Confectionary Processing

Level-II

Based on May 2019, Version 2 Occupational standards

Module Title: - Operate a Confectionery Depositing and molding Process

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Contents

LG #53	LO #1- Prepare the Depositing /molding 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 services
- Identifying and confirming cleaning and maintenance requirements and status
- Fitting and adjusting machine components and related attachments
- Entered processing/operating parameters to meet safety and production
- Checking and adjusting typical equipment performance
- Carrying out pre-start checks
- Transferring ingredients ,Syrup/dough

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 services
- Identify and confirming cleaning and maintenance requirements and status
- Fit and adjust machine components and related attachments
- Enter processing/operating parameters to meet safety and production
- Check and adjust typical equipment performance
- Carry out pre-start checks
- Transfer ingredients ,Syrup/dough

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- Confirming and made available services

1.1 Confirming and made available services

- **The following are Depositing/molding services**

a) Lighting and power

Where lighting is needed, florescent tubes use less electricity than bulbs, but care is needed when using fluorescent lights above mills, moulders and other equipment that has moving or rotating parts. This is because they can make machinery appear stationary at certain speeds, causing a hazard to operators.

b) Water supply and sanitation

Water is used in bakeries to make dough in moulding process and for washing equipment. An adequate supply of potable (safe for drinking) water should be available from taps in the processing room.

c) Compressed Air

In chocolate production, compressed air is essential. Even the system of tubes for conveying the chocolate masses to the moulding equipment is controlled by pneumatically activated valves.

Chocolate is a very sensitive foodstuff, and every effort must be made at the production and packaging stages to prevent contamination with even the faintest.

d) Steam

Steam that comes into contact with food or food contact surfaces should be generated from potable water. Ice for use in food plants should be made from potable water and should be handled and stored to protect from contamination.

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 or false

1. Steam that comes into contact with food or food contact surfaces should be generated from potable water. (2pts)
2. Water is used in bakeries to make dough in moulding process and for washing equipment.(2pts)

Test II: Choose the best answer

1. Which of the following service is must available in chocolate molding process?(3pts)

A) Lightning
B) Water
C) Power
D) All

2. ……..comes into contact with food or food contact surfaces should be generated from potable water? (3pts)

A) Lightning
B) Power
C) Steam
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 2- Identifying and confirming cleaning and maintenance

2.1 Identifying and confirming cleaning and maintenance

2.1.1 Identifying and confirming cleaning

- **Cleaning System**

Cleaning parts in contact with the material such as transport and blending containers, drums, funnels, components from production facilities, etc., is an essential part of the manufacturing process in the chemical, cosmetic and food industry.

Cleaning designs or equipment which fulfills requirements for reproducibility and validatibility. The Basic solutions are semi-automatic washing and drying stations as well as fully automatic single and double-chamber cleaning equipment.

- **Cleaning methods**

a) Dry cleaning

Dry cleaning methods are used for products that are smaller, have greater mechanical strength and possess lower moisture content. The main advantages of dry cleaning methods are that, these methods are generally inexpensive and involve cheaper equipment than wet cleaning methods and produce a concentrated dry effluent which may be disposed of more cheaply but it suffers from various disadvantages such as, it is prone to production of dust, which can be a source of product recontamination and in some cases, a fire and explosion hazard.

The main groups of equipment used for dry cleaning are:

- Aspirators
- magnetic separator

- Separators based on screening of foods

❖ Manual Mold Cleaning

Manually Mold Cleaning is a slow and tricky process. It involves the use of spray cleaners, solvents, and brushes. It requires a high-performance ventilation system or technicians might be exposed to fumes that are most likely to be detrimental to their health.

Fig2 Manual Mold Cleaning

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.

Fig1 Washing System

2.1.2 Maintenance

Maintain your equipment with our trained engineers. Prolong the life of your machine, increase uptime and help reduce operating costs**.**

- **Mold Maintenance**

Mold maintenance, or tool maintenance, refers to the cleaning and repairs that are needed to keep an injection mold in the best working order. Maintenance is performed routinely over the life of the mold (preventative maintenance or PM), and also when any problems arise.

- **Importance of Mold Maintenance**

The condition of the injection mold affects the plastic components produced. Performing necessary preventative improves tool longevity and part quality by stopping issues before they happen.

- **Types of maintenance**

a) Preventive maintenance

Preventive maintenance defined as an equipment maintenance strategy based on replacing, or restoring, an asset at a fixed interval regardless of its condition.

b) Time-based maintenance

Time-based maintenance refers to replacing renewing an item to restore its reliability at a fixed time, interval or usage regardless of its condition.

c) Predictive maintenance

Predictive maintenance where we use potentially many process parameters gained from online sensors to determine if our equipment is moving away from stable operating conditions and is heading towards failure.

d) Corrective maintenance

Corrective maintenance Is strategy only restores the function of an item after it has been allowed to fail.it is based on the assumption that the failure is acceptable (i.e. no significant

impact on safety or the environment) and the preventing failure is either not economical or not possible.

