food Technology

Introduction

- Health hazards on the job site
- Protect yourself; protect your family



Source: OSHA

Introduction

Lesson objectives:

1. Identify types of health hazards in the workplace.
2. Describe strategies to control chemical hazards.
3. Describe strategies to control biological hazards.
4. Describe strategies to control physical hazards.
5. Describe strategies to control ergonomic hazards.

Introduction

Industrial Hygiene – the science of protecting the health and safety of workers through:

- Anticipation,
- Recognition,
- Evaluation, and
- Control

…of workplace conditions that may cause workers' injury or illness.

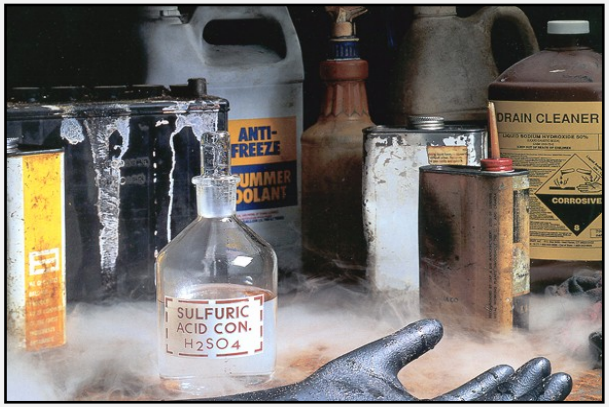


Source: OSHA

Types of Health Hazards

Common workplace health hazards:

Chemical



Physical



Biological



Ergonomic



Source of photos: OSHA

Chemical Hazards and Controls

Forms

- Solids
- Liquids
- Gases and vapors
- Aerosols - dust, mist, fumes

Multiple chemical hazards



Spraying mist



Welding fumes



Dust particulates



Source of photos: OSHA

Chemical Hazards and Controls

Effects of chemical exposures:

Health Risks		
Heart Ailments	Lung Damage	Sterility
CNS Damage	Kidney Damage	Burns
Cancer	Liver Damage	Rashes

Safety Risks		
Fire	Explosion	Corrosion



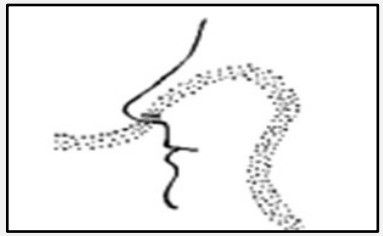
Source of photos: OSHA



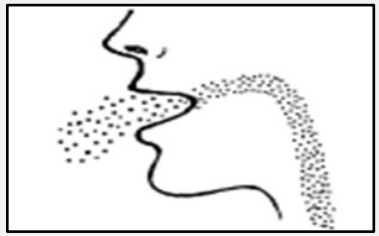
Chemical Hazards and Controls

Exposure entry routes:

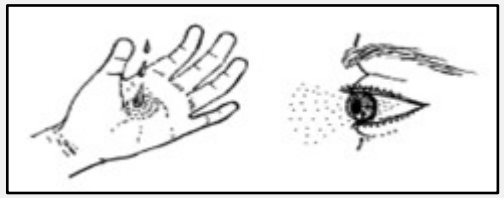
Inhalation: **Breathed in (most common route)**



Ingestion: **Swallowing via eating or drinking**



Absorption: **Drawn through skin or eye surface**



Source of graphics: OSHA

***Injection:** **Penetration through the skin**

Chemical Hazards and Controls

Warning Signs of Potential Chemical Exposure:

- Dust, mist, smoke in the air
- Accumulation of particulates (dust) on surfaces
- Unusual tastes and/or smells
- Eye, nose, throat, upper respiratory, and/or skin irritation

Chemical Hazards and Controls

Examples of chemical exposure symptoms:

- Eye, nose, throat, upper respiratory, skin irritation
- Flu-like symptoms
- Difficulty breathing
- Fatigue
- Loss of coordination
- Memory difficulties
- Sleeplessness
- Mental confusion

Chemical Hazards and Controls

Types of health effects:

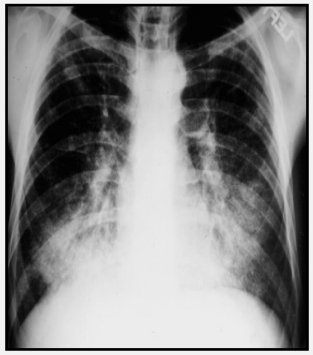
Exposure Condition		Exposure	Example
ACUTE	Immediate	Short-term, high concentration	H_2S exposure within a confined space
CHRONIC	Delayed; generally for years	Continuous; for long periods of time	Asbestosis

Acute



Source: U.S. Army Corps of Engineers

Chronic



Source: OSHA

Chemical Hazards and Controls

What is toxicology?

- The science that studies the poisonous or toxic properties of substances





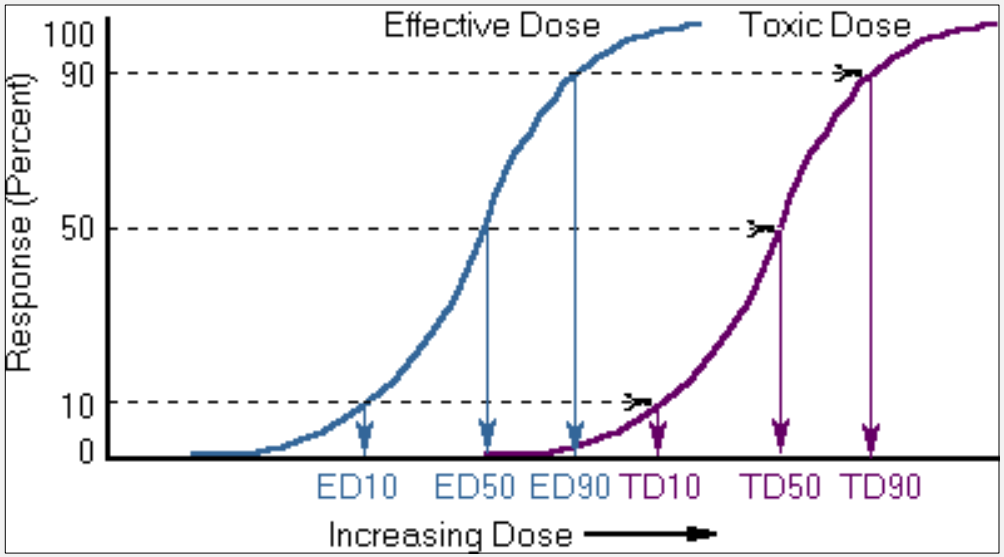


Source of graphics: OSHA Hazard Communication Pictograms

Chemical Hazards and Controls

Toxic effects:

- Dose
  1. Concentration – amount
  2. Duration of Exposure – time



Source: OSHA

Chemical Hazards and Controls

- Toxic chemicals disrupt the normal functions of the body. Effects can be:
  - **Local** - at the site of exposure
  - **Systemic**
    - Affects the entire body
    - Target organs - organs or systems where symptoms of exposure appear

Chemical Hazards and Controls

Local (direct) effects:

- Irritation (dryness, redness, cracking) - fiberglass
- Corrosion (chemical burn) - acid
- Upper Respiratory Track Infection – inhaling particles



Source: Occupational Dermatoses (CDC)

Chemical Hazards and Controls

Systemic effects:

- Hepatotoxins
  - Cause liver damage
  - Carbon tetrachloride, nitrosamines
- Nephrotoxins
  - Cause kidney damage
  - Uranium, halogenated hydrocarbons
- Neurotoxins
  - Cause nerve damage
  - Mercury, lead, carbon disulfide

Chemical Hazards and Controls

- Hematotoxins
  - Cause blood system damage
  - Carbon monoxide, cyanides
- Anesthetics
  - Depress nervous system
  - Hydrocarbons, propane, isopropyl ethers

Chemical Hazards and Controls

Factors affecting exposures:

- form and innate chemical activity
- dosage, especially dose-time relationship
- exposure route
- age
- sex
- ability of chemical to be absorbed
- metabolism
- distribution within the body
- excretion
- presence of other chemicals

