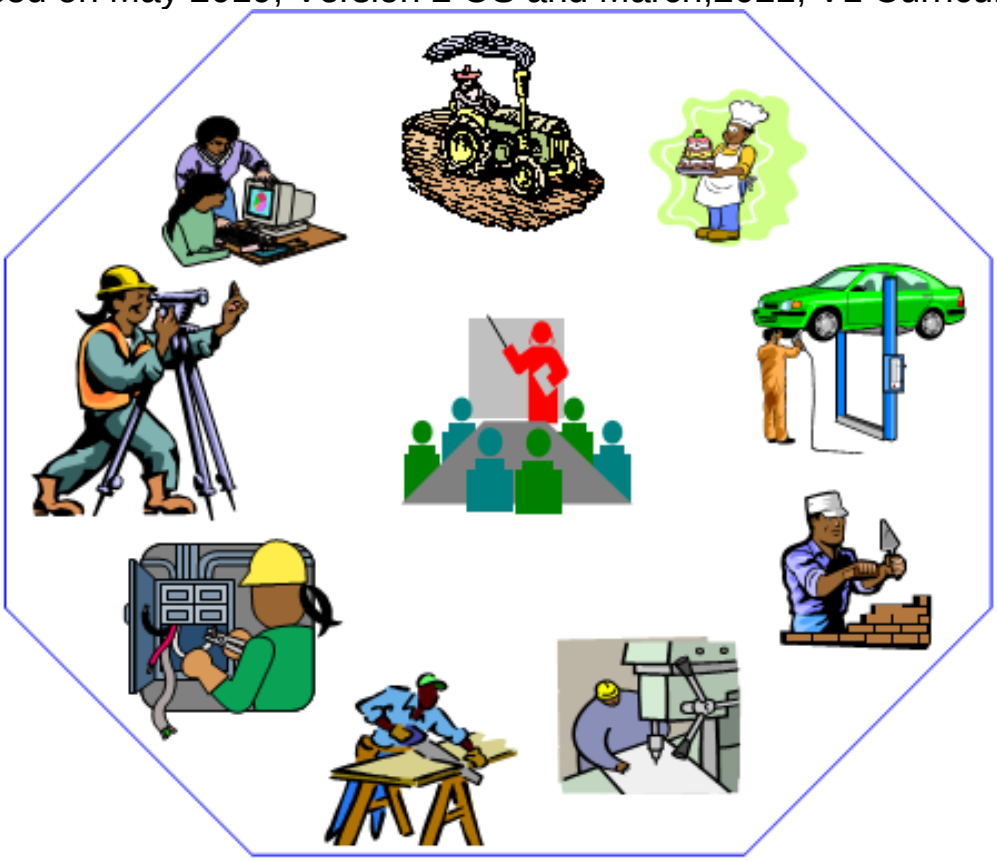
Fruit and vegetable processing level III

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



Module Title: - Operating Blowing Mould and Injection Equipment

LG Code: IND FVP3 M11 LO(1-4)LG(55-58)

TTLM Code: IND FVP3 TTLM 0321v1

March, 2021

Bishofitu, Ethiopia

United Nations Educational, Scientific and Cultural Organization

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LG #35 LO #1- Check work requirements

Instruction sheet

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

- Identifying work requirements from procedures
- Identifying product, materials, equipment and tools requirements
- Recognising hazards and adopting steps required to ensure safety
- Checking whether requirements are in accordance with usual practice

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 work requirements from procedures
- Identify product, materials, equipment and tools requirements
- Recognis hazards and adopting steps required to ensure safety
- Check whether requirements are in accordance with usual practice

Learning Instructions:

Read the specific objectives of this Learning Guide.

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

Information Sheet 1- identifying work requirement from procedures

1.1. Blow moulding

Blow molding is a process of producing hollow or double wall objects from thermoplastic materials.This process can be used to manufacture plastic products. The process involves heating a plastic tube (known as a preform or parison) to its melting point and then putting that into the cavity of a mold.

The thickness of of the final product is determined by the amount of plastic used and air pressure

Basic Process

The basic process of blow moulding consists of three stages:

1. Melting and Plasticising – This is accomplished with either extrusion and/or injection moulding machine to produce the melt.
2. Plastic Formation – Through head and die or in an injection mould.
3. Blowing and Moulding – An auxiliary compressor provides air pressure and a clamp unit, which closes over a split mould that is operated with an hydraulic system.

Process stages description

- Plastic pellets are fed into the machine via a hopper or screw depending on the machine.
- Plastic melts and then gets shaped into a parison, which looks like a tube with a hole at one end.
- Clamped in place inside the mold.
- Compressed air inflates the parison.
- The heated plastic balloons to fill the space of the mold.
- After the plastic cools, the machine opens the mold and removes the part, sending it on to any applicable finishing,

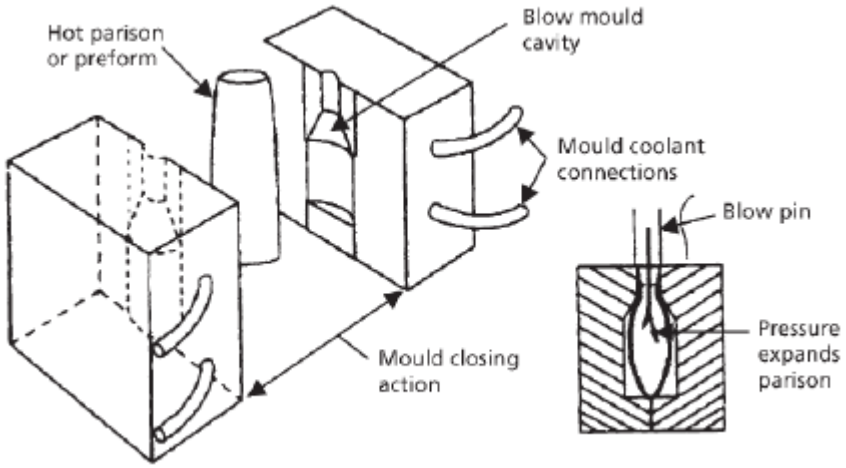

Fig 1. Basic blow moulding process

1.1.2 Types of Blow Moulding

There are a few different types of blow molding. Their differences lie mostly in how they form the parison, the size of the parison, and how the parison moves between the molds. The main types of blow molding are:

- Injection Blow Moulding Process
- Stretch Blow Moulding (SBM)
- Extrusion Blow Moulding (EBM) Process

Injection Blow Moulding Process (IBM)

The term injection blow moulding is the compatible integration of two processes, injection moulding and blow moulding. It is a two-step process. The first stage consists of injection moulding the preform in a mould consisting of a cavity and a hollow core. The second involves moulding and cooling in a follow-on mould. The preform is injection moulded at a temperature which is in the temperature range of the moulding resin and blown at a temperature in the thermoplastic range. Injection blow moulding produces a parison with bottle neck and threads already formed to final dimensions. This method is preferred over extrusion blow moulding for making small parts that require high production volumes and closer quality dimensions.

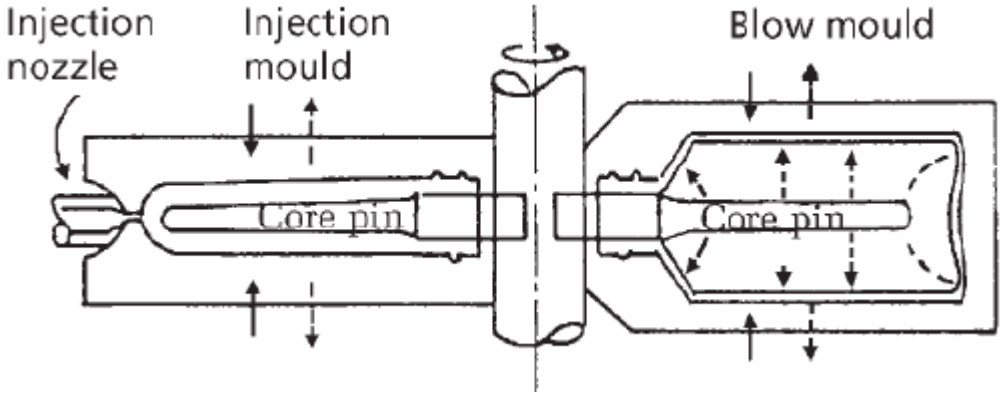

Fig 2. injection blow moulding

Stretch Blow Moulding (SBM)

Stretch blow moulding became known in the blow moulding industry with the introduction of the soft drink bottle. One of the major advantages of stretch blow molding is the ability to stretch the preform in both the hoop direction and the axial direction.