Fig3 Maintenance

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. Manually Mold Cleaning is a slow and tricky process. (3pts)

Test I: choose the best Answer

1. Which of the following parts are in contact with the material during cleaning?(3pts)

A) transport and blending containers
B) drums and funnels
C) components from production facilities
D) All

2. Which of the following is true about Mold maintenance?(4pts)

A) Tool maintenance, refers to the cleaning and repairs that are needed to keep an injection mold in the best working order
B) Maintenance is performed routinely over the life of the mold (preventative maintenance or PM), and also when any problems arise.
C) A & B
D) None

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

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

Information Sheet 3- Fitting and adjusting machine components and related attachments

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3.1 Fitting and adjusting machine components and related attachments

3.1.1 Fitting machine components and adjusting machine components

Machine components/parts of Depositing/molding Machine are as follows:

a) Heating System

It assists in maintaining the liquid chocolate in a molten state at specific temperatures.

b) Cooling System

After depositing chocolate, pass it through the cooling tunnels to cool it down to the right solid cooling tunnels to cool it down to the right solid or liquid state.

c) Conveying System

This is the main part that is responsible for the transport of chocolate and other ingredients in the machine.

d) Filling Nozzle

The nozzles accurately and precisely fill or deposit the chocolate into various molds.

Fig1 Metal and Plastic Nozzels

e) Motor system

This is mechanical part of the machine that initiates and controls moving parts such as gears and conveyor systems.

f) Pneumatic System

This is the pressure system that uses air to push the chocolate and other fluids through the delivery system.

g) Control System

The PLC control system allows you to configure and control all the operations in an automatic chocolate depositor machine.

h) Power System

This is the main source of electric energy that the machine requires for continuous operations.

Fig2 power System

i) Mass Tank

It is the first location for storage of chocolate from the chocolate manufacturing machine before it flows to the hopper.

j) Hopper

The hopper receives the liquid chocolate and maintains it at specific temperature before releasing it before depositing purposes.

Fig3 Hopper

k) Depositing Head

It is the main area that holds the entire nozzle and controls the amount of chocolate the flows through the nozzles.

l) Molds

The molds act as the main containers of the shells that will receive the chocolate from the filling nozzles.

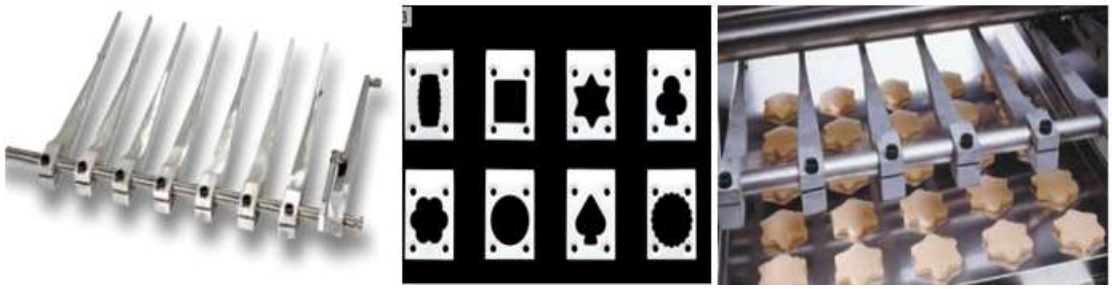

Fig4 Dies

m) Sensors

Sensors enhance the safety of the machine and will alert you whenever anything is not going according to plan.

3.1.2 Fitting and adjusting machine components

❖ **Fitting chocolate molding machine may include:**

- Fits electrical control box to check there is oil or water
- Electrical parts should be blown dry by maintenance personnel before turning them on.
- Barrel should be cleaned to prevent thermal decomposition
- Ideal working temperature of hydraulic oil should be maintained.
- Workshop must be equipped with lifting equipment

Fig5 Fitting machine

❖ **Mold adjustment**

Mold forward and backward speed usage by using slow speed, once the mold plate start timing, then it will change into speed.

- **Molding machine-temperature adjustment**

1. **Barrel temperature:** Temperature to be controlled during molding process is barrel, nozzle temperature and mold temperature.
2. **Nozzle temperature:** is usually slightly lower than maximum temperature of the barrel
3. **Mold temperature:** has a great influence on intrinsic properties and apparent quality of product.

- **Molding machine-Pressure adjustment**

1. **Screw pressure:** (back pressure) when using a screw type machine, pressure that top melt of the screw receives when rotates backward is called screw pressure.
2. **Injection pressure:** In current production, injection pressure of almost all injection machines is based on pressure exerted by plunger or top of screw on machine.

Fig6 Adjusting molding machine

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 molds act as the main containers of the shells that will receive the chocolate from the filling nozzles.(4pts)
2.

Test II: Choose the best answer

1. Which of the following are components/parts of Depositing/molding Machine?(3pts)

A) Hopper
B) Power system
C) Molder
D) Control system
E) All

2. Which of the following temperature adjustment is done in Molding machine (3pts)

A) Barrel temperature
B) Nozzle temperature
C) Mold temperature
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 4- Entering processing/operating parameters to meet safety and production

4.1 Entering processing/operating parameters to meet safety and production

Development of sensors on molding and the engineers make the right choice when planning cavity measurements. The Parameters to be monitored covers the following:

Fig1 Process indicator and process controller

Processing/operating parameters to be covers the following:

a) Pressure

The possible method of sensing pressure includes:

- The mechanical deflection of a flexible member under a varying load
- Strain gauges, which measure the resistance of a folded wire deformed by pressure
- Sensors based on piezoresistive or piezoelectric effects
- The variable capacitance of a diaphragm that deflects with pressure
- Vibrating element which changes its resonance with pressure.

❖ **piezoresistive or piezoelectric sensors**

The performance of crystal-based piezoresistive or piezoelectric sensors **i**s based on the linear electromechanical interaction between the mechanical and the electrical state of crystalline materials.

b) Temperature

The second issue is that the sensing head is exposed to a corrosive and abrasive medium at high and fast-changing temperatures, frequently above 300^0C.