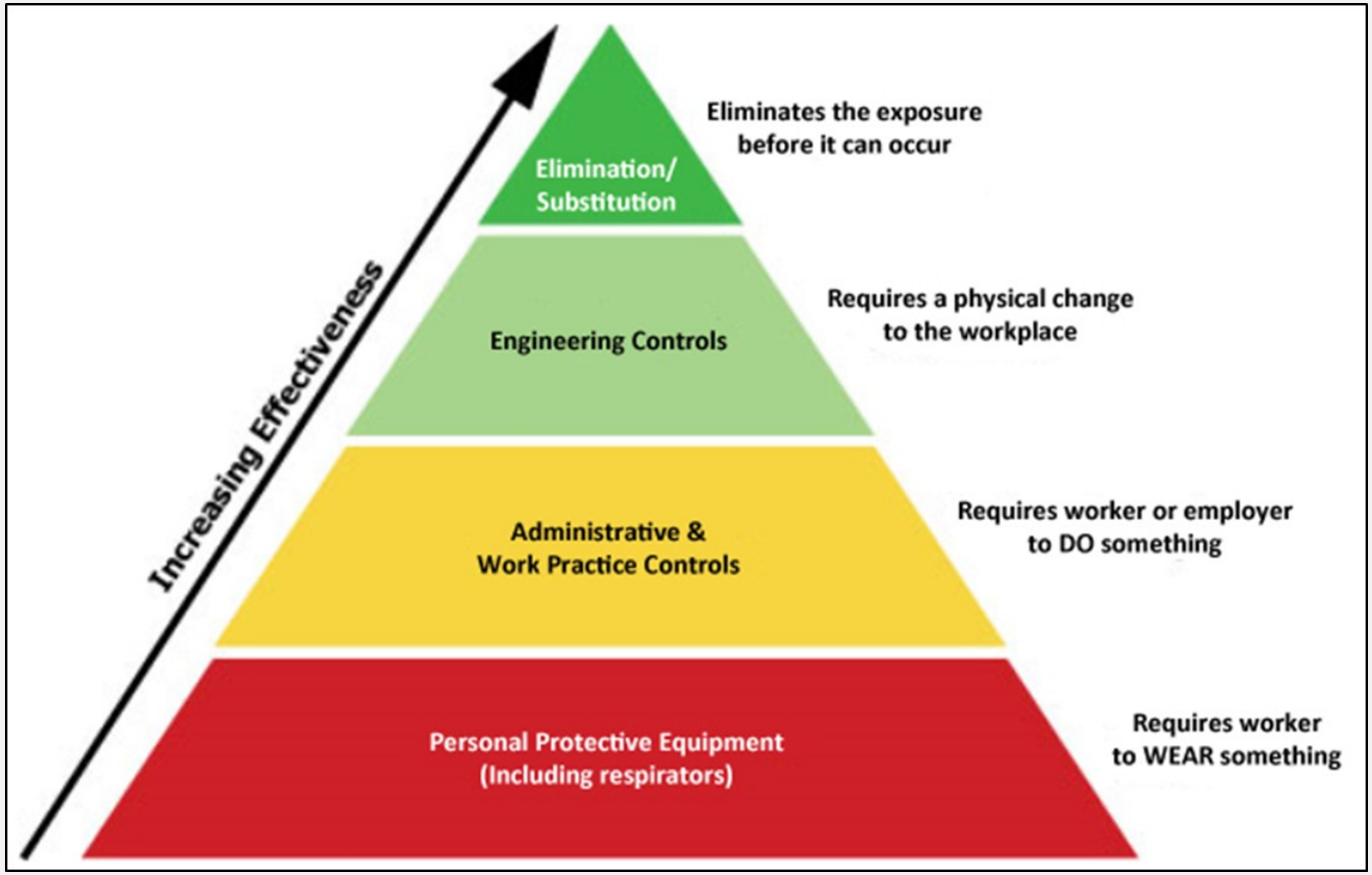
Chemical Hazards and Controls

Interactions with multiple chemicals:

- Additive effects $2 + 2 = 4$
- Synergistic effects $2 + 3 > 5$
- Potentiation effects $2 + 0 > 2$
- Antagonistic effects $4 + 6 < 10$

Chemical Hazards and Controls

Hierarchy of control:



Source: OSHA

Chemical Hazards and Controls

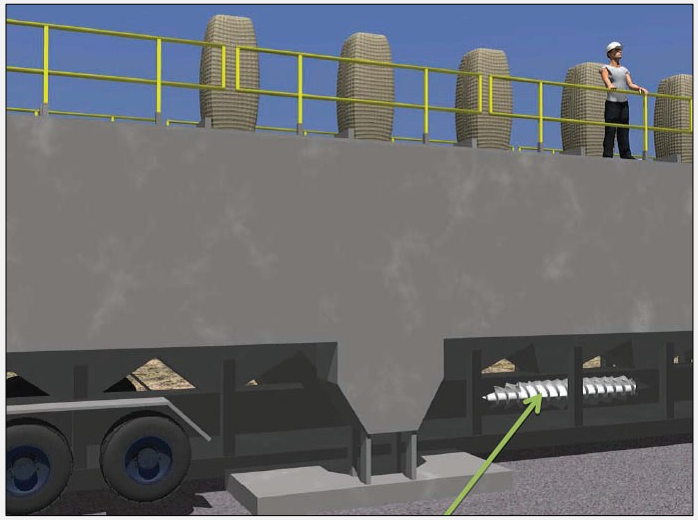
- Elimination and substitution



Source: OSHA

Chemical Hazards and Controls

- Engineering controls
  - Ventilation – local (hood) / general (dilution)
  - Process and equipment modification
  - Isolation/automation



Source: NIOSH

Example: Replacing transfer belts with screw augers on sand movers used in hydraulic fracturing will help contain sand and reduce dust release (lowering exposure to silica).

Chemical Hazards and Controls

- Administrative controls
  - Establish written programs & policies
  - Training
  - Monitor/measure exposure levels
  - Inspections and maintenance
  - Restricted area signage
  - Develop SOPs







Source of photos: OSHA

Chemical Hazards and Controls

- PPE
  - Respirators
  - Gloves
  - Safety glasses
  - Long clothing





Source of photos: OSHA

Chemical Hazards and Controls

Worksite analysis – assessing exposures:

- Air monitoring – personal and area
- Noise monitoring
- Observation – PPE use and work practices
- Ventilation measurements
- Wipe samples – surfaces and personnel



Source: OSHA

Chemical Hazards and Controls

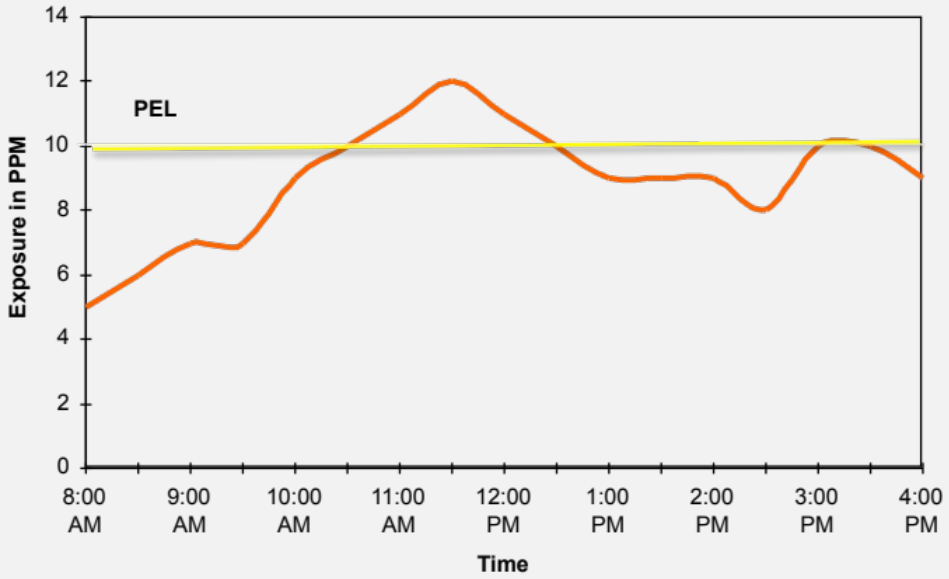
- PELs, or permissible exposure limits:
  - OSHA's regulations that establish the acceptable amount or concentration of a substance in the workplace
  - Intended to protect workers from adverse health effects related to hazardous chemical exposure

Chemical Hazards and Controls

Exposure limits:

- TWA = Time - Weighted Average

- Levels vary over the shift duration

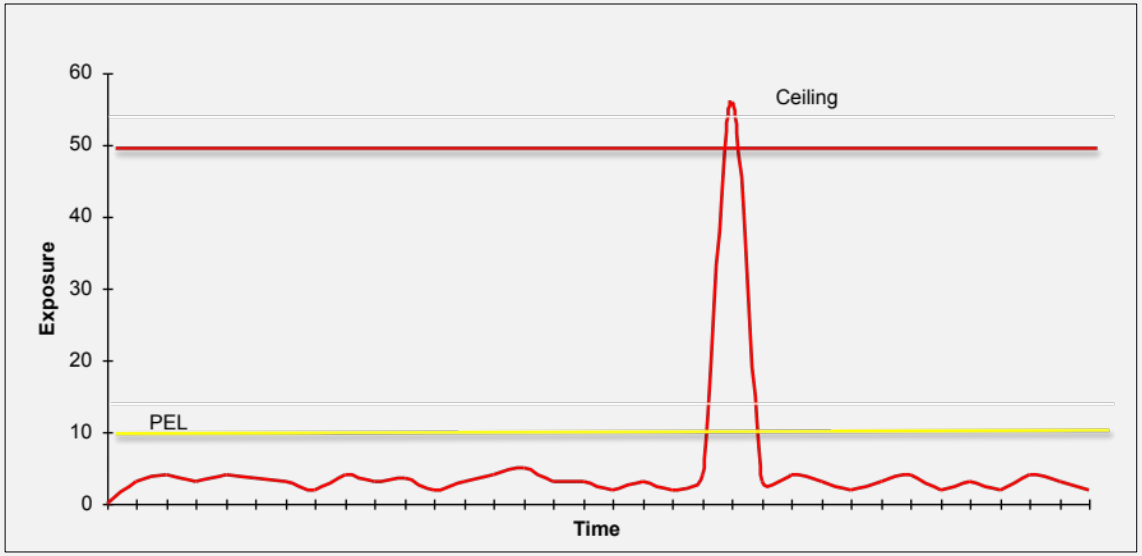


- These limits protect from chronic diseases

Chemical Hazards and Controls

"C" = ceiling limit:

- Level never to be exceeded during the work shift
- Protect from acute disease or health effects



Chemical Hazards and Controls

Substance-specific standards:

- Established by OSHA to identify specific requirements
- Potentially exposed workers must be monitored and protected



Source: NIOSH

Chemical Hazards and Controls

- Components of substance specific standards: (in general)
  - Air monitoring
  - Control of exposure
    - Engineering controls
    - Work practices
    - Respiratory protection
  - Medical surveillance / removal (lead)
  - Recordkeeping
  - Worker training

Chemical Hazards and Controls

Hexavalent chromium:

- Toxic form of chromium;
- Known to cause cancer
- Compounds are man-made and widely used
- Major source of exposure during "hotwork" on stainless steel and other alloy steels containing Cr(VI)



Source: OSHA

Chemical Hazards and Controls

Asbestos:



Source: OSHA

- Mineral fibers – chrysotile, amosie, crocidolite, tremolite, anthophylite, actinolite, and chemically treated/ altered forms
- Known carcinogen;
  can cause chronic lung disease, as well as lung and other cancers
- Used in numerous building materials and vehicle products
- Exposure potential during construction and ship repair; as well as manufacturing of products containing asbestos

Chemical Hazards and Controls

Silica:

- Important industrial material found abundantly in the earth's crust; most common form is quartz
- Can cause lung diseases, including silicosis and lung cancer, as well as kidney disease
- Exposure to respirable crystalline silica
  - Inhalation of small particles in air
  - Common with operations such as cutting, sawing, and drilling



Source: NIOSH

Chemical Hazards and Controls

Lead:

- Blue-gray, heavy metal occurring naturally in Earth's crust
- Can harm many of the body's organ systems; variety of ailments
- Exposure
  - Inhalation and/or ingestion of airborne particles containing lead
  - Occurs in most industry sectors, including manufacturing, wholesale trade, transportation, construction, remediation, and even recreation

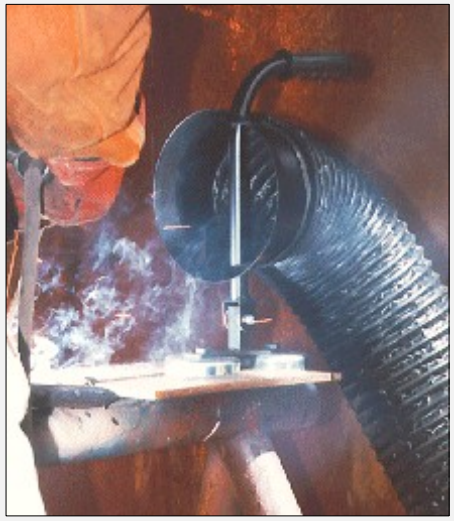




Source of photos: OSHA

Chemical Hazards and Controls

Welding fumes:



Source: OSHA

- Content depends on components of base metal, coatings, and/or filler materials; and welding temperatures
- Potential health effects
  - Acute exposure: eye, nose, and throat irritation; dizziness; nausea
  - Prolonged exposure: lung damage; various types of cancer, including lung, larynx, and urinary tract
  - Certain fumes and gases can lead to additional health issues

Chemical Hazards and Controls

- Exposure to welding fumes affected by:
  - Welding process
  - Materials used
  - Location (outside, enclosed space)
  - Work practices
  - Air movement
  - Use of ventilation



Source: OSHA

Chemical Hazards and Controls

Toxic atmospheres:

- Confined spaces – storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, open-top spaces more than 4’ in depth (pits, tubs, vaults)
- Hazardous atmospheres
  - Oxygen-deficient
  - Hydrogen sulfide
  - Carbon monoxide



Source: OSHA

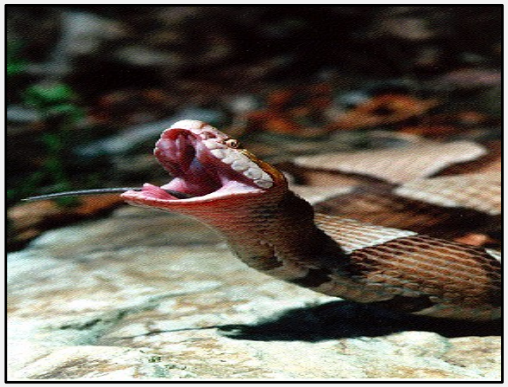
Biological Hazards and Controls

Insects



Source: OSHA

Animals



Source: OSHA

Contaminated Soil



Source: CDC

Poisonous Plants



Source: OSHA

Water/Sewage



Source: OSHA

Bloodborne Pathogens



Source: OSHA

Biological Hazards and Controls

- Possible effects of exposure to biological hazards:
- Mild, allergic reactions
- Serious medical conditions
- Death
- Most virulent and prevalent biological agents







Source of photos: CDC

Biological Hazards and Controls

Protection against biological hazards:

- Practice universal precaution with:
  - Blood
  - Bodily fluids
- Practice personal hygiene
- Provide proper first aid
  - Cuts/Scratches
- Vaccinations
- Wear proper PPE/clothing





Source of photos: OSHA

Biological Hazards and Controls

- Practice precaution with:
  - Animals
  - Insects
- Use insect repellent
- Provide proper ventilation or other appropriate environmental controls



Certain species of fruit bats are thought to be the natural reservoir for Ebola virus. EHF outbreaks are believed to start as a result of contact with infected animals or animal carcasses.
Source: OSHA; photo courtesy of National Park Service, U.S. Dept. of Interior.



The best way to protect yourself from Zika, as well as other mosquito-borne illnesses, is to prevent mosquito bites by using insect repellent, wearing long sleeves and pants, and reducing mosquito breeding grounds, such as standing water. Source: OSHA; photos courtesy of CDC.



Physical Hazards and Controls

Types of physical hazards:

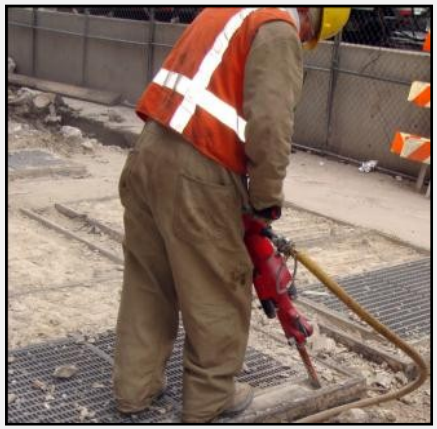
Temperature



Radiation



Vibration



Noise



Source of photos: OSHA

Physical Hazards and Controls

Effects of exposure to physical hazards:

Temperature	Radiation	Vibration	Noise
Rash; Cramps	Burns	Fatigue	Interferences
Exhaustion	Sickness	Strains	Stress
Stroke	Aging	Carpal Tunnel	Tinnitus
Hypothermia	Cancer	HAVS	Headaches
Frostbite	DNA Mutations	Raynaud's	Hearing Loss

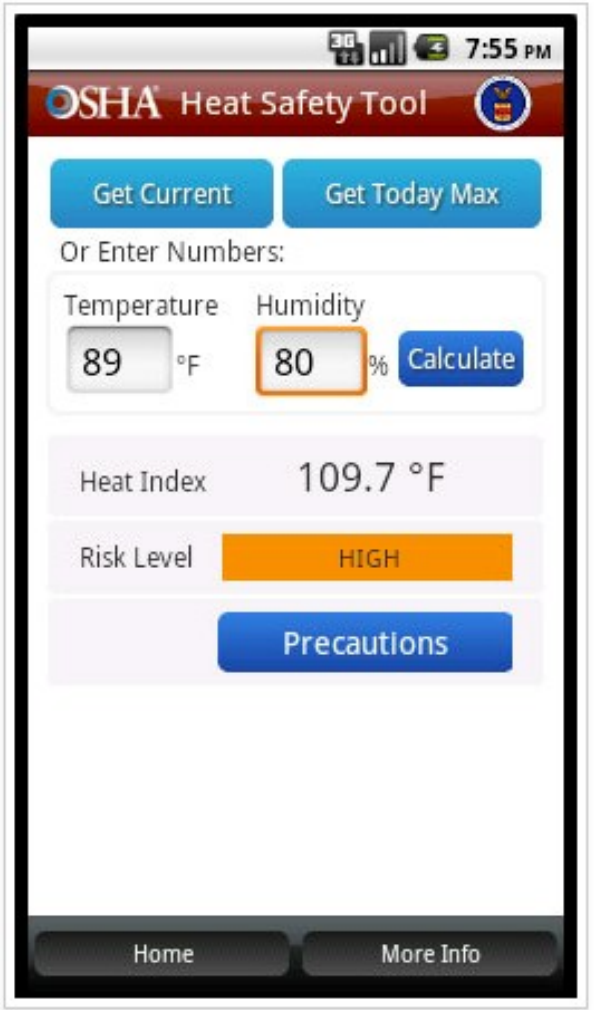
Physical Hazards and Controls

Exposure to heat:

Health Effects	Cause	Symptoms
Rash; Cramps	Heavy sweating	Red cluster of bumps/blisters; Muscle pains or spasms
Exhaustion	Loss of body fluids/salts	Dizziness, light-headedness, weakness, heavy sweating, pale skin, sick to stomach
Stroke	Rapid body temperature rise	≥104F body temperature. Red, hot, dry skin; dizziness; confusion; unconscious

Physical Hazards and Controls

OSHA's Heat Safety Tool



https://www.osha.gov/SLTC/heatillness/heat_index/heat_app.html

Physical Hazards and Controls

Protection against heat:

Engineering	Administrative	PPE
• Air conditioning • Ventilation • Cooling fans • Local exhaust ventilation • Reflective shields • Insulation • Eliminate steam leaks	• Emergency plan • Acclimatization • Adequate water • Work/rest cycles • Avoid hottest times; adjust work demands • Rotate job functions • Buddy system • Monitoring	• Insulated PPE, in some work places • Thermal clothing (cool vests)



Eliminate or substitute hazard, whenever feasible

Physical Hazards and Controls

Exposure to cold:

Health Effects	Cause	Symptoms
Hypothermia	Body temperature drops ≤95F	Uncontrolled shivering; slurred speech; memory loss; blue/purple skin
Frostbite	Exposed to ≤0F air	Pale, cold, waxy-white skin; tingling; stinging

Physical Hazards and Controls

Protection against cold:

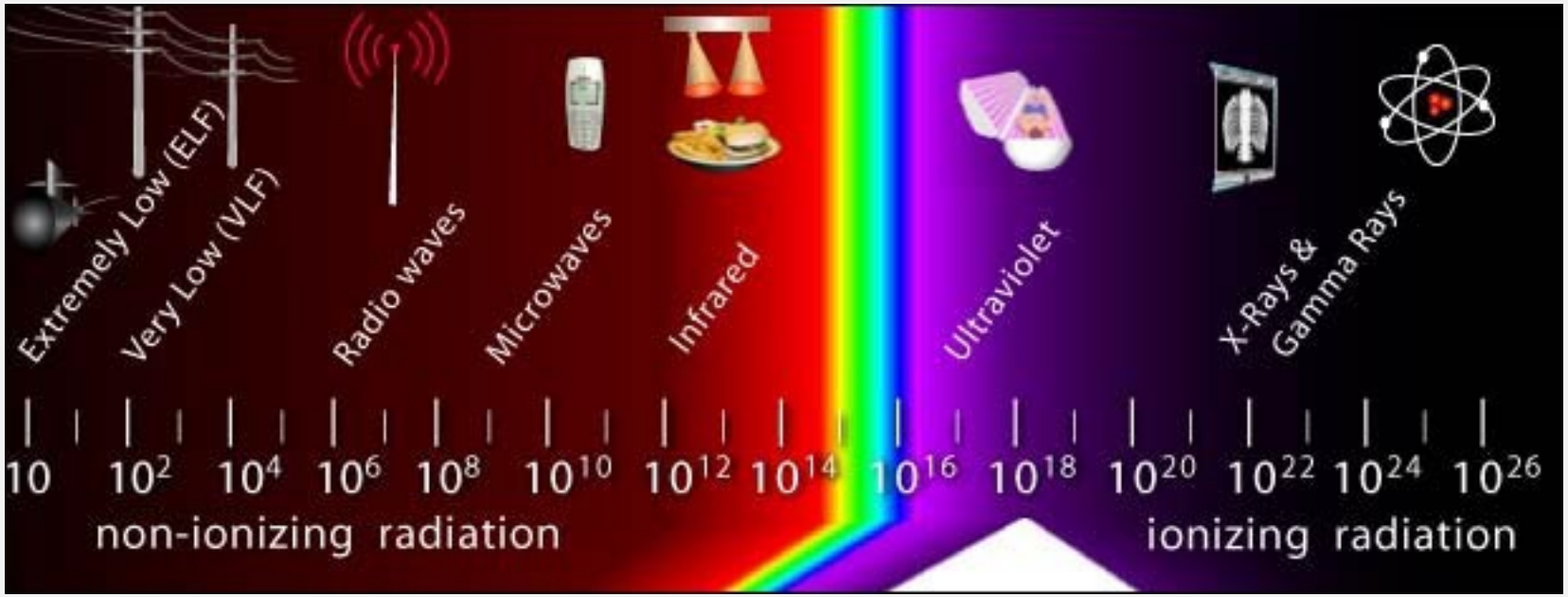
Engineering	Administrative	PPE
• Heaters • Shield work areas (windbreaks)	• Warm liquids • Adjust work schedule • Buddy system • Monitoring • Frequent breaks in warm areas • Acclimatization	• Layered clothing • Hat or hood, face cover, gloves • Clothing out of fabric that retains insulation even when wet • Insulated and waterproof boots



Eliminate or substitute hazard, whenever feasible

Physical Hazards and Controls

Exposure to radiation:



Source: OSHA

Physical Hazards and Controls

Protection against radiation:

Engineering	Administrative	PPE
• Enclose/Shield work areas to minimize stray radiation • Interlocked doors on devices that can produce acute thermal injuries • Remote operation of radiation-producing devices	• Clearly mark controlled spaces • Minimize exposure times • Location/ installation of devices • Proper maintenance	• RF/MW protective suits, including head and eye protection • Safety glasses, goggles, welding helmets, or welding face shields with appropriate filter lenses



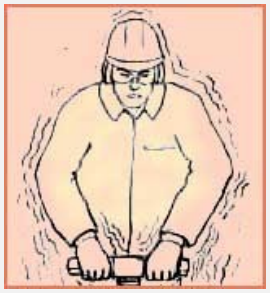
Eliminate or substitute hazard, whenever feasible

Physical Hazards and Controls

Exposure to vibration:

Health Effects	Early Signs and Symptoms	Later Signs and Symptoms
• Circulatory disturbances, such as VWF and HAVS • Sensory nerve damage • Muscle, bone, and joint injury	• Intermittent tingling of one or more fingers • Blanching of fingertips • Pain in fingers	• Loss of sense of touch; numbness • Blanching of entire fingers • Loss of grip strength • Sever pain • Carpal tunnel syndrome • Pain and loss of strength in arms • Loss of finger dexterity or coordination

Physical Hazards and Controls



Protection against vibration:

Engineering	Administrative	PPE
• Vibration reduction equipment • Vibration dampeners or shields to isolate source of vibration from employee	• Proper positioning and grip; let the machine do the work • Job rotation • Limit duration of task • Proper maintenance	• Anti-vibration gloves

Eliminate or substitute hazard, whenever feasible

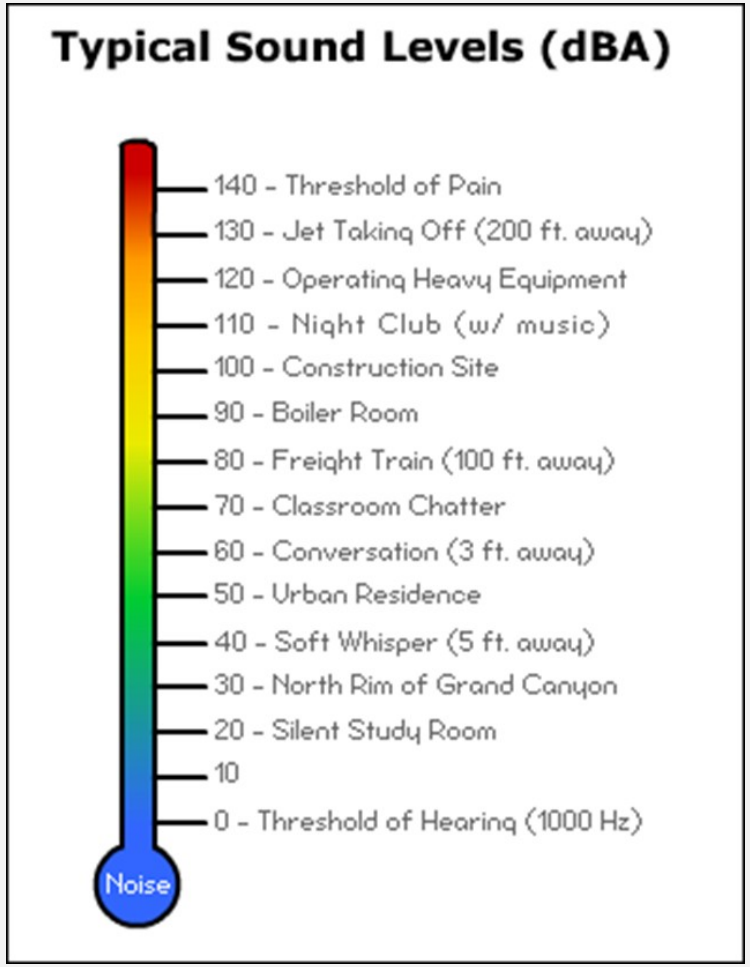
Physical Hazards and Controls

Exposure to noise:

Health Effects	Signs and Symptoms
• Tinnitus • Permanent hearing loss • Physical stress • Psychological stress	• Ears feel stuffed up • Ringing in the ears • Limited ability to hear high frequency sounds, understand speech, and communicate

Physical Hazards and Controls

- **Noise –** prolonged exposures to 85 dB can lead to hearing loss



Source: OSHA

Physical Hazards and Controls

Protection against noise:

Engineering	Administrative	PPE
• Use low-noise tools and machinery • Place a barrier between noise source and worker • Enclose or isolate noise • Weld parts rather than rivet • Use acoustical materials • Install silencers, mufflers, or baffles	• Increase distance between source and worker • Alter work schedule • Limit time of noise exposure • Provide quiet areas for breaks	• Ear plugs • Ear muffs • Hearing bands



Eliminate or substitute hazard, whenever feasible

Physical Hazards and Controls

- When to wear hearing protection
  - Noise or sound level exceeds 90 dBA (OSHA)
  - Recommended when exceeds 85 dBA (NIOSH)

- What to wear
  - Personal comfort preference
  - Long-term/Single use (plugs)
  - Short-term/On and off (muffs)
  - Consider NRR

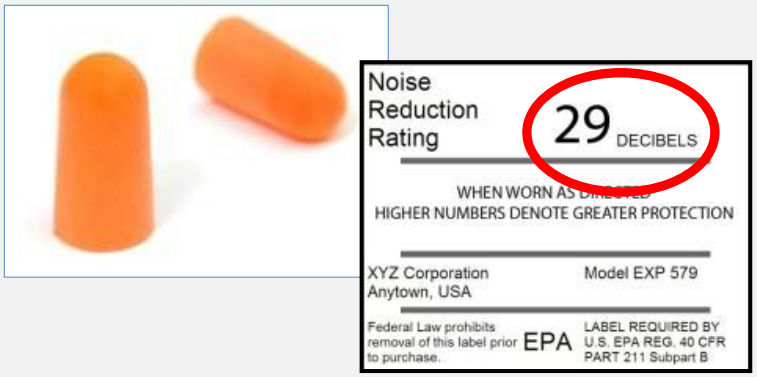




Source of photos: OSHA

Physical Hazards and Controls

Dual hearing protection:



Formable Ear Plugs
Listed NRR = 29
Adjusted NRR (29 – 7) = 22



Earmuffs
Listed NRR = 16
Adjusted NRR for Dual Protection = 5

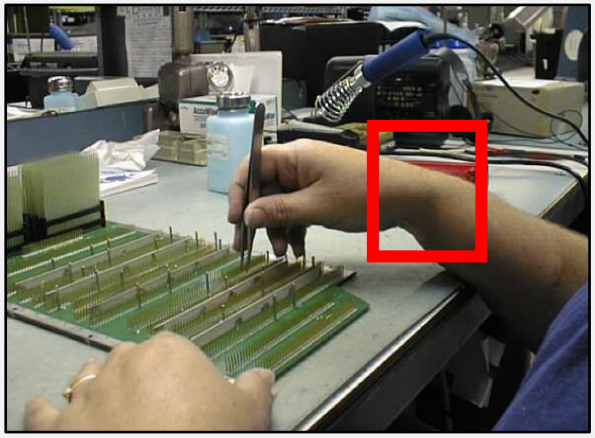
22 (adjusted NRR) + 5 (Dual Protection NRR) = 27

Source of graphics: OSHA

Ergonomic Hazards and Controls











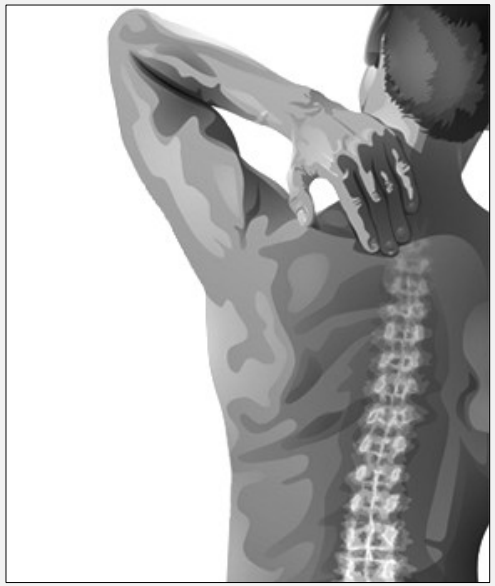


Source of photos: OSHA

Ergonomic Hazards and Controls

Effects of exposure to ergonomic hazards:

- Musculoskeletal Disorders (MSDs)
  - Exposure to ergonomic risk factors for MSDs increases a worker's risk of injury
    - Repetition
    - High force
    - Awkward postures
  - Work-related MSDs are among the most frequently reported causes of lost or restricted work time.



Source: OSHA

Ergonomic Hazards and Controls

Risk factors for MSDs:

- Overexertion
- Repetitive tasks
- Awkward posture/positions
- Localized pressure
- Cold temperatures
- Vibration
- Combined exposure

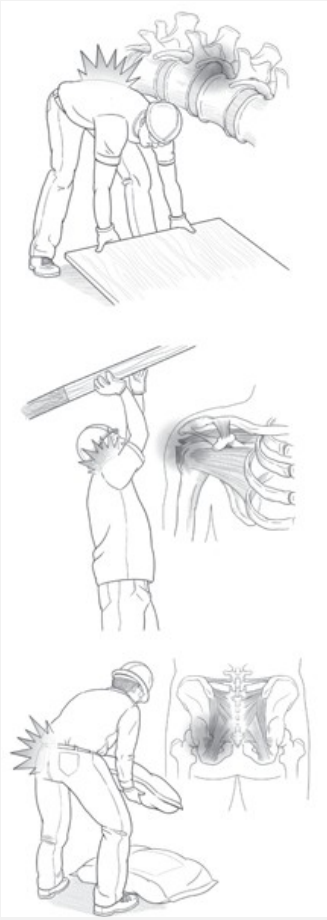


Source of photos: OSHA

Ergonomic Hazards and Controls

Protection against ergonomic hazards:

- Use ergonomically designed tools
- Use correct work practices
  - Proper lifting techniques
- Ask for help when handling:
  - Heavy loads
  - Bulky/Awkward materials
- Properly fitting PPE



Source: NIOSH

Discussion

- What are examples of health hazards at your worksite?
- How are they controlled?

Knowledge Check

1. Which of the following is an example of an industrial hygiene health hazard?
   a. Chemical hazards
   b. Economic hazards
   c. Electrical hazards
   d. Fall hazards

Answer: a. Chemical hazards

Knowledge Check

2. Which of the following is an example of a physical health hazard?
   a. Asbestos
   b. Noise
   c. Silica
   d. Lead

Answer: b. Noise

Knowledge Check

3. Which of the following controls is an example of an engineering control for protection against chemicals?
   a. Ventilation
   b. Respirators
   c. Training
   d. Signage

Answer: a. Ventilation

What questions do you have?

Thank You!

☆ ORIENTAL FERMENTED FOODS ☆

→ Fermented foods are those foods produced by the modification of raw materials, Raw materials can be of animal, vegetable origin by the activity of m.o

→ M.o can be bacteria, yeast, moulds, by this we get a diverse range of products which differ in flavour, texture, stability when compared to raw material.

Eg: Lactic acid Bacteria (carbohydrates → Lactic acid)

Propionic acid Bacteria (Carbohydrates → Propionic acid)

Yeast (carbohydrates ferment to ethanol)

→ moulds directly don't play a role in fermentation of carbohydrates but further in preparation are used (like cheese preparation)

Examples of Foods:

Yoghurt, curd, cheese, sauce, beans, meat (Salami)

Beverages (wine, beer (malt))

History of fermented foods:

→ It is used as a method of preservation of food (oldest method).

→ milk is the one which was fermented to produce Yogurt. in (200 AD)

→ Leaved Bread, it was produced in Egypt around 2500 BC ago.

→ Soyabean fermentation in china 1000 BC

→ fermented meat products are produced from golden times

Benefits of fermentation:

→ It increases variety in the diet (5000 varieties of cheese)

→ we can use variety of ingredients in diff foods

→ Induces the nutritional quality (increases vit B)

→ Protein content also increases

→ The anti-nutritional factors (lectins, phytates) some of these are used by fermentation

→ It improves the shelf life and safety of foods & helps in preservation of foods.

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Health Benefits:

→ casid is a probiotic (gives protection to digestion)
→ Probiotics (Yokust). (3)
→ Improves the digestability.
→ Helps in the toxic substances
Eg: casava contains carcigenic glycosides (toxic material) → it is broken down when casava is fermented.

Different types of food fermentation:- (2½ m)

1) Acid food fermentation
2) Yeast food fermentation
3) solid state fermentation
4) Oriental & indigeneous fermentation

1) Acid food fermentation:-
The common feature is they produce Acid after fermentation
i) Acid fermented diary products
cheese, butter, Yogurt, coffee (Animal milk)
ii) Acid fermented vegetable product
cabbage (sauerkraut), olive seeds, diff pickles
3) Acid fermented meat products
→ semi dry & dry

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Dry → Salami, preparsni

4) Sour dough breads

(4)

→ All 4 use Lactic acid Bacteria in fermentation

② Yeast food fermentation:

Here Yeast is imp ingredient in fermentation produces CO_2 & Ethanol. (used in livening process of bread)

→ Ethanol Eg is beer, spirits, wine.

→ CO_2 in bread.

③ Solid state fermentation:

We use solid state fermentation in which foods are elongated, & we use solid substrates

Eg: we use moulds

→ koji process → second stage of Temphe fermentation (soyabean)

④ oriented & indigeneous fermentation:

oriented = traditional

→ idli, dosa, temphe, sauce, fish sauces

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classification (ಅಧ್ಯಾಯ 2½ m) (5)

* The oriental fermented foods are broadly divided into 8 classes they are

1) Legume based { miso, soya sauce, natto etc }
2) Cereal based products
3) mixed → { idli, dosa, dhokla } - { Tape, pot }
4) Fibers crops
5) fermented beverages ← { Beer, ale, wine }
6) fermented roots ← { kafein, koumis }
7) Fish preparations ← { Fish sauce, paste }
8) fermented vegetables. ↓ [olive, sauerkraut, kinchi].

1) Legume Based Preparations :- → soya sauce
→ miso
→ tempeh
→ natto
→ ontjom.

* The legume mainly consists of protein (20-25%) cho & oil.
→ Types of cho in legumes are oligosaccharides
* when we eat legumes we have problem of 'flatus' (gas problems).

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1) Soyasauce :- (2½ mark). (1)

→ The soyasauce is a liquid food condiment used to add flavour and colour to the bland basic oriented diet including rice, raw fish, bean curd, fermented beans, boiled vegetables etc.

→ It is known by diff names in diff countries

- In china — chau yau / dracoing oil
- In china - Pak yau / white oil
- In Japan - shoyu
- In malaysia - ketjap
- In Indonesia - kecap
- In korea - kanjang

* Types :-

we have 2 main types they are

In orient types they are

1) Japanese type
2) chinese type

→ The chinese type, made from soyabean alone, and mixture of soyabean & wheat (more soybean)

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→ In Japanese we have soyabean & wheat but proption of both are Equal.

