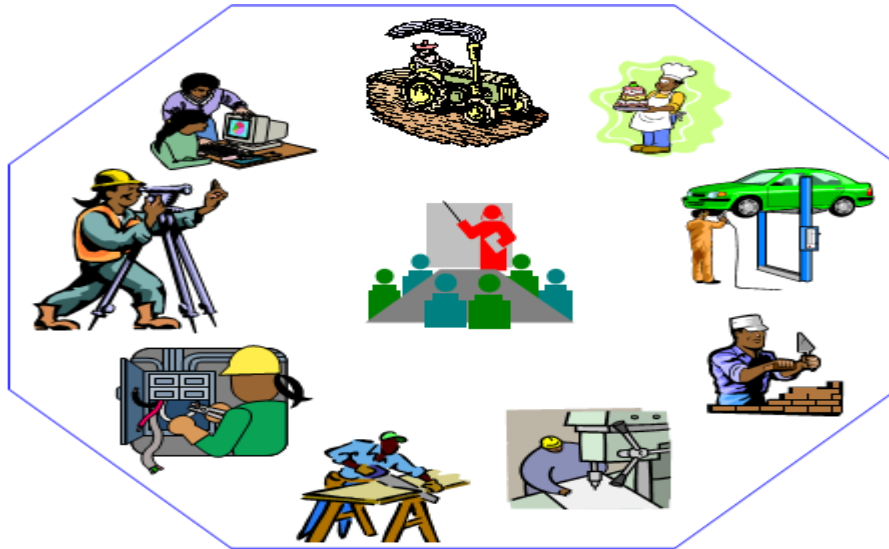




Fruit and Vegetable Processing

Level-III

Based on October 2019, Version 2 OS and March.2021, V1 Curriculum



Module Title: Monitoring Aroma recovery process

LG Code: IND FVP3 M15 LO (1-3) LG(40-42)

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Table of content

LO #1 Confirm aroma recovery operation	4
Instruction sheet 1	4
Information Sheet 1- Checking materials and available to meet production/recipe requirements.....	6
Self-check 1	8
Information Sheet 2: Establishing Hygiene and sanitation standards	9
Self-Check – 2.....	14
Information Sheet 3- Checking available services	15
Self-Check – 3.....	16
Requirements Information Sheet 4- Setting inspected operation parameter ..	17
Self-Check – 4.....	20
Information Sheet 5- Setting aroma recovery to meet production requirements...	21
Self-check 5	28
LO 2 Monitor Aroma Recovery process.....	29
Instruction sheet 2	29
Information Sheet 1- Starting up aroma recovery process.....	31
Self-check 1	34
Information Sheet 2- Monitoring and keeping control point.....	35
Self-Check – 2.....	37
Information Sheet 3- Monitoring aroma and checking evaporation level and unit interception	38
Self-check 1	42
Information Sheet 4- Identifying, rectifying and reporting out-of-specification.....	43
Self-Check – 4.....	46
LO #3- Shut down the process.....	47
Instruction sheet 3	47
Information Sheet1 - Shutting down the process	49
Self-Check – 1.....	51
Information Sheet 2 - Recording <i>Workplace information</i>	53
Self-Check – 2.....	55
Reference Materials	56



Page 3 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1 March 2021
--------------	---	--	--------------------------



LG #41

LO #1 Confirm aroma recovery operation

Instruction sheet

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

- Checking materials and available to meet production/recipe requirements.
- Establishing Hygiene and sanitation standards
- .checking available Services
- Setting inspected operation parameter.
- Setting aroma recovery to meet production requirements

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

- Check materials and available to meet production/recipe requirements.
- Establi Hygiene and sanitation standards
- .check available Services
- Set inspected operation parameter.
- Set aroma recovery to meet production requirements

Learning Instructions:



1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
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7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
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Page 5 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Information Sheet 1- Checking materials and available to meet production/recipe requirements

Introduction

The machine is to be installed and is to be set according to the task condition its performance is checked and every materials available and adjusted according to the production requirement.

Material needed like:

- Aroma column / Filled absorber
- pasteurizer
- Aroma catcher
- Plate exchangers -
- Aroma pumps -
- Vacuum pump
- Cooling device
- Control system
- Set of pipes for fumes
- Tanker
- Evaporator
- Hydraulic press

Tanker is one of the material which is used on process and storage of final product

Page 6 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Fig 1.storage tank

Hydraulic press used for the extraction of juice on process line which is checking before starting of process operation.



Fig 2.hydraulic press in the separation process of aroma of fruit



Self-check 1	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I Short Answer for the following question

- 1. List material needed during aroma recovery?(10 pts)

Test II Write true if the statement is correct and false if statement is incorrect

1.The machine is to be installed and is to be set according to the task condition its performance is checked and every materials available and adjusted according to the production requirement.(2 pts)

Note: Satisfactory rating -12 points Unsatisfactory – below 12points

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

Page 8 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Information Sheet 2: Establishing Hygiene and sanitation standards

2.1 Hygiene and sanitation

Sanitation -cleaning and sanitizing—in its proper perspective: **Sanitation** maintains or restores a state of cleanliness and promotes hygiene for prevention of foodborne illness. It is an essential prerequisite program for food safety program.

Cleaning and disinfection, together known as sanitation, is undertaken to remove all undesirable material (food residues, microorganisms, foreign bodies and cleaning chemicals) from surfaces, to a level such that residues remaining are of minimal risk to the safety or quality of the product.

