IN-PLANT TRAINING REPORT

A Training report submitted
In partial fulfillment of the requirements degree of for the award of

FOOD PROCESSING AND TECHNOLOGY

BY

B. S. DIVYA

PVKN GOVERNMENT DEGREE COLLEGEE,

DEPARTMENT OF BOTONY

CHITTOOR 517001

JULY-2021

Acknowledgement

It is our undeniably privilege to carry out our in-plant training in **SRINI FOOD PARK. PVT. LTD. Mogili, Chittoor (dist), ANDHRPRADESH.**

It is our proud privilege to express our deepest sense of gratitude to **Mr.A.VEERENDRA (GM OPERATIONS), Mr. NETHAJI and Mr.SUBBAYYA (HR & ADMIN)** for giving us this prestigious opportunity and all time guidance during our training.

We are also expressing our sincere and heartfelt gratitude to, **Mr.KULKARNI (SR PRODUCTION MANAGER - ASEPTIC) , Mr.K.CHANDRA BHANU (PRODUCTION MANAGER-IQF) Mr. PRAVEEN KUMAR PATERIA (PRODUCTION MANAGER - TETRAPACK)** for extending all feasible facilities and full -pledged support at each and every state for successful completion of our training.

We would like to thank all employees in the industry who are directly and indirectly associated with the successful completion of our training.

We also thank our HOD, Teaching staff & Non-teaching Staff of the COLLEGE for their Valuable guidance and confidence to do this In-plant training**.**

B.S. DIVYA
CHITTOOR

INDEX

Chapter-1
INTRODUCTION ABOUT SRINI FOOD PARK PVT.LTD

Nestled in a sprawling 147-acre space, Srini Food Park is located at Mogili Village in Chittoor Dist. of Andhra Pradesh, India. This state-of-the-art facility provides world-class facilities for pulping, IQF, bottling, tetra packing, modular cold storage, warehousing and advanced testing lab. It enables basic and supply chain infrastructure, cluster farming and is ably backed by field collection centers, self help groups and individual farmers. We believe in extracting nature's finest offerings and creating products that nourish life. As a result of our close interaction with nature, we have achieved the capability to skillfully blend natural ingredients with technological capabilities to achieve the perfect recipe for a balanced life. From seed to shelf, Srini Food Park facilitates end-to-end food processing with beneficial forward and backward linkages. On par with techno-intensive software parks, this new-age facility is equipped with Central Processing Centre and Primary Processing Centers. It aims at becoming a pioneering infrastructure enabler and facilitator for the Food Processing Industry. Srini Food Park will empower food industry with state-of-the-art infrastructure and quality raw material sourcing.

It provides end to end solutions to food processing in industries with backward and forward linkage. Mega food park is promoted by experienced professionals and supported by the government (The Ministry of food processing industries and the Andhrapradesh infrastructure investment corporation) and benefits all components of the value chain.

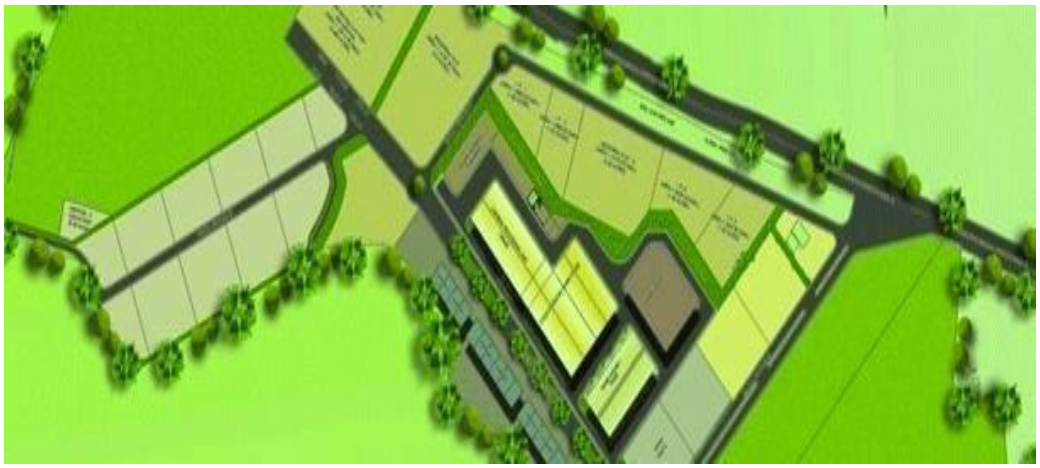


Plate no 1.1: plan of Srini Food Park

Location:

Srini Food Park occupies an area of 147 acres at a strategically advantageous location on the National Highway connecting Bangalore and Chennai; is only 120 kms from Tirupati, a pilgrim center with more than 150,000 floating population per day. Being equi-distant from two major metros in India, a major port (Chennai) and two international airports (Chennai and Bangalore) and one domestic airport (Tirupati), it offers great benefits to food processors and buyers.

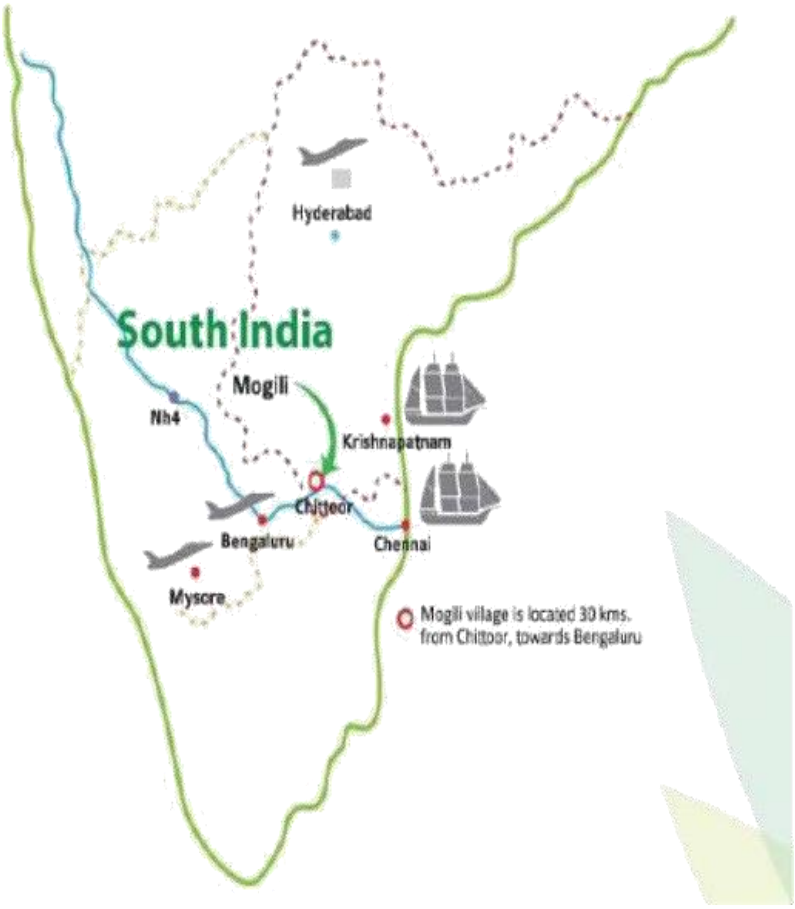


Plate no1.2: location view

Plate 1.3 view of srini food park

Site details:

Overall area : 147 acres

- Plinth area : 30acres
  Aseptic & Tetrapack located area : 53750 sq.ft
- (5000 2)
- Ware house located area : 48375 sq.ft (45)
- IQF located area : 43537 sq.ft (4000

.

SECTIONS IN SRINI FOOD PARK:

1. Aseptic section.
2. IQF (individual quick freezing) section.
3. Tetra packs section.

1) Aseptic process:

Aseptic means free from contamination caused by harmful bacteria , viruses or other micro organisms , that is sterile or sterilized

(or)

A system of packing sterilized products in airtight containers , so that the freshness is preserved for several days.

Aseptic pulp& concentrate process flowchart in aseptic packing.