The accumulation of a frozen layer during the cooling stage restricts measurement of the real melt pressure.

Moreover, the sensors are usually embedded in a mold, which could cause output variations as well as deviations of sensor dimensions and from due to the high temperature of the mold.

Therefore, the proper selection of sensors for measurements in the during the process is a challenging task.

Fig2 Temperature controllers

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 proper selection of sensors for measurements in the during the process is a challenging task.(4pts)

Test II: Choose the best answer

1. Which of the following are processing/operating parameters in Chocolate molding process?(3pts)

A) Pressure
B) Temperature
C) A & B
D) All

2. Which of the following are true about sensing pressure includes? (3pts)

A) The mechanical deflection of a flexible member under a varying load
B) Strain gauges, which measure the resistance of a folded wire deformed by pressure
C) Sensors based on piezoresistive or piezoelectric effects
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 5- Checking and adjusting typical equipment performance

5.1 Checking and adjusting typical equipment performance

Generally**,** the machine will save you time and money in large scale production of different types of chocolate.

❖ **Features of chocolate Depositing Machine**

Whenever you are shopping for a good chocolate depositing machine, here the features you need to look at.

a) Accurate in chocolate Depositing

The precision and accuracy of the chocolate depositor machine will enhance the speed and time of chocolate.

b) Flexibility in chocolate Depositing

It allows for processing and depositing of different masses such as small-sized ingredients**.**

Fig1 One-shot Depositor

c) Fully Automated system With PLC

It is a fully automatic system with a PLC touch panel that allows you convenient and easy control of machine parameters.

Fig2 Automated system

d) Compact and Modular Design

It has a compact design that allows you to integrate the machine and save space in the factory.

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: Say true false

1. the machine will save you time and money in large scale production of different types of chocolate(4pts)

Test I: Choose the best answer

1. Which of the following are features of chocolate Depositing Machine?(3pts)

   A) Accurate in chocolate Depositing
   B) Flexibility in chocolate Depositing
   C) Fully Automated system With PLC
   D) All

2. ……allows for processing and depositing of different masses such as small-sized ingredients(3pts)

   A) Accurate in chocolate Depositing
   B) Flexibility in chocolate Depositing
   C) Fully Automated system With PLC
   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 6-Carrying out pre-start checks

6.1 Carrying out pre-start checks

Pre-start check is carrying out a series of checks before using a piece of machinery.

❖ **The following are molding machine checks before booting:**

- Check if there is oil or water in electrical control box .Electrical parts should be blown dry by maintenance personnel before turning them on.
- Check if power supply voltage is consistent, generally should not be high
- Check emergency stop switch, whether front and rear safety door switches are normal.
- Verify that motor and oil pump are rotating in same direction.
- Check whether cooling pipes are unblocked, and pass cooling water and end of barrel.
- Check if there is any lubricating oil in each active part and add enough lubricant.
- Turn on electric heating and warm various sections of barrel.
- Cover heat shield on barrel to save energy, extend life of electric heating coil and current contactor.

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: Short Answer Questions

1. List at least six (6) molding machine prestart checks before booting?(8pts)

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

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

Information Sheet 7 - Transferring dough into molding equipment

7.1 Transferring dough into molding equipment

- **Movement of chocolate dough**

At this point, you will start the operations at the transferring point. The chocolate will move from the mass tank and flow through pipes onto the heating hopper.

At the same time the shell molding will also occur and move strategically on the conveyor system.

Fig1 Movement of chocolate dough

Technique's to Transferring dough

1. Chocolate **dough** ready
2. Will move from the mass tank By conveyor
3. Flow through pipes onto the heating hopper

4. Molding occur

Self-Check –7	Written test

Name…… ID…… Date…….

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

Test I: Choose the best

1. Which of the following is true about transferring chocolate dough to the molding equipment?(8pts)

   A) At this point, you will start the operations at the transferring point.
   B) The chocolate will move from the mass tank and flow through pipes onto the heating hopper.
   C) At the same time the shell molding will also occur and move strategically on the conveyor system
   D) All

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

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

LG #54	LO #2- Operate and monitor the depositing/molding 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 depositing/molding process
- Depositing/molding confectionery product is
- Monitoring operation of equipment and processes
- Identifying and maintaining variation in equipment operation
- Monitoring the depositing/molding 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

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
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Information Sheet 1- Starting and operating molding process

1.1 Starting and operating the process

❖ **Chocolate Molding**

The casting of chocolate into molds … followed by cooling and demoulding….” This is a good, intuitive definition explaining how the molding process is composed of a sequence of steps or operations producing perfectly formed chocolate products.

❖ **Types of molded products**

We can identify several different types of molding products.

The main ones follow: Solid the product is molded using only chocolate.

Fig1 Types of molded products

The product is molded using chocolate and inclusions. The inclusions can be deposited into the molds before depositing the chocolate, they can be mixed with the chocolate before depositing or they can be deposited into the mold after the chocolate. In this last case, backing off of the product may or may not be required (by backing off we mean the deposit of a layer of chocolate to form the bottom of the product).

Fig2 standard and seasonal molded Products

Types of molded products are:

a) Cookies and wafers

Chocolate is deposited first into the mold cavity and then cookies or wafers are pressed into it. Backing off of the chocolate may or may not be required.