Sanitation is the major day to day control of the 'surface' factor of the environmental routes of food product contamination. When undertaken correctly, sanitation programmes are cost effective, easy to manage and can reduce the risk of microbial or foreign body contamination. This will become increasingly pertinent in the future given the intrinsic demand for higher standards of hygiene in the production of short shelf-life chilled foods, together with pressure from customers, consumers and legislation for ever increasing hygiene standards. Sanitation demands, therefore, the same degree of attention as any other key process in the manufacture of safe and wholesome food products.

Hygiene is the practice of keeping surrounding clean, specially in order to prevent illness or spread of diseases

Maintaining a clean work environment is critical in preventing foodborne illness. Bacteria can grow on unsanitary surfaces and then contaminate food. Just because a work surface looks clean does not mean that it is sanitary.

Page 9 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Foodborne illness cases can be attributed to poor sanitation and food hygiene, including poor personal hygiene and contamination of equipment and/or environments.

The following general prerogatives of the guidelines are laid out:

Identify the essential principles of food hygiene applicable throughout the food chain (including primary production through to the final consumer), to achieve the goal of ensuring that food is safe and suitable for human consumption

Recommend a HACCP-based approach as a means to enhance food safety

Indicate how to implement those principles

Provide guidance for specific codes which may be needed for – sectors of the food chain; processes; or commodities; to amplify the hygiene requirements specific to those areas

When designing a food hygiene and sanitation program, a total supply chain approach is crucial. The major areas to cover are:

- Equipment
- Environment
- Air
- Water

This is why good food hygiene programs need to be responsive to the dynamics of the plant environment and emerging risks – the same proactive approach used when developing HACCP.

According to the Codex Alimentarius Commission, food hygiene should cover all of these elements throughout the supply chain (all GFSI-benchmarked standards have similar requirements for housekeeping and food hygiene, with details laid out in their respective guidance documents):

- Primary Production (environmental hygiene, hygienic production, handling storage & transport, cleaning, maintenance and personnel hygiene)

Page 10 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



- Establishment – design and facilities (location, premises and rooms, equipment, facilities)
- Control of operation (food hazards, hygiene control systems, incoming materials, packaging, water, management & supervision, documentation & records, recall procedures)
- Establishment – maintenance and sanitation (maintenance & cleaning, cleaning programmes, pest control systems, waste management, monitoring effectiveness)
- Establishment – personal hygiene (health status, illness and injuries, personal cleanliness, personal behaviour, visitors)

Cleaning and food hygiene procedures for the building, plant and equipment should be validated using visual, analytical or microbiological methods – and records should be maintained. For instance, swab samples can be taken from various places on equipment, floors, walls or drains, to test for the presence of contamination.

Then, after applying a sanitation step, samples can be taken again and compared with the original results to ensure that the step is effective at reducing harmful microbes to safe levels. For certain high-risk materials (e.g. allergens, ruminant protein or ready-to-eat products), validation of procedures is mandated, with individual governments designating acceptable methods for cleaning of high-risk materials.

A comprehensive food hygiene and sanitation program leaves nothing to chance.

Responsibility should be designated for each parameter:

- Frequency of cleaning
- Method (chemicals used, concentrations, materials – including colour-coded/segregated tools to prevent cross contamination of high-risk materials)
- Verification records to ensure that procedures are being carried out consistently and effectively.
- Acceptable limits for CCPs must also be scientifically-established and maintained with regular monitoring

Page 11 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



- Training and communication throughout the organization, with clear leadership from management on food hygiene and sanitation

As with other areas of food safety, sanitation and food hygiene should be proactive. End-product testing is important, but a positive result in the end-product doesn't tell you

where the contamination originated. The overall food hygiene system, when applied at each point in the supply chain, is about managing risks before they result in a case of food contamination. Using common sense and food science based approaches, a well-designed food hygiene program can provide for proactive responses and risk-mitigation from farm to fork

All equipment must be routinely cleaned and inspected. Older equipment may have nooks and crannies where dirt and bacteria can hide, which can be difficult to clean effectively. Proper cleaning procedures must be established and followed at all times with regular review to ensure that procedures are working. If equipment is replaced or cleaning materials change, the process may have to be adjusted. If you notice any safety concerns with the equipment while cleaning it, such as a frayed cord, missing

2.1.1 Importance of Personal Hygiene

guard or loose parts, let your supervisor know immediately.

- To handle food safely
- Prevent bad breath
- To maintain environment and workplace as good manner
- To prevent the spread of germs and food born illness

It is imperative for safe food-handling outcomes for all workers to be familiar with standard sanitation and hygiene practices. Stablishing sanitation and hygiene principle

Page 12 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



is . One of the basic principles to break the cycle by avoiding cross-contamination, which can be achieved by ensuring personal hygiene practices

Page 13 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Self-Check – 2	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short answer for the following question

1. What is sanitation?(2pts)
2. Write the importance of personal hygiene?(4pts)

Test II: Write true if the statement is correct and false if the statement is incorrect

1. Maintaining a clean work environment is critical in preventing foodborne illness.(2pts)
2. **Sanitation** maintains or restores a state of cleanliness and promotes hygiene for prevention of foodborne illness.(2pts)

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

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

Score = _____
Rating: _____



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

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

Test I: Short Answer Questions

- 1 .what does mean service?(2 pts)
- 2 .list service availability in operation?(2 pts)

Test II:choose the best answer

1.which of the following sevices is used in food processing industry?

A.water B.power C. compressed air D. Vacuum E.ALL

Page 16 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Requirements Information Sheet 4- Setting inspected operation parameter

4.1 Setting inspected operation

Inspected parameters are set according to operational requirements .

