Confectionary processing
Level-II

Based on May 2019, Version 2 Occupational standards

Module Title: - Operating a Chocolate Tempering Process

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Contents

LG #50	LO #1- Prepare the tempering equipment and process for operation

Instruction sheet

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

- Confirming and made available chocolate for tempering
- Identifying and confirming Cleaning and maintenance requirements and status
- Entering processing/operating parameters to meet safety
- Checking and adjusting equipment performance

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Confirm and made available chocolate for tempering
- Identify and confirm Cleaning and maintenance requirements and status
- Enter processing/operating parameters to meet safety
- Check and adjust equipment performance

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheet
6. Do the “LAP test

Information Sheet 1- Confirming and made available Chocolate for tempering

1.1 Confirming and made available Chocolate for tempering

Tempering process refers to a controlled melting and cooling of chocolate in order to achieve at the end the correct crystalline structure of the constituent cocoa butter.

Tempering Chocolate: Basic Tempering Principles

Testing Temper Manual Method to check if chocolate is in good temper, dip a metal spatula or knife blade into chocolate and leave a small film on the blade.

If the chocolate is firm and not tacky after five minutes at normal room temperature (68° F), it is in good temper. If it is still tacky, place the chocolate chunks back in the bowl and cool about 2° F. Repeat test until tempered.

Using a Temper meter the degree of tempering, indicating the quality of stable crystals that have been formed, can be measured by means of a temper meter. A temper meter produces a temper curve that is a temperature-versus-time curve resulting from uniform cooling of the chocolate sample over a specified period of time. The slope of the temper curve provides a quantitative means of interpreting the amount of heat of crystallization (latent heat) produced during the cooling of the test sample. A negative slope indicates over-tempered chocolate and a positive slope indicates under-tempered chocolate.

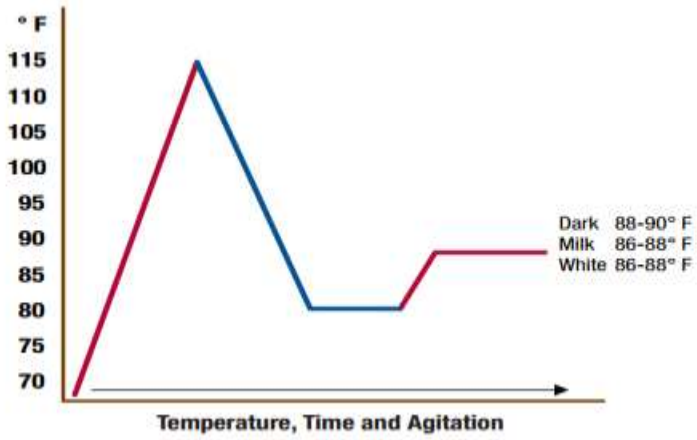

Fig1 Graph of showing Positive and negative

Properly tempered chocolate will have the following characteristics:

- Shiny/glossy surface
- Even color
- Good snap
- Smooth texture
- Good contraction
- No bloom

Fig2 tempered chocolate

Improperly tempered chocolate will have the following characteristics:

- Dull finish
- Fat bloom
- Soft uneven texture
- Poor contraction
- Poor snap

Fig3 Untemper chocolate

Self-check 1	Written test

Name…… ID…… Date…….

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

1. Which of following is one basic tempering principle? (5pts)

A. Testing Temper Manual Method to check if chocolate is in good temper, dip a metal spatula or knife blade into chocolate and leave a small film on the blade.

B. If the chocolate is firm and not tacky after five minutes at normal room temperature (68° F), it is in good temper.

C. If it is still tacky, place the chocolate chunks back in the bowl and cool about 2° F.

D. All

2. Which of following characteristics true improperly tempered chocolate? (5pts)

A) Dull finish

B) Fat bloom

C) Soft uneven texture

D) Poor contraction

E) All

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

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

Information Sheet 2- Identifying and confirming cleaning and maintenance

2.1 Identifying and confirming cleaning and maintenance

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

- ❖ Reasons for Cleaning, includes the following:

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

- ❖ **Cleaning methods**

a) Dry cleaning

Dry cleaning methods are used for products that are smaller, have greater mechanical strength and possess lower moisture content.

b) Wet Cleaning

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

2.1.1 Cleaning Stages of chocolate tempering machine

Step1 Disassemble the Injection Device Loosen up the set screw circled on the photo. Push up the injection device to remove it.

Fig1 Remove injection Device

Step 2 Disassemble the Screws for the rotating plate loosen up the set screw for the rotating plate circled on the photo. Remove the fixing piece

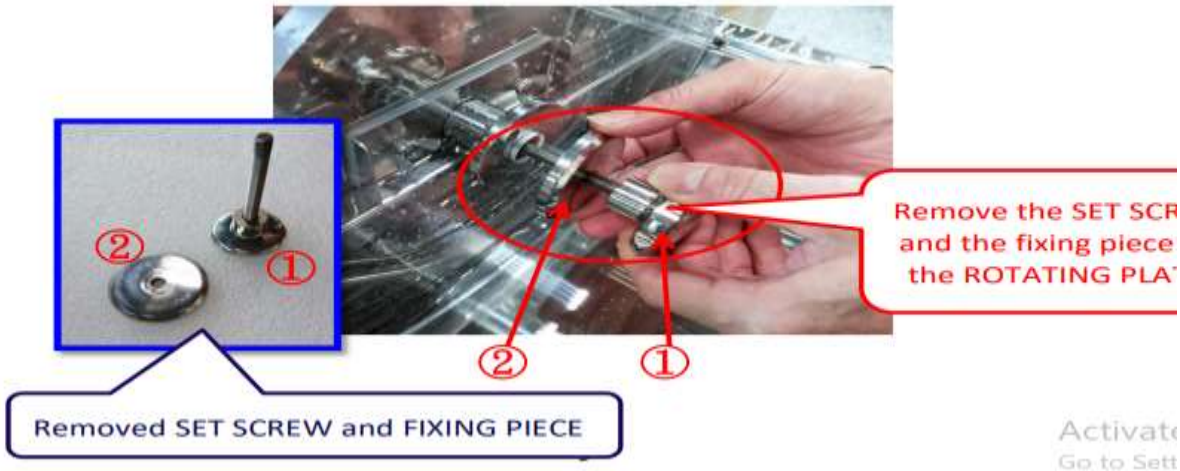

Fig2 Remove Set Screw

Step 3 Disassemble the axis for the rotating plate pull out the axis with a parallel direction.