Extrusion Blow Moulding (EBM) Process

Extrusion is the process of applying heat and pressure to melt the resin and force it through an accurately dimensioned die to produce the desired shape. For blowing purposes this is a shape from which the parison is cut. In contrast to injection blow moulding, all areas of the extruded parison, with the exception of the pinch off, undergo forming during the blowing step. This includes the closure threads on bottles and, in some cases, handles and support lugs.

1.2. Identifying work requirement

A blow moulding operator sets up one or more machines, observes their operation, ensures the manufactured products meet specifications, makes adjustments as necessary and tears down the equipment.The operator removes also finished products from the molds and may trim excess plastic from parts. Some operators perform minor or routine maintenance and repairs.

Blow moulding operators troubleshoot problems and perform simple repairs. They know how to use correct tools. Operators must also demonstrate monitoring skills, using visual observation of gages and listening to mechanical sounds to make sure the equipment is working properly. A good blow moulding operator also needs manual dexterity and strength to lift, pull, push and carry objects.

Self-check 1	Written test

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

Test I Short Answer Questions

1. Define blow moulding (2pts)
2. List types of blow moulding (2pts)
3. What factors determine the thickness of blow moulded plastic products(5)
4. What are the basic process in blow moulding?(5pts)
5. Show blow moulding process in diagram(5pts)
6. What are the work requirements for a blow molder?(5pts)

Test II. Choose the best answer (2pts)

1. Which one of the following is used to make the desired shape in extrusion blow moulding?

   A. Die B. Stretch rod C. Srew D. None

Note: **Satisfactory rating – 13 points** **Unsatisfactory - below 13 points**

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

Score = _____

Rating: _____

Information Sheet 2- Identifying product, materials, equipment and tools requirements

2.1. Identifying products

Blow molding is used to produce hollow containers, such as bottles. On the other hand, injection molding is used to produce solid pieces, such as solid plastic plates used in the kitchen.

Blow Molded products Materials

Water Bottles Liquid Containers

Plastic Buckets Plastic Cups

Fig 3.plastic juice containers

2.2. Identifying raw materials

The plastic bottles used to hold potable water and other drinks are made from polyethylene terephthalate (PET), because the material is both strong and light.Polypropylene (PP) is used for pill bottles and the like. Polycarbonate (PC) is used for refillable water bottles and similar reusable containers. To understand the manufacturing process, it is helpful to first examine the compositions of PET, PE, PP, and PC and how these materials affect the making of plastic bottles.

Table 1. Raw materials description

Material name	Abbreviation	Trade names	Description	Applications
Polyethylene - Low Density	LDPE	Alkathene, Escorene, Novex	Lightweight, tough and flexible, excellent chemical resistance, natural waxy appearance, low cost	Kitchenware, housings, covers, and containers
Polypropylene	PP	Novolen, Appryl, Escorene	Lightweight, heat resistance, high chemical resistance, scratch resistance, natural waxy appearance, tough and stiff, low cost.	bottles, caps, crates, handles
Polystyrene - High impact	HIPS	Polystyrol, Kostil, Polystar	Impact strength, rigidity, toughness, dimensional stability, naturally translucent, low cost	food container

a) PP **b)HIPS**

Fig4. a) pp plastic granuels, b) HPIS plastic granuels

2.2.1 Plastics Additives

All plastics products are made from the essential polymer mixed with a complex blend of materials known collectively as additives. Without additives, plastics would not work, but

with them they can be made safer, cleaner, tougher and more colourful. Additives cost money, of course, but by reducing production costs and making products last longer, they help us to save money and conserve the world's precious raw material reserves. In fact, our world to day would be a lot less safe, a lot more expensive and a great deal duller without the additives that turn basic polymers in to useful plastics.

Importance of additives

- Make Plastics Easier to Process
- Make Plastics Look Good
- Additives Save Money
- Make Plastics Safe and Sound
- Make Plastics Clean and Healthy
- Make Plastics Work Longer
- Additives Respect the Environment

Types of Additives used in plastic blow molding

Anti Counterfeiting: There are a number of ways manufacturers and brand owners can combat counterfeiting by employing one of several or indeed multilayer anti-counterfeiting technologies. Optical brighteners absorb ultraviolet and violet light then re-emit this energy at a higher wavelength, normally as a blue glow.

Antimicrobials/Biostabilisers: Help prevent deterioration of plastic materials where part of the material might be susceptible to microbiological attack. Such attacks can cause staining, discolouration, odour and loss of aesthetics but more importantly, loss of electrical insulating properties, hygiene and overall loss of mechanical properties in the material.

Antioxidants: Help prevent "oxidation", the polymer reacting with oxygen. Oxidation can cause loss of impact strength, elongation, surface cracks and discolouration. Antioxidants help prevent thermal oxidation reactions when plastics are processed at high temperatures and light-assisted oxidation when plastics are exposed to UV light.

Antistatic Agents: Help to prevent the build up of static electric charge. Plastics are generally insulating and so have the capacity to build up static charges on the surface which greatly disturb processing procedures and can be an issue for hygiene and aesthetics.

Biodegradable Plasticisers: Used to make plastics softer and more flexible and to enhance the degradability of the product.

Blowing Agents: Form gases in the plastic to produce a foam material. The blowing agents form gases by breaking down on heating at a pre-determined temperature and form a foam structure within the plastic's polymer matrix.

External Lubricants: To prevent damage to plastics or the mould during processing. Applied to the material or directly to the machine to allow processing without damage

Fillers/Extenders: Natural substances used to improve strength and lower the cost of the material. Usually mineral-based, fillers/extenders literally increase the overall "bulk" of the plastic.

Heat Stabilisers: To prevent decomposition of the polymer during processing. Processing usually results in temperatures well above 180 deg celsius, which without the addition of heat stabilisers would result in the plastic material literally falling apart

Impact Modifiers: Enables plastic products to absorb shocks and resist impact without cracking. Particularly relevant for polyvinyl chloride (PVC), polystyrene (PS) and polypropylene (PP) materials.

Internal Lubricants:used to improve processability of plastics by increasing the flowability. Internal lubricants improve the melt flow of material by lowering the viscosity and heat dissipation.

Light Stabilisers: Used to inhibit the reactions in plastics which cause undesirable chemical degradation from exposure to UV light.

Pigment: Tiny particles used to create a particular colour.

Plasticisers;Used to make plastics softer and more flexible.

2.3. Identifying equipments and tools

Needle molders:A blow-molding technique in which air is injected into the plastic article through a hollow needle inserted in the parison.

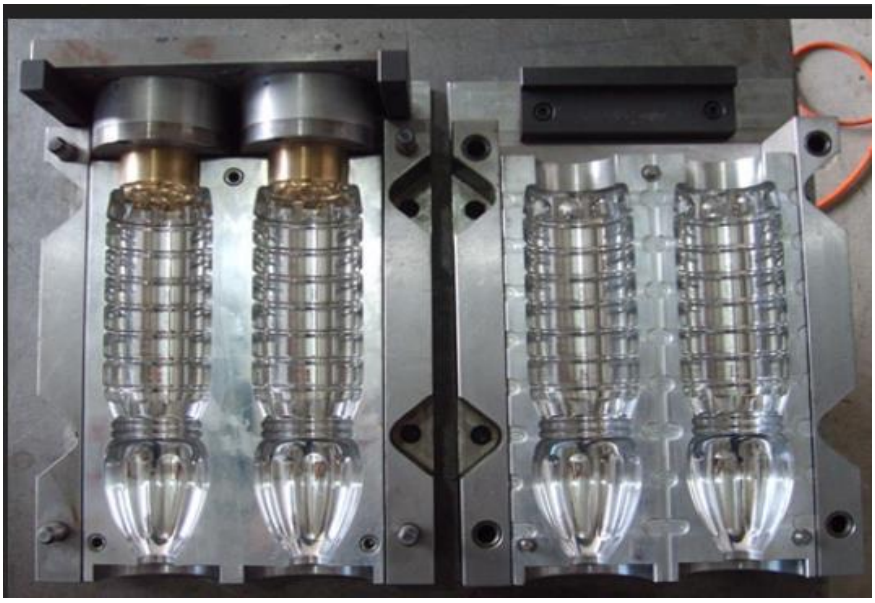

Fig 5. Needle molders

Tail to tail blow molders: In the process of manufacturing bottles, Plastics utilizes belt conveyors to move the moils and tails away from their extrusion blow molding machines. Two conveyors are paired together; one conveyor is used to get the moils and tails out from under the molding machine and the other conveyor feeds them into a grinder. The two belt conveyor system is way of removing the moils and tails from the process of blow molding bottles as they are trimmed or deflashed.