During fruit and vegetable juice concentration many components of aroma lost due to their high volatility in aqueous solution. These compounds are rather important for the sensorial quality of juice and must be recovered and added back to the concentrated juice. Despite their importance the compounds are present at very low concentration in juice and recovered by using techniques :such as

- ✓ Distillation
- ✓ Partial condensation
- ✓ Membrane separation
- ✓ Fermentation
- ✓ Pervaporation
- ✓ Pasteurization

Pasteurization is the process of heat treatment which are between 60 and 100 degree centigrade to destroy target micro organisms and enzymes

Distillation is the process of separating the component or substances from a liquid mixture by using selective boiling and condensation.

Page 17 of 60	Federal TVET Agency Author/Copyright	TVET program title Fruit and vegetable Level III	Version -1
			March 2021

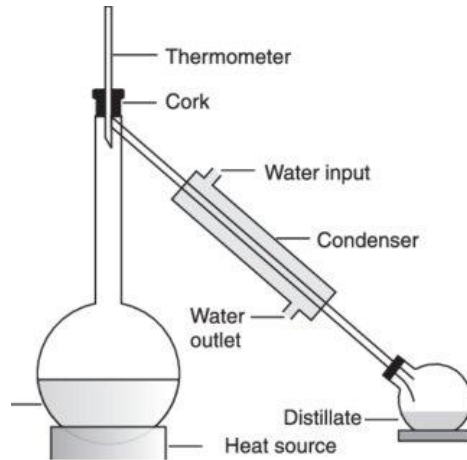


Fig 3. process of distillation

Therefore the pervaporation process may be able to substitute distillation methods because it meets the needs of lower energy consumption and high efficiency

Pervaporation is inherently available for separation of volatile organic compounds from even very dilute mixtures with high performance. The pervaporative separation is highly selective towards aroma compounds and can operate under mild conditions. Several studies investigated the aroma compounds recovery present in different fruit juices and reported high separation factors at low temperatures for multi-component mixtures by commercial pervaporation membrane. Ganophylic pervaporation is particularly suitable for the recovery of volatile compounds from their dilute solution.

As the process temperature and the feed concentration increased, the flux increased, but separation factor values of binary aqueous solutions of the aroma components propyl acetate, pentyl acetate, and octyl acetate decreased. Pervaporative.

Recovery of volatile aroma compounds juice was influenced by various operating parameters such as feed flow rate, feed temperature, and permeate pressure on flux and selectivity. Feed flow rate had no significant effect on performance of process but feed temperature and permeate pressure variations affected the flux and selectivity of



aroma compounds. Increasing in feed temperature led to higher flux and enrichment factor. As permeate pressure increased, the flux and enrichment factor of some aroma compounds decreased. Some of the aroma compounds showed higher enrichment factor at higher permeate pressures.

1.2 Operational parameters

Operational parameters which are practiced in each operation like:

- ✓ Temperature
- ✓ Feed rate
- ✓ Pressure
- ✓ selectivity

The application has found a great interest in the food industry since it is known that the quality of fruit juices and alcoholic drinks can deteriorate during the production process.

The compounds relevant for these products quality and aroma are alcohols, hydrocarbons, esters and aldehydes. which are all volatile compounds that are present in low concentrations.

By employing pervaporation for their extraction and concentration, heat damage to these compounds does not occur, additional solvent are not necessary for the separation and there is only a minimum loss of aroma compounds

These parameters are infeed according to operation requiment.

Page 19 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Self-Check – 4	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

- 1. List the operational parameter which are practiced during aroma recovery? (4pts)

- 2 .list the operational techniques of aroma recovery process?(6 pts)

Test II:Write true if the statement is correct and false if the statement is incorrect

- 1. During fruit and vegetable juice concentration many components of aroma losts due to their high volatility in aqueous solution.(2pts)

Note: Satisfactory rating - 12 points Unsatisfactory - below 12 points

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

Score = _____
Rating: _____





Information Sheet 5- Setting aroma recovery to meet production requirements

5.1. Nature of aroma compound

Aroma is one of the most appreciated fruit characteristics, volatile flavor compounds are likely to play a key role in determining the perception and acceptability of products by consumers. Identification of key volatile flavor metabolites that carry the unique character of the natural fruit is essential, as it provides the principal sensory identity and characteristic flavor of the fruit .

Aroma is a complex mixture of a large number of volatile compounds, whose composition is specific to species and often to the variety of fruit . Although different fruits often share many aromatic characteristics, each fruit has a distinctive aroma that depends upon the combination of volatiles, the concentration and the perception threshold of individual volatile compounds . The most important aroma compounds include amino acid-derived compounds, lipid-derived compounds, phenolic derivatives, and mono- and sesquiterpenes. Although fruit aroma is generally a complex mixture of a wide range of compounds, volatile esters often represent the major contribution in apple and peach

Aroma of fruit and vegetable is the key factor assessing their quality as well as identity. Aroma profiles of different fruit juices usually cover a mixture of a large number of volatile organic compounds.

The individual aroma of any fruit components differs according to their molecular structure, which defines the solubility, the boiling point, and the volatility of each type of compound.

Page 21 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Aroma components are present in different concentrations and combinations, where the concentrations of individual aroma substances in common fruit juices usually range from less than 1 to 20 ppm.