Fig3 Remove Axis

Step 4 the Temperature Sensing Rod (Sensor) Loosen up the screws on the fixing stand of temperature sensing rod, pull out the temperature sensing rod and wipe it clean. Stick it on the side.

Fig4 Remove Axis

Step 5 Wash the whole sink directly under a water tape. *The disassembled parts can be washed at the same time while disassembling the parts, or wash all the parts altogether after finishing the demolition.

Fig5 Wash the whole parts

2.1. Maintenance

Maintenance is an actions performed to keep some machine or system functioning or in service.

2.1.2 Maintenance

- **Identify maintenance tasks to be undertaken**

In any property large or small, there will be a variety of maintenance tasks to be completed either daily, periodically or as required. Good maintenance of any property is vital if the property is to remain viable and safe. Maintenance of any property involves the upkeep of the exterior, interior, fixtures, fittings and furniture as well as plant and equipment. Maintenance may be carried out by on site qualified technicians or by a variety of contractors, or a combination of both. There is a huge cost in maintaining any building.

- **Types of maintenance**

Maintenance tasks are endless and must be classified as:

1. **Urgent**

Urgent maintenance is defined as a task that must be attended to immediately. If not attended to as a matter of urgency a small problem may become a larger problem.

- For example, a tap that is allowed to drip will then start to run and may lead to a room or area being flooded. Urgent issues are ones that can cause more damage or may present later as a hazard
- If a fridge that is storing a large amount of frozen meat breaks down, for example, it must be fixed urgently otherwise the meat will have to be disposed of at a huge cost to the hotel
- For example, if there is a hole in the carpet and somebody trips and falls, that person may make a financial claim against the hotel for personal injury and medical costs.

A hazard is something that has the ability to cause harm, injury or even death to somebody.

2. **Preventative**

Preventative maintenance should be ongoing and included in everyday operations. Preventative maintenance is designed to prevent breakdowns and complaints and is vital in maintaining the investment.

This would include the following examples.

- Cleaning of air conditioning filters and exhausts fans
- Oiling machinery
- Tightening of screws
- Oiling locks and door hinges **Fig Preventive Maintenance**
- Regular servicing of all machinery. This includes items such as cleaning equipment, washing machines and photocopying machines
- Regular servicing of boilers and gas fittings
- Checking gutters and down pipes for leakages, blockages and rust
- Checking roofs for loose or missing tiles Checking drains to make sure they are not blocked by inefficient cleaning practices or tree roots
- Regular checking and maintenance of all fire-fighting equipment
- Regular serving of all elevators.

3. Planned

Planned maintenance is maintenance that is carried out during quiet periods, overnight or when areas are closed. It is planned in advance and all relevant staff is notified.

It may include items such as:

- Replacement of carpets
- Replacement of beds or furniture
- Re-upholstery of chairs
- Window cleaning
- Re-grouting of bathroom tiles
- Carpet cleaning Stripping and sealing of large floor areas.
- Dry cleaning of curtains
- Resurfacing of baths Painting
- Wall papering Cleaning of high areas
- Cleaning of grease traps (kitchens)
- Special project cleaning.

Fig Planned Maintenance

4. Maintenance personnel

Depending on the size of the property there may be in-house staff, contractors or a combination of both.

Every property needs the services of qualified:

- Electricians
- Plumbers and Gasfitters
- Carpenters
- Painters and Decorators
- Mechanical engineers
- Air conditioning and Heating specialists
- Water treatment technicians
- Upholsterers Carpet layers
- General hands (to change light globes and attend to minor repairs).

Fig Maintenance Personnel

2.1.1 Maintenance Procedures

Step 1 Reassemble the Butter-Cream Sink Tilt the clean butter-cream sink to install it back on the machine.

Fig6 Install it back on the machine.

Step 2 Fix up the Tempering equipment with screws Tighten up the butter-cream sink with the 4 screws.

Fig7 screws tighten up

Step 3 Reassemble the Rotating Plate Reassemble the rotating plate aiming at the locating rod.

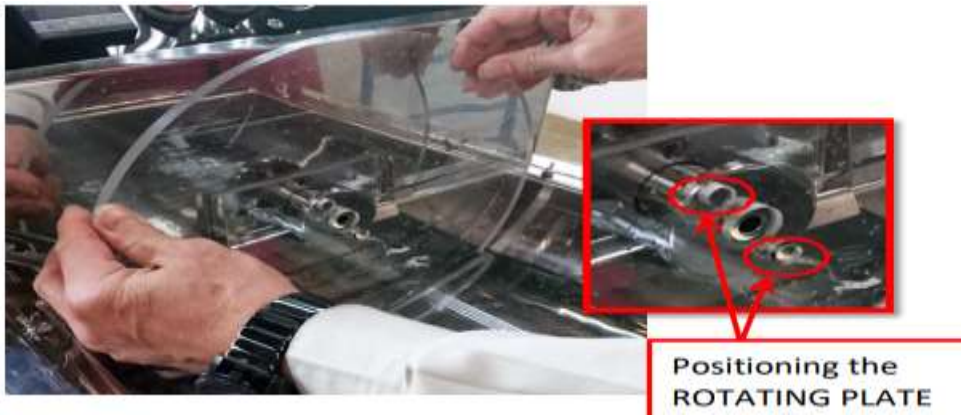

Fig8 Rotating Plate

Step 4 Reassemble the Injection Device Loosen up the set screws circled on the photos and then move up the injection device to remove it.