Fig6. Conveyors for tail tail blow molding

A bottom blow stand: A bottom blow stand unit is used for mounting the blow-pin assembly, pre-pinch unit, and parison spreader unit. The stand is used for manual setups during mold changes and setup requirements. Motorized control allows for rapid

The blow-pin assembly: allows the parison forming air to enter the parison from the bottom of the mold. The blow pin also forms the neck opening in the molded part. It requires water cooling. Depending on the part requirements, the neck opening could be compacted for a sealing or finished surface in the part. This can be accomplished by having a secondary position or midpoint, and the blow pin will move to this position at full mold closing. Once the mold is closed, the vertical cylinder is fully extended.

Once the mold starts to open, the bottom blow pin is used to help demold the parts from the cavities on the bottom, along with the takeout device gripping the upper portion of the parts. After a small movement of the platens, the blow pin is retracted completely from the mold cavity to allow the takeout device to remove the part from the press. Blow pins can also be used as spreaders.and accurate up/down position changes.

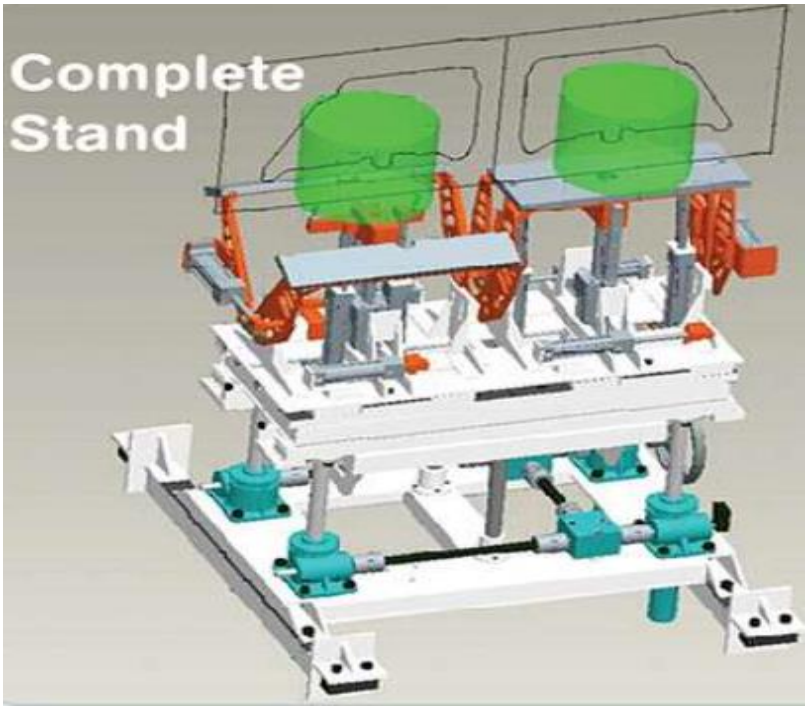

Fig7. Bottom blow stand

Parison pre pinch unit:uses two water-cooled aluminum plates in either a bear-trap or horizontal-closure arrangement. Either type of unit is normally used in conjunction with a

needle-blow setup. The parison is pushed out, and at the end of the cylinder stroke (accumulator empty) the two pinch bars will close and seal the parison on the bottom. Preblow air then inflates the sealed parison. The preblow air will shut off when the clamp is closed. At this time, main blowing air will be introduced by a needle that is injected into the parison.

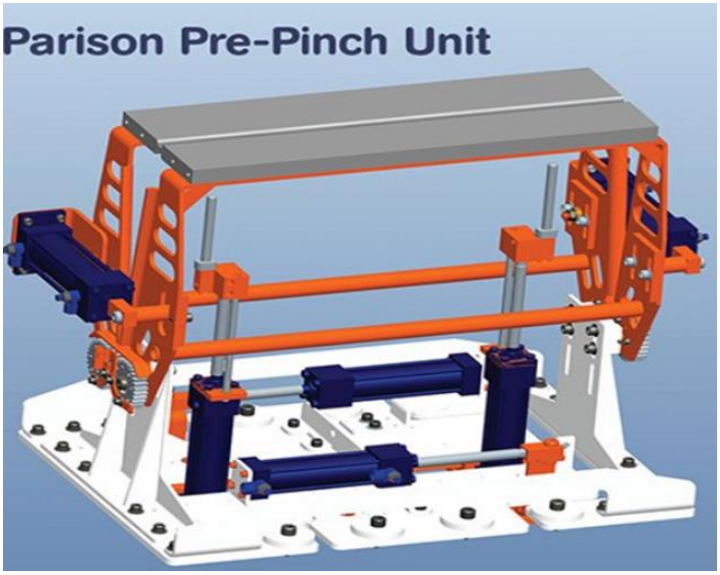

Fig8. Parison prepinch unit

Parison spreader units:are ideal for making blow molded panels. Two spreader pins will ensure that the parison width will be at the same desired position cycle after cycle.
It will also prepare the parison for the wide, flat part shape, which is usually 2 in. to 3-in. thick. It will also tend to move the thin wall of the parison into the flash pocket of the mold and not in the actual part.

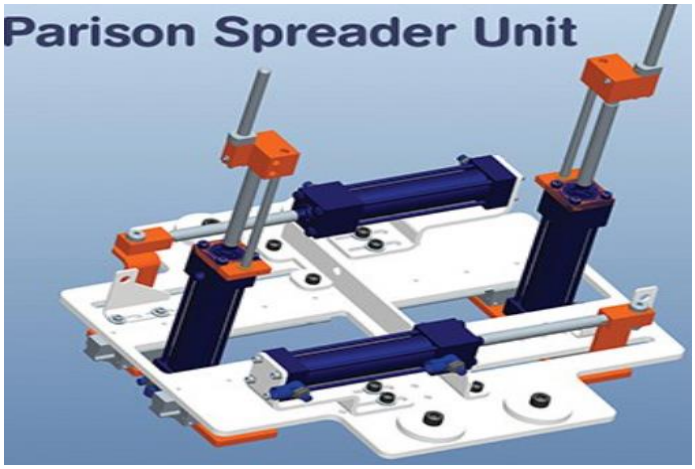

Fig9. Parison spreader unit

Self-Check – 2	Written test

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

Test I: Answer the Questions aequired

1).List raw materials which are suitable blow molding process.(5pt)

Test II: Choose the correct answer. (2pts)

1. which one of the following is function of Impact Modifiers

A. prevent the build up of static electric charge

B. Used to make plastics softer and more flexible.

C.Enables plastic products to absorb shocks and resist impact without cracking

D. Enables products to resisit heat

2.Most kitchenware products are produced by injection molding.

A. True B.False

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

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

Score = _____

Rating: _____

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Information Sheet 3- Recognising hazards and adopting steps to ensure safety

3.1. Recognizing hazards

Injection and blow moulding presses use plastic granules loaded from a hopper into a closed auger. They pass through a heater to be melted and forced into a mould.

The moving part of the mould is forced against the fixed part by a hydraulic ram with several tonnes of force. Molten plastic is shaped into a hollow tube, which is blown into the shape of a mould, for example a bottle.

The mould is held closed during plastic injection and cooling. It is forced open by the hydraulic ram and the moulded item is taken out for further processing.

Blow moulders often have machinery associated with them to handle formed products. This additional machinery presents hazards that require identification and guarding.