Receiving Of Fruits
↓
Weighing of the Fruits
↓ Ok
Unloading → Not Ok Return to Customer
↓
Storage in Ripening Chambers
↓
Ripening (Natural/Artificial)
↓
Feeding
↓
Primary Washing with Chlorine Water (10-15ppm)
↓

Secondary Washing (normal water)

↓

Conveyor Belt

↓

Tip Cutting, Remove Damaged Fruits

↓

Destoner (or) Crusher

↓

Collection Tank

↓

Turbo Refiner

↓

Collection Tank

↓

Pre heating (55 deg-95 deg)

↓

Holding Tank

↓

Decanter

↓

Standardization Tank

↓

Metal Detector

↓

Deaeration Tank

↓

Homogenization

↓

Heating Modules (104 -109 °) Holding

↓

Tubes

↓

Cooling Tubes (55 °)

↓

Chilling Tubes (20 -28 °)

↓

Aseptic Filling

↓

Sterilizer Aseptic Bags

↓

Online Numbering To Drums

↓

PreDispatch

↓

Dispatch

Flow chart of Aseptic process

Receiving of raw fruits:

The receiving of raw fruits is based on by considering the parameters like mature, immature, small, mangu, fruitfly, stonevil. Depending upon the customer specification, above parameters are accepted up to the certain percentage and then the fruits are unloaded.

Storage in ripening chambers:

The Unloaded fruits are stored into ripening chamber for ripening of fruits after the procedure of unloading and analysis of Quality check. The unloaded fruits having low brix and high acidity for aseptic product. This quality is maintained into the ripening chamber as per the specification of final product. In some parts of the world, acetylene or calcium carbide has been used to ripen mango fruit. We strongly discourage these methods, most especially because making ethylene gas from catalytic generators is so inexpensive, reliable, and safe. The capacity of ripening chambers is 250 tonnes.The volume of each chamber is 16m×24m ×16m.

Plate no 3.1: Ripening chamber

Plate no 3.2: Exhaust fan

Feeding:

The ripened fruits are transferred from the ripening chambers to feeding area. Then the fruits are travel on feed roller conveyor to washing tank. The capacity of feed roller conveyor is 12 tonnes/hr.

Plate no 3.3 feeding area section

Washing:

Primary / first washing is done by water immersion to remove dust and foreign materials. In the washing tank, we maintain the 10-15 ppm of chlorine is used as disinfectant. The capacity of the fruit washing tank is 12 ton / hr .The brush washer is used to completely clean the raw fruit with chlorinated water. Then the washed fruit is transferred to blancher through roller conveyor.

3.4 Fruit washing tub

Blanching:

Blanching is a cooking process where in the food substance, usually a vegetable or fruit, is scalded in boiling water, removed after a brief, timed interval, and finally plunged into iced water or placed under cold running water (shocking of refreshing) to halt the cooking process.

Boiler:

Boiler is used for the production of steam. The type of boiler that existed in the site is water tube boiler. There exist two number of boilers. The capacity of each boiler is 500kg/hr i.e., steam is generated at the rate of 500kg/hr. It is stated that the Efficiency of the boiler is 70%.Ground water is made softened by using softener plant. Softener removes the hardness of the water and thereby scale formation can be prevented. This water is sent to the tanks. Two water storage tanks are presented of capacity 25kl&10kl.With the help of the pump, water is sent to the shell. Shell comprising of 70% water and 30% steam. From there it will be sent to the tubes in the furnace. Heated water is sent again to the shell and thereby maintaining steam and water. There is a level glass indicator on the shell to indicate the level of water.

Plate 3.6 Boiler house.

Fuel:

Fuel is burnt within the furnace. The temperature in the furnace is maintained 700^0C.Mango wood is primarily used due to the fact that it is easily and sufficiently available. Other types of wood also available from forest.

- For 1 tonne of wood -3.5 tonnes of steam will be produced.
- If the fuel used is coal, 6 tonnes of steam will be produced.
- For the preparation of 100 kg of steam, 110 kg of water required.
- One kg of steam contains 540 k.cal of Energy.

Plate 3.7 fuel for boiler

Furnace:

Burning of fuel actually happens inside the furnace. The floor area of the furnace is 1.8m×2m.Two different types of bricks are used for the construction of the furnace wall. One is refractory brick (inside wall) can withstand the temperature of 1200^0C and the other is isolated brick (outside wall) can withstand the temperature of 700^0C.There exists two doors for feeding the fuel and two doors for the collection of ash. Temperature of the steam at the furnace is 210^0C.The percentage of ash that is collected is 6-7%.Two safety walls exist at the top of the shell. If the pressure inside the shell exceeds 16.5 kg/cm^2, values are released so that the blasting of the shell can be prevented .Fuel gasses are sent out through the chimney. Steam line is sent from the boiler to the production chamber. Expansion bents are placed in between the steam line to remove the condensed water.

Plate 3.8 furnace

Conveyor belt:

The blanched fruits are placed on the conveyor belt. As the fruits are passing over the conveyor belt, tip cutting and separation of the damage fruit is done by the labour. Tip cutting is done to reduce the acidity of the fruit. The length of conveyor belt is 25m.Capacity of the conveyor belt is 12 ton/hr.

Plate 3.9 conveyor belt

Destoner:

The capacity of the destoner is 15 ton/hr. It consists of sieve and brushes. The collected fruit are transferred to destoner through the bucket elevator. The capacity of bucket elevator is 12 ton/hr.The purpose of destoner is to separate the stone and skin of the fruit. These brushes are attached to the shaft. The rotational speed of the shaft is 1450rpm and sieve size 3-4mm. It is in the inclined position. Fruits are crushed between sieve and bruish by centrifugal and impact forces.

Plate 3.10 Destoner

Turbo Refiner:

Fiber particles which are present in the pulp are removed by the turbo refiner. It contains the sieve size 0.45mm. The pulp is transferred to the collection tank.

Plate 3.11 Turbo refiner

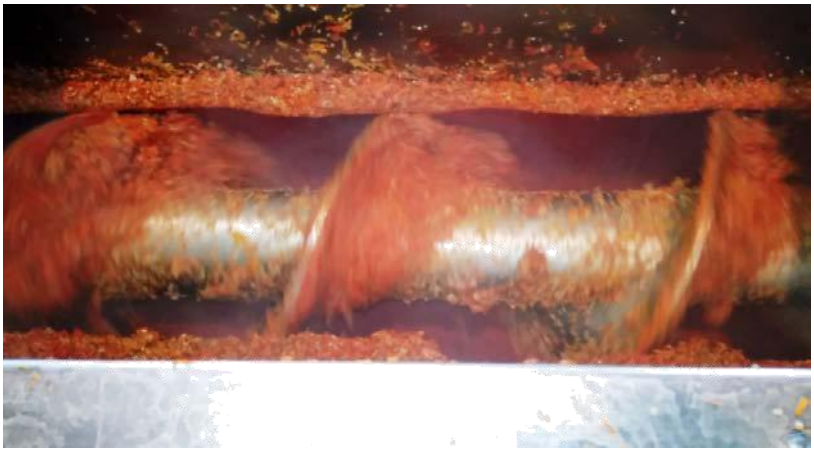


Plate 3.12 turbo waste through screw conveyor

Pre-heating:

Refined pulp is pumped from collection tank to spiro flow for preheating. In this preheating system tube in tube heat exchanger is used. Pulp is preheated upto 55-90^{0}C for enzymatic inactivation. Capacity of preheating system is 6 ton/hr.

Plate 3.13 tube in tube preheater

Decanter:

The pre-heated pulp is sent to decanter. The purpose of the decanter is to remove black and brown specs in the product. Decanter is a centrifugal device, which employs a high rotational speed to separate components of different densities.

The operating principle of the decanter is based on gravitational separation naturally, a component with density would fall to the bottom of a mixer, while the less dense component would be suspended above it. A decanter centrifuge increases the rate of settling through the use of continuous rotation, producing a gravitational force between 1000-4000 times that of normal gravitational force. As the pulp enters into the bowl, the bowl rotates with the high speed to induce the gravitational forces. The high speed rotation seperates the different density particles and the purified pulp is discharged out through the outlet and the unwanted particles are removed out. Capacity of decanter is 4 ton/hr.

Standardization:

Pulp is received from the decanter and then it is standardized. Based on the customer requirement, addition of citric acid, ascorbic acid is done to maintain brix, acidity and colour value. The capacity of the each tank is 3000litres.

Plate 3.14 standardization tanks

Citric Acid ($C_6H_8O_7$) Solution Dosing:

In order to increase the value of acidity, citric acid is used. This is done to adjust the PH value and increase the shelf life of the product.