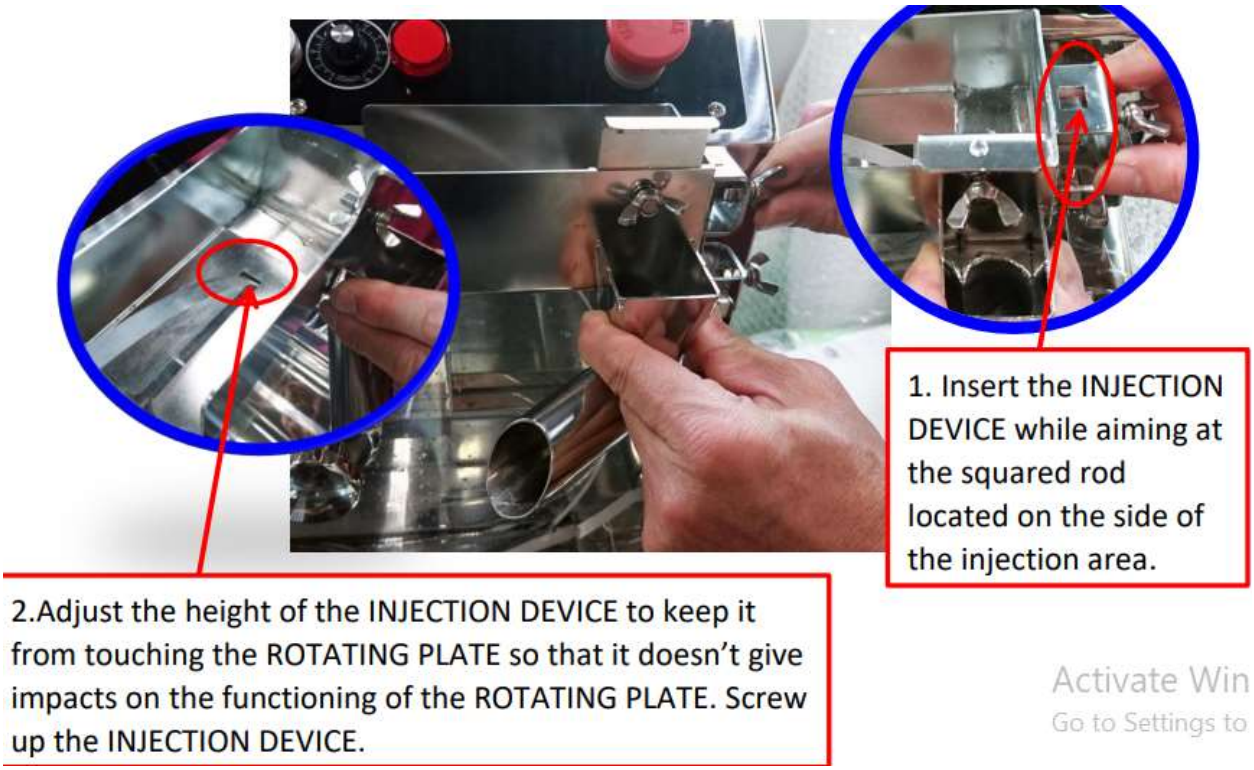

Fig9 Adjust Injection

- Continue the Tempering Operation After reassembling the parts; the machine can be served to temper another lot of butter cream**.**

Self-Check – 2	Written test

Name…… ID…… Date…….

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

Test I: Choose the best answer

1. Which of the following is one of maintenance procedures?

A. Disassemble the Injection Device Loosen up the set screw circled
B. Disassemble the Screws for the rotating plate loosen up the set screw for the rotating plate circled
C. Disassemble the axis for the rotating plate pull out the axis with a parallel direction.
D. All

2. Which of the following is one types of maintenance?

A. Urgent
B. Preventative
C. Planned
D. Maintenance personnel
E. All

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

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

Information Sheet 3- Entering processing/operating parameters to meet safety

3.1 Entering processing/operating parameters to meet safety

The three critical parameters that affect the type, size, and number of cocoa butter crystals being formed during chocolate tempering are: temperature, time, and agitation.

a) **Temperature:** critical because cocoa butter crystals both form and melt at specific temperatures.
b) **Time:** necessary for cocoa butter crystals to form and grow.
c) **Agitation**: needed to ensure the cocoa butter crystals are well distributed within the melted chocolate and to prevent their premature growth.

❖ There are four different forms cocoa butter crystals assume and each has a unique melting point, set of characteristics, and stability point.

1. **Gamma** – exists in this form for only a few seconds before transforming into Alpha
2. **Alpha** – melts between 50-75° F (not stable)
3. **Beta I** – melts between 60-83° F (not stable)
4. **Beta** – melts between 64-94° F (stable)

It is important to provide conditions that grow “good” fat crystals and minimize “bad” fat crystals

Fig Large melters

Self-Check –3	**Written test**

Name…… ID…… Date…….

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

Test I: Choose the best Answer

1. Which of the following parameters in chocolate tempering? (5pts)

A) Temperature
B) Time
C) Agitation
D) All

2. Which of the following included in forms of cocoa butter crystals? (5pts)

A) Gamma
B) Alpha
C) Beta I
D) Beta

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

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

Information Sheet 4- Checking and adjusting equipment performance

4.1 Checking and adjusting equipment performance

❖ **Equipment performance**

Over all Equipment Effectiveness (OEE) is defined as a measure of total equipment performance. That is, the degree to which the equipment is doing what it is supposed to do.

The big losses to be checked are given below with some examples:

a) Downtime losses

Breakdown losses categorized as time losses and quantity losses caused by equipment failure or breakdown**.**

For example, a breakdown of palletizing plant motor in a brewery leads to downtime and thus production loss.

- Set-up and adjustment losses occur when production is changing over from requirement of one item to another. In brewery plant, this type of loss is encountered during set-ups between different products, testing during start-ups and fine-tuning of machines and instruments.

b) Speed losses

- Idling and minor stoppage losses occur when production is interrupted by temporary malfunction or when machine is idling.

For example dirty photocells on palletizing machines cause minor stoppages. Though they are quickly fixed, much capacity is lost due to their frequency.

Reduced speed losses refer to the difference between equipment design speed and actual operating speed. In a palletizing plant, use of unadapted pallets cause longer processing time for the same number of bottles leading to speed losses.

c) Quality Losses

Quality defects and rework are losses in quality caused by malfunctioning production equipment.

For example, some pallet types get stuck in between depalletizer and unpacker and are damaged.

4.1.2 Adjusting equipment performance

❖ **Steps for adjusting equipment performance**

Steps 1 study current setup. To initiate the setup realization process, understanding the production floor is a must. Most of the production floor will have a number of duplicate machines or groups of machines, so the setting up activities of every machine will be similar. Therefore, selecting the most important machine among the groups of machines is advisable, rather than focusing individually on each machine.

Step- 2 categorizes setup. In Step 2, the activities of setup operations are separated according to the categories. The categories are used to identify the value-added (VA) activities, non-value-added but necessary (NVAN) activities, and non-value-added (NVA) activities responsible for performance in the setup operation..

Step- 3 evaluates the setup operation. Once the category of the setup operation is clearly identified, the information will be used to analyze the overall performance of the setup activities. The developed performance measurement, namely, OPE, originated from the concept of overall effectiveness equipment (OEE). OPE considers two measurement elements. The first element is the availability of a setup technician to set up the machine. Total setup time is the actual setup time used in the entire setup process.