→ characteristics distingueish b/co chinese & Japanese

(7)

1) Aroma
2) flavour
3) colour
4) stability

* soyasauce in Japan:-

⇒ In Japan we have 5 types of soyasauce are available. they are

	colour	aroma
1) koikuchi	deep brown	strong aroma
2) Usukuchi	Light brown	milder flavour
3) Tamari	dark brown	strong flavour
4) Saishikomi	dark brown	little alcohol flavour
5) shiro	Yellow & tan	reducing sugars of sweetest

high % of salt

→ they contain acids like acetic, succinic, phosphoric, lactic responsible for typical flavours colour & storability of sauces

→ some of the colour also due to browning reactions

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Preparation of Soyasauce: (10 m)

→ Main ingredients are wheat & soyabean &

We have 5 stages of preparation (8)

a) Processing of soyabean

b) Processing of wheat

c) Koji process

d) mash

e) Pasteurisation

→ steam polished rice/ wheat bran

↓

Add soyaflour (using 50%)

→ Soyabean

↓

Soak in H2O (12–15 hrs) (At room temp)

↓

steam/boil (until soft) (vol is 2.1 times increase)

* Take wheat (wheat Bran) → Roast (characteristic aroma could occur)

↓

crush (cracked

↓

Add 50%

Flowchart of Koikuchi:

steam polished rice/wheat Bran

↓

Add soyaflour & inoculate with Aspergillus

↓

Incubate 3-5 days (30°C)

↓

Seed (tane) koji (0.1–0.2 %)

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↓

mix 50% of both

↓

Spread on trays or in fermentors of 5cm deep & place in koji room

(Trays are of Bamboo strips or steel strips Use 2 trays gap of 10cm)

↓

Incubate 2-3 days (25-30°C)

↓

Koji mixed salt (17-19%)

↓

Add water to form mash (prevents from bad bacteria)

↓

In mash Lactic Acid fermentation & (m.o is Pediococcus halophulum or Pediococcus soyae) followed by Yeast fermentation (Saccharomyces souxii on Torulopsis top) from 2 months - 1 year

↓

Press

- Press cake (Animal feed)
- Liquid → ↓ Pasteurised → ↓ Bottled → ↓ in Soyasauce

→ Rapid cooling of grains in soyabean is advisable

→ Boiling inactivates the Enzymes)

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while Roasting of wheat we get ferulic acid

→ Functions of wheat in soya sauce)

(10)

→ 1) Helps to reduce moisture content

2) Acess in obtaining high proto lytic activity from koji

3) It is a major source of etto for second phase of fermentation

4) The lignin & glycosides present in wheat brea help to impart valintnic flavour to soyasauce

5) Helps to reduce the nitrogen content of soyasauce

6) It contributes to the rich flavour & aroma obtained from glutamic acid.

7) formation of several Brown colour compounds → gives final colour to soyasauce

Koji Process

The word koji means bloom of mold

→ Its an Enzyme preparation used as a starter to the substrates to initiate fermentation.

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→ The seed koji is prepared by cultivating aspergillus soffa for 72 hrs in small boxes in aseptic room

→ Before adding koji, mix thoroughly steam (11)
Soyabeans & wheat (50%) & then koji

→ Greater than 23% of salt in mash will increase the growth of osmophilic bacteria & less than 14% increases putrificative bacteria.

→ In initial stages of fermentation the hydrolysis of proteins to aminoacids & sugars are fermented to glutamic acid, lactic acid by bacteria & finally to alcohol & CO_2

→ Pediococcus halophilum sugars to lactic acid & yeast will dominate & act on mash

→ The Raw soyasauce is heated to 72-80°C it. pasteurisation to kill micro-organisms & enzymes & use filter (clay, Alam i.e. Aluminium silicate) to separate

→ we add preservatives they are 1/Butyl p hydroxy benzoate if is used at 15mg per ml

→ we use 200 mg/ml of sodium benzoate is used for Export products.

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MISO (Traditional) 8/9/16

miso is a fermented soyapaste, which is known by various names and this product have been originated from china 1600 AD or before

In Japan - MISO
china - chiang
korea - jang or doenjang
Indonesia - Tauco

(2)

* They contain cereals like Rice or barely and these cereals are also used in koji.
* Traditionally 'MISO' semisolid fermend paste containing salt, koji, water, fermented soyabeans.

Koji preparation:

It is prepared from rice in which 'Aspergillus oryzae' is cultured

washing → soaking → steaming → mashing of soyabeans

mixing with koji, salt, water

fermenting to 3-4 months

* In Japan it is also prepared commercially in modernized factories

Uses:-

It is used in soups, stews with grains corn beans bean curds, noodles to enhance the flavours.

→ In china 'chiang' is used as base for sauce, and served with meat, seafood & vegetable dishes.

Flowsheet of koji preparation:-

Polished rice (Barley or soyabeans) sometimes used

↓ wash & soak in H_2O

↓ Drain

↓ steam

↓ spread in tray to cool at 35°C

↓ Innoculate with Aspergillus oryzae

↓ Incubate (40-50hrs at 28-35°C)

↓ Koji

* Instead of Rice, if they use barley called as 'Barley miso'

* We have sweet & salty of Yellowish, Reddish Brown miso

FOR MISO:

Take the soyabeans (dehulked / grits)

↓ wash & soak in water

↓ Drain

↓ steam (55 - 60% of moisture)

↓ cool (60°C) + 30% koji → mix

↓ NaCl (11 - 13%)

↓ Ferment for several months (1 - 3 months) (25 - 30°C)

↓ Age for 2 weeks

↓ Blend & Mash

↓ Pasteurize → Pack in Bags

↓ MISO

(11)

★ Precautions of preparation:-

1) while preparing soyabean, which are thin glossy, light yellow / white colour seed coats are taken

2) wash & soak it for 18 - 22 hrs. and frequently change the water

3) steaming is done till the beans are soft & cooked

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4) Koji preparation:

* Polished Rice is taken not brown Rice as surface area is hard & contains waxes, which inhibit the growth of A. oryzae.
* we use soaking in H2O to increase the moisture content of atleast 35%.
* then cook the Rice & spread in the trays & cool till 35°C & then inoculate with fungus (1gm/kg) the space should be b/w the trays for pass of CO_2
* Fermentation of 40-50hrs since sporulation of fungi is 4-7 days. & then koji with salt, mixing with soyabeans (miso can be used as culture to inoculate but should not be pasteurized).
* In some factories they use osmophillic yeast & Bacteria
* we have diff types of miso
  1) white miso (less 5% soyabean)
  2) salty miso (4-5% soyabean)
  3) sweet miso
  4) soyabean miso
* white miso takes only 1 week fermentation & aging
* salty miso takes 1-3 months of fermentation
* soyabean miso takes more than a year of fermentation
* sweet miso takes 5-20 days of fermentation
* Yellow/Brown miso has greater than 11-13% of soyabean) & more salt

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* During koji preparation the proteins of soybean are digested by proteases of A. oryzae & then aminoacids, salts and sodium glutamate (for flavour) are formed.

* Then carbohydrate content of miso depends of % of Rice we use (30-60)

* Miso contains 0.6-1.5% of acids of lactic, succinic & acetic acid. these acids forms Esters with Ethyl & higher alcohols.

* we also have Esters formed from soyabeanlipids which contribute to aroma.

* Lipid content of soyabean is hydrolyzed during the Early stages of fermentation

* Tocofesol content is decreased during cooking but not effected during aging

* Strong antioxidative property present in miso due to lecithin, Isoflavons, Tocofesol

* vit B, Riboflavin, thiamine are used for fortification of vit A

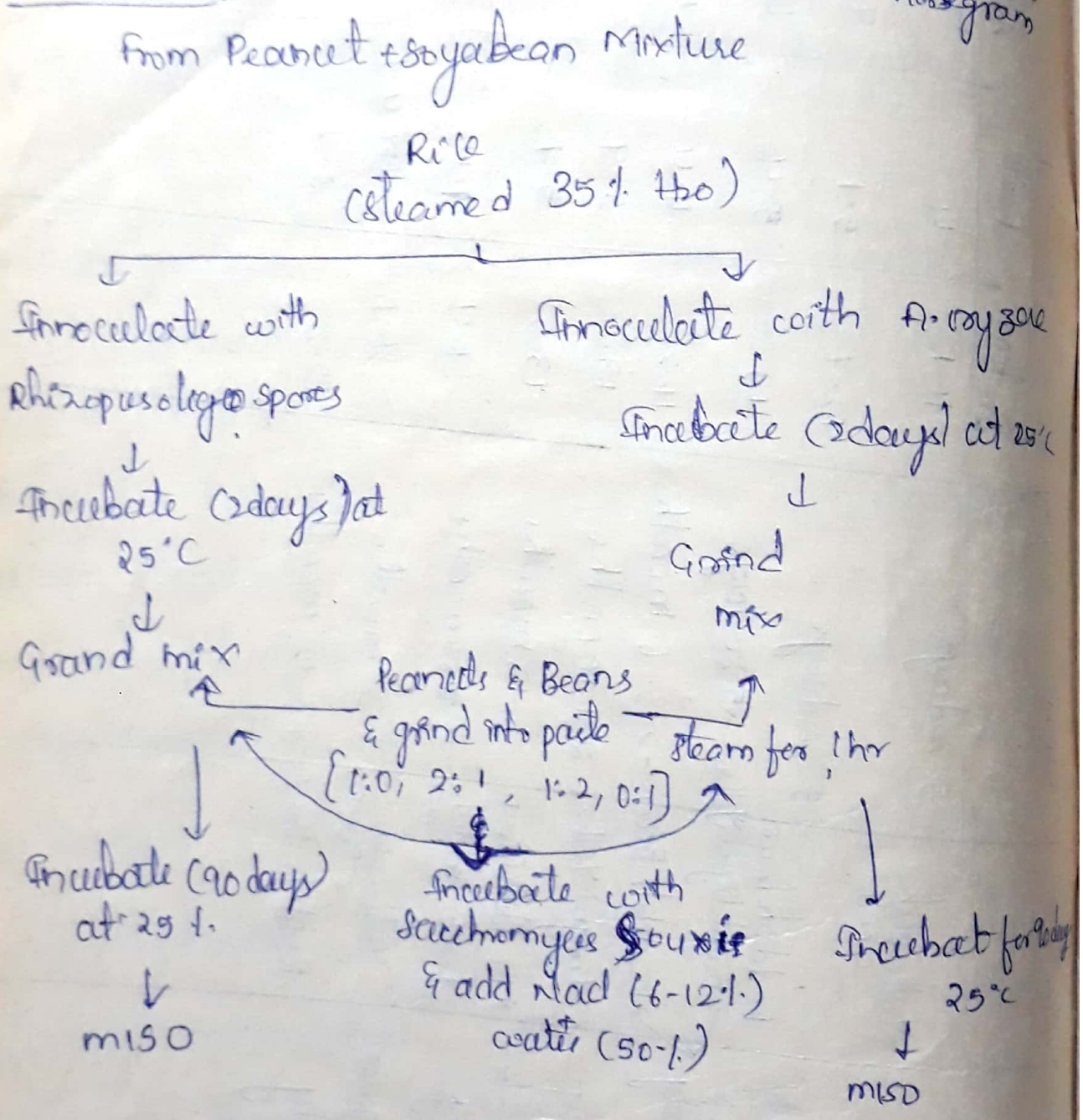
Raw material	Taste	colores	fermentation/aging	composition in %.			
				Protein	Fat	Ash	carbohydrate
1) Rice	1) Sweet	Yellowish white	5-20 days	11.1	4	7	35.9
2) ~~Sweet variety~~	2) Sweet variety	Reddish Brown	5-20 days	12.7	5.1	7.5	31.7
	3) semi sweet variety	→ Bright Light Yellow	5-20 days	13	5.4	18.5	29.1
		→ Reddish Brown	→ 3-6 months	11.2	4.4	14.5	27.9
	4) Salty	→ Bright Yellow	2-6 months	13.5	5.9	14	99.6
		→ Reddish Brown	3-12 months	13.5	5.9	14.5	19.1
2) Soyabean	1) Salty	Dask Reddish Brown	5-20 months	19.4	9.4	13	13.2
3) Barley	1) Semisweet	Yellowish Brown	1-3 months	11.1	4.1	13	29.8
	2) Salty	Reddish Brown	3-12 months	12.8	5.2	15.1	21.1