Ascorbic Acid Solution Dosing:

The addition of ascorbic acid solution is done for minimizing oxidization process. It is also used for maintaining color value.

Evaporation:

Evaporator is used to remove the water from the product. The capacity of the evaporator is 6 ton/h. The process of evaporation is widely used to concentrate foods. The evaporator existed in the site is Double Effect Evaporator. From the standardization tanks, pulp is passed to second affect first and first effect next. Steam from the boiler is sent to the first effect at which pulp get concentrated and the vapours evolved are sent to second effect so that the energy can be saved and efficiently used. The main intention of using double effect is to increase the efficiency of the process. Next to that, vapor gets condensed by the cooling tower by the help of corrugated sheets. That condensed water is used for the cooling process. Treated pulp is conveyed through screw pump to the deaeration or concentration plant for evaporation of air for pulp filling or evaporation of air and water for concentrate to retain original colour flavor and brix.

Plate 3.16 evaporator

Plate 3.17 metal detector

Magnetic metal detector (CCP-1):

The evaporator product is passed through metal detector, if any metal particle is detected in the product, then there is a provision to remove the metal i.e. the sensor valve present at certain distance from the detector opens and the metal contained product get separated.

Deaeration:

A deaerator is a device that is widely used for the removal of oxygen and other dissolved gases from the product. The capacity of the deaerator tank is 1000 litres.

Homogenization:

This process is to make the product uniform in nature. In this, the piston pump pushes the product to the sterilizer tubes with high pressure.

Sterilization:

The concentrate / natural pulp is transferred to the product tank where it is passed through tube heat exchanger, to sterilize the product up to sterilization temperature of 103-109^{0}C with super heated hot water and cool the product immediately up to normal temperature with chilled water. The sterilization process contains 4 Heating tubes, 2 Holding tubes, 4 Pre cooling tubes and 6 Chilling tubes. The length of each tube is 9 m. The capacity of the sterilizer is 10 ton/h.

Plate 3.18 tube in tube sterilizer

Aseptic filling:

Sterilized and cooled product is then filled in aseptic bags with capacity of 220-litres placed in standard mild steel drums by computerized automatic filling machine equipped with automatic control for sterilizing the product.

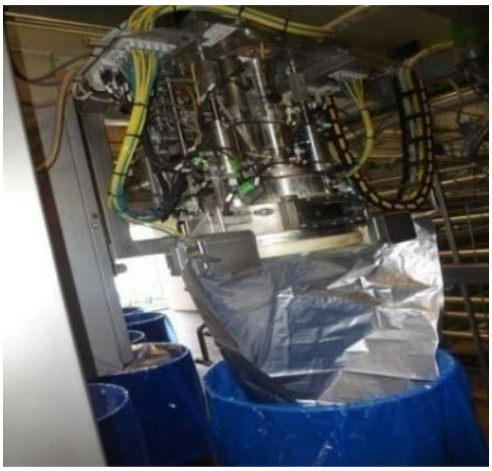


Plate 3.19 Aseptic filling

Storage:

The filled product in drums is stored at ware house at ambient temperature.

Plate 3.20 Ware house

DISPATCH PROCESS:

Filling of drums
↓
Storage in go downs
↓
Incubation for 7days
↓
Inspection Not ok → disposal
↓ Ok
Applying ring and bolt
↓
Container inspection not ok → returned
Ok ↓
Cleaning
↓
Container stuffing
↓
Dispatch

Advantages of aseptic packaging:

1. Convenience – it is portable and light.
2. Food safety – the process ensures that the food is safe from harmful bacteria.
3. No refrigeration is required – which saves energy in the transportation and storage of the food product.
4. Less energy is required – less energy to heat and sterilize the product and the container.
5. Protection of nutritional content – the food product contains more nutrients due to less damage; preservatives do not need to be added.
6. Low packaging to product ratio – there is more than 90% food product to 10% package.
7. Storage efficiency – brick shapes are easier to pack in bulk than cans or jars.

Disadvantages:

1. Production costs due to a more complicated system, production costs increase, resulting in increased costs for the consumer.

Chapter-4

IQF (INDIVIDUAL QUICK FREEZING)

Introduction:

Quick freezing is at present the only process whereby virtually all the properties of most foodstuffs can be preserved. The important feature of this process is ultra-rapid freezing to very low temperatures ie, IQF air temp (-30°C to - 40°C) and IQF product temp of (-18°C) designed to halt the activities of the microorganisms that cause decay and deteriorate foodstuffs.

Individual Quick Freezing (I.Q.F.) is the latest technology available in freezing and with the advent of the same, it is now possible to preserve and store raw fruit and vegetables in the same farm-fresh condition for more than a year, with the color, flavor and texture of produce remaining as good as fresh from the farm. In IQF, each piece is frozen individually using technique of fluidization resulting in freezing of fruit and vegetables only in 10 to 12 minutes which otherwise takes at least 3 to 4 hours or even more in the blast freezer. This results into better texture and there is no lump/ block formation and the product is free flowing. One does not have to thaw or defrost the whole packet to take out only a portion, and the rest will remain frozen till required again.

Objective:

The primary objective of the IQF is to increase the shelf life of product and preserve the characteristic of the product.

Raw Material Availability:-

Major vegetables grown in the state are Potato, Sweet Potato, Tomato, Brinjal, Cabbage, Peas and Onion etc. Banana, Orange, Guava, Papaya etc. are the major fruits grown.

Market Opportunities:-

Demand for IQF fruits and vegetables are increasing now a days.The market for frozen fruits and vegetables is growing both in the domestic and international market. Growth in the fast food sector offers outstanding opportunities for IQF operators to enter into supply agreements with restaurant chains, hotels and airlines, catering businesses etc. Frozen fruits and vegetables have a huge market potential not only in India, But there is an excellent export opportunity to Middle East and neighboring countries as well.

The major market segments for IQF are:-

- Retail outlets for direct consumption
- Hotels, restaurants, caterers and eateries
- Food industries which use fruits and vegetables as raw material and want to process during the lean season
- Good export potential
- In most of the western countries, the frozen food products dominate the local and export market. There is increasing consciousness towards health and nutrition in India and hence the acceptance and consumption of IQF fruits and vegetables is likely to increase in India and abroad. Particularly in India, a large source for fresh fruits and vegetables, there is a great potential for utilizing such techniques and technology to avoid deterioration of fresh commodities and convert them into value added products.
- The trade estimates for the industry project total production between 35,000 – 40,000 MT per annum valued at 250-300 crores annually. According to US International Trade Administration, the frozen foods market size in India is US$ 9 million, which is 0.3% of total processed foods market. Indian frozen fruits and vegetable market is represented by some of the important products with following market shares.

Advantage of IQF technology over slow or deep freezing technique:-

The main advantage of IQF is as follows,

1) The ice crystal forms are much smaller, which therefore, causes much less damaged to the cell structure or texture of the food.
2) The freezing period being much shorter, less time, allow for the diffusion of the salts and the separation of water in the form of ice.
3) The product is quickly cooled below the temperature, at which bacterial, mould, yeast growth occurs, thus preventing decomposition of foods during freezing.
4) The fourth and very practical reason in favor of IQF over slow freezing is the inherent speed and greater output and hence, higher capacity for commercial freezing plants with the resultant cost reduction.

Advantage of IQF food:

IQF frozen foods have the following advantage over other preserved foods.

1. Best freshness, closed to natural freshness.
2. Better taste.
3. Better flavor / aroma.
4. Better color and appearance.
5. Higher nutritive value.
6. Required less timing in cooking.
7. Greater convenience in handling and preparation.
8. Less fuel required.
9. Greater value for money, notably during off-season.
10. Ready to eat and serve frozen meals possible.
11. More hygienic than fresh or dried foods.
12. Malpractice and chances of adulteration reduced to the minimum.
13. Cent per cent edible portion of food available in each package(no brine, no syrup and no gravy) a notable features.
14. See thought pouches /container help the purchaser/ consumer in prompt evolution /selection purchase (unlike in canned foods which are hermetically sealed in opaque tin containers)
15. Freezing provides a great variety of seasonal food all the year round in almost fresh condition and at a reasonable cost too.
16. In the case of frozen prawns ,etc, they greatly facilitate the trade by making small and attractive consumer packs; Unlike block frozen product , they do not take much time for thawing also.