Aroma recovery processes are used widely in food processing. The main reason to apply such a technology, is to preserve aroma for the final product, while other

operations are carried out in processing. The most important example of this is evaporation. During an evaporation process, water is taken out from the main stream product by heating the product to boiling point. When water changes from a liquid state to a gas state, it will also take along any aromas that have lower boiling points. As such, when an aromatic product is evaporated, most of the good aromas, which have low boiling points, are taken out of the process. In order to avoid that, aroma is recovered before the evaporation stage and stored for further processing

aroma compounds, which are secondary metabolites of the plant metabolism, are distributed between the pulp and skin of the grape berry, with the highest concentration in the grape skin. characterised the aromas of table grapes, and they found that in 20 grape cultivars, a total of 67 volatile compounds, 61 in the mesocarp and 64 in the skin and the total contents of volatiles of mesocarp and skin largely depended on the levels of esters and terpenes, respectively

In most of the processes the aroma is added back to the concentrated product stream in order to make the concentrate taste and smell like the original.

Page 22 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021

Skins

- Geraniol
- Linalool
- Terpineol
- Nerolidol
- β -damascenone
- β -ionone
- S-3-(hexan-1-ol-L-cysteine



- **Mesocarp**
- Malate
- Tartrate
- Glucose
- Fructose

Fig 5. volatile components of berry fruit

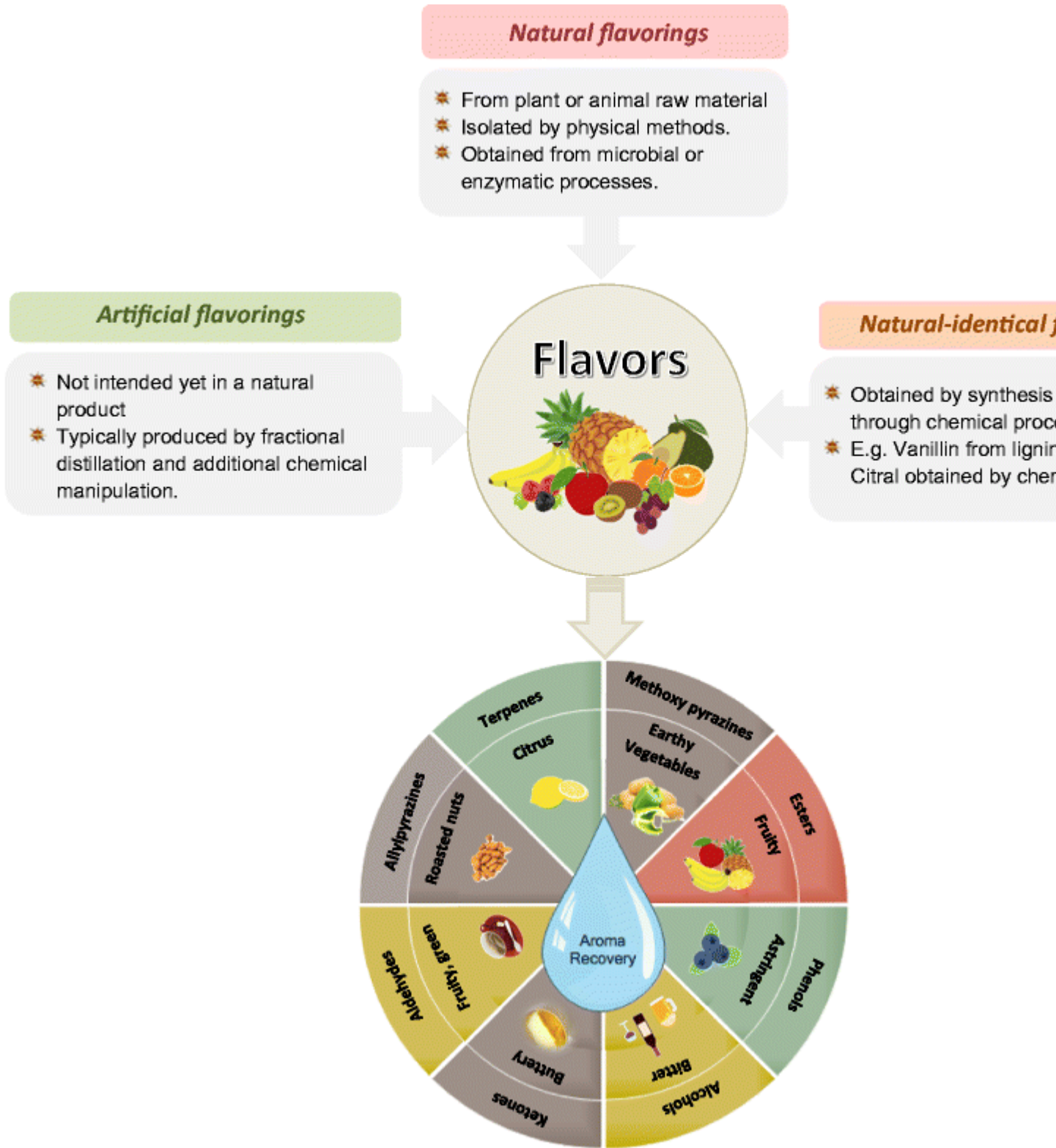


Fig .volatile component of berry fruit

Page 24 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1 March 2021
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A good aroma recovery system fulfils two criteria:

- Effective and simple separation of aromas from the main stream product.
- Valorisation of aromas by separating the aroma in usable portions.

several techniques that are simple and effective. Depending on customer requirement we separate aromas into several accurate portions. The most important part of an effective operation is that the process is repeatable over time. But equally important is flexibility in operation. Not every process requires the same process parameters. Our technology allows to separate very volatile aromas as well.

5.1.2 Setting aroma recovery to meet production requirements

A good aroma recovery system provides a quality final concentrated product. As aroma recovery will dilute the final product again, it is important that the concentration method used is in line with this operation. Our evaporation techniques allow for much higher concentrations as standard concentration technologies. When aroma is added back to the concentrate an ideal concentration will exist for either shipment or drying.