Fig3 Cookies and wafers

b) Chocolates with centers (fat based, sugar based, liquid, etc.)This can be done by

code positing of shell and centers (one-shot, triples hot, multi shot, etc.) or center depositing into a shell. Center depositing can be done by traditional shell

Fig4 Chocolates with centers

- **Depositors**

Stand for capability and engineering. The diversity of depositing options is extensive and accordingly high is the flexibility of the possible production types. We are covering the complete range from simple wire cutters up to multi flexible automated depositors in working width from 300 mm to 1.800 mm – if desired even above and below this standard.

Fig5 Depositor or Molder in action

Fig6 Cake production line

Molding Once chocolate is properly tempered**;** it is immediately transferred to desired molds to form the base of most chocolate confections. There are several types of molding techniques ranging from drop depositing, used in retail production; solid molding, resulting in chocolate bars and retail blocks; shell molding or 'enrobing', usually a three step operation with an encapsulated center confection; and hollow molding.

Fig7 Different types of molded products

Techniques of starting molding process

1. Temper chocolate properly
2. transfer It immediately to desired molds
3. Forming the different shape of chocolate confections

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 or false

1. Molding is casting of chocolate into molds … followed by cooling and demoulding? (2pts)
2. Chocolate is deposited first into the mold cavity and then cookies or wafers are pressed into it? (2pts)

Test I: Choose the best answer

1. **Which of the following are one of Chocolates centers**?(3pts)
   A) Fat based
   B) Sugar based
   C) Liquid
   D) All

2. **Which of the following are** types of molded products?(3pts)
   A) **Chocolates centers**
   B) **Cookies and wafers**
   C) A & B
   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 2- Depositing/molding confectionery product

2.1 Depositing/molding confectionery product

Confectionery depositing-molding equipment consists of individual molds, which have the required size and shape for a specific product, attached to a continuous conveyor. They are carried below a depositor, which has a piston filler to deposit accurately the required volume of hot sugar mass into each mold.

Depositors can place food of a single type, in layers, or center filled (for example liquid centers or chocolate paste around hard-boiled sweets). The food is then cooled in a cooling tunnel. When it has hardened sufficiently, individual sweets are ejected and the molds restart the cycle.

Rotary Molders are well known for their long life-cycle, performance and comfortable operation. Design series from standard molder up to fully automated high-performance Molder, from compact type to long-chassis for additional accessories such as coating and sprinkling devices – all available from 300 mm to 1.800 mm working width.

❖ **Advantages of Rotary Molders**

- High performance
- Comfortable adjustment possibilities including recipe storage functions
- Extensive accessories
- High variant diversity
- Quick product change over and easily cleaned

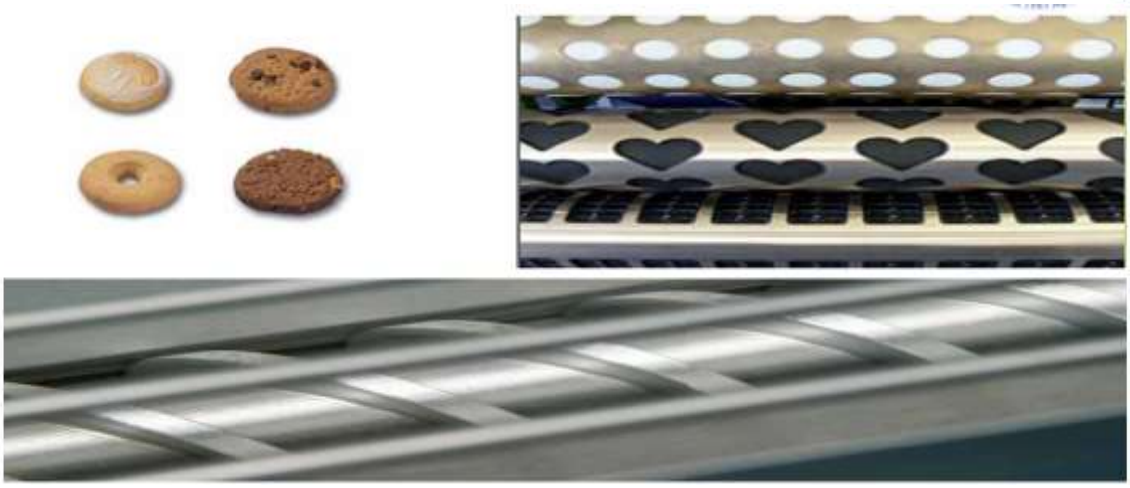

Fig1 Molders and molded products

Fig3 confectionary molding machine

The **three main types** of equipment differ in the method of ejection, and the material used for the mold:

1. Metal molds fitted with ejector pins are

- Used for hard confectionery (for example Butterscotch)

2. Flexible polyvinyl chloride molds which eject the food by mechanical deformation
    - are used for soft confectionery (for example toffee, fudge, jellies, caramel, fondant and chocolate)
3. polytetrafluoroethylene-coated aluminum molds, with compressed-air ejection are
    - Used for jellies, gums, fondant and crèmes.

Fig4 Depositing/molding machine

❖ **Procedure for Depositing/molding confectionery product**

Step 1: Fill the Mold

Quickly fill your mold cavities using either a ladle or spoon. Don't worry if you have chocolate all over the mold as you're going to scrape off all the excess later.

Fig5 Fill the Mold

Step 2: For Solid, Molded Chocolate Shapes

Scrape off the excess using a pastry scraper or pallet knife. Tap the mold on the table again to settle the chocolate into the cavities. Place the mold (cavity side up) on a flat cool surface to harden.