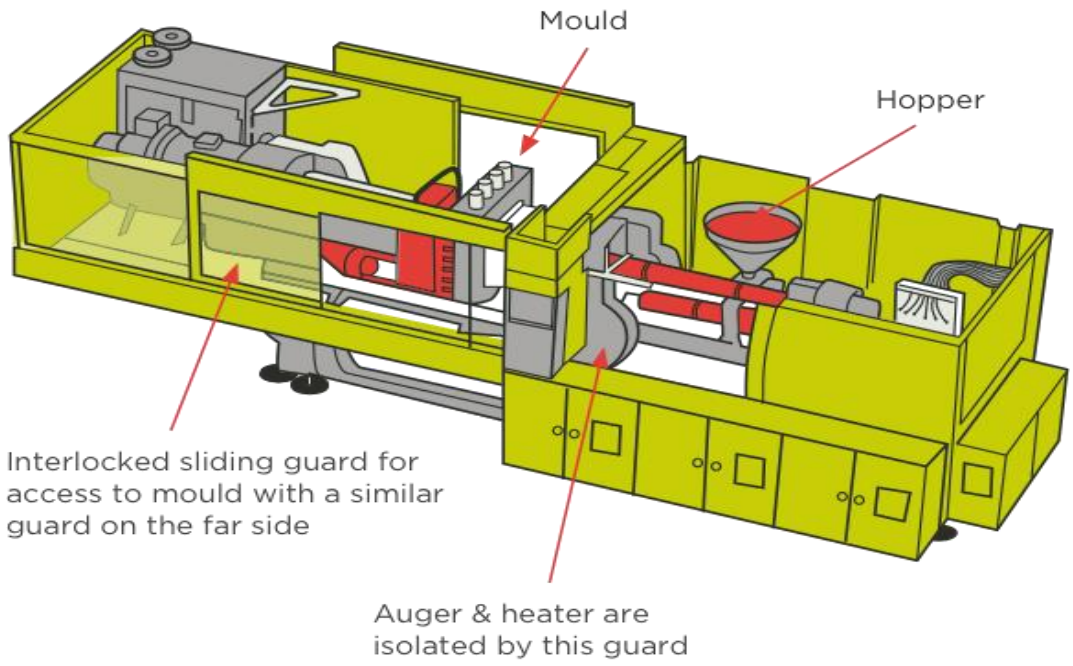

Figure10. Injection and blow moulding press

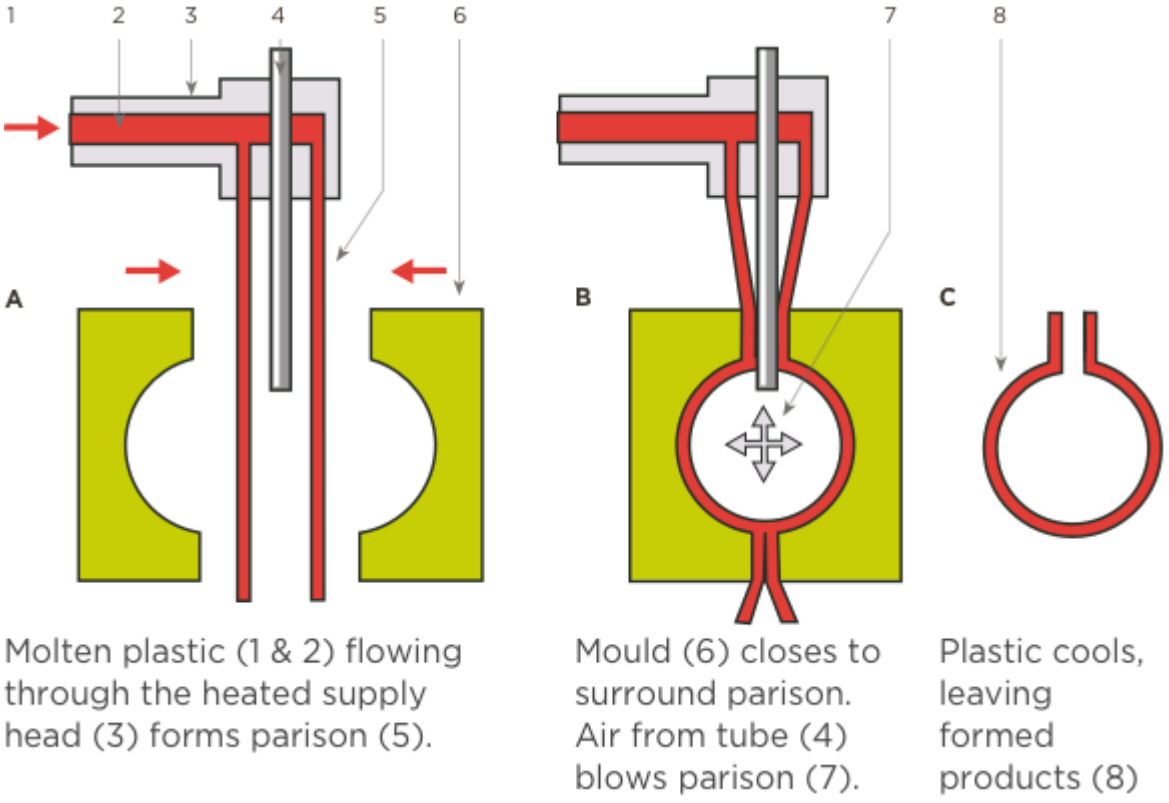

Fig11. parts of injection and blow moulding press

Hazards

- Manual Lifting
- Entanglement from reaching into the auger
- Entrapment in closing moulds
- Heat from plastic
- Toxic fumes
- Entrapment in moving parts
- Dust
- Noise
- Slips, trips & falls
- Entrapment from unexpected movement (during maintenance, cleaning & repairs)

Personal protective equipment (PPE)

- Ear protection
- Eye protection
- Respiratory protection

a)

b)

c)

fig12.Personal protective equipment a)ear protection, B)eye protection c) respiratory protection

Table2. hazard and control

Task	hazard	Harm	Control
Load granules	Manual lifting	Strain injury	• Lift loads in manageable quantities. • Use mechanical aids when necessary. • Use pneumatic conveyors.
Bags of granules are often lifted manually to pour into the hopper			
	Entanglement from reaching into the auger	Risk of cuts and crushing to hands	• Fix guards where possible to prevent reaching into the auger. • Keep interlocked guards safely maintained. • Use mesh to prevent reaching through hoppers.
	Entrapment in closing moulds	Crush injuries to anyone caught in a decreasing gap	• Isolate hazardous processes such as heat or mould closure. • Automatically Push moulded components from the mould, onto a belt conveyor or into a bin for collection. • Provide dual channel interlocks, with mechanical stops if necessary, to ensure that moulds cannot close. • Use mechanical aids for lifting, when appropriate.
Moulds close with several tonnes of force, and weigh up to several kilograms			
Heating, melting, and moulding collection	Heat from plastic, Toxic fumes from hot plastic	Burns from touching the auger cover or being hit by molten plastic, Inhaling toxic fumes – breathing problems, lung damage	•Isolate hazardous processes such as heat or mould closure. •When heating granules, Use temperatures low enough to avoid formation of toxic vapours. •Shield he auger and heating equipment from contact. •Provide adequate ventilation. •Use respiratory protection.

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			.
	Plastic becomes liquid at about 200°C. Plastic is forced into moulds under high pressure. Leakage between the auger and the mould is likely to squirt out jets of molten plastic		
	Entrapment in moving parts	•Crush injuries •Bruising •Fractures	• Use dual channel interlocks to stop mould parts moving while guards are open. • Fix guards to prevent reach into moving parts – guards open Must be interlocked to prevent movement. • Maintain guard interlocks in a safe operational condition. • Use mesh within the hopper, or by high-sided hoppers, to prevent reach to the moving auger. • Presses with guards that close under power Must be fitted with: • sensitive edges on both sides to detect intrusion and stop or • a reduced pressure closing system which allows a person to easily stop the guard. • If additional Safeguards are required, they Must be fitted by competent suppliers.
non-mechanical hazards	Dust	• Eye irritation or damage • Breathing problems • Lung damage or	• Use dust extraction equipment to minimise dust getting in the operator's breathing zone. • Handle and Store granules to minimise spills and dust. • Promptly clean plastic dust from surface.

		cancer • Worsening of existing health problem • Risk of explosion or fire	• Provide adequate ventilation. • Alwayes wear eye protection. • Alwayes use respiratory protection. • Keep fire extinguishers nearby, and ensure operators know how to use them.
	Noise	•Hearing damage or loss	• Reduce noise levels by isolating machines or enclosing within noise barriers. • Assess noise levels. • Arrange hearing screenings. • Alwayes wear hearing protection.
A safe noise level over an eight hour day is 85dB(A). An injection and blow moulding press may exceed this noise intensity			
	Slips, trips and falls	•Trapping or crushing injuries •Burns •Bruising	•Keep up-to-date housekeeping procedures. •Keep the area around machines clear of slip and trip hazards.
Maintenance, cleaning & repairs	Entrapment from unexpected movement	•Cuts •Burns •Crush injuries	• Lock-out all power supplies before maintenance, cleaning and repairs. • When guards are open, there must be a second option to shut off power. • Use the correct electrical rated equipment. • Keep guard interlocks safely maintained. • Keep daily inspection records, and arrange regular testing. • Arrange annual inspections by a qualified technician. • Remove presses that fail safety tests, and do not use until repaired or replaced.

Self-Check – 3	Written test

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

Test I: Short Answer Questions

1**.** How can granule loading task be safe?(5pts)

2.What are the control measures for hazards caused by Heating, melting, and mould collection task?(5pts)

3. list out personal protective equipments used to preven thazards in workplace.(3pts)

4. Identify atleast five(5) types of hazards that exist in blow molding workplace.(5pts)

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

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

Score = _____

Rating: _____

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Information Sheet 4-Checking requirements with usual practice

4.1.Checking requirements

A manufacturing company has its working programmes and schedules ,these programmes and schedules always are followed in the usual practices or day today activities.the consistency of thes uaual practices are maintained by fulfilling the the requirements of manufacturing plant.There are different requirements for blow moulding and injection equipment operation these includes raw material,equipment and tools,air,water,electricity.valve location requirments.