The technologies that can be applied for aroma recovery in food industry according to former investigations are stripping or distillation, which can be performed as membrane vacuum distillation or centrifugal distillation, pervaporation supercritical extraction and adsorption. Among these available techniques, stripping and distillation are widely applied for aroma recovery in processing alcoholic beverages and juices.

Page 25 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



The aroma recovery (flavor extraction) station combines various pieces of components in order to collect the fruit aroma which vaporized during the production of concentrates at the evaporation station. The device is embedded in the existing pipeline system. It consists of a bell column, in which the initial condensation of the aroma vapors takes place, and the aroma station where the aroma is condensed to an appropriate concentration level, and then cooled down. Cooling performs in two stages; the first section of the cooling process is performed using the cooling water and the second stage is carried out using the refrigeration unit.

Page 26 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Fig 5. Aroma recovery station



Self-check 3	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I Short Answer Questions

- 1. What is aroma?(2 pts)
- 2. Write the main reason to apply aroma recovery process.?(2 pts)

Test II Write true if the statement is correct and false if statement is incorrect

- 1. Aroma recovery processes are used widely in food processing?.(2 pts)

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

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

Page 28 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



LG #41

LO 2 Monitor Aroma Recovery process

Instruction sheet 2

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

- Starting up aroma recovery process
- Monitoring and keeping control point
- Monitoring aroma and checking evaporation level and unit interception
- Identifying, rectifying and reporting out-of-specification

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

- Start up aroma recovery process
- Monitor and keep control point
- Monitor aroma and checking evaporation level and unit interception
- Identify, rectifying and reporting out-of-specification



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Page 30 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Information Sheet 1- Starting up aroma recovery process

1.1 Starting up aroma recovery process

The recovery of volatile aroma components is practiced in processing of fruit juice ,alcoholic beverage other liquid food stream is usually connected with evaporation .It is mainly performed by stripping or distillation process based on volatility difference .Among the available techniques for flavor recovery in food industry ,distillation ,pervaporation,supercritical fluid extraction,and selective recovery of flavor components from food stream. These techniques can be combined In different stages of the process or applied as an alternative to the other techinqus for aroma recovery .

1.1.2 Aroma recovery through distillation

The principle of the classical distillation system is stripping the aqueous food stream containing the most volatile compounds and concentrate them by fractional distillation. Distillation is process of transforming fluid in its vaporized state from one level to another .in its meaning essentially some liquids are easier to evaporate than other because the components are volatile.

Distillation process

Page 31 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021

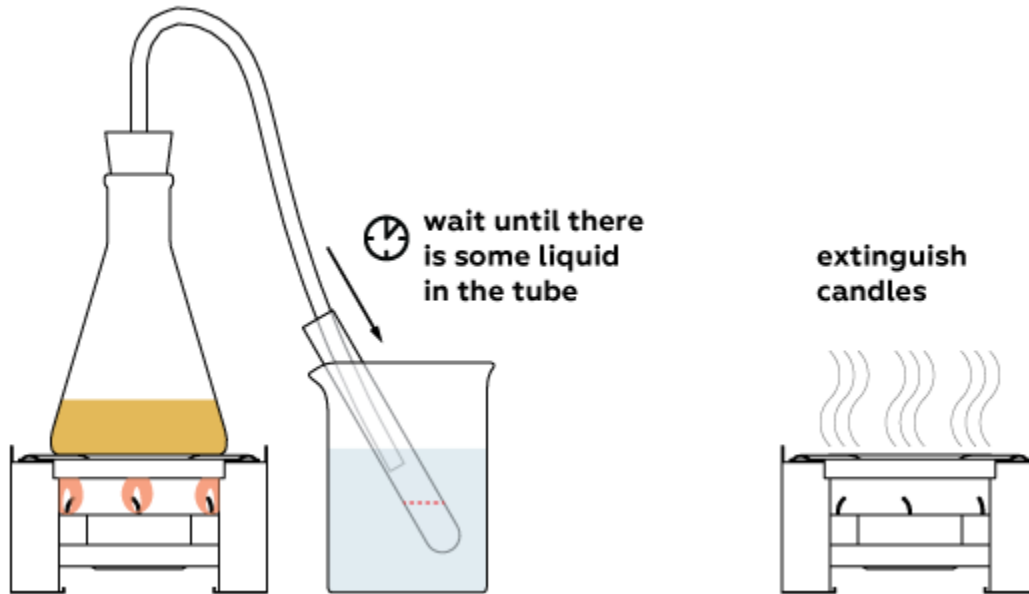


Fig 6 . simple sketch of distillation process.

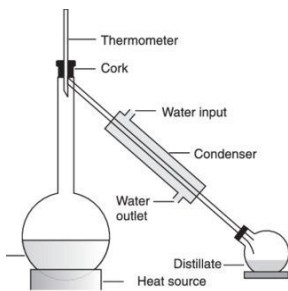


Fig.7

Fig. separation process of aroma of fruit through distillation



Material needed :

- Condenser
- Conical flask
- Thermometer
- Heat source
- Bekear

procedures :

To do the separation process the following instruction must be applied

1. Make sure that the flask has half full sample of juice
2. place the thermometer on it
3. apply the heat source
4. connect the condenser to the distillate flask
5. collect the distilate and compare to the original one

Page 33 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Self-check 1	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I Short Answer Questions

1. List materials needed during separation of aroma through distillation. (2 pts)

Test II Write true if the statement is correct and false if statement is incorrect

1. The recovery of volatile aroma components is practiced in processing of fruit juice, alcoholic beverage other liquid food stream is usually connected with evaporation (2 pts)

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

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

Page 34 of 60	Federal TVET Agency Author/Copyright	TVET program title Fruit and vegetable Level III	Version -1
			March 2021



Information Sheet 2- Monitoring and keeping control point

2.1. monitoring

Monitoring is a process of inspecting over all production line and how process operation are being implemented.