Step- 4 identifies improvement opportunities. In Step 4, the improvement opportunity lies in the setup operation. It is carried out by investigating and analyzing the activities that have been categorized under (Step 3). From the opportunity determination, the cause of the occurrence will be brainstormed, and alternatives for setup improvement will be generated.

Cooling Tunnels

Fig Cooling Tunnels

Self-Check – 4	Written test

Name…… ID…… Date…….

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

Test I: Say true or false

1. Over all Equipment Effectiveness (OEE) is defined as a measure of total equipment performance?(3pts)
2. Down time losses is Breakdown losses categorized as time losses and quantity losses caused by equipment failure or breakdown? (3pts)

Test I: Choose the best answer

1. Which of the following of big losses to be checked? (4pts)

A. Speed losses
B. Quality losses
C. Downtime losses
D. All

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

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

Operation Sheet 1- Cleaning Stages of chocolate Tempering machine

Procedure

Step1 Disassemble the Injection Device Loosen up the set screw

Step2 Disassemble the Screws for the rotating plate loosen up the set screw for the rotating plate

Step 3 Disassemble the axis for the rotating plate pull out the axis with a parallel direction.

Step 4 the Temperature Sensing Rod (Sensor) Loosen up the screws on the fixing stand of temperature sensing rod, pull out the temperature sensing rod and wipe it clean.

Step 5 Wash the whole sink directly under a water tape.

Operation Sheet 2	Maintenance procedure

Procedure

Step 1 Reassemble the Butter-Cream Sink Tilt the clean butter-cream sink to install it back on the machine.

Step 2 Fix up the Tempering equipment with screws Tighten up the butter-cream sink with the 4 screws.

Step 3 Reassemble the Rotating Plate Reassemble the rotating plate aiming at the locating rod.

Step 4 Reassemble the Injection Device Loosen up the set screws and then move up the injection device to remove it.

Operation Sheet 2	Tempering Equipment Adjusting

Procedure

Step 1 Study current set-up

Step 2 Categorize set up

Step 3 Evaluate the set up operation

Step 4 Identify improvement opportunities

LAP TEST	Performance Test

Name……. ID……..
Date…….

Time started: _____ Time finished: _____

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

Task-1 Cleaning Tempering Equipment
Task-2 Maintaining Tempering Equipment
Task-3 Tempering Equipment Adjusting

LG #51	LO #2- Operate and monitor the tempering process

Instruction sheet

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

- Starting and operating the process
- Monitoring equipment to identify variation in operating conditions.
- Identifying and maintaining variation in equipment operation
- Monitoring the tempering process
- Identifying, rectifying and/or reporting out-of-specification product/process outcomes
- Maintaining the work area
- Conducting the work
- Maintaining workplace records

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

- Start and operate the process
- Monitor equipment to identify variation in operating conditions.
- Identify and maintain variation in equipment operation
- Monitor the tempering process
- Identify, rectify and/or report out-of-specification product/process outcomes
- Maintain the work
- Conduct the work
- Maintain workplace records

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test

Information Sheet 1- Starting and operating the process

1.1 Starting and operating the process

Tempering process refers to a controlled melting and cooling of chocolate in order to achieve at the end the correct crystalline structure of the constituent cocoa butter. Tempering involves controlled cooling of melted chocolate that will promote a stable crystalline structure for a finished product. This can be compromising to visual, textural, and physical appeal for finished chocolate products.

A full understanding of tempering requires a significant knowledge of the chemistry of chocolate. Instead of giving the whole background here, I’ll just gloss over almost all of the details and skip directly towards the process. On the most basic level, tempering is necessary because the particles that make up a chocolate bar can arrange themselves in many different ways. The different arrangements of the chocolate particles on a molecular level create different physical properties of the final chocolate on a much larger scale. Chocolate with the correct molecular arrangement (referred to as Form V chocolate) is dark brown, glossy, and makes a satisfying snap when broken.

Chocolate with an incorrect molecular arrangement is lighter in color, matte, and will crumble when broken instead of snapping.

Mistempered chocolate will also exhibit an unsightly white coating called fat bloom.

- **To ensure that our chocolate is properly tempered, we perform the following steps**

1. **Melt the chocolate**

By raising the chocolate above 110^0F, we erase all existing crystalline structures within the chocolate. We can now cause the chocolate to crystallize into the form we want. It is generally safe to use a microwave at this step, melting the chocolate for 15-20 seconds, mixing it up, and then repeating until it is of uniform consistency and above 110◦F.

Fig1 Melting chocolate

2. Create seed crystals

In order to encourage our chocolate to crystallize into the correct molecular arrangement, we will cause a small portion of the chocolate to crystallize into that form and then use that portion of the chocolate as “seed crystals”: when recombined with the rest of the chocolate, the seed crystals encourage the rest of the chocolate to crystallize.

Fig.2 Create crystals

3. Add the seed crystals back into the main mass of chocolate

Once the chocolate we used to create seed crystals has solidified into a paste, we recombine it with the rest of the chocolate. Note that our goal is for the final equilibrium temperature of the seed crystal + main chocolate mixture to be between 87 and 90 degrees Fahrenheit

Fig3 Adding Crystals and combine

4. Pour the chocolate, cover it, and let it solidify

At this point, the chocolate should be on its way to solidifying into Form V crystals.

We can now pour it onto a sheet of parchment paper (or into a mould), cover it with parchment paper, and leave it to solidify.

Fig4 Pouring chocolate

Note: Video of Chocolate Tempering

Self-Check – 1	Written test

Name…… ID…… Date…….

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

Test I: Say or True

1. Tempering involves controlled cooling of melted chocolate that will promote a stable crystalline structure for a finished product?(2pts)
2. By raising the chocolate above 110^0F, we erase all existing crystalline structures within the chocolate? (2pts)

Test II: Choose the best Answer?

1. Which of the following is included in steps of properly tempering chocolate? (2pts)

A) Melt the chocolate
B) Create seed crystals
C) Add the seed crystals back into the main mass of chocolate
D) All

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

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

Information Sheet 2- Monitoring equipment to identify variation in operating Conditions

2.1 Monitoring equipment to identify variation in operating conditions

Monitoring equipment is the act of detecting the presence of signals, such as sound or visual signals, and the measurement there of with appropriate measuring instruments**.**
Some equipment, like meters and field kits, are intended for spot sampling. Others, like sondes, data buoys and data loggers are designed for long term monitoring applications.