Before starting operation operators check whether the requirements are fulfilled.The requirements for raw materials and equipments are identified in the preveous lessons.The other requirements for air,water and electricity,valve location are as follow.

4.1.1 Utilities requirments(air,water,electricity)

The following are requirements for air,water and electricity

Air

- Amount of pressure available
- Amount of volume required
- Existence of pressure drop in the line
- Is a surge tank necessary
- line sizes are required (Is filtered/dry air needed)

Water

- The hookups located on the machine
- The size lines are required
- Water temperature is required
- cooling tower
- What size chiller is needed and where is it located

Electricity

- Consider the voltage
- breaker size (full-load amps), and location of the main breaker.
- Power hookup on the machine

- Amount of power in the plant for equipment

4.1.2.Location of air & Hydraulic valves

It is best to locate the main air valves as close to the inlet of the parison as possible to ensure that the parison inflates quickly. The air lines and the valve and manifold should be as large as feasible—at least 1 in. diam. or 1.25 in. for very large parts. Large lines will facilitate quick exhaust of air within the part during the vent cycle.

The exhaust valve must be located right at the discharge of the blowing needle or pin. Some parts will require “low blow” or low-pressure blowing air.

Pre-blow air must be set up to be part of main blow air or separate when pre-blow is in a different part location from main air blow. In both cases, if the main air blow is directly connected to pre-blow or low blow, check valves must be used in the connecting lines. This will prevent the main air from leaking out through these auxiliary valves. In most cases, the other air valves used in blow molding are 3/8 in. These are for the gates, needles, knockouts, pre-pinch, strippers, etc. Most often, these valves are manifold mounted on the press or on the main frame.

Like the air valves, locate the hydraulic valves near the actual function they are used to control. Valves for split molds, knockout, unscrewing threaded blow pins, parison spreaders, up/down movement of blow pins, etc. are usually mounted on the press frame. The shooting and programming valves should be mounted near the accumulator heads on top of the main base.

Self-Check – 4	Written test

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

Test I: choose the best answer (2pts)

1.Which one of the following is correct?

A. Exhaust valve must be located right at the discharge of the blowing needle

B. Exhaust valve must be located at the right of the blow needle

C. A cold draft has no effect on the parison .

D. B& C

2.All of the following are the requirements for electricity,except_____.

A.Voltage

B. Breaker size (full-load amps), and location of the main breaker.

C. Existence of pressure drope

D.none

Test II: Answer the questions as required(5pts)

1.List the criterias that determine the requirements for water.

2.Identify the recommended position for

a) Main air valve

b) hydraulic valves

Note: **Satisfactory rating – 7 points** **Unsatisfactory – 7 below points**

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

Score = _____

Rating: _____

LG #36 LO #2- Conduct pre-start checks as required

Instruction sheet

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

- Checking safety gates and guards and fighting hazard
- Checking raw materials
- Undertaking other pre-start checks in accordance with procedures
- Starting up equipment and 'dry run' to warm hydraulics and components to operating temperature before production

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

- Check safety gates and guards and fighting hazard
- Check raw materials
- Undertak other pre-start checks in accordance with procedures
- Start up equipment and 'dry run' to warm hydraulics and components to operating temperature before production

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Read the specific objectives of this Learning Guide.

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Information Sheet 1-Checking safety gates and guards and fighting hazard

1.1. Machine guarding

Machine guarding is a safety feature on or around manufacturing or other engineering equipment consisting of a shield or device covering hazardous areas of a machine to prevent contact with body parts or to control hazards like chips or sparks from exiting the machine.

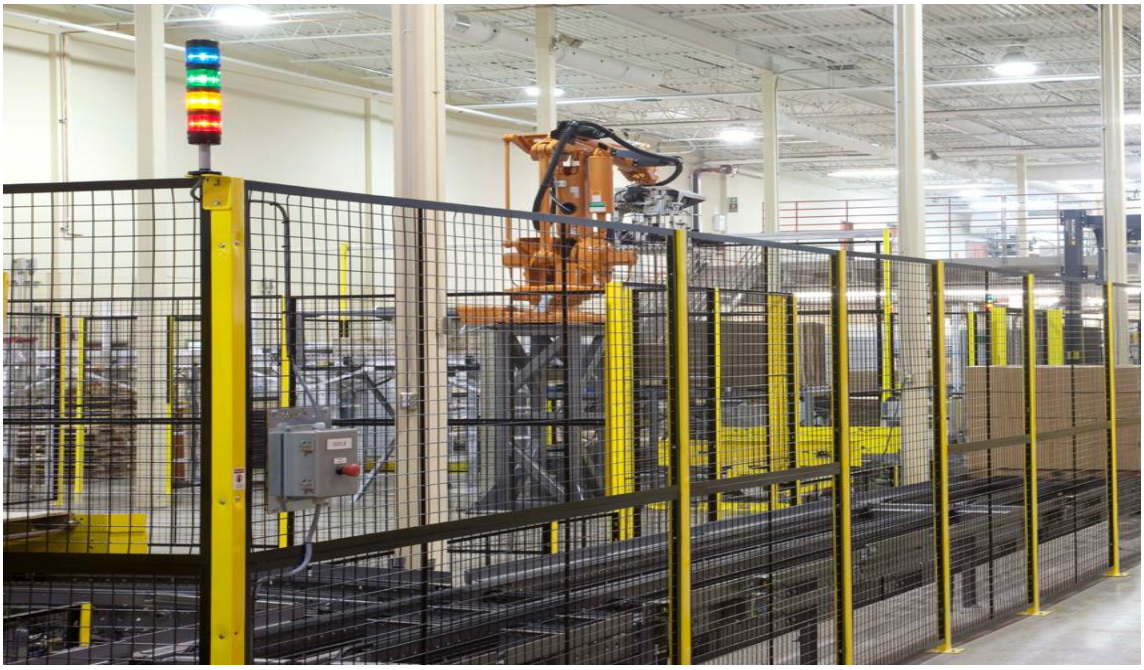

Fig13. Machine guarding

3.2 Requirements for Safeguards

Machine Safeguards must meet these minimum general requirements:

- Prevent contact

The safeguard must prevent hands, arms or any other part of a worker's body from making contact with dangerous moving parts.

- Be secure

Workers should not be able to easily remove or tamper with the safeguard. Guards and safety devices should be made of durable materials that will withstand normal use. They must be firmly secured to the machine where possible or secured elsewhere if attachment to the machine is not possible.

- Protect from falling objects

The safeguard should ensure that no objects can fall into moving parts.

- Create no new hazards

A safeguard defeats its own purpose if it creates a hazard such as a shear point, a jagged edge or an unfinished surface.

- Create no interference

Any safeguard that impedes a worker from performing a job quickly and comfortably might soon be bypassed or disregarded. Proper safeguarding can actually enhance efficiency because it relieves a worker's injury apprehensions.

- Allow safe lubrication

If possible, one should be able to lubricate the machine without removing the safeguard. Locating oil reservoirs outside the guard, with a line leading to the lubrication point, will reduce the need for the operator or maintenance worker to enter the hazardous area.

Machine guarding safety checklist

Questions	Yes	No
Requirements for All Safeguards		
1. Do the safeguards provided meet the minimum OSHA requirements?		
2. Do the safeguards prevent workers hands, arms, and other body parts from making contact with dangerous moving parts?		
3. Are the safeguards firmly secured and not easily removable?		
4. Do the safeguards ensure that no objects will fall into the moving parts?		
5. Do the safeguards permit safe, comfortable, and relatively easy operation of the machine		
6. Can the machine be oiled without removing the safeguard?		
7. Is there a system for shutting down the machinery before safeguards are remove		
8. Can the existing safeguards be improved?		
Mechanical Hazards		
The point of operation:		
9. Is there a point-of-operation safeguard provided for the machine?		
10. Does it keep the operator s hands, fingers, body out of the danger area?		
11. Is there evidence that the safeguards have been tampered with or removed?		
12. Could you suggest a more practical, effective safeguard?		
13. Could changes be made on the machine to eliminate the point-of-operation hazard entirely?		
Power transmission apparatus:		
14. Are there any unguarded gears, sprockets, pulleys, or flywheels on the apparat		
15. Are there any exposed belts or chain drives?		
16. Are there any exposed set screws, key ways, collars, etc.?		
17. Are starting and stopping controls within easy reach of the operator?		
18. If there is more than one operator, are separate controls provided?		
Other moving parts:		
19. Are safeguards provided for all hazardous moving parts of the machine, including auxiliary parts?		
Nonmechanical Hazards		
20.Have appropriate measures been taken to safeguard workers against noise hazards?		
21.Have special guards, enclosures, or personal protective equipment been provided,were necessary, to protect workers from exposure to harmful substances used in machine operation?		
Electric Hazards		
22. Is the machine installed in accordance with National Fire Protection Association and National Electrical Code requirements?		
23. Are there loose conduit fittings?		
24. Is the machine properly grounded?		
25. Is the power supply correctly fused and protected?		
26. Do workers occasionally receive minor shocks while operating any of the machines?		