Fig6 Solid, Molded Chocolate Shapes

Step 3: For Shell Molds to Be Filled with Your Truffle or Candy Mixture

Quickly fill your mold cavities using either a ladle or spoon and then turn the mold over your bowl of chocolate and let the excess chocolate run out of the cavities, leaving a thin coating of chocolate.

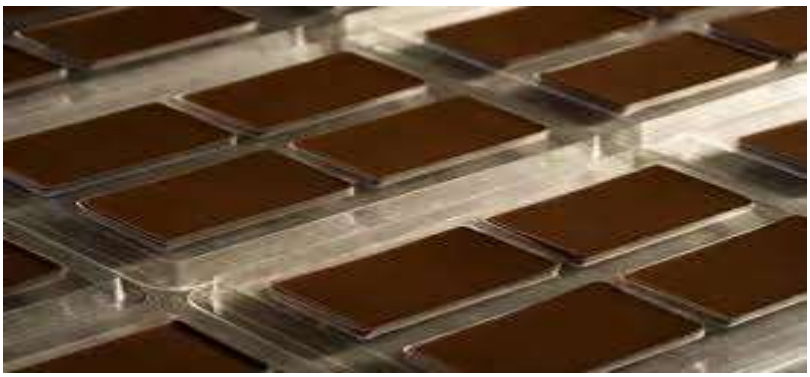

Fig7 Shell Molds to Be Filled with Your Truffle

Step 4: Hardening Your Molds

If you don't have a cool room or cupboard in which to harden the chocolate in the molds or are pressed for time, you can use the refrigerator to speed up the process. Set aside one shelf in the fridge and have it empty before you start tempering the chocolate and molding.

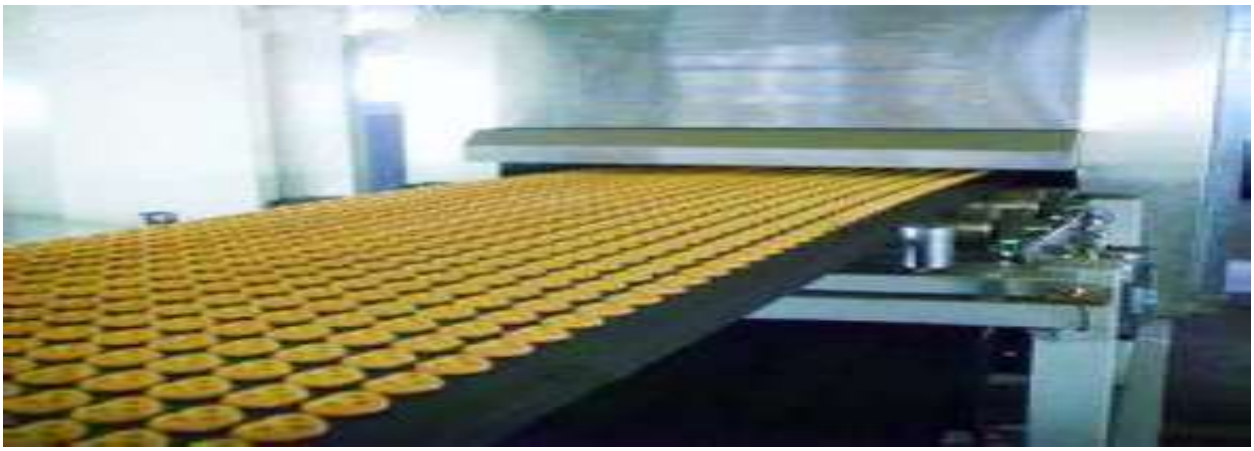

Fig8 Molding Biscuit's

The Most Popular Products Produce by Depositors/Molding machine are:

Names of the popular products in confectionary

1. Macrons
2. Muffins
3. Roulades
4. Meringues
5. Eclars
6. Tray Bakes
7. Cookies
8. Sponge cakes
9. Cupcakes
10. Viennese Whirls

Fig9 Ten Most Popular Products produced by Depositor

The Chocolate Molding Process

Fig10 Showing the procedure of melding 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 of false

1. Rotary Molders are well known for their long life-cycle, performance and comfortable operation.(4pts)

Test I: choose the best answer

1. Which of the following is the main type of molding equipment?(3pts)
   A) Metal molds fitted with ejector pins are
   B) Flexible polyvinyl chloride molds
   C) polytetrafluoroethylene-coated aluminum molds
   D) All
2. Which of the following are advantages of rotary molders? (3pts)

   A) High performance
   B) Comfortable adjustment possibilities including recipe storage functions
   C) Extensive accessories
   D) High variant diversity
   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- Monitoring operation of equipment and processes

3.1 Monitoring operation of equipment and processes

Some of the Techniques that you can monitor in the chocolate depositor machine include:

a) Numerical control Technique in chocolate depositor Machine

- It ensures dynamic and accurate depositing.
- It has a one-fixed position with a series of continuous deposits.
- It also has different divisions of nozzle lifting functions

b) Precise Depositing Technique in Chocolate depositor Machine

- It has precise and accurate control of flow at a minimum of 0.01g.
- It variable depositing is also accurate.
- The piston system has a design that cannot leak.

c) Modular Technique in chocolate depositor Machine

- This technique has a perfect configuration of the production lie without limits.
- It can easily shift the machine functions due to its flexibility.
- The production line is adjustable according to the length of the workshop.