The process of monitoring is not only the responsibility of individual ,but also duty of all who act on each operation.

The monitoring of aroma recovery process needs the controller who have an excellent performance to analys the product by sensorial evaluation.

The panel person must be skill ful and ability to inspect all operation.

panel person involved in monitoring operation of aroma of fruit needs to have received training in the safe and correct way.

The quality manager should ensure and manage products met according to contro point and standards

Many of these people will learn the necessary skills inprocessing area so the management and supervisory team need to actively engage in organizing and providing training.In addition to allocating tasks to suitably skilled and experienced workers, achievement of targets and monitoring of operations to processing requires that the correct method to each task.

1.1.2 keeping control point

Acontrol point is work which is aimed at checking of the compliance of the results of ascertain work in abusiness process with formulated requirement to its results. In case of non coniformity afeed –back is arranged and the result should be corrected.

Keeping a control point during monitoring process esure products quality according to the requirement.when the pramaneter of the operation set out of control the final product loses aroma and its nutritional value all,

Page 35 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



When monitoring the correct control point in process is combining temperature time combination should be applicable .

High temperature for short time and low temperature for long time is best control point to maintain volatile components in juice through pasteurization.

The combination parameter is different based on the natural character of fruit.

Page 36 of 60	Federal TVET Agency Author/Copyright	TVET program title Fruit and vegetable Level III	Version -1
			March 2021



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

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

Test I: Short Answer Questions

- 1 .What is monitoring?(2 pts)
- 2 .what is control point?(2 pts)

Test II:Write true if the statement is correct and false if the statement is incorrect

- 1. The monitoring of aroma recovery process needs the controller who have an excellent performance to analys the product by sensorial evaluation?(2 pts)
- 2. High temperature for short time and low temperature for long time is best control point to maintain volatile components juice through pasteurization?(2 pts)

Note: Satisfactory rating - 9 points Unsatisfactory - below 9 points

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

Score = _____
Rating: _____



Information Sheet 3- Monitoring aroma and checking evaporation level and unit interception

1.1 Monitoring aroma and checking evaporation level and unit interception

The effect of thermal treatments on the quality and aroma of water juice was evaluated. juice was pasteurized via ultrahigh temperature (UHT, pasteurized at 135°C for 2 s), low temperature long time (LTLT, pasteurized at 60°C for 30 min), and high temperature short time (HTST, pasteurized at 100°C for 5 min), respectively. UHT and LTLT reduced the total flora count and maintained the color and the aroma of the pasteurized juice,. Consequently, the aroma of the LTLT was similar to that of unpasteurized juice., the LTLT was the best way to maintain the quality and aroma of the juice.

Evaporation is the conversion of a liquid to its vapor below the boiling temperature of the liquid.

Evaporation is used to pre-concentrate food, to increase the solid content of food, to change the colour of food and to reduce the water content of a liquid product almost completely.

The typical evaporator is made up of three functional sections: the heat exchanger, the evaporating section, where the liquid boils and evaporates, and the separator in which the vapour leaves the liquid and passes off to the condenser or to other equipment.

In many evaporators, all three sections are contained in a single vertical cylinder. Steam, vapour or exhaust gases from other drying operations, are usually used as the heating medium.

Evaporation processes involve heating the juice under conditions which promote oxidation of compounds in the juice. This can cause the aroma and flavour compounds to be chemically altered .For instance, lipids can be oxidized and the amino acids and sugars can undergo browning reaction. Such degradation products can cause off-flavours in the orange juice concentrates.

Page 38 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



1.1.3 Purpose and principles of evaporation

Evaporation is the process by which water changes from liquid to gas or vapor.

It is the exceed the rate of condensation.

Boiling point is the temperature at which the vapour pressure of a liquid equals the pressure of surrounding the liquid and the liquid changes into a vapor. The boiling point of aliquid varies depending upon the surrounding environmental pressure.

primary path way that water move from the liquid state back into the water cycle as atmospheric water. In this time energy is used to to break the bonds that hold water molecules together which is water easily evaporates at the boiling point 100 °C, but evaporates much more slowly at the freezing point. Net evaporation occurs when the rate of evaporation

Purpose evaporation:

- To reduce wateractivity and lengthen shelf life
- To reduce packaging , transportation, and storage cost (reduction in bulkiness)
- To improve the stability and handling of the product
- It may be used as an economical preparatory step for subsequent dehydration, as in the cases of spray drying. Drum drying, vacuum drying, freeze-dried. Crystallization, and mixing
- Pre-concentration reduces cost of energy for subsequent processes
- Making the product free ,by killing spoiladge micro organisms

Recovery of volatile flavor-active aroma compounds which are key components of processed liquid food streams is of utmost concern to food industry, as these compounds contribute to the quality of the final product. recovery of the key flavor components which all aim for minimizing the loss of volatile aromas and (re-) using them in process streams, in order to enhance the flavor profile of the liquid food product.

Among the available techniques for flavor recovery in food industry, distillation or stripping, pervaporation, supercritical fluid extraction, and adsorption showed potential for selective recovery of the flavor components from liquid food streams.