	yes	No
Protective Equipment and Proper Clothing		
31. Is protective equipment required?		
32. If protective equipment is required, is it appropriate for the job, in good condition ,kept clean and sanitary, and stored carefully when not in use?		
33. Is the operator dressed safely for the job (i.e.,no loose fitting clothing or jewelry?		
Machinery Maintenance and Repair		
34. Have maintenance workers received up-todate instruction on the machines they service?		
35. Do maintenance workers lock out the machine from its power sources before beginning repairs?		
36. Where several maintenance persons work on the same machine, are multiple ck lockoutdevices used?		
37. Do maintenance persons use appropriate and safe equipment in their repair work?		
38. Is the maintenance equipment itself properly guarded?		
39. Are maintenance and servicing workers trained in the requirements of lockout/t agout, and do the procedures for lockout/tagout exist before they attempt their tasks?		

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: Short Answer Questions

1.Explain what machine guardening mean? (5pts)

2.List the Requirements for Safeguards.(5pts)

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

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

Score = _____

Rating: _____

Information Sheet 2- Checking raw materials

2.1 Raw material inspections

Raw material inspections are a vital step in a process, helping to ensure that supplier are meeting specifications and giving you insight into the nature of your raw materials;

Identity:it the nature of the raw material

Safety : free from any kinds of hazard causing contaminants (physical,chemical, Biological)

Suitability for your product:resistance to production process like high heat temperature, type,melt flow,viscosity etc

Raw material inspection help ensure that your final product is of the best quality, they also enable you to highlight and mitigate problems before they become costly financially and in terms of your business's reputation.

Raw material testing, involves tests for raw material inspection and raw material identification that can cover chemical, microbiological, mechanical and physical properties testing.

Fig 14. Checking raw material

2.2.Testing Plastics

Bridge the gap between industry process and material rheology. It is important to understand the types of testing that goes into creating the end products.Plastics, or thermoplastic materials, are processed as fluids under the effect of temperature and pressure. They can be formed into a wide variety of shapes and tailored for many different applications by means of molding, extrusion, and blowing techniques. However, their flow properties during these processes are complex and affected by many parameters. For this reason it is important to characterize materials and fully understand their rheological properties.

Rheology is a multi-disciplinary science that incorporates fundamental physics and chemistry, as well as many facets of materials engineering. Rheological measurements are essential for material characterization when studying or monitoring the conversion of thermoplastics from pellets (raw material) to finished parts.

2.3.Types of Testers

There are two types of instruments used to measure the rheological properties of plastics: melt flow testers and rheometers.

Melt flow test: determines the flow properties of a polymer melt or similar material, following the main international standards ISO 1133 and ASTM D1238. Typically, a few grams of a thermoplastic sample are heated and compacted inside a furnace, becoming a homogeneous fluid. A constant load is then applied, pushing the material out through a capillary die. The melt flow rate (MFR) is the quantity of the sample that flows out in a defined period of time, traditionally expressed in grams per 10 minutes.

Fig15.Melt flow tester

Capillary rheometers:which characterize viscosity and other rheological properties of molten polymers, are described by the main international standards ISO 11443 and ASTM D3835. They simulate process conditions and investigate the flow behaviors of thermoplastics as a function of temperature and flow speed. A certain quantity of thermoplastic sample is compacted inside a heated barrel, becoming a homogeneous fluid. The molten sample is then forced through a capillary die of known dimensions while pressure is exerted on it by a piston. The test pressure is normally measured via a pressure transducer close to the die entrance. One test normally includes a series of different piston speeds at a controlled temperature and shows how shear stress (proportional to the steady-state pressure at a certain speed) changes as a function of shear rate (speed of shear deformation). The typical result is the rheological curve that plots viscosity versus shear rate.

Rheological tests make it possible to simulate processing conditions with various combinations of deformation speeds and temperatures.

Instability of a test may be caused by a number of factors including the nature of the sample, test temperature, capillary geometry, pressure, and extrusion speed. Processing the material under unstable conditions will generate problems, such as a change in the extruded filament geometry (producing helical, rather than smooth, finish).

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(10pts)

1.Why does raw material inspection is important?

2.Why does we use capillary rheometers and melt flow rate?

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

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

Score = _____

Rating: _____

Information Sheet 3- Undertaking other pre-start checks

3.1. Undertaking Prestart check

Running a pre-start check on plant or machinery before startarting the operation is the best way to ensure the job gets done safely and without delay. Undertaking a pre-start check on machine done by the following technics

- Visual inspections of important features prior to starting the machine
- Visual & function tests while the machine is turned on but stationary
- Testing the machine's functions during a short drive

Tools and equipment should be checked for the following conditions before use;

- Functionality and sufficiency
- Contaminantion
- Maintenance requirement

3.2.Prestart check for blow molding machine

1. Check the hydraulic oil level of blow molding machine and each hydraulic device to keep the oil quantity of tank above the base oil level.
2. Materials that used for blow molding machine operations should meet the requirement of drying, and it needs to make further drying when necessary.
3. Check the material color whether it meets the requirement of the product.
4. Choose a suitable die head according to the type and size of the product. Install die head in the following order: die head flange, mold, porous plate, and filter.
5. Connect the compressed air pipe. Install core mold electric heating rod and die head heating ring. Check and open the hydraulic system. Adjust the clearance of the die evenly. Check the alignment of the centerline between the main machine and auxiliary machine.
6. Set up a mold adjustment parameter. And set up mold opening, mold closing, and other various parameters according to mold specific circumstances. Until the mold running normal, stable, and safe.
7. Startup extruder, clamping device, manipulator, and other operating equipment and make the machine run with no load. Troubleshooting in time.

8. According to the technological conditions, the temperature of the extrusion blow moulding machine head and each heating section is set and heated step by step, and the integrity of each heating section is tested with scrap material to check whether there is the heating phenomenon or not.

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: Short Answer Questions

1.List the prestart check that must be done before blow moulding starting operation(10pts)

2.List the technic used to check materials.(3pts)

Note: **Satisfactory rating – 7.5 points** **Unsatisfactory - below 7.5 points**

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

Score = _____

Rating: _____

Information Sheet 4- Starting up equipment and dry run

4.1.Equipment Start-Up

After all prestart checks are conducted the equipment is made ready to make easy and fast start up.this process brings equipments on-line from an inoperative condition such that normal production rates are being achieved.another purpose of stat up is dry run which warms hydraulics and components to operating temperature

1. Open the charging machine.
2. Open main oil pump, servo pump, and winch.
3. Open the rotating potentiometer. Be careful not to spin to the end at once. Increase speed gradually. Closely observe the magnitude and change of current. The maximum instantaneous current should not exceed 220A.
4. Start to discharge, pre-injection when the temperature of the material and mold get to the predetermined parameters requirement. And you should observe the material flow until they're smooth and color evenly.
5. Set up the quantity and speed of material charging and pressure holding transition point and other parameters. When adding materials, it is necessary to carefully check whether there are impurities in the material barrel. Don't let the hard object and metal enter the material barrel.
6. Open the outer layer first when startup and put in the material. Avoid material flowing back since overpressure after opening the inner layer. Material adding frequency increases step by step from small to large. Avoid screw injury caused by low temperature due to excessive opening frequency.
7. On the programmable logic controller, the thickness of the parison wall at each point is set according to the technical regulations.
8. After the main machine winch is opened, and adding material to a half. Open the mold and try to inject material. After repeated attempts, prepare into automatic production.
9. Always pay attention to the variety of temperature and pressure at any time during blow molding machine operations. If abnormal conditions are found, the

power should be shut down and repaired by the mechanic repairman, and then used after recovery.

Self-Check – 4	Written test

Name…… ID…… Date…….