Advantage of equipment monitoring

a) Monitoring provides a wireless sensors solution that will allow you to**:**

- Monitor machines
- Motors and other equipment for run times
- Voltage fluctuations
- Monitor or mechanical failure
- Temperature issues, current usage over time and much more.

b) Monitor machines, motors and equipment for critical issues

- Ensure that equipment is functioning properly and catch critical issues before they costly repairs.

c) Save Time and Money

Automated system tracks sensor data for you and alerts you when there is an issue, so no more manual checking.

Fig Set up of up monitoring machine

2.2 Equipment Variation

It measures one appraiser has when measuring the same part using the same gage more than one time. This variation is usually referred to as equipment variation (EV) in the gage.

Sources of variation in measurements

a) Subject Variation

Difference made on the same subject occasions may be due to several factors, including:

- Physiological changes
- Factors affecting response
- Changes because of awareness

b) Observation Variation

Variations in recording observations arise from several reasons including: Bias, errors, and lack of skills or training.

c) Technical Limitations

Technical equipment may give incorrect results for several reasons, including:

- The method is unreliable
- Faults in the test system
- Absence of an accurate test

Fig Monitoring machines, motors and equipment

Self-Check – 2	**Written test**

Name…… ID…… Date…….

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

Test I: Say True or False

1. Variations in recording observations arise from several reasons including: Bias, errors, and lack of skills or training(2pts)
2. Some equipment, like meters and field kits, are intended for spot sampling(2pts)

Test I: Choose the best Answer

1. Which of the following is a wireless sensors monitoring provide?(3pts)

A) Monitor machines
B) Motors and other equipment for run times
C) Voltage fluctuations
D) Monitor or mechanical failure
E) All

2. Which of the following are sources of variation in measurements? (3pts)

A) Subject Variation

B) Observation Variation
C) Technical limitations
D) All

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

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

Information Sheet 3- Identifying and maintaining variation in equipment operation

3.1 Identifying and maintaining variation in equipment operation

3.1.1 Identifying variation in equipment operation

Variation in equipment operation

Variation is the act or state of varying; a partial change in the form, position, state, or qualities of a thing.

- **Types of errors in measurement variation**

1. **Measurement error**

All measures may be subject to some degree of systematic measurement error and therefore result in the introduction of bias on into the study.

a) Validity

The degree to which an instrument is capable of accurately measuring what it intends to measures is referred to as its validity.

b) Reliability (reproducibility)

Reliability, also known as reproducibility, refers to the consistency of the performance of an instrument over time and among different observers.

2. **Random error**

Chance differences in the true and recorded values may result in an apparent association between an exposure and an outcome, and such variations may arise from unbiased measurement errors.

3. **Systematic error**

This is consistent error between the record value and the true value in a series of observations which results in some individuals being systematically misclassified.

Fig1 chocolate tempering machine

3.1.2 Maintaining variation in equipment operation

Prior to starting data collection, careful thought should be given to potential sources of error, bias and variation in measurements, and every effort made to minimise them.

Furthermore, when data are processed, sensitivity analyses should be conducted and presented to test how robust the study findings are to variations in, for example, classifications or assumptions.

Techniques to avoiding unnecessary variation include:

- Using clear defined diagnostic criteria
- Using calibrated, easy-to-use equipment
- Employing standardised measurement methods

Self-Check – 3	Written test

Name…… ID…… Date…….

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

Test I: Say true or false

1. The degree to which an instrument is capable of accurately measuring what it intends to measures is referred to as its validity.(2pts)

Test I: Choose the best Answer

1. Which of the following are types of errors in measurement? (2pts)

A) Measurement error
B) Random error
C) Systematic error
D) All

2. Which of the following are Principles to avoiding unnecessary variation? (2pts)

A) Using clear defined diagnostic criteria
B) Using calibrated, easy-to-use equipment
C) Employing standardised measurement methods

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

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

Information Sheet 4- Monitoring the tempering process

4.1 Monitoring the tempering process

Two mechanisms to monitoring the tempering process are:

a) Manual Method

To check if chocolate is in good temper, dip a metal spatula or knife blade into chocolate and leave a small film on the blade. If the chocolate is firm and not tacky after five minutes at normal room temperature (68° F), it is in good temper. If it is still tacky, place the chocolate chunks back in the bowl and cool about 2° F. Repeat test until tempered.

Fig1 Manual Chocolate Tempering

b) Using a Temper meter

The degree of tempering, indicating the quality of stable crystals that have been formed, can be measured by means of a temper meter.A temper meter produces a temper curve that is a temperature-versus-time curve resulting from uniform cooling of the chocolate sample over a specified period of time.

The slope of the temper curve provides a quantitative means of interpreting the amount of heat of crystallization (latent heat) produced during the cooling of the test sample.

Fig Tempered and Un-tempered chocolate

Different looks when tempering chocolate

(a) Properly tempered chocolate is dark brown and snaps cleanly (b) Poorly tempered chocolate is lighter and crumbles

(c) Poorly tempered chocolate also exhibits ugly white impurities known as fat bloom

Fig The effect of Tempering chocolate

Note: Video of Chocolate Tempering

Self-Check – 4	Written test

Name…… ID…… Date…….

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

Test I: Say true or false

1. The degree of tempering, indicating the quality of stable crystals that have been formed, can be measured by means of a temper meter. (3pts)

2. To check if chocolate is in good temper, dip a metal spatula or knife blade into chocolate and leave a small film on the blade. (3pts)

Test II: Choose the best Answer

1. Which of the following are types of monitoring chocolate tempering Process?(4pts)

A) Manual Method
B) Using Temper meter
C) A & B
D) All

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

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

Information Sheet 5- Identifying, rectifying and/or reporting out-of-specification product/process outcomes

5.1 Identifying, rectifying and/or reporting product/process outcomes

5.1.1 Identifying out-of-specification

To identify out-of-specification the following the following are indicators:

A) Machine does not Power up

Cause:

- Power cord not connected to machine or outlet correctly
- Fuse in machine is blown
- Circuit breaker or fuse on outlet is tripped

B) Coating will not melt

Cause:

- No heat
- Temperature control set too low

C) Coating melts too slowly

Cause:

- Temperature control set too low
- Light bulb(s) are blown
- Coating level too low in rear of bowl
- Bowl will not rotate

D) Coating will not cool to temper

- Fan not working
- Temperature control set too high
- Coating level too low in rear of bowl
- Room temperature too high