Page 39 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1 March 2021
---------------	---	--	--------------------------



These techniques can be combined in different stages of the process or applied as an alternative to the other techniques for aroma recovery

Recovery of the volatile aroma components is practiced in processing of fruit juices, alcoholic beverages, and other liquid food streams and is usually connected with evaporation . It is mainly performed by stripping or distillation processes (based on differences in components' relative volatility) and also other alternatives like pervaporation (using vapor and liquid phase and a membrane), supercritical fluid extraction (using liquid/ solid and a supercritical fluid), and adsorption (using solid as auxiliary phase and liquid).represents the available technologies for aroma recovery in liquid food processing. An overview of current research advances in each technology is provided in the next sections.

Aroma Recovery Through Distillation

The principle of the classical distillation system is stripping the aqueous food stream containing the most volatile compounds and concentrate them by fractional distillation.

Pervaporation Membrane Separation Technique

Pervaporation is an attractive technology for processing thermal sensitive aroma compounds. This membrane process is based on a selective transport of a liquid mixture through a selective ceramic or polymeric membrane).

This technique can be an alternative to conventional separation processes such as steam distillation, liquid solvent extraction, and vacuum distillation and has been successfully applied during the last years, for recovery of aroma compounds from fruits and fruit juices and subsequent addition to the same juice after concentration by evaporation.

Page 40 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



High temperature evaporation is the most widely used industrial techniques for aroma recovery, and concentration of juice, but membrane distillation may provide for gentle aroma stripping and lower energy consumption.

Page 41 of 60	Federal TVET Agency Author/Copyright	TVET program title Fruit and vegetable Level III	Version -1
			March 2021



Self-check 1	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I Short Answer Questions

- 3. Define evaporation?(2pts)

- 4. Write purpose of evaporation?(5 pts)

Test II Write true if the statement is correct and false if statement is incorrect

- 1. Boiling point is the temperature at which the vapour pressure of a liquid equals the pressure of surrounding the liquid and the liquid changes into a vapor. (2pts)

- 2. Pervaporation is an attractive technology for processing thermal sensitive aroma compound?(2pts)

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

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

Score = _____
Rating: _____



Information Sheet 4- Identifying, rectifying and reporting out-of-specification

1.1 Identifying, rectifying and reporting out-of-specification

Out of specification, is defined as in coming goods, in process or finished product testing, which falling out of specified limits

The frequent occurrence of (out of specification), results indicates that the manufacturing and analytical procedures not in control.

The consequences of out of specification may result in market complaints, and rejection of commercial batches, which is an inventory loss for any processing industry.

When the limits are not in specified, limits are called out of specifications. When out of specifications has occurred, the quality controller should report the result to the manager and make a decision or hold the product separately.

All out-of-specification products must be clearly identified, rectified, and reported to prevent unauthorized release. Identifying, rectifying and reporting of out-of-specification adhere to the following guidelines for control of non-conforming product.

Specific individuals should be responsible for decisions pertinent to nonconformance, release, rework, or destruction of product.

When the recovery monitoring process shows defect on the final product ,the product should be Clearly labeled and isolated “on hold” products.and tagged on yellow color card .

Products should only be released after necessary controls are made and specification limits are achieved.

If non-conformance does not affect the use or safety of the product, then corrective action completes the response.

If non-conformance affects the safety of the product,recall is initiated with management approval.

Page 43 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Until the recall is completed, products from the same lot cannot be shipped and must be quarantined.

Determine the corrective action required to eliminate non-conformance of future product, i.e., through re-work or other means. Upon completion, re-check the quality of the product to ensure the elimination of the non-conformance and seek approval for shipment.

Document any destruction/disposal of non-conforming product.

Where customer-branded products not meeting specifications are sold to staff or passed on to charities, this shall be with the prior consent of the brand owner, and shall be fit for consumption, meeting the legal requirements

When a quality defect is found and documented, the technician assumes the third role of quality control, which is to report the defect.

This function usually contains four parts:

- Notification to others of the defect;
- Follow-up to make sure the defect does not occur again;
Documenting how the problem was fixed; and
- Changing the processing specification as needed.

The panel person should be properly washed and disinfected thoroughly before handling products at different stages of operation. Out of specification such as unpleasant aroma, happens the stakeholder should monitor and report every situation to responsible person.

Panelist is person who check product quality through sense organ.

take corrective action in response to out-of specification results or non-compliance

Monitor the process and equipment operation to identify out-of-specification results or noncompliance. This can involve monitoring:

- temperatures
- vacuum
- motor amperage
- condensate flow
- steam flow and pressure
- throughput
- time/speed
- evaporated product characteristics

Page 44 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Causes of Out of specification

- Lab equipment malfunctioning
- Test analysis error in quality lab
- Production equipment malfunctioning
- Human errors in manufacturing
- Power fluctuation
- Unmature of raw materials
- Over ripen and under ripening
- Mishandling condition

Page 45 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



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

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

Write true if the statement is correct and false if the statement is incorrect

- .1. Out of specification, is defined as in coming goods, in process or finished product testing, which falling out of specified limits.(2pts)
- 2.. The panal person should be properly washed and disinfected thoroughly before handling products at different stages of operation (2pts)

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

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

Score = _____
Rating: _____



LG #42

LO #3- Shut down the process

Instruction sheet 3

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

- Shutting down the process
- Recording *Workplace information*

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

- Shut down the process
- Record *Workplace information*

Learning Instrucions

Page 47 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



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

Page 48 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Information Sheet1 - Shutting down the process

1.1 Shutting down the Process

The point of a shutdown is to create a plan for a complete cessation of all plant activities in order to perform necessary maintenance, repairs, equipment replacements, and to perform internal maintenance. The shut-down procedure is just as important as the start-up procedure for both an extruder and an injection molding machine.