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MISO (Modified):-

* They are trying to replace soyabean by peanuts
* They are trying to replace soyabean with cassava, chickpea, horsegram

Flowsheet:



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Flowsheet for koji with cassava:-

cassara
↓
Peel removed
↓
cut into pieces
↓
Dry for 2 hrs in sunlight
↓
Steam (118°C for 45 min)
↓
cool
↓
Inoculate with A. oryzae spores
↓
koji (43 hrs)
↓
Finished koji.

TEMPEH:-

It is made from soyabeans fermented with several species of Rhizopus.

Tempeh is considered as meat analog in Indonesia & we have 4 types :-
1) Tempeh kedele (soyabean)
2) Tempeh ontjom (peanut press cake)
3) Tempeh bongkinek (coconut press cake)
4) Tempeh gembus (soyabean residue after manufacturing soymilk curds

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Pilot plant Production: (Industrial Process) 12/9/16

(21)

Raw Soyabeans (size graded)

↓ Heat for 10min (83°C)

↓ Dehull in burr mill

↓ Hulls - separated by gravity

↓ Cotyledons { Soak 2hrs at 25°C / 30min at 100°C in dilute lactic acid

↓ Boil for 90min & soak the

↓ Drain → cool till 38°C → mix with mold inoculum (Rizopus oligosporus)

↓ Incubate for 15-18hrs at temp 35 - 38°C

↓ Spread on dryer trays

↓ Dehydrate (90-120min at 93°C)

↓ Tempeh is packed in bags.

(Same)

⇒ They tried to use wheat, cereals, Rice, barely, oats in combination with soyabeans and also they tried other legumes horsebean, chickpea, unripe meals

⇒ ~~Shelf life of~~ Tempeh:

⇒ Highly perishable eaten in a day or 2days

⇒ In Indonesia, they tried to increase shelf life by steaming & drying it in the sun, so they can extend shelf life to few months. They conducted acceptable studies after 6weeks

which was successful

Biochemical changes taking place during the processing of tempeh:- (22)

* The free fatty acid content increases, the water soluble solid content increases. when we are cooking, there was no change in the N_2 content but during fermentation soluble N_2 content increases.
* The vit content also increase, and phytic acid content, it was decreased when cooking was involved

NATTO :-

It is a fermented food utilizing whole soyabean it is a japanese product.

→ In china - Tou-sheh
East India - Tao-tjo
Phillipenes - tao-si

→ The colours will vary on depending the organisms it has pungent, pleasent aroma, consumed with boiled rice can used as seasoning with cooked meat seafoods and vegetables.

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We have 3 types of Natto, traditionally prepared in Japan, Each of which differs in the manufacturing method. they are 1) Itohiki Natto (23)
2) Yukiwari Natto
3) Hama Natto

1) Itohiki Natto:
It is the main natural product in Eastern Japan, it is refered to as only Natto. and it is also called as 'Bacillus Natto'.

Production of Itohiki Natto:-
Soyabean is washed → soaked in the to increase in volume by twice the original → then they are steamed for 15min and cooled, inoculated with Bacillus Natto, the inoculated beans are packed in 100gm packet & allowed to ferment at 40-45°C for 18-20hrs. After fermentation the surface of soyabean is covered with viscous polymeric substances made up of glutamic acid → high quality of Natto has layer of viscous around the surface of bean

Flowsheet:- Soyabean → Soaking → steaming
↓
Inoculate with Bacillus natto at 42°C - 16hrs
↓
Itohiki Natto ←

2) Yukiwari Natto:-

In Yukiwari Natto is made by mixing by Itohiki Natto with Rice koji and salt, and then it is aged at 25-30°C for about 15 days. Rice koji is prepared by using Aspergillus oryzae

Flow sheet:- Rice polishing → soaking → steaming → Add koji mold (A. oryzae) → Mix with Itohiki Natto → Remove it days at 25°C → Yukiwari Natto.

3) Hama Natto:-

It is mainly produced in Hamamatsu region in Japan. It is 3rd type made in Japan

Processing: Soyabeans washed & soaked in the for 4hrs & steaming without pressure for 1hr after cooling beans are inoculated with koji, prepared from Roasted ~~meal~~ wheat & barley and then fermented for 20hrs till the beans are covered with Aspergillus oryzae & then fermented mass is dried to moisture content of 12%, then dried beans are submerged in brine along with ginger. It is kept like this for 6-12 months.

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During this carbohydrates broke down & gives a typical flavour & odour.

Flowsheet: Soyabeans → soaking → steaming → koji mold → Aging (6-8 months) (Ripened) → Soy koji

(25)

* koji mold prepared from Aspergillus oryzae & roasted barley flour.

* Composition:

Many free aminoacids present, we add many bacteria like micrococcus, streptococcus, pediococcus species and all these help in the hydrolysis of soya. Hamanatto has a harsh flavour due to high free fatty acid content. The free fatty acid is about high than other 2 natto.

ONTJOM:-

All these are legume based, it is fermented peanut press cake, very popular in Indonesia It is consumed as a snack or for breakfast. It has a fruit like aroma and it is known by different names → oncom
→ oncom
→ Lontjom

Processing: oil is extracted from peanuts. Then Soaking, steaming then mixing with cake & adding inoculum and pack in banana leaves & leave for fermentation.

(26)

→ diff types of ontjom depending upon mo used for fermentation they are

(a) Neurospora intermedia → we get Red ontjom

(b) Rhizopus oligospores → we get white ontjom

→ At household level we have more oil

→ ontjom is boiled/Roasted then it is seasoned with salt/sugar and then eated.

Flowsheet:-

Peanuts → Pressed (oil recovered)

↓

Press cake (Soak in 2 hrs in H_2O)

↓

Drain & mix with high starch material like cassava / tartaric acid / salt

↓

steam 1-2 hrs

↓

Inoculate with ontjom mold (Neurospora intermedia or tempeh mold Rhizopus oligosporus)

↓

wrap in Banana leaves

↓

Ferment for 1-2 days (25-30°C)

↓

ontjom

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* The Presscake is called by diff names boongkil soaked in 2 lts of tho (to remove Excess oil).
* After steaming it is pressed into layer using a Bamboo frame to remove Extra moisture
* If we do aeration to product we get uniform mold
* Lactic acid lowers the pH to 5.1 for growth of molds
* cassava helps in fermentation.
* we get the modified ontfom by replacing the peanuts with other nuts. They used coconut
If coconut - called as Bongkrek.

(27)

(2) Cereal Based Products:-

We have
Ang-kak
Puto

1) ANG-KOK:
It is fermented red Rice, used in the preparation of Red-rice wine, other foods like Sepher, fish sauce, Red-soyabean curds.
→ The food colours prepared from mo like Monascus purpureus
Monascus anka
→ Ang-kok is marked in-powdered form (or) dry red Rice.
→ Its origin is china

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Preparation: Rice → crushed → soaked in H2O for a day

↓

Drain

↓

cooled ← Autoclave for 20 min 15 psi

↓ (Innoculate)

with 25 day old culture of Rhizopus oligosporus

mix it & leave it for 3 days at 25-30°C

↓

After 3 days the rice will be red, to shake it

↓

Dried

↓

Add little amount of sterile water

↓

ferment it for 2 weeks

↓

Rice kernels change to deep purple

↓

After 3 weeks the rice is dried at 40°C & powdered.

↓

Added to diff beverages and used.

* The fungus produces α-amylase, β-amylase, protease, esp. all these help in hydrolysis of the Rice

→ Ang-kok is used as medicine in china, it is effective against decenting, anthox, cleaning digestion.

→ monascus purpureus has an anti-bacterial propesty.

19/9/16

Puto:

⇒ It is a fesmented rice cake, generally prepared in phillipines by natural fesmentation

⇒ It is similar to 'Idli' in India and 'toyfu' in Thailand.