❖ **Product Specifications:**

1. Voltage: 220V Single Phase

2. Power: 1500W
3. Dimensions: 60cm (Length) x 56cm (Width) x 55cm (Height)
4. Weight: 40Kgs
5. Materials: Stainless Steel
6. Heating Method: Heat Transferred From Hot Water
7. Capacity: 10 Liters/lot
8. Place of Origin: Taiwan

5.1.2 Rectifying product/process outcomes

A) Machine does not Power up

Remedy

- Properly insert power cord into power module
- Replace fuse in machine
- Replace or reset circuit breaker on outlet

B) Coating will not melt

Remedy

- Replace light bulb(s)
- Set temperature to 95-100° F

C) Coating melts too slowly

Remedy

- Set temperature to 95-100° F
- Replace light bulb(s)
- Add additional coating to bowl
- Turn bowl motor on or replace bowl motor

D) Coating will not cool to temper

Remedy

- Replace fan
- Set temperature to 86-88° F
- Add additional coating to bowl
- Cool room to below 75°F

5.1.3 Reporting product/process outcomes

❖ **Reporting chocolate tempering Process Outcomes**

- Notification to others of any defect can be simple or complicated.
  - ✓ For instance, if the defect is just a matter of the slow speed of die, then a simple notification to the line operator will suffice (although if this is a constant occurrence, a different and elevated reporting procedure should be used).
  - ✓ On the other hand, if the defect is a microbiological problem that has reached the customer, then multiple parts of the company must be notified, including ownership and top management.

❖ **Reporting the chocolate tempering Defects when the following is happen:**

✓ Machine does not Power up

✓ Coating will not melt

✓ Coating will not cool to temper

Format for report damages or defects

Safety and durability of tools & equipment is very important. To check its workability and condition fill up a standard form required by your institution and submit to your facilitator or personnel in-charge of the maintenance for immediate repair or disposal.

Sample Form:

Date Checked	Name of Tools/Equipment	No. of Items (Piece or Unit)	Specification	Condition
06-30-06	Tempering Machine	1 pc	Medium sized,Red Color	With Screw is damaged

	Hand Mixer	1 unit	Electric-driven: 220 volts	No power supply

Self-Check –5	**Written test**

Name…… ID…… Date…….

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

Test I: Choose the best Answer

1. Notification to others of any defect can be simple or complicated(2pts)

Test I: Choose the best Answer

1. Which of the following is one of identified out-of-specification(2pts)

A) Machine does not Power up
B) Coating will not melt
C) Coating will not cool to temper
D) All

2. Which of the following is one Cause to machine does not power up(2pts)

A) Power cord not connected to machine or outlet correctly
B) Fuse in machine is blown
C) Circuit breaker or fuse on outlet is tripped
D) All

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

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

Information Sheet 6- Maintaining the work area

6.1 Maintaining the work area

Maintaining the work area

Area is any particular extent of space or surface; part.

Work area is the place where a person or people work.

The elements of an effective housekeeping program are:

a) Dust and Dirt Removal

In some jobs, enclosures and exhaust ventilation systems may fail to collect dust, dirt and chips adequately. Vacuum cleaners are suitable for removing light dust and dirt. Industrial models have special fittings for cleaning walls, ceilings, ledges, machinery, and other hard-to-reach places where dust and dirt may accumulate.

Compressed air should not be used for removing dust, dirt or chips from equipment or work surfaces.

b) Employee Facilities

Employee facilities need to be adequate, clean and well maintained. Lockers are necessary for storing employees' personal belongings. Washroom facilities require cleaning once or more each shift. They also need to have a good supply of soap, towels plus disinfectants, if needed.

c) Surfaces

Floors: Poor floor conditions are a leading cause of accidents so cleaning up spilled oil and other liquids at once is important. Allowing chips, shavings and dust to accumulate can also cause accidents. Trapping chips, shavings and dust before they reach the floor or cleaning them up regularly can prevent their accumulation. Areas that cannot be cleaned continuously, such as entrance ways, should have anti-slip flooring. Keeping floors in good order also means replacing any worn, ripped, or damaged flooring that poses a tripping hazard.

Walls: Light-coloured walls reflect light while dirty or dark-coloured walls absorb light. Contrasting colors warn of physical hazards and mark obstructions such as pillars. Paint can highlight railings, guards and other safety equipment, but should never be used as a substitute for guarding. The program should outline the regulations and standards for colors.

d) Maintain Light Fixtures

Dirty light fixtures reduce essential light levels. Clean light fixtures can improve lighting efficiency significantly.

e) Aisles and Stairways

Aisles should be wide enough to accommodate people and vehicles comfortably and safely. Aisle space allows for the movement of people, products and materials. Warning signs and mirrors can improve sight-lines in blind corners. Arranging aisles properly encourages people to use them so that they do not take shortcuts through hazardous areas.

f) Spill Control

The best way to control spills is to stop them before they happen. Regularly cleaning and maintaining machines and equipment is one way. Another is to use drip pans and guards where possible spills might occur. When spills do occur, it is important to clean them up immediately. Absorbent materials are useful for wiping up greasy, oily or other liquid spills. Used absorbents must be disposed of properly and safely.

g) **Tools and Equipment**

Tool housekeeping is very important, whether in the tool room, on the rack, in the yard, or on the bench. Tools require suitable fixtures with marked locations to provide orderly arrangement, both in the tool room and near the work bench. Returning them promptly after use reduces the chance of being misplaced or lost.

6.1.2 Maintaining of working area

The maintenance of buildings and equipment may be the most important element of good housekeeping. Maintenance involves keeping buildings, equipment and machinery in safe, efficient working order and in good repair. This includes maintaining sanitary facilities and regularly painting and cleaning walls.

a) **Waste Disposal**

The regular collection, grading and sorting of scrap contribute to good housekeeping practices. It also makes it possible to separate materials that can be recycled from those going to waste disposal facilities.

Placing scrap containers near where the waste is produced encourages orderly waste disposal and makes collection easier. All waste receptacles should be clearly labeled (e.g., recyclable glass, plastic, scrap metal, etc.).

b) **Storage**

Good organization of stored materials is essential for overcoming material storage problems whether on a temporary or permanent basis. There will also be fewer strain injuries if the amount of handling is reduced, especially if less manual materials handling is required..

Self-Check –6	Written test

Name…… ID…… Date…….