Shut down is the act of closing equipment/machine or stopping of equipment/a machine. Refer to your standard operating procedures for the correct way to operate each type of processing unit in your workplace.

The standard operating procedures for each type of equipment must be adhered to when shutting a processing down.

The types of shutdowns used in a plant unit are:

- Scheduled shutdown
- Maintenance shutdown
- Emergency shutdown

1.1 Scheduled shutdown

A scheduled shutdown is programized types of shutdown when, the operation maintenance is required. The shutdown procedure will depend on the type of equipment and the process to be done. Some steps taken in a unit/process shutdown include:

- Shutting off the feeds to stop processes and heat generation particularly if processes are produce heat
- Shutting off heating or cooling to the unit/ processing operation
- Shutting off the process operations
- Removing or flushing waste materials from the processing workplace

1.1.1. Maintenance shutdown

Page 49 of 60	Federal TVET Agency Author/Copyright	TVET program title Fruit and vegetable Level III	Version -1
			March 2021



When maintenances happens in evaporation , clarification and ultra filtration tank . it should be maintained , the equipment may need to be entered so that work can take place.The shutdown should be a scheduled or planned shutdown as per standard operating procedures where equipment is:

- Isolated (process, mechanical and electrical)
- Cooled and depressurized
- Cleaned
- Electric tested on a continuous basis prior to and during entry.
- A planned unit/plant shutdown prevent:
 - ✓ plugging of lines or equipment
 - ✓ possible damage to equipment
 - ✓ Possible injury.

1.1.2. Emergency shutdown

An emergency shutdown is initiated in the event of a fire, instrument failure, power failure, unexpected hazard or total loss of the processes.Emergency shutdown procedures must be followed during a shutdown sequence.Where a shutdown will affect upstream or downstream process units, advanced warning must be given to the appropriate personnel to allow them to prepare for, and react to, the changing conditions.

Page 50 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



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

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

Test I short answer

1. List the three type of shutdowns used in equipment or machine?(3)

Test II Write true if the statement is correct and false if the statement is incorrect

1. The shutdown procedure will depend on the type of equipment and the process to be done.(2pts)
2. Shout is the act of closing equipment/machine. (2pts)
3. An emergency shutdown is initiated in the event of a fire, instrument failure, power failure, unexpected hazard or total loss of the processes. (2pts)

Note: Satisfactory rating - 9 points Unsatisfactory - below 9 points

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

Score = _____
Rating: _____



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

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

Test I short answer

2. List the three type of shutdowns used in equipment or machine?(3)

Test II Write true if the statement is correct and false if the statement is incorrect

4. The shutdown procedure will depend on the type of equipment and the process to be done.(2pts)
5. Shout is the act of closing equipment/machine. (2pts)
6. An emergency shutdown is initiated in the event of a fire, instrument failure, power failure, unexpected hazard or total loss of the processes. (2pts)

Note: Satisfactory rating - 9 points Unsatisfactory - below 9 points

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

Score = _____
Rating: _____



Information Sheet 2 - Recording *Workplace information*

1.1 Recording *Workplace information*

Work is conducted according workplace information , guidelines ,policies and procedures.

Workplace information is different from place to place.

Accurate records are essential for monitoring the performance of each production line and it requires accurate data.

Operational/ workplacerecords about products and practices can be helpful to ensure consistency of over all production from raw material recieption to end-product quality and safety.with out proper record,it can be difficult iff not imposible,to effectively monitor performance and productivity levels

Alack of such important imformation can hinder both the growth of the business and the development of the individual employee,so everyone benefits from up to date records

The purpose recording is to provide reliable evidence of and information about who,what,when ,and why something happened.in some cases the requirement to keep certain records is clearly defined by law ,regulation or professional practice.

Record keeping is amatter of policy and good b usiness practice ,developed over time and built into work process .it refers to records of past transaction in order to perform subsequent action Produce evidence of Contractual obligation.

1.1.3 work place information.sources

Each workplace relies on the exchange of information to act its daily business information is passed from employees to employees ,supervisor to team member supplier to customer and so ,on dealing ifficiency with information and record is necessary and important for all organization .the quantity and the variety of information

Page 53 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



kept by an organization can be huge. Information to be sorted into related groups so that it can be stored easily and found when needed .

An organization success depends largely on how well it manages its information

Finding and using information is alarge part of many jobs ,so knowing how to deal with it which an important workplace skill ,being confident and efficient in this skill the organization succeeded..

The sources of workplace information that performed in an organization include:

- Standard of operating procedures(sop)
- Manufacturer's instruction
- Occupational health and safety record
- Equipment maintenance recordsproduction data sheet
- Staff records
- Packaging labels
- Specifications,
- production schedules and batch/recipe instructions

Page 54 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



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

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

Test I short answer

1. Lists sources of workplace infoermtion?(5)

Test II Write true if the statement is correct and false if the statement is incorrect

1. Work is conducted according workplace information , guidelines ,policies and procedures. . (2pts)
2. The purpose recording is to provide reliable evidence of and information about who,what,when ,and why something happened.(2pts)

Test III choose the best answer from the following alternative

1. Wich of the following is sources of work place information ?

*A.Standard operating procedures B.production data sheet C.manufacturers instruction
D.All of the above*

Note: Satisfactory rating - 9 points Unsatisfactory - below 9 points

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

Score = _____
Rating: _____

Page 55 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1 March 2021
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Page 56 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



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Page 59 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021



Page 60 of 60	Federal TVET Agency Author/Copyright	TVET program titleFruit and vegetable Level III	Version -1
			March 2021