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

I**. Answer the questions as required**

1. what conditions should be checked before starting operation?(list atleast 10 points).(10pts)
2. Explain the importance of equipment start-up and dry run. (5pts)

Note: **Satisfactory rating – 8** **Unsatisfactory - 8**

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

Score = _____

Rating: _____

Operation Sheet 1– Starting up equipment

Objective: To start up equipment

List of Materials needed:personal protective equipment

Procedures:

1. Prepare PPE
2. Prepare tools, equipment and machineries
3. Open the charging equipment
4. Open main oil pump, servo pump, and winch
5. Open the rotating potentiometer. The maximum instantaneous current should not exceed 220A.
6. Start to discharge, pre-injection when the temperature of the material and mold get to the predetermined parameters requirement.
7. Set up the quantity and speed of material charging and pressure holding transition point and other parameters.
8. Open the outer layer first when startup and put in the material.
9. Set the thickness of the parison wall at each point On the programmable logic controller
10. Adding the material to a half,open the mold and try to inject material, prepare into automatic production.
11. At abnormal conditions , shut down the power and use after recovery.

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 **6** hour. The project is expected from each student to do it.

Task 1: start-up

LG #37	LO#3 Operate equipment

Instruction sheet

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

- Checking condition of equipment and introducing raw materials
- Checking product/process
- Collecting and storing Products
- Checking product is in specification to required quality standard
- Maintaining supply of material as required
- Completing Logs and records
- Collecting and reprocessing/discarding scrap/trim and other materials
- Cleaning equipment and work area.
- Workplace and emergency procedures.

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

- Check condition of equipment and introducing raw materials
- Check product/process
- Collect and storing Products
- Check product is in specification to required quality standard
- Maintain supply of material as required
- Complet Logs and records
- Collect and reprocess/discard scrap/trim and other materials
- Clean equipment and work area.
- Workplace and emergency procedures.

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding

them.

3. Accomplish the “Self-checks” which are placed following all information sheets.
4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information sheet1-Checking condition of equipment and introducing raw materials

1.1.Checking equipment condition

The purpose of an cheking is to identify whether work equipment can be operated, adjusted and maintained safely, with any deterioration detected and remedied before it results in a health and safety risk. Not all work equipment needs formal inspection to ensure safety and, in many cases, a quick visual check before use will be sufficient. However, inspection is necessary for any equipment where significant risks to health and safety may arise from incorrect installation, reinstallation, deterioration or any other circumstances.

You should inspect work equipment if your risk assessment identifies any significant risk (for example, of major injury) to operators and others from the equipment's installation or use. The result of the inspection should be recorded and this record should be kept at least until the next inspection of that equipment. Records do not have to be made in writing but, if kept in another form (eg on a computer), these should be held securely and made available upon request by any enforcing authority.

Work equipment that requires inspection should not be used, unless you know the inspection has taken place. Where it leaves your undertaking, or is obtained from another (eg a hire company) it should be accompanied by physical evidence of the last inspection, such as an inspection report or, for smaller items of equipment, some form of tagging, colour coding or labelling system.

The scope of inspection will depend on type of work equipment, its use and the conditions to which it is exposed. An inspection should concentrate on those safety-related parts which are necessary for the safe operation of work equipment and, in some cases, this may require testing or dismantling. However, not all safety-critical features on a particular item of work equipment may require inspection at the same intervals.

An inspection can vary in its extent, as the following

- quick checks before use (eg electric cable condition on hand-held power tools, functional testing of brakes, lights on mobile machinery)
- weekly checks (eg presence of guarding, function of safety devices, pressures, and the condition of windows, mirrors)
- more extensive examinations, undertaken every few months or longer (eg general condition of the machine, close examination of a safety harness, portable appliance testing)

1.2. Introducing raw materials

Plastic pellets are plasticized in the barrel of an injection molding machine where the plastic is melted by heat and the shearing action of a feed screw. The plastic is then injected into multiple-cavity molds where it assumes the shape of long, thin tubes. These tubes, called parisons, usually include the formed necks and threads that will be used to cap the bottles that are yet to come. PET parisons, or pre-forms, are easily shipped to bottling facilities as they are much more compact than fully formed bottles

In injection moulding plastic raw materials such as Pet are fed into Hopper this can be done manually but it is safe to use authomatic option. Manual method can be replaced by robot arm,pallet conveyor system or automated hopper. Additives are added at a dosage of 0.25-5%.

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 answer the questions as required

1. What is the required dosage level of additives in plastic moulding?(5pts)
2. Explain the options used to transfer raw materials in to hopper.(5pts)

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

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

Score = _____

Rating: _____

Information Sheet 2- checking process

2.1.Checking process

Creating an effective and efficient process, as well as monitoring and maintaining optimal process settings, can result in significant energy cost reduction. These efforts will also help produce products that meet all of the required quality standards.

Points that must be observed during process

- The type of plastic that will be used for the product
- The required strength and flexibility for the plastic form (container)
- The product design and dimensions (including wall strength and thickness)
- The products ability to withstand hot and cold temperatures, and to what degree that the risk of leaking seals and pinhole leaks are negligible
- That all product requirements for durability (such as for shipping and storage) are met
- Attributes of the total product/container design that should meet the stringent demands of the marketplace

The blow molding production process should fulfill the following criterias:

- The plastic injection process must be constantly reliable
- The velocity and pressure of the blown air is consistent for reliable product production;
- The speed and reliability of the mold closing is reliable
- The manufacturing temperature must be within process parameters; this includes an assurance that the cooling time is correct for the process;
- That all other product dimensions and criteria are constantly met during production

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. Answer the question as required

1.What poins must be checked during blow molding process?(5pts)

2. List the criterias for blow molding process.(5pts)

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

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

Information Sheet 3- collecting and storing product

3.1.Collecting and storing product

Once the bottle (or, in continuous manufacturing, bottles) has cooled and set, it is ready to be removed from the mold. If a continuous molding process has been used, the bottles will need to be separated by trimming the plastic in between them. If a non-continuous process has been used, sometimes excess plastic can seep through the mold during manufacturing and will require trimming. After removing the bottle from the mold and removing excess plastic, the plastic bottles are ready for transportation or filling.

Self-Check – 3	Written test

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

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

1. When does collection of product takes place?.(2pts)

   A.After melting B.blowing C.after cooling and settling D. none E.All

Note: Satisfactory rating - 2 points Unsatisfactory - 2below points

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

Score = _____

Rating: _____

Information sheet 4-Checking product

4.1.Checking product

To ensure blow molding product quality, it's important to have a procedure in place for leak testing the plastic bottles that are produced through the blow molding manufacturing process.

The majority of clear bottles and other product containers that are used by manufacturers are typically produced through high-volume, high-speed blow molding machines.The standard and most commonly made bottle types created through PET blow molders include water bottles, juice bottles, bottles for carbonated beverages, sport drinks, and containers for other liquid products like food sauces, food oils, and liquid soaps, shampoos, and detergents. (PET stands for Polyethylene Terephthalate; a thermoplastic polymer resin that's used in the making of injection molding and blow-molded bottles and similar products.) The purposes of leak testing bottles in the blow molding process are to:

- Test product quality to ensure that the bottles will remain impenetrable and hold pressure, including against the stresses of transportation and getting the products to market.
- Check for and address the most likely critical defects in the formed products.
- Employ a full-proof inspection process that far outweighs a random sampling method.
- Monitor the blow molding process by way of the products generated; thereby addressing any manufacturing pitfalls prior to full high-volume runs.

common product defects

- Crooked (tilted) necks;
- Contamination holes and fissures;
- Seal nicks, gaps and openings;
- Laser coding holes

Any of these container flaws would be catastrophic to the product, particularly in high-volume runs. The advantages of leak testing bottles therefore, are to ensure a reliable

product run with minimal risk of generating flawed products. Having a high-quality leak testing system in place will protect the investment while minimizing the risk of production downtime. This translates to an assurance of product quality and inventory, while preventing any of the associated problems of discarded containers, costly product damage, and inventory returns. In short, leak testing is an essential part of the blow molding process.

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 short answer

1. List the importance of leak test in blow molding process(5pts)
2. What are the common defects that may be seen on blow molded products?(5pts)
3. Identify the purpose of leak test bottles in blow molding. (5pts)

Note: Satisfactory rating – above 7.5 points Unsatisfactory - below 7.5points

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

Score = _____

Rating: _____

Informationsheet 5-Maintaining supply of material

5.1.Material management

Material management is a scientific technique, concerned with Planning, Organizing &Control of flow of materials, from their initial purchase to destination.

Purpose of material management

- To gain economy in purchasing
- To satisfy the demand during period of replenishment
- To carry reserve stock to avoid stock out
- To stabilize fluctuations in consumption

Points to remember while purchasing

- Proper specification
- Comparison of offers based on basic price, freight & insurance, taxes and levies
- Quantity & payment discounts
- Payment terms
- Delivery period, guarantee
- Vendor reputation (reliability, technical capabilities, Convenience, Availability, after-sales service, sales assistance)
- Short listing for better negotiation terms
- Seek order acknowledgement

Storage

- Store must be of adequate space
- Materials must be stored in an appropriate place and in a correct way
- Group wise & alphabetical arrangement helps in
- identification & retrieval
- First-in, first-out principle to be followed
- Monitor expiry date
- Follow two bin or double shelf system, to avoid Stock outs
- Reserve bin should contain stock that will cover lead time and a small safety stock

Selfcheck-5	Written test

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

I.Choose the best answer(2pts)

1.Which one of the following points is not considered during purchasing?