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

Test I: Choose the best Answer

1. Poor floor conditions are a leading cause of accidents so cleaning up spilled oil and other liquids at once is important?(2pts)
2. The regular collection, grading and sorting of scrap contribute to good housekeeping practices(2pts)

Test I: Choose the best Answer

1. Which of the following are the elements of an effective housekeeping program?(4pts)

A) Dust and Dirt Removal
B) Employee Facilities
C) Maintain Light Fixtures
D) All

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

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

Information Sheet 7- Conduct the work according to Environmental guidelines

7.1 Conducting a Work with workplace Environmental Guidelines

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

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

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

7.1.1 Environmental Guidelines in the workplace

The followings are Environmental Guidelines in the workplace of chocolate tempering:

- **Develop Health and Safety Program**

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

- Accidents are not only costly in human terms, but they can disrupt the flow of work and halt production.
- There are always hidden costs.
- The actual injury to an employee is only the “tip of the iceberg”. A good health and safety program should include the following components:

- **Written Health and Safety Policy**

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

❖ **Written Safety Rules**

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

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

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

❖ **Safety Director/coordinator**

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

❖ **Employee Training**

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

Self-Check –7	Written test

Name…… ID…… Date…….

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

Test I: Say true false

1. Accidents are not only costly in human terms, but they can disrupt the flow of work and halt production(2pts)
2. Employees should receive periodic training as necessary to review safety procedures(2pts)

Test II: Choose the best Answer

1. Which of the following is true about employee training? (4pts)

A) Employees should receive periodic training as necessary to review safety procedures.

B) New employees should receive safety training both before and on the job.

C) Close -calls or accidents should trigger an immediate review of procedures and safety with employees

D) All

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

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

Information Sheet 8- Maintain work Records

8.1 Maintain work Records

Record is the state or fact of being recorded.

Maintain work records are an official document that records the works of public body or officer**.**

The following are types workplace records are discussed as follows:

a) Production records

The following are records during production:

- Recipes
- Raw materials and ingredients received and suppliers.
- Wastage % at different stages of the process.
- Stock levels for each ingredient.
- Production volumes and measurements.
- Maintenance programs and schedules.

b) Quality assurance records

Target amounts of ingredients and any changes made to recipe. Measurements made at process control points. Batch numbers and product code numbers Cleaning procedures and schedules.

c) Sales records

Names of customers and amounts sold to each Weekly and monthly sales volumes.

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

d) General requirements

Good documentation constitutes an essential part of the quality assurance system. Clearly written procedures prevent errors resulting from spoken communication, and clear documentation permits tracing of activities performed. Documents must be designed, prepared, reviewed, and distributed with care. Documents must be approved, signed, and dated by the appropriate competent and authorized persons.

Techniques to record the work

Step1 complete inventory of all work records

Step2 Determine who is going to manage the process and records

Step3 Develop a records retention and destruction schedule

Step4 Determine the best way to store and manage your records

Self-Check –8	Written test

Name…… ID…… Date…….

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

Test I: Say true or false

1. Good documentation constitutes an essential part of the quality assurance system(2pts)

Test II: Choose the best Answer

1. Which of the following are included in workplace records(3pts)
   A) Production records
   B) Quality assurance records
   C) Sales records
   D) All
2. Which of the following is true about the production records(3pts)
   A) Raw materials and ingredients received and suppliers.
   B) Wastage % at different stages of the process.
   C) Stock levels for each ingredient.
   D) All

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

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

Operation Sheet 1- Chocolate tempering Process

Procedure

Step1 Melt the chocolate

Step2 Create seed crystals

Step3 add the seed crystals and combine

Step4 Pour the chocolate and cover it

Step5 let it solidify

LAP TEST	Performance Test

Name……. ID……..
Date…….

Time started: _____ Time finished: _____

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

Task-1 Chocolate tempering Process

LG #52	LO #3- Shut down the tempering process

Instruction sheet

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

- Identifying the appropriate shutdown procedure
- Shut down the process.
- Identifying and reporting maintenance requirements

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

- Identifying the appropriate shutdown procedure
- Shut down the process.
- Identifying and reporting maintenance requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”.

Information Sheet 1- Identifying the appropriate shutdown procedure of tempering machine

1.1 Identifying the appropriate shutdown procedure of chocolate tempering machine

Shutdown procedure is tend to go through step by step what is required to complete a task.

❖ **Shutdown Work Identification**

The work, which is to be carried, should be clearly identified. The work identification depends upon following points:

- The number of failures
- The root causes of those failures
- The Maintenance costs associated with those failures
- The Production costs associated with those failures - note that these may incorporate more than just downtime costs.
- Any Safety or Environmental implications associated with those failures.

❖ **The types of shutdown process**

a) Item shutdown

It shutdown only the equipment item, without shutting down the entire process or plant.

b) Maintenance shutdown

A Maintenance shutdown will consists of shutting down, then fully isolating, draining and purging an equipment item to make it safe for maintenance work.

c) Unit shutdown

A Unit shutdown will shut down only the process unit in the plant, but not shutdown the entire plant, many units will feed to storage tanks so that downstream processes can take their feed from the storage and continue to operate when another unit is offline.

d) Total shutdown

A Total shutdown will shut down an entire plant.

Fig Difference between types of shut down

e) Emergency shutdown

An Emergency shutdown due to fire, spills or gas release, will shut down an equipment item as quickly as possible, then depressurize and drain equipment and lines to leave them in the safest possible condition.

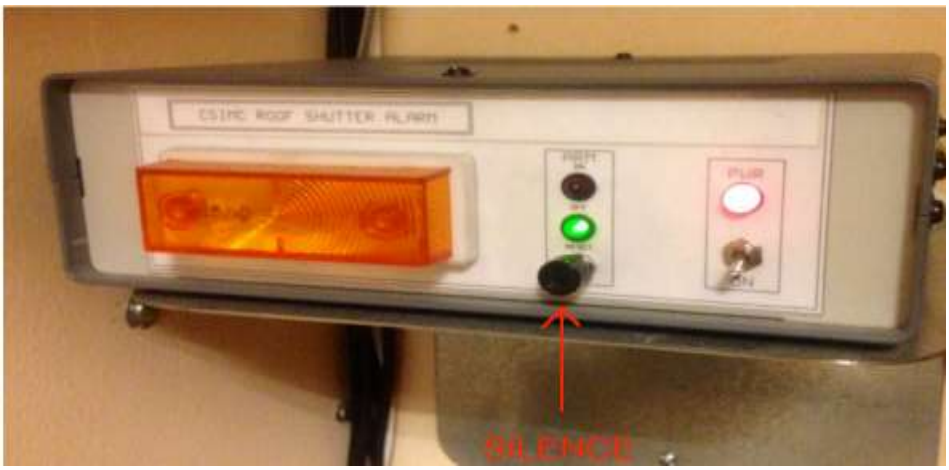

Fig Alarm button to silence

❖ **Shut down procedure of tempering equipment**

1. Shut off tempering equipment at stop/start switch.
2. Shut off at disconnect behind tempering equipment.
3. Apply lock to disconnect.
4. Attempt to start tempering equipment, reset or return switch to “off” position.
5. Complete work on tempering equipment.
6. Check the tempering equipment are empty of any loses