Fig1 Moulding machine layout

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 is techniques that you can monitor in the chocolate depositor machine include(5pts)

A) Numerical control Technique in chocolate depositor Machine
B) Precise Depositing Technique in Chocolate depositor Machine
C) Modular Technique in chocolate depositor Machine
D) All

2. Which of the following is precise depositing technique in chocolate depositor Machine(5pts)

A) It has precise and accurate control of flow at a minimum of 0.01g.
B) It variable depositing is also accurate.
C) The piston system has a design that cannot leak.
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 4- Identifying and maintaining variation in equipment operation

4.1 Identifying and maintaining variation in equipment operation

4.1.1 Identifying variation in equipment operation

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

4.1.2 Maintaining variation in equipment operation

Maintaining variations in measurements

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.

Principles to avoiding unnecessary variation include:

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

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.

❖ **Benefits of properly maintained Equipment**

i) Well maintained (and designed) mold is key to producing consistent, high quality injection molded parts.

ii) Uniform cooling throughout the cavity impression (and from cavity in multi-cavity tools) will yield the highest quality part and the fastest cycle time.

iii) Ensuring a quality mold requires well-designed tooling and higher precision build, both of which can increase the tool construction cost. However, these measures will ultimately save you significant costs on repairs.

Fig1 confectionary molding machine

Self-Check – 4	Written test

Name…… ID…… Date…….

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

Test I: choose the best answer

1. Which of the following is Principles to avoiding unnecessary variation?

A) Using clear defined diagnostic criteria

B) Using calibrated, easy-to-use equipment

C) Employing standardized measurement methods

D) All

2. Which of the following Benefits of properly maintained Equipment (5pts)

A) Well maintained (and designed) mold is key to producing consistent, high quality injection molded parts.

B) Uniform cooling throughout the cavity impression (and from cavity in multi-cavity tools) will yield the highest quality part and the fastest cycle time.

C) Ensuring a quality mold requires well-designed tooling and higher precision build

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 5- Monitoring the depositing/molding process

5.1 Monitoring the depositing/molding process

Comprehensive overview of in-mold process monitoring tools and methods for injection molding process control. It aims to survey the recent development of standard sensors used in the industry for the measurement of in-mold process parameters, as well as research attempts to develop unique solutions for solving certain research and industrial problems of molding process monitoring.

This review covers the established process monitoring techniques-direct temperature and pressure measurement with standard sensors and newly developed sensors.

❖ **Full control of molding includes three levels:**

- Machine Parameters: are machine learning, big data, networks and others.
- In-mold Parameters: Deals about different kinds of sensors are available, which vary in measurement purpose and sensing methods.
- Part quality control Parameters: Deals about predominant-pressure and temperature sensors.

Today, a set of automation and digitalization technologies are developed to perform process control at each level. Among these technologies are on-machine and in-mold sensors, artificial intelligence methods, such as machine learning, big data, networks and others.

In-mold process parameters are detected by sensors. Different kinds of sensors are available, which vary in measurement purpose and sensing methods. However, for in-mold process control, two classes of sensors are predominant-pressure and temperature sensors.

Fig1 depositing/molding process

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: Say true or false

1. In-mold process parameters are detected by sensors.(4pts)

Test I: choose the best answer

1. Which of the following is included in full control of molding?(3pts)

A) Machine Parameters
B) In-mold Parameters
C) Part quality control Parameters
D) All

2. Which of the following is included in classes of sensors (3pts)

A) Pressure sensors
B) temperature sensors
C) A is answer
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 6- Identifying, rectifying and/or reporting out-of-specification product/process outcomes

6.1 Identifying, rectifying and/or reporting out-of-specification product/process outcomes

6.1.1 Identifying out-of-specification product/process outcomes

❖ Out- of-specification means not part of an explicit set of requirements to be satisfied by a material, product, or service.

Procedures identifying out-of-specification product/process outcomes

- A fine layer of material gradually builds up on the mold surfaces
- If left unchecked, this vent deposit can dent the tool
- Causing flash and other unwanted part defects. It's like owning a car.
- If you never perform regular maintenance, like changing the oil, the mechanical parts will experience wear, reduce running efficiency, and eventually.

6.1.2 Rectifying out-of-specification product/process outcomes

Unfortunately, many molders will avoid doing maintenance until these quality problems arise or the tool breaks down. Repairing the mold at this point can be expensive and can jeopardize your part supply.

However, if done regularly and correctly, preventative maintenance can improve production and lower the overall cost of owning the tool.

6.1.3 Reporting out-of-specification product/process outcomes

❖ **Report**

For each subsample, report defective product units or pieces according to the type of defect and determine the percent of each.

❖ **Reporting processes outcomes**

When a quality defect is found and documented, the technician assumes the 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
- Changing the processing specification as needed.

❖ 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.

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. For each subsample, report defective product units or pieces according to the type of defect and determine the percent of each.(4pts)

Test I: choose the best answer

1. Which is true about the molding process can cause wear on the mold? (3pts)
   A) A fine layer of material gradually builds up on the mold surfaces
   B) If left unchecked, this vent deposit can dent the tool
   C) Causing flash and other unwanted part defects. It's like owning a car.
   D) If you never perform regular maintenance, like changing the oil

2. Which is true about rectifying out-of-specification product/process outcomes(3pts)

A) Repairing the mold at this point can be expensive and can jeopardize your part supply.
B) However, if done regularly and correctly,
C) Preventative maintenance can improve production and lower the overall cost of owning the tool.
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 7- Maintaining the work area

7.1 Maintaining the work area

Maintaining the work area of molding process

Maintaining the work area is the mechanism of making working area fit for done our work properly and sustains the good working environment.