A. Vendor reputation

B. Stabilizing fluctuations in consumption

C. Payment terms

D.Delivery period, guarantee

2.Material management concerns only about organizing.

A. true B. False

II. Answer the questions as reqired

1.what are the points that are considerd during purchasing(5pts)

2.Identify the approprait storage conditions (5pts)

Note: Satisfactory rating – above 7 points Unsatisfactory - below 7points

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

Score = _____

Rating: _____

Information sheet 6-Collecting and reprocessing/discarding scrap/trim and other materials

6.1. Plastic recycling

Plastic recycling has been described as the process of recovering scrap or waste plastics and reprocessing the material into useful products, sometimes completely different in form from their original state.

Based on the final product of any recovery process; the recovery process is grouped into four.

Primary recycling: involves processing of a waste/scrap into a product with characteristics similar to those of the original product. The recovered plastic is used in products with performance characteristics that are equivalent to those made using virgin plastics. An example of primary recycling is where PET recovered from postconsumer bottles is used in the production of new bottles.

Secondary recycling: involves processing of waste/scrap plastics into materials that have characteristics different from those of the original plastics products.The recovered plastic is used in products that have less demanding performance requirements than the original application. Secondary recycling often requires reformulation to meet specifications of the new product. An example of secondary recycling is in the production of flooring tiles from mixed polyolefins.

Tertiary recycling: Waste plastic is used as the feedstock in a process that generates chemicals and fuels. An example of tertiary recycling is the glycolysis of PET into diols and dimethyl terephthalate that can then be used to make virgin PET.

Quaternary recycling: Energy is recovered from waste plastic by burning/ incineration. Tire derived fuels (TDF) is an example of quaternary recycling.

6.2. Steps involved in the recycling process

Collection:the first step in the mechanical recycling process is the collection of plastic waste or scrapes from processing line (out of specification product),post-consumer materials from homes, businesses, and institutions.

Sorting and categorizing

There are several different types of plastic which need to be separated from each other. Further to that, plastics sorted by properties such as color, thickness, and use. This is done by machines at the recycling plant and is an important step to increase the efficiency of plants and avoid the contamination of end products.

Washing

Washing is a crucial step in the plastic recycling process since it removes some of the impurities that can impede the operation, or completely ruin a batch of recycled plastic. The impurities targeted in this step commonly include things such as product labels and adhesives as well as dirt and food residue. While plastic is often washed at this stage, it is important to remember that this doesn't take away from the importance of ensuring plastics are as free from impurities as possible before disposal and collection.

Shredding

The plastic is then fed into shredders, which break it down into much smaller pieces. These smaller pieces, unlike formed plastic products, can be processed in the next stages for reuse. Additionally, the resized plastic pieces can be used for other applications without further processing, such as an additive within asphalt or simply sold as a raw material.

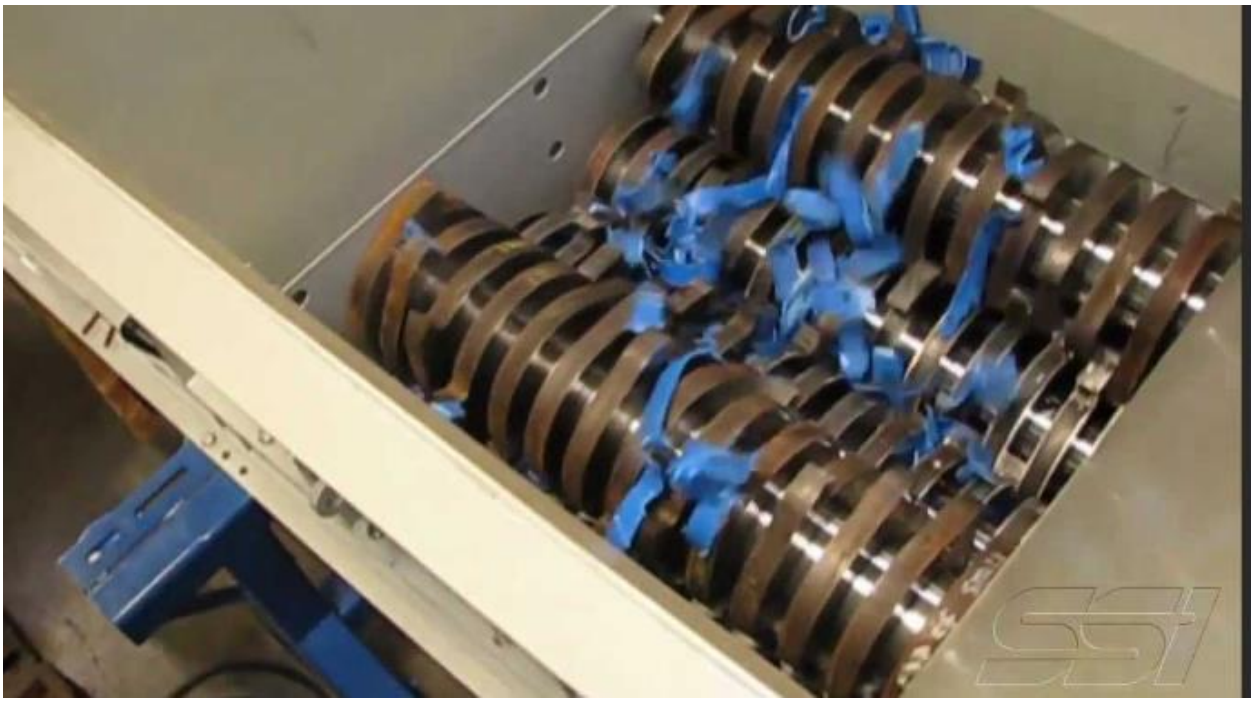

Fig 20. Plastic Shredding

Breaking down the plastic into smaller pieces also allows for any remaining impurities to be found. This is especially true of contaminants such as metal, which may not have been removed by washing but can be easily collected with a magnet at this stage.

Identification and separation of plastics

Here, the plastic pieces are tested for their class and quality. First, they are segregated based on density, which is tested by floating the particles of plastic in a container of water. This is followed by a test for what is known as the “air classification”, which determines the thickness of the plastic pieces. It is done by placing the shredded plastic into a wind tunnel, with thinner pieces floating while larger/thicker pieces stay at the bottom.

Extruding and compounding

This final plastic recycling process step is where the particles of shredded plastic are transformed into a usable product for manufactures. The shredded plastic is melted and crushed together to form pellets. It is worth noting that it is not always possible to compound all types, classification, and qualities of plastic at a single plant, so different grades of plastic are sometimes sent to other recycling facilities for this final step.

Selfcheck-6	Written test

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

I.Answer the question as required

1.Explain types of recycling. (10pts)

Note: Satisfactory rating – above 5 points Unsatisfactory - below 5points

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

Score = _____

Rating: _____

Informationsheet 7-Cleaning equipment and work area

7.1.Cleaning equipment

It is well known that regular maintenance of the blow molding machine and cleaning of the machinery, raw materials, and workshop are helpful to ensure that the blow molding is carried out normally.

7.1.1.Methods of Cleaning the head of the blow molding machine

There are three methods of cleaning the head of blow moulding machine

- Manual cleaning

Before removing the head, heat it to above the plastic melting point using an electric heater. It cannot be heated with an acetylene flame, as this will cause partial overheating and warping of the machine head, affecting the size and shape of the die and mandrel.

Then stop heating, remove the heater, and disassemble the nose. Use a copper sheet or copper-beryllium spatula to remove most of the melt, followed by brass cotton for final cleaning. High-speed airflow can also be used to remove the melt on the nose, but this time it is still necessary to use brass cotton to wipe off the oxidized melt, sometimes using a grinding wheel or heat to remove the melt. The melt on the thread can be removed by anti-adhesive. Avoid scratching the flow channel, especially the die area, when cleaning the head by hand.

This method has a large workload, which will cause physical damage to the metal on the wall surface of the head runner, and is often metallurgical. The following cleaning method can be avoided.

- Solvent cleaning

That is, with the help of acid or alkaline chemicals, organic or inorganic solvents to clean. Generally, it will corrode metal. The cleaning efficiency of the organic solvent is high. Solvent cleaning method to set up recycling equipment, so as not to pollute the environment.

- Ultrasonic cleaning method

This method has a good cleaning effect, but