→ The starter (Monoecedum) used for puto is

Rice flour

flowsheet:

→ starter preparation:

Rice flour (500gm)

↓ ← Add bacteria + yeast (starter) & 100ml H_2O

mix thoroughly

↓

shape into balls

↓

flaten both sides

↓

dry balls

↓

Powder & store in bottle & use as starter

Puto preparation:

Milled rice grains (500gm)
↓
Soak in H_2O (3-4 hrs)
wash & discard H_2O
↓
Soaked rice grains
↓
Grind to semipaste consistency with H_2O
↓
Ground rice paste
↓
Add 5% starter + 5g sugar
then ferment for 12-15 hrs
↓
fermenting mixture

stage I fermentation

⟹ * Rice flour (500g)
↓
Add 80-100ml H_2O + 50g sugar + 5% starter
Mix ferment 15-20 times
(stage I fermentation)
↓
fermenting mixture

mix both
↓
Add 250gm of sugar
↓
1.2g lye
↓
II stage of fermentation
3 hrs
ferment water
↓
steam for 30min
↓
puto. //

→ Quality depends on type of rice & composition of the rice. There was high co-relation b/w amylase content & volume of expansion its dependend on amylose content. (31)

→ Traditional puto preparation takes 12hrs where in preparation of starter takes 2hrs & then soak the rice for 2hrs

* the organisms used to starter is
  → streptococcus licales
  → leuconasta mesatorides
  → sachromyces cerevesia

→ Puto is prepared for milled grains also & level of culture is only 5% for preparation of puto is standardised. If we use milled grains the product is superior

→ After using culture the time reduced to 41-44hrs for traditional & tried to prepare modified puto where base medium was rice & tried to substitue 'cassava'. Upto 50% it is same, beyond that hardness & cohesiveness increases.

⇒ Rice gram (100g) → soak 3hrs with H_2O wash thrice → Grind with 75ml H_2O

Cassava flour (100g) → Add H_2O 100ml

mix & homogenise

↓

Galapong mixture

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→ Add 20g of flaxseed + 20g sugar

↓

mix

↓

ferment 15 hrs (I stage fermentation)

+ Add 100g sugar &
30 ml lye
mix 15 min

↓

ferment 5 hrs (II stage fermentation)

↓

steam for 30 min

↓

Puto.

→ They also tried mixing of rice & wheat (1:1) & it is superior than any other product & also tried with Ragi.

3) Mixed Preparations :-

We have Idli, Dosa, Dhokla

i) Idli :-

Its a South Indian product made by mixture of Black gram & rice, & fermented product & steamed in special vessels before consumption

→ The type of rice varies from region to region proportion from 1:4 con 1:5 (Rice to Black gram)

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→ highes amount of rice it impart a starchy flavour

→ modifications are adding ginger, carrots, curryleafs, pepper, salt before steaming gives colour

* Definition:

⇒ It is small white acidic leavent steam cooked cake made by lactic acid fermentation of a thick batter made from polished rice & ~~dehydrated~~ dehilled blackgram dal

→ the cakes are soft, spongy & have a pleasant sour flavour

Flocosheet for Idli:-

White polished Rice
↓
soak in H2O (5-10hrs)
↓
Grind to yield coarse batter
↓
Take 33%

Blackgram dal (dehilled)
↓
Soak in H2O for 5-10hrs
↓
Grind finely & smooth paste (gelatinous)
↓
Take 67%

→ Mix well (Combine)
↓
Add salt (0.8%)
↓
Incubate (ferment for 15-24hrs 30-32°C)
↓
Pour in small containers
↓
Steam for 10 min
↓
Serve hot

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The micro-organisms used in Idli are

Natural microflora { → Lactic acid bacteria
→ Streptococcus mesales

Isolated m.o for idli { → Pediococcus cerviseae
→ Lactobacillus delbrueckii
→ Lactobacillus fermenti
→ Lactobacillus lactii

→ The yeast are → Oedium lactis
→ Candida
→ Trichosporum cutaneans

ii) Dosa) Method of preparation is same, because add species & then fry as a pan cake.
→ Idli they are preparing with Bombay Rava & with Jowar, Ragi & all millets.

⇒ iii) Dhokla:-
It is a steam fermented food (mainly in gujarath) from bengal gram (or) Rice (or) wheat, the

Definition:
It is also called 'dhokra'. It originates from gujarath. It is made from fermented chick pea (or) bengal gram. It is eaten as side dish, breakfast (or) snack.

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Traditional preparation of dhokla:

Take bengal gram
↓
Soak in 10-12hrs in H2O
↓
drain the H2O
↓
steam it & season it
oil (with flavours) salt citric acid → add it on the Dhokla

→ They also add Rice flour (polished rice) & Bengal gram separately → mix it → Add salt
↓
Ferment it 12-15 hrs
↓
steam it in a grease tray

→ Streptococcus species
→ Leuconostoc species
→ Candida species
→ T. pullulans
} M.O involved

Khamman:- Similar to dhokla but instead of Bengal gram we add other products.

4) Fish fermented Products:

→ Fish sauce, paste are traditional to need to store
→ Apply salt & dry it for preservation for small fishes

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→ fermented fish is a traditional preparation which was followed before canning, refrigeration & other preservation techniques available to mankind
→ Fermented fish is a staple food of Eskimos in the cold climates.
→ Put the fish in a pit with salt & leave it for 2 months then it is consumed & fermentation time depends on region, people, fish
→ In Iceland & Vietnam it is called as 'plara' (fermented fish)
→ Different fishes used for fermentation are :
*) Herein - clubaharengus (Zoological name)
↳ It is dried in salt & dry salted in barrels. 1 kg of salt is 15-36 kg & add weight

+ They were special cures, known as 'Gutchi, Icelandic' & fish prepared by these 3 methods can be stored for more than a year in ambient European countries
* After fermentation process the salt in is 10-12%, those bacteria which are Halophilic (salt bacteria) they only ferment sometimes they add sugar to fasten the fermentation
→ Species like pepper maize hops, coriander cinamon ginger, cardamom & even sandalwood & Preservative like Benzoic acid is used.

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→ They also used Boric acid till it was banned

Anchobies:

cured Anchobies are popular delicacy in mediterranean areas

zoological name - Fish Engraulis Encrasicolus
(genera) (species)

⇒ Preparation is salting & fermentation

⇒ Fish with high fat content is used & in a Kg they used to get 35-40 fishes.

⇒ Fish → Remove the gut (head) then g.I track comes out → Fish is salted in layers
10kgs (fish) than 5-6 kg of salt
↓
Also done it Barrels & wooden desk is used to weight on top
↓
Filling the tank & leave it 6-7 months fermentation
↓
The liquid which is ones flowing is reused to spray the fish
↳ sell the fish to some containers

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24-10-2016

Fish paste:

shrimp or fish paste:

Fish paste is made from fresh and fermented fishes.

The processing of preparing fermented fish involves

1) Pounding with the proportion of salt, get the fish paste, the fish paste is subjected to sun drying before it is packed and left in a container for maturing. The moisture content of paste varies from 35-50%. Typical examples of fish paste are known by different names in different places.

Nga pi of Burma

Prahoc and mams (- cambodia)

Belachan - Malaysia

Trassi - Indonesia

Trassi can be made from shrimp or fish. ~~or~~ the procedure vary from region pound before drying after drying sundrying - first some

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region cooden motors are used for pounding. The dough is exposed to sun light (second salt) pounded and mixed with salt. The vessel in which they catch add salt and subjected to sun drying and pack. After catching they spread is called breading and is similar to preparation of coine.

pounding: choppers, buchers and mixers are used.

Typical process:- Different varieties of fishes shrimps used are acetes shrimps, mysid shrimp (used in small proportion.

The moment they catch the fish they separate the smaller shrimp and keep in wooden 4-5kgs of salt for looks. They are spread out in layers on mash and expose for drying Drying is continued for 4-5 kgs till 50% of moisture is evaporated. The materials is separated from scraps. The salted shrimp are mixed and press into a paste in wooden boxes. while pressing no air bubble should be there - This mixed

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paste ferment for 7 days after spread in trays & dry for 3-5 hours.

Again remove mix diane and put it in tub and leave for 1month. pack in and corap in.

The yield of paste is 40-50% of ray shrimp weight.

Protein - 30-34%

Salt - 13-18%.

Ash - 20-24%.

including salt

moisture - 27-40%.

p^H - 7.6 to 7.8

Fish sauces:-

Fermented fish sauce is made by different varieties of fish. eg snakehead. The fish is collected, munel cleaned and cut into pieces and mix with salt & rice bran. It is left in the jar which is covered and fermented for 2months-1 year.

Fish sauce is emberged liquid which is obtained from fermentation of fish from sea salt. This particular fish

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sauce is used as a condiment. It is used as a staple ingredient in south east Asia, Thai, phillipines. All these fermented fish preparation are liquid which contains protein degraded products, and mixture of amino acids.

They are similar to soya sauce and have high concentration of salt, They are used as a condiment for flavour for rice dishes. some add in vegetables. sauces are known by different names.

nuac mam - cambodia

nampla - Thailand.

General steps: The fish is mixed in tubes and left for 5-18 months. The different methodology for preparation for fish sauce

Anchovies, & telephorus species.

The fishes are washed in seawater and mix with salt and kept in tubs made of wooden ratio of fish and salt is 1:5 or 1:1 and allowed to

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ferment for 5-18 months. The clear liquid is found on the top or bottom The liquid is filtered and exposed to sun till it is ripened. It is packed in bottles or earthen were containers for distribution.

chemical composition:-

Ingredients	Low grade	High grade
1) salt (gms/100 cm cube)	28.4	28.15
2) Total nitrogen(")	0.92	1.92
3) Ammonia nitrogen	0.8	0.28-0.64
4) TMA nitrogen	0.2	1.13
5) organic nitrogen	0.62	0.85
6) pharmal nitrogen	0.83	
7) Ammonium nitrogen	0.55	
8) pH	0.75	5.58

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