Maintaining the work area according to Housekeeping Standards includes:

- When opening and closing double molds, take care to avoid trapping or injuring your fingers due to the high clamping force of the magnets!
- Molds should be regularly inspected for breakage, cracks and missing components (magnets, plastic or metal parts). Damaged molds should not be used! Damage is best visible if the molds are inspected immediately after washing.
- Please be aware, that even just one single neglect of the care and maintenance recommendations provided herein may result in irreversible damage to the molds.
- This especially applies to the dosing of cleaning agents, incorrect water temperature, and abrasive cleaning action, inadequate rinsing with de-mineralized water and the storage of molds under less than completely dry conditions.
- Polycarbonate molds have the capacity to store static electrical charge. This is a normal physical occurrence.

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: Short Answer Questions

1. List at least ten (10) about maintaining the work area according to Housekeeping Standards ?(10pts)

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

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

8.1 Conducting the work according to environmental guidelines

- The environmental Health and safety should state intent to:
  - Prevent or mitigate both human and economic losses arising from accidents, adverse occupational exposures, and environmental events.
  - Build EHS consideration into all phases of the operations. Including laboratory discovery and development environment.
  - Achieve the compliance with regulations
  - Continually improve EHS performance

- **General Safety Rules**

Below are some basic guidelines for maintaining a safe working environment.

1. To ensure that help is available if needed, and not work alone if using hazardous materials or performing hazardous procedures.
2. Do not perform unauthorized experiments.
3. Plan appropriate protective procedures and the positioning of all equipment before beginning any operation. Follow the appropriate standard operating procedure at all times in the laboratory.
4. Always read the label before using a chemical in the laboratory.
5. Wear appropriate personal protective Equipment (PPE) including visitors.
6. Use appropriate ventilation such as laboratory chemical hoods when working with hazardous chemicals.
7. Contact the EHS (**environmental Health and safety)** office you have questions about the adequacy of the safety equipment available or chemical handling procedures.

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: Choose the best answer

1. Which of the following is true about the environmental Health and safety(5pts)

A) Prevent or mitigate both human and economic losses arising from accidents
B) Adverse occupational exposures and environmental events.
C) Build EHS consideration into all phases of the operations
D) Including laboratory discovery and development environment.
E) All

2. Which of the following is true about some basic guidelines for maintaining a safe working environment?(5pts)

A) To ensure that help is available if needed, and not work alone if using hazardous materials or performing hazardous procedures.
B) Do not perform unauthorized experiments.
C) Plan appropriate protective procedures and the positioning of all equipment before beginning any operation. Follow the appropriate standard operating procedure at all times in the laboratory.
D) Always read the label before using a chemical in the laboratory.
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 9- Maintaining workplace records

9.1 Maintaining workplace records in molding

You are required to document a variety of workplace activities and procedures. The legislation uses several terms for record keeping, including log book, document, records and written reports. To demonstrate due diligence, it is important to keep records of workplace activities and of health and safety procedures.

❖ Examples of the types of records you must keep include, but are not limited to:

- Employee orientation records.
- Workplace inspection reports and records of corrective actions taken.
- Incident investigation reports and records of corrective actions taken.
- Records of employee and supervisor training with the date, attendance and topics covered.
- Joint health and safety committee (JHSC) minutes showing what steps have been taken to address health and safety issues.
- Equipment log books and maintenance records.
- First aid records, medical certificates and hearing tests.
- Sampling and monitoring records for work around harmful substances (asbestos, mould) and physical agents (noise, vibration, radiation).
- Records of visits by a health and safety officer.
- Safety Data Sheets (SDS) of hazardous products used in a workplace

❖ Examples of the types of records you should keep include, but are not limited to:

- Records of meetings and crew talks where health and safety issues were discussed.
- Subcontractor pre-qualification documents.
- Supervisors' notes and logs of safety activities.

- Records showing the use of progressive discipline to enforce safety rules.
- Forms and checklists, such as confined space entry permits, that show that you require workers to follow safe work procedures.
- Emergency response plan, records of drills and any resulting improvements

❖ The health and safety program must have a record management system that includes:

- Reports of employee training.
- Incident statistics.
- Work procedures.
- Records of all health and safety inspections and any follow-up.
- Records of any health and safety related investigations and any follow-up.
- Records of all maintenance of facilities or equipment in the workplace and any follow-up.

Self-Check –9	Written test

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. List at least ten (10) types of records you must keep in chocolate molding process.(10pts)

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

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

Operation Sheet 1- chocolate molding process

Procedure

Step1 Preparing Molding equipment

Step2 Prepare ingredients

Step3 Preparation of moulding procedures

Step4 Movement of the chocolate dough into moulding equipment

Step5 Filling the process

Step6 Cooling process

Step7 Quality Assessment

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 molding process

LG #55	LO #3- Shutdown the chocolate molding 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**:

- Identify the appropriate shutdown procedure
- Shut down the process.
- Identify and report 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

1.1 Identifying the appropriate shutdown procedure

Shut down/isolation means and includes isolation of mechanical, electrical drives, pipework (pressure) rotating equipment etc. utilizing electrical lock-off isolators, mechanical and power driven valves etc. in accordance with standard operating instructions. Pull plug or throw switch to off position before cleaning or adjusting any machine. Keep fingers, hands, spoons, etc., away from moving parts. Wait until machine stops before moving food.