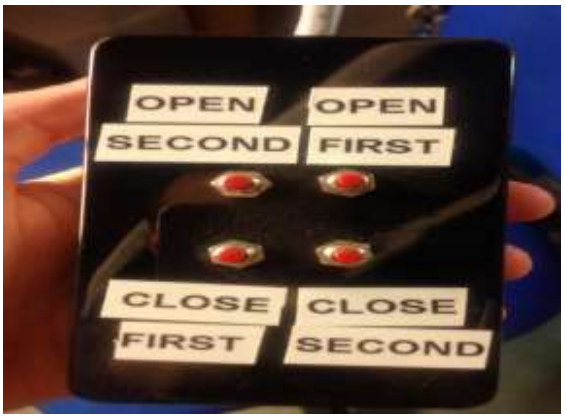

Fig close/open button

Self-Check – 1	Written test

Name…… ID…… Date…….

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

Test I: Say true false

1. Shut down can be defined as scheduled down period for a plant for scheduled maintenance for an extended period of time(2pts)
2. A Maintenance shutdown will consists of shutting down, then fully isolating, draining and purging an equipment item to make it safe for maintenance work. (2pts)

Test II: Choose the best answer

1. Which of the following are types of shutdown process? (2pts)

A) Item shutdown
B) Emergency shutdown
C) Maintenance shutdown
D) All

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

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

Information Sheet 2- Shut down chocolate tempering process

2.1 Shut down the process

Shut down process can be defined as scheduled down period for a plant for scheduled maintenance for an extended period of time. During a shutdown, system checks should be made to ensure the shutdown proceeds safely.

Typical checks during a shutdown could include:

- Equipment cools down at a safe rate to prevent thermal fractures
- The correct valve sequence is followed to depressurise and purge equipment and lines
- All process flows are maintained at required values, by use of standby or alternative equipment.

Self-Check – 2	Written test

Name…… ID…… Date…….

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

Test I: Say true or false

1. Shut down can be defined as scheduled down period for a plant for scheduled maintenance for an extended period of time(4pts)

Test II: Choose the best answer

1. Which of the following could include in typical checks during a shutdown? (4pts)

A) Equipment cools down at a safe rate to prevent thermal fractures
B) The correct valve sequence is followed to depressurise and purge equipment and lines
C) All process flows are maintained at required values, by use of standby or alternative equipment
D) All

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

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

Information Sheet 3 Identifying and reporting maintenance requirements

3.1 Identifying and reporting maintenance requirements

3.1.1 Identifying Maintenance requirements

Maintenance requirements are dependent on the size and type of mechanical equipment, transportation of equipment parts, as well as access requirements for tool and lifting clearances.

Maintenance requirements fall into the following categories:

1. Operational checks to simulate automatic start-up, shut down and emergency shut down
2. Inspection and maintenance
    - Hardware control systems
    - Hydraulics
    - Electrical control signals and power system
    - Braking system

The maintenance safety requirements are carried out. The requirements state before a permit for work issued, the following requirements must be carried out:

1. All electrical sources must be isolated and secured in the open position, by locking and providing caution notes.
2. All sources of energy that can cause danger must be dissipated or contained.

Fig maintenance

3.1.2 Reporting maintenance requirements

- **Reporting maintenance**

The report shows maintenance details of each in the time range, including the setup/takedown time, instructions, Event Time, Facility, Event, ID (Rental, Contract or Event), Service, And Customer.

- **Reporting faults and problems**: **maintenance**

Every work shop has a different maintenance schedule and it is important that you are familiar with the schedule implemented on the work shop where you work.

There will usually be a routine schedule for particular tools that states how often maintenance checks have to be performed. These will also specify the checks that have to be performed. Some tools may require daily checks and maintenance after use. Other tools, such as power tools, usually must be checked once in 6 months or so. More complicated power tools would need to be serviced on a regular interval; refer to the operation manual.

A maintenance schedule assigns a specific date to specific maintenance tasks. It states what has to be checked and will require that the assigned person signs off the document assuring that the checks were done. If faults are found, the tool must be sent for maintenance and the assigned person that fixes the tool has to report on exactly what was done and when it was completed.

An example of checklist is for how to fill or document maintenance required and report performed maintenance is given below**.**

Table.2 maintenance schedule

Date	Tool	Maintenance check points	Signature	Maintenance required	Signature
10/2/2013	Chocolate Tempering Machine	screws		Fit the screw	

Maintenance Performed	Date	Signature
Chocolate Tempering Machine	October22,20	

Uses

- Additional work that is either manually entered or automatically created as an alarm or disturbance can be planned and performed.
- Updated maintenance statistics enable you to follow-up on your maintenance
- The next scheduled service is available for work

Self-Check –3	Written test

Name…… ID…… Date…….

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

Test I: Say true or false

1. When you report, you inter information about the operation(4pts)

Test II: Choose the best answer

1. Which of the following is must followed during Inspection and maintenance(3pts)

A) Hardware control systems
B) Electrical control signals and power system
C) Braking system
D) All

2. Which of the following is true about results of reporting maintenance(3pts)

A) You have optimized production availability and minimized downtime.
B) The work order is closed and the equipment is either back in production, or being maintained according to the maintenance intervals.
C) For scheduled services, the next service is generated
D) All

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

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

Operation sheet 1– shut down chocolate tempering equipment

Procedure

Step1 shut off tempering equipment at stop/start switch.

Step2 Shut off at disconnect behind tempering equipment.

Step3 Apply locks to disconnect.

Step4 Return switch to “off” position.

Step5 Complete work on tempering equipment.

Step6 Check the tempering equipment are empty of any loses.

Lap Test	Demonstration

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task1. Shut down chocolate tempering equipment

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www.nabim.org.uk/index.asp National Association of British and Irish Millers

www.namamillers.org North American Millers' Association

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