Limitations of quick frozen foods:-

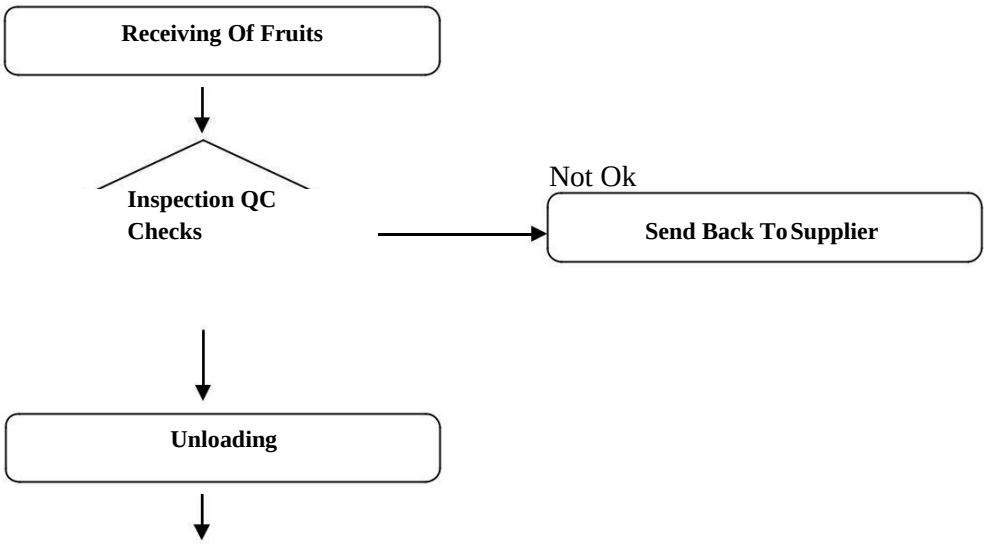
1) Higher investment in deep freezer/ freezing equipments/ frozen stores;(only once, of course).
2) Some thawing problems in some cases.
3) There is need for cold chain thought the length and breadth of the country, otherwise the charm of quick freezing is lost.
4) Urgent need for refrigerated display cabinets for retail marketing.
5) Freezing technology at present suitable for upper and middle classes.
6) In IQF shrimps, etc, they do not possess the compact nature of block frozen product and hence they occupy more space.
7) The products are more prone to dehydration, because of large expose surface.
8) Small fluctuation in storage temperature can result in thawing and refreezing of product into a large lump thereby destroying the entire concept of IQF .

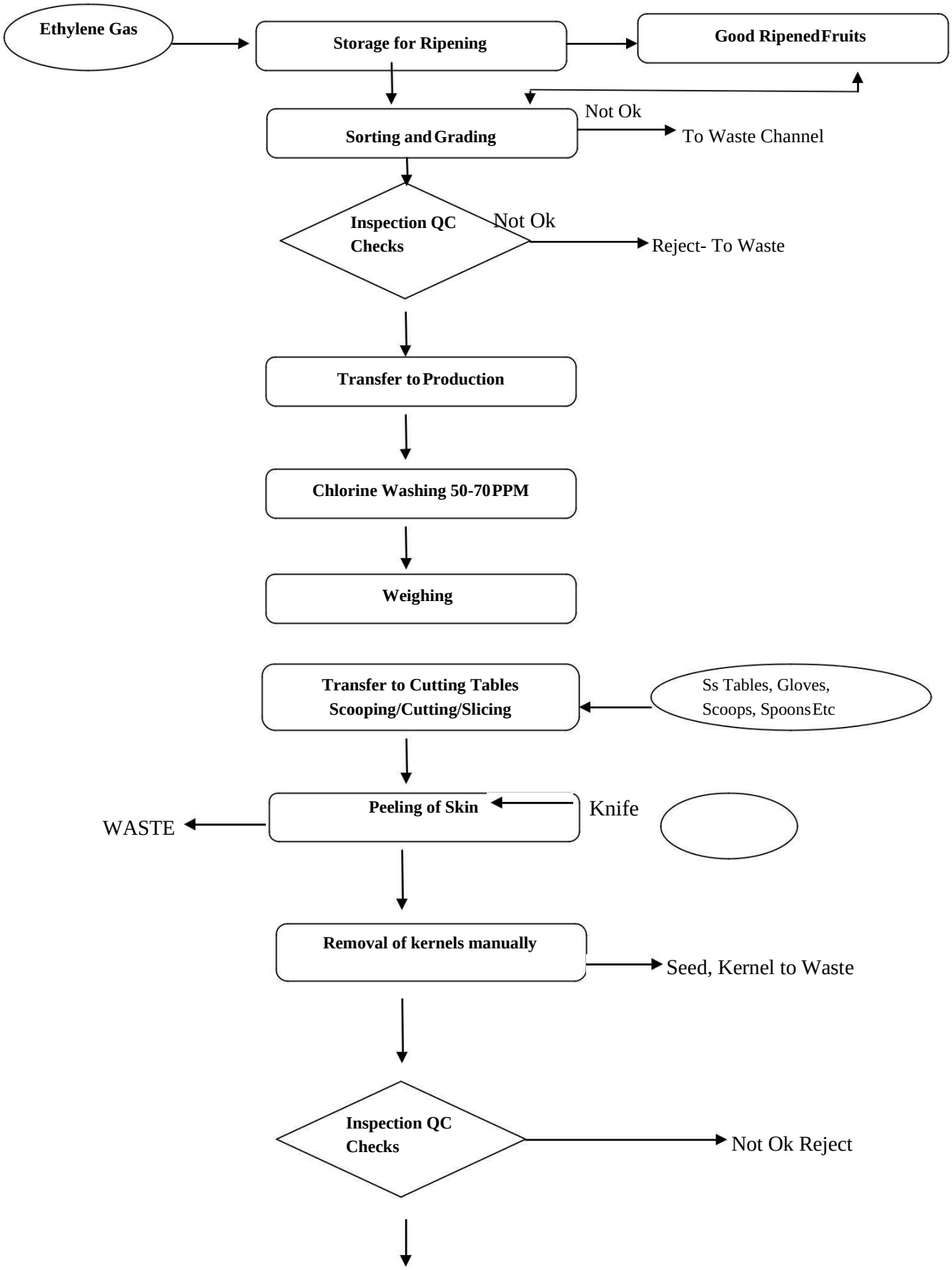
Applications:

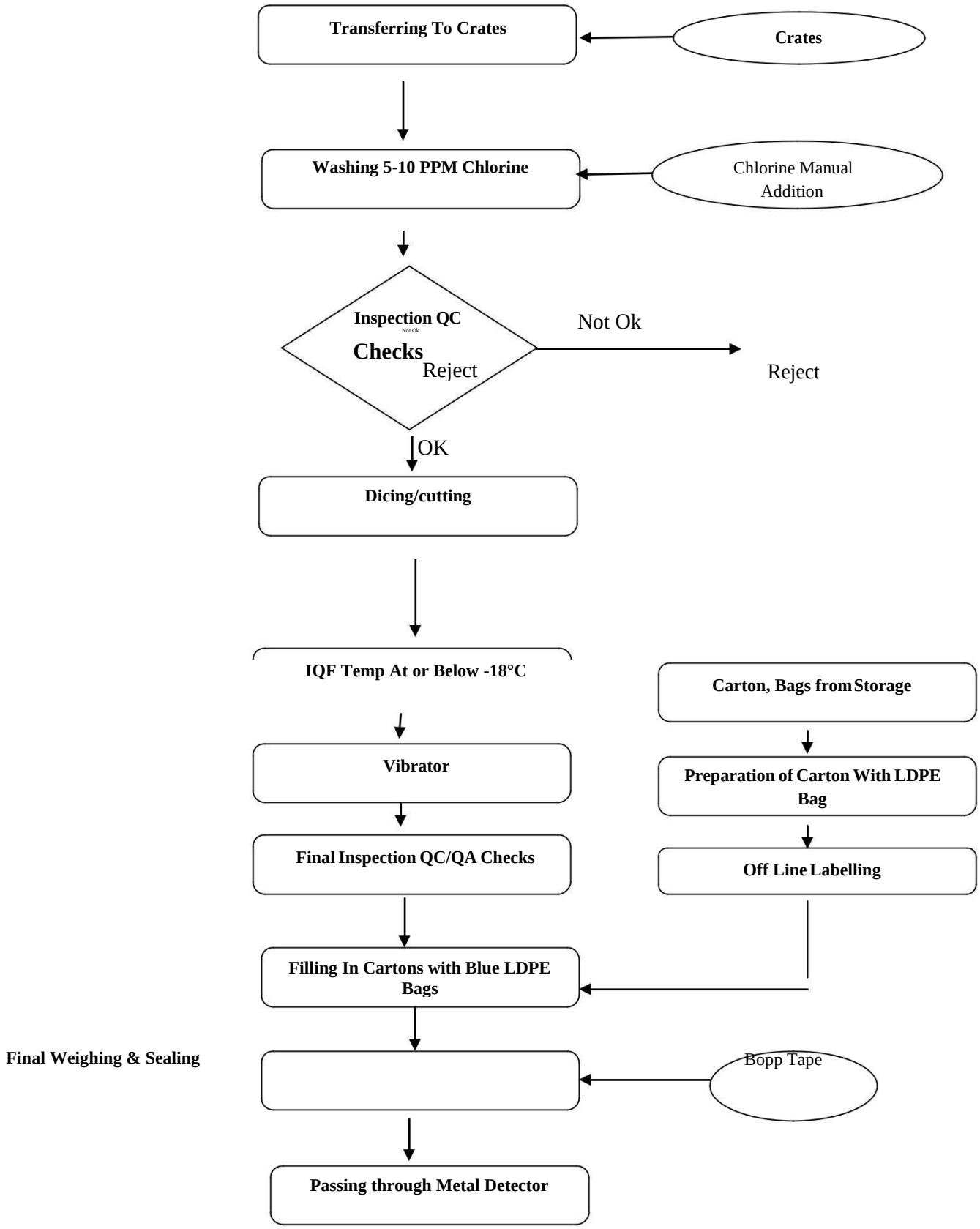
- For extension of shelf life of fresh agro commodities preserving their freshness and nutritional Values. The typical shelf life is around twelve month in a well-maintained post freezing cold chain.

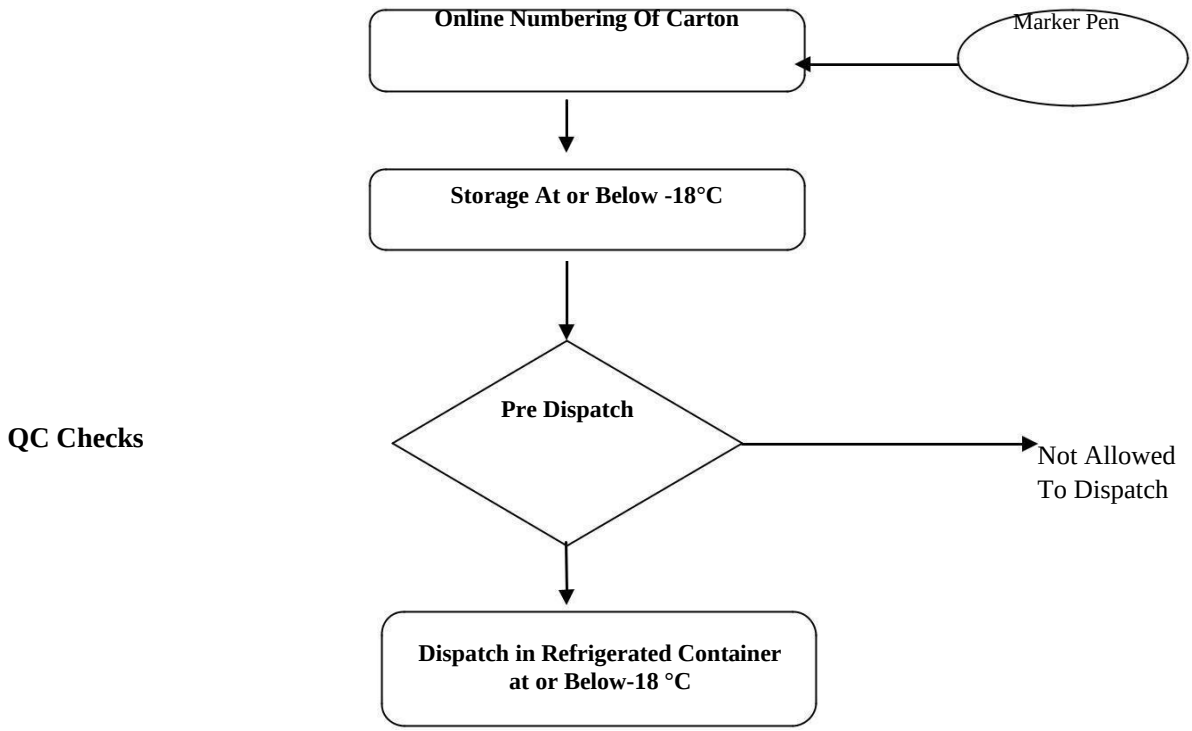
Process of IQF (Individual Quick Freezing) section:

Flow chart of fruits:




Ethylene Gas
Storage for Ripening
Good Ripened Fruits
Sorting and Grading
Not Ok
To Waste Channel
Inspection QC Checks
Not Ok
Reject- To Waste
Transfer to Production
Chlorine Washing 50-70 PPM
Weighing
Transfer to Cutting Tables Scooping/Cutting/Slicing
Ss Tables, Gloves, Scoops, Spoons Etc
Peeling of Skin
Knife
WASTE
Removal of kernels manually
Seed, Kernel to Waste
Inspection QC Checks
Not Ok Reject


Transferring To Crates
Crates
Washing 5-10 PPM Chlorine
Chlorine Manual Addition
Inspection QC
Not Ok
Checks
Reject
Not Ok
Reject
OK
Dicing/cutting
IQF Temp At or Below -18°C
Carton, Bags from Storage
Vibrator
Preparation of Carton With LDPE Bag
Final Inspection QC/QA Checks
Off Line Labelling
Filling In Cartons with Blue LDPE Bags
Final Weighing & Sealing
Bopp Tape
Passing through Metal Detector



Flow chart of IQF

TETRA PACK

PROCESSING & CO-PACKAGING:

Tetra pack:

Salient Features:

- One of the most hygienic Juice processing and packing line.
- Gives shelf life of six months in ambient temperature.
- Tetra Pak TBA 19 200ml Filler 7500PPH. Tetra Pak TBA 8 1000ml Filler 5500PPH. 1500 LPH Capacity Juice Line with Critical Components of Tetra Pak.
- Option to add additional Juice Line as space is available in existing building.

Operating Model:

- Leasing of Juice line to interested parties; Preference will be given to new entrepreneurs at any given time
- Lease would not be on a dedicated or exclusivity model to encourage new players in the market.
- Customers for Tetra pack facility would bring the packing material that is preordered from Tetra pack with their packing design, recipes and raw material (Pulp, Sugar, and any other additives) and pay per pack processing charges.

Plant and Machinery:

- Sugar Syrup preparation
- Pulp Dumping
- Blending section with recipe management
- De-aerator
- Homogenizer
- Sterilizer
- CIP equipment
- Tetra Pak filler

BEVERAGE PROCESSING (TETRA PAK)

Sugar → Syrup Raw ← water

↓

Activation ACP, Hyflo citric acid (as per specification)

↓

Filtration

↓

Simple syrup

↓

Addition of fruit pulp, pectin additives (as per specification)

↓

Final make up with water

↓

Beverage

↓

Homogenization

↓

Sterilizer

↓

Filling in tetra pack

↓

Straw application

↓

Casing

↓

Dispatch

Tetra Pak Process:

Syrup preparation:

Sugar syrup is prepared by mixing sugar with 40% of water. For example 50 sugar bags of each 50 kg required 1000L of water to be mixed. The capacity of the sugar dumping tank is 12000L. The water is pumped to sugar dumping tank through the jet mix pump, and steam is given to the water while passing to the tank to maintain the temperature of 85°C inside the tank.

The hyflo, carbon are added to the sugar water mixture at the rate of 10% of the sugar. The addition of hyflo makes the solution to be in liquid state, and the addition of carbon is to absorb the dust particles. Hyflo and carbon have to be in contact with the solution for about one hour.

The filter press which contains the filter papers is used to filter the solution. The hyflo water is passed through the filter papers to absorb the hyflo at a pressure of 300 bars. Then the sugar solution is passed through the filter press until clear sugar syrup solution is obtained. Then the solution is transferred to the blending tanks.

Pulp dumping:

The pulp is dumped in the tank as per the BOM (bill of manufacturing), the different pulps are used for different types of beverage preparation.

Pectin solution preparation:

This pectin acts as the stabilizer in the beverage preparation, where the pectin and hot water is used for the preparation.

Blending room:

There are 4 tanks (standardization tanks) and 1 small tank (ingredient tank) is used to mix malic acid, ascorbic acid and this tank is used for increasing acidity. 1 big tank is used to collect the mixed sugar syrup and remaining 3 tanks collect pulp. After the pectin preparation, there is addition of ready syrup and other ingredients

Standardization:

Standardization is a process where balancing the acidity, TSS (Total Soluble Solids), of the beverage.

De-aeration, Homogenizer room:

Plate 8.1 sterilizer

From blending room, the juice directly enters to a balance tank. For this tank upside 1 motor will be present which is used to mix the juice. After that, based on viscosity 2.1hp motor which is used for mango and litchi and 2.2hp motor which is used for pomegranate, guava to transfer the juice in to deaeration tank where air is removed and then enters in to homogenizer where 75-80°C is maintained.

Whereas for mango and litchi homogenizer pressure is 180bar and for pomegranate, guava homogenizer pressure is 160bar. Then the juice sent for preheating at 60°C.Then it passes to homogenizer and return to regeneration tank where 80°C is maintained and then for sterilizer. The process of homogenization is done in two stages in the first stage 2600-2800 psi and in the second stage 500 psi. This is to make the beverage in uniform in nature.

The process of sterilization of beverage is done by tubular heat exchanger, to kill the microbes present in it and make the product commercially sterile which is fit for human consumption.

In this, the product passes through the holding tubes where the temperature is 98°C then again to regeneration tank to step down heat at 75°C from 98°C then to cooling tubes (40-60°C). After the sterilization the product is transferred for filling. During sterilization, the beverage is in very hot condition so to make it to normal temperature these cooling coils are used. Finally filling is done at temperature of (20-35°C) this whole process covers 6600L/h but to filling 5500L/h and 10%back to homogenizer.

Plate 8.2 homogenizer

FILLING ROOM:

Plate 8.3 filling room

First of all the tetra pack sheet is attached with bobbin which passes inside the machine at first stage the tetra pack sheet is passed through Hydrogen Peroxide at 68°C (water to be heated to 80°C to get hydrogen peroxide to 68°C to get sterile i.e., free from bacteria then air blast will be done to evaporate the pack i.e., evaporation temperature about 126°C then strip will be attached to pack on SA side -60% and LS side 40% this stripping will be done at 270°C then comes to filling where indent and other ball liner present and due to high.

Cap/Straw applicator:

After the beverage is filled, in the tetra pack that is further sent to the capping or straw application this is automatically done by machine.
Then these are sent for casing, shrink -wrapping, after packing, they are kept for incubation for 5 days before taken for the dispatch.

Plate 8.2 cap applicator

CIP PROCESS

1) Caustic soda-lye dosing 1.5-2% to water. Filling CIP lye tank capacity 500ltr. For blending lye tank capacity 10,000ltr.
2) Nitric acid-acid tank -1 to 1.5% to water.
   - Filling CIP acid tank capacity -500ltr.
   - For blending acid tank capacity-10,000ltr.
3) For circulation of lye it should be 75°C and steam should be at 45°C to85°C.
4) For circulation of nitric acid it should be 80degc and steam should be at 45°C to 85°C.
5) For single line-10,500ltrs flow maintained.
   For double line -9000ltrs flow.

Step by step Process of CIP:

1) Lye
2) Acid
3) Acid +lye
4) Hot water
5) Normal water

Blending CIP Process:

There are 3 standardization tanks

1) First 10,000ltrs hot water will be sending for 300sec.
2) Lye 10,000ltrs will be sending for 20sec.
3) Acid 10,000ltrs will be sending for 20sec.

First water will send for 300sec then lye for 20sec then again water is flushed for 1200sec then lye recovery for 900sec then wash with water after that it should be drained.

If product is changed the above 5 steps process should be done.

TESTS FOR TETRA PAK

1) PREPARATION OF ERYTHROSIN DYE:

- Take 1.5grams of erythrosine bita sodium salt
- Mix with 1ltr of isopropyl alcohol
- Shake well and leave overnight
- Filter the solution with paper towel in to another container
- Then red ink is ready to use
- Red ink is to be stored in room temperature to reduce evaporation.

2) CONDUCTIVITY TEST METHOD:

- Cut the packet in 2halves and dry the inside portion
- Add 10grams of Nacl to 1ltr of deionised water
- Fill the tray with these solution
- Put these cut pack in tray
- Dip 1probe in tray and another 1probe in pack
- If it shows positive perform red ink test.

Plate 8.3 conductivity test

3) RED INK TEST:

- Clean the sample
- Apply red ink and leave for 5min and then remove excess ink with pipette
- When the ink has dried peel of the outer layer
- Visually inspect the package. If any ink has penetrated this is considered as defect.

Plate 8.4 Red ink test

4) TRANSVERSAL SEAL:

- Cut the pack at the transverse side
- Take stretch peeler and stretch the strip
- Then aluminum and plastic layer of the packaging material appears it is said to be good seal if not bad seal (blocked or cold seal).

5) LONGITUDINAL SIDE INK TEST:

- Open the air gap with a cut it makes inserting the needle easier.
- Insert the needle in the air gap and inject the red ink.
- Look for leakage, any leakage is to be considered a defect and acted on.

Plate 8.5 Longitudinal side ink test

LAYERS OF TETRA PAK:

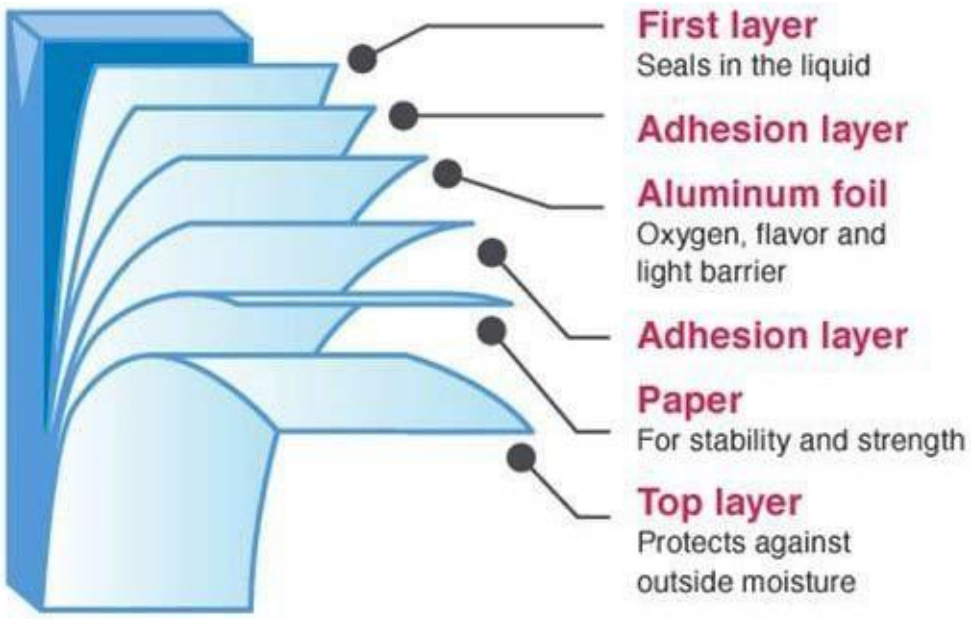


Plate 8.6 Layers of Tetra pack

PROXIMATE ANALYSIS AND QUALITY CONTROL

TESTING PROCEDURES FOR (IQF&ASEPTIC SECTIONS):

1. ESTIMATION OF TSS:

Principle:

Sugar concentration can be found by Refract meter. Light is refracted as it passes through sugar solution, with the specific values being calibrated in degrees, brix. It gives directly the percentage of sugar by weight in the syrup.

Procedure:

- Expose the Refract meter measuring surface by lifting the surface cover. Clean the surface by spraying it with distilled water, and wiping it dry with a delicate cloth.
- Open the lens cover and carefully place a drop of distilled water onto the measuring surface and close the cover plate.
- Press it gently to remove any trapped air bubbles underneath the cover.
- Then adjust the screw to make the light/dark boundary coincide the null line, by looking through the eyepiece while holding the Refract meter up to light source and wiping it dry.
- Carefully place a drop a sample being measured on the measuring surface.
- Read the contrast line (difference between the light and dark areas) crosses the scale. Record the brix value.

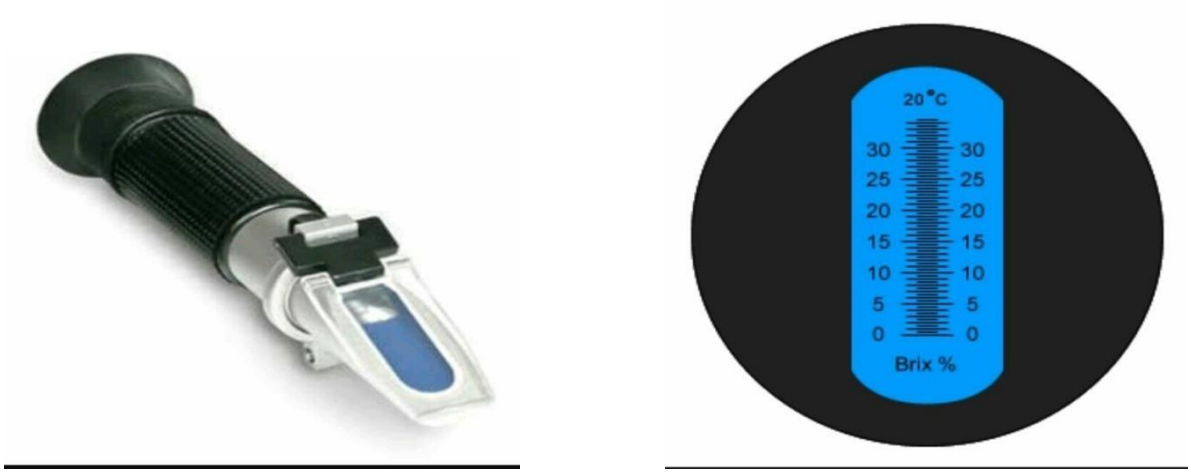


Plate 8.7 hand Refractometer

2. DETERMINATION OF ACIDITY:

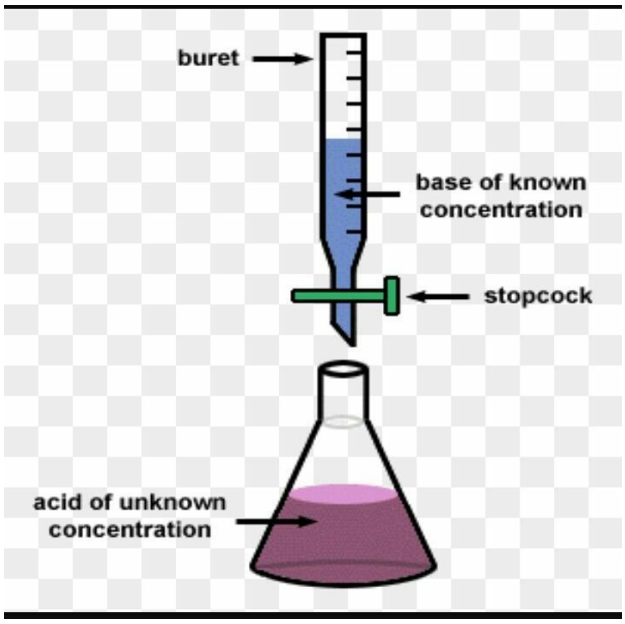


Plate 8.8 determination of acidity

Reagents:

0.1N Sodium Hydroxide solution, phenolphthalein indicator, distilled Water.

Procedure:

- Pipette out 5ml of Fruit pulp/concentrate in a conical flask and add required quantity of distilled water.
- Add 2 drops of Phenolphthalein Indicator to the sample in the conical flask.
- Shake well to get a uniform solution.
- Titrate the above mixture against 0.1 n Sodium Hydroxide solutions taken in the burette.
- Note down the burette reading when a pale pink colour is obtained.

- **Formulae:**

$$\text{Acidity} = \frac{\text{Burette reading (initial-final)} * 0.64}{\text{Weight of the sample}}$$

2. **ESTIMATION OF pH**:

Reagents:

Buffer solutions of pH 4.0 & 7.0

Procedure:

- Connect the electrodes to the pH meter.
- Dip the electrode in 7.0 pH buffer solution and set the temperature knob as per the temperature of the solution.
- Ensure that the function selected in pH mode.
- Observe the reading and set pH meter exactly at 7.0 PH.
- Wash the electrode thoroughly in distilled water and dip in 4.0 pH buffer solution and set instrument at 4.0 PH.
- Then again place the electrode in 7.0 pH buffer solution & verify for reading 7.0. Else adjust & replace in 4.0 pH buffer solution. Continue till it gives the desired readings at both buffer solutions.
- Wash the electrode and immerse in prepared sample and directly read pH Value.

Plate 8.9 PH meter

3. IDENTYFING SPECS IN THE MANGO PULP:

The pulp after preheating then sent through decanter to remove any black specs in the product, which will ensure high quality with NIL black specs. We have to find the specs presented in the pulp regularly. So that the specs that are brown specs should not be more than 5-10 and black specs should be zero. If it is, more the DECANTER should be washed with water.

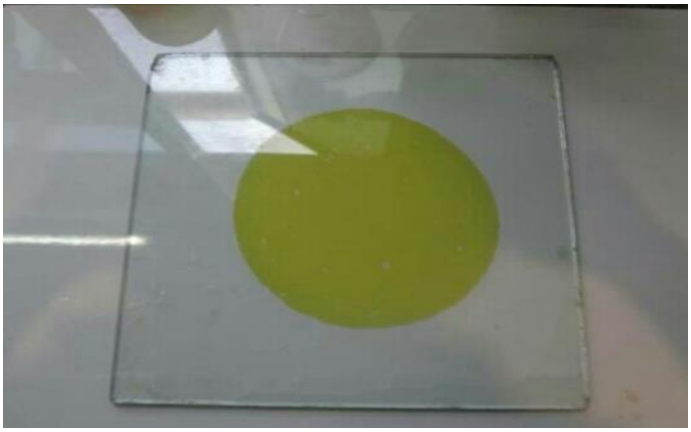
AIM: To find the specs in the mango pulp.

INSTRUMENTS:

- White tile (40*30 cm size)
- glass plate (30*30 cm)
- Weighing machine.

PROCEDURE:

- Take a white tile and clean it thoroughly with tissue paper so that there should not be any moisture present on the tile.
- Weigh 10 grams of mango pulp.
- Take the pulp on the white tile.
- Press the pulp with glass plate on the tile.
- Now absorb and count the specs in the mango pulp.
- If there are more specs allow the decanter for washing.



4. TESTING THE CONSISTENCY OF MANGO PULP:

The consistency is tested with BOSTWICK CONSISTENCY MACHINE. It is used to find the thickness of the pulp. It is discovered by E.P.BOSTWICK. (U.S department of AG in 1938). The use of this instrument is based on theory test. The length of flow is proportional to consistency. Its units are cm/30 sec. Firstly, BOSTWICK CONSISTENCY MACHINE is placed on a leveled place and check whether the machine is in leveled position or not with a leveler.

- Clean the machine with tissue paper so that the moisture, which is presented, is fully cleaned.
- Close the valve gate with valve pin.
- Fill the pulp in the BOSTWICK.
- Set the timer.
- Press the pin and start the timer.
- Absorb movement of the pulp in 30sec.
- Note the reading on the BOSTWICK scale by this procedure consistency will be checked**.**

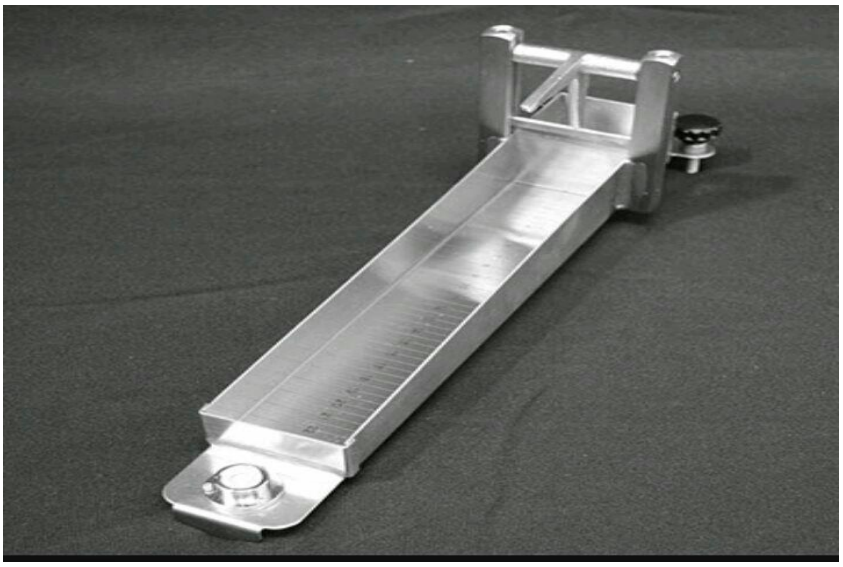


Plate 8.10 consistometer

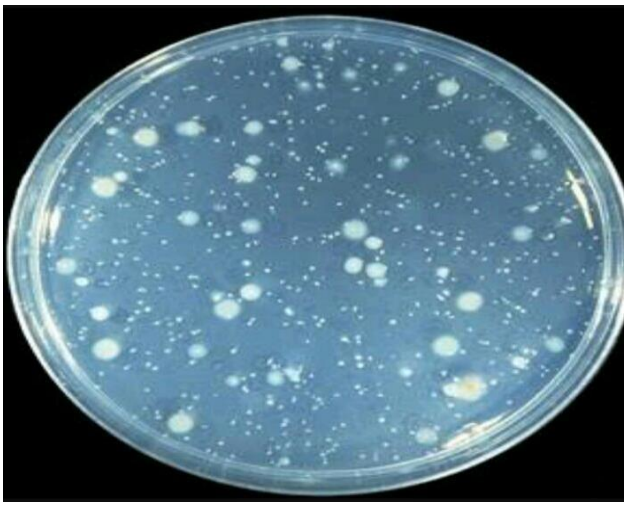
MICROBIOLOGICAL ANALYSIS

MICROBIOLOGICAL TESTS

AIM: To establish a uniform method for microbiological analysis
Scope: this work instruction applies to QC & QA process

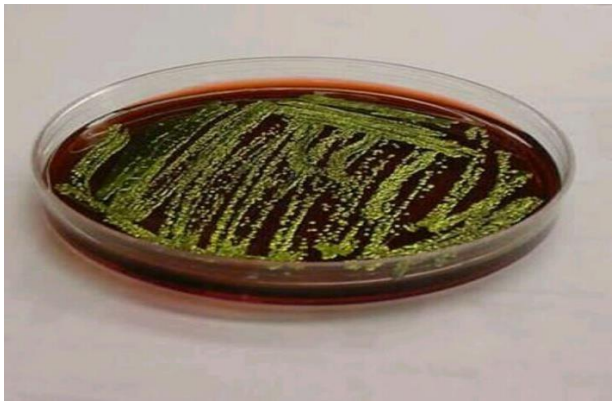
Total bacterial count

Materials required: sterile petri dishes, plate count agar/ nutrient agar (culture medias), sterile pipettes, sterile dilution solution, 70% Ethanol etc.



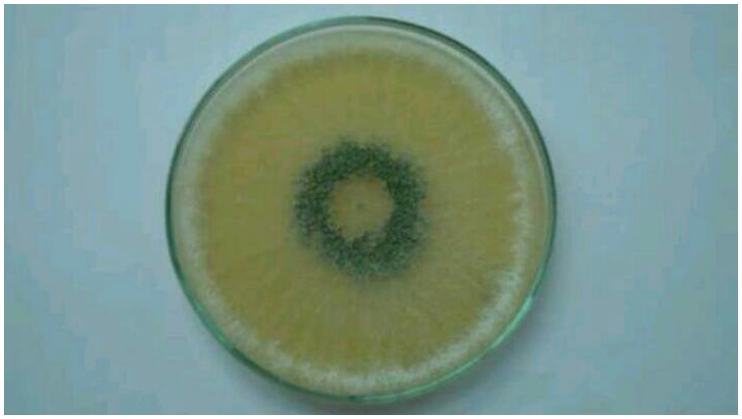
Coli forms count (pour plate method)

Materials required: sterile Petri dishes, eosin methylene agar (culture media), sterile, pipettes, sterile dilute solutions, 70% Ethanol etc.



Yeast and mould count

Materials required: sterile Petri dishes, potato dextrose agar/ malt extract agar (culture medias), sterile pipettes, sterile dilution solutions, 1% tartaric acid, 70% Ethanol etc.



GOOD MANUFACTURING PRACTICES (GMP):

Terms and definitions:

(As per section 201 of US Federal, Food, Drug, and Cosmetics act.)

Plant: -

Means the building, facility, or parts are therefore used in connection with the manufacturing, packaging, labeling or holding of human food.

Food: -

Means food as defined in section 201 (F) of the act and included edible raw material and ingredients.

Acid Food or Acidified Food:

Means that have an equilibrium pH of 4.6 or below.

Adequate:

That which is needed to accomplishes the intended purpose in keep with public good health practice.

Shall:
Is used to state mandatory requirement.

Should:
Is used to state recommended or advisory procedures or identify recommended equipments.

Sanitize:
Means to adequately treat food contact surfaces by a process that is effective in destroying vegetative cells of microorganism of public health significance and substantially reducing numbers of undesired microorganism but without adversely affecting the product or its safety for the consumers.

Rework:
Means clean, un adulterated food that has been removed from processing for reasons other than in sanitary conditions or that has been successfully re-conditions by re-processing and that is suitable as food.

Quality Control:
Means a planned and systematic procedure for taking all actions necessary to prevent food being adulterated within the meaning of the act.

Pest:
Refers to any objectionable animal or insect including but not limited to birds, rodents, flies and larvae.

Microorganisms:
Means yeast, molds, bacteria and virus and include but not limited to species having public significances. The term public health significances, that subject the food is contaminated with filth or that otherwise may cause food to be adulterated within the meaning of the act. Occasionally in this regulation, FDA used the objective "Microbial" instead of using an adjectival phase containing the word microorganism.

CLEANING IN PLACE (CIP)

The machines should be cleaned frequently but they cannot be taken out for cleaning, as they are heavy machines. This, cleaning can be cleaned by CIP (cleaning in place) process.

For CIP process, CAUSTIC SODA is used. By using caustic soda there is no harm for the machine and pulp, which is prepared. (1.5-2.0percentage) caustic soda is used.

Firstly caustic soda is mixed with water up to the level. Estimate the caustic soda (5-10ppm) in CIP process. When reached the level then CIP process is carried out.2 times rinsing process is carried out with caustic soda. Then rinsing is done with hot water then rinsing process is done with normal water.

ESTIMATION OF CAUSTIC SODA IN CIP SOLUTION:

Take 1ml of sample solution

↓

Add two drops of phenolphthalein solution

↓

Titrate with 0.1N HCL

↓

Pink colour changes to colorless

CALCULATION: $\frac{\text{Burette reading * Normality of HCL * 4}}{\text{Weight of sample}}$

After the process is over, we have to check the machinery that weather the caustic soda is fully released or not. For that take 10ml of water after finished rinsing with normal water and add 2 drops of phenolphthalein solution. If it turns to pink colour, it mentions that caustic soda is not fully released. Then again rinsing with normal water should be done. If water does not change to pink colour after adding phenolphthalein then caustic soda is fully released. By this, the CIP process is completed.

Conclusion

The training period in Srini Food Park had given me an opportunity to involve in various aspects in the organization. The in-plant training has helped me to know more about the practical knowledge than theoretical knowledge that i learnt in my college, it also helped me a lot to analyze different raw materials, and semi finished products and finished products with fine quality by using different tests.

This really helped me to understand various quality methods used in food industry. Along with this, it also helped me to know the different processing methods that are used in the production with highly modernized equipments.

It also inspired me a lot to learn different things in a different manner and to see things in a multi dimensions. Along with the other things it has also helped me to learn the importance of a simple, systematic, punctual and a well planned in achieving success in any aspect of life.