❖ Relevant regulations to shut down are :

- Undertake shut-down sequence safely and to standard operating procedures.
- Depressor /empty/de-energy/bled machine/equipment to standard operating procedures.
- Verify safe shut-down of machine/equipment.
- Install safety/security lock-off devices and signage to standard operating procedures.
- Do not start a miller until the bowl is locked in place and the attachments are securely fastened.
- Turn off motor before you scrape down the sides of the bowl, when using a miller.
- Left machine/equipment in clean and safe stat
- Make sure they cannot fall, when working with tools at height

Self-Check – 1	Written test

Name…… ID…… Date…….

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

Test I: Choose the best answer (6 pts.)

1. Which of the following are true about the relevant regulations for shut down water treatment equipment?

A) Shut-down sequence is undertaken safely and to standard operating procedures.
B) Machine/equipment is depressurized /emptied/de-energized/bled to standard operating procedures.
C) Safe shut-down of machine/equipment is verified.
D) Safety/security lock-off devices and signage are installed to standard operating procedures.
E) 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 the process

2.1 Shut down the Chocolate molding process

❖ **Shutting down process**

Shutting down process is the act of closing a factory or business or stopping a machine/equipment either temporarily or permanently.

Reading, interpreting and following information on written job instructions, specifications and other applicable reference documents

- Checking and clarifying task-related information
- Entering information onto preforms and standard workplace forms.
- Shutting down machine/equipment.
- Purging/de-energizing equipment.
- Installing safety/security lock-off devices and signage

Procedure of Chocolate molding process

Step 1 Make sure power tools are properly grounded or are double insulated

Step 2 Switch off Chocolate molding equipment and unplug power tools before changing blades or servicing and repairing

Step 3 Wear appropriate personal protective equipment (PPE), such as glasses, goggles, dust masks, face shields, hearing protection, etc.

Step 4 Keep by standers at a safe distance

Step 5 Keep all guards and shields in place

Step6 Unplug and store tools after use

Step 7 Consider keeping power tools locked up to prevent unauthorized use

Step 8 Cleaning and other activities by turning off molding equipment by unplugging a power or by pressing emergency button.

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: Short Answer Questions

2. List down Chocolate molding process Shut down procedure?(10pts)

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 reporting maintenance requirements

3.1 Identifying maintenance requirements

The followings are maintenance requirements

- Degradation begins to occur due to an errant temperature controller
- Mold cleaner and wipe neutralizer off core, cavity, vent area and parting line faces in good condition. ·
- The barrel is movable or not
- Electrical areas cleaned or wipped

3.2 Reporting maintenance requirements

The followings are reporting maintenance requirements

- Open press and spray both mold halves, vent grooves, and parting line face with a good mold cleaner. Then wipe off. ·
- Manually advance injector box so injection pins are fully extended.
- Spray injector pins, cavity, core and parting line face with a spray neutralizer
- Manually retract and advance injector box several times to work neutralizer down injection pin bores. Spray both mold halves with a good mold cleaner and wipe neutralizer off core, cavity, vent area and parting line faces. ·
- Manually advance injectors again and spray down with good mold cleaner or electrical contact spray cleaner. This will flash off the oils of the neutralizer spray on the injector pins and injector pin bores. ·
- Pull nozzle away from mold, empty the barrel, make up next shot, move barrel injection unit forward, and resume production.

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 are true about Maintaining of chocolate molding machine?(6pts)

A) Open press and spray both mold halves, vent grooves, and parting line face with a good mold cleaner. Then wipe off. •

B) Manually advance injector box so injection pins are fully extended.

C) Spray injector pins, cavity, core and parting line face with a spray neutralizer

D) All

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

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

Operation sheet 1– shutdown chocolate molding equipment

Procedure:

Step 1 Make sure power tools are properly grounded or are double insulated

Step 2 Switch off Chocolate molding equipment and unplug power tools before changing blades or servicing and repairing

Step 3 Wear appropriate personal protective equipment (PPE)

Step 4 Keep by standers at a safe distance

Step 5 Keep all guards and shields in place

Step6 Unplug and store tools after use

Step 7 Consider keeping power tools locked up to prevent unauthorized use

Step 8 Cleaning and other activities by turning off the equipment by unplugging a power

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 molding equipment

Reference Materials

Martin, B. (2003) “Putting Theory into Practice: A Guide to Effective Maintenance

Mechefske, C.K. (2006) “Machine Condition Monitoring and Fault Diagnostics”.

Yannis and Mackwanzie. (2003) Advanced Condition Based Maintenance. Matricon Inc.

Jeff, E. and S. Daniel. (2007)“Biocontainment Facilities”. Tradeline 2007 International

LAFARGE, Cement Division. (2005) “Maintenance Organization and Functions”. Meyre, M. (2002)“A Publication on Inspection”. Lafarge Cement Division.

Duke Energy. (2006) “Programmatic Maintenance; Best Practices”. Hydro Division Walt

Mechefske, C.K. (2006) “Machine Condition Monitoring and Fault Diagnostics”. ISO 9000:2005 Quality Management System – Fundamentals and Vocabulary

http://www.qualitygurus.com/courses/mod/forum/discuss.php?d=1557
http://www.iitg.ac.in/spal/Methods%20of%20mounting%20of%20jobs%20and%20cutting%20tools.ppt

http://www.iitb.ac.in/safety/sites/default/files/Machine%20Safety_0_0.pdf)

https://www.fda.gov/media/109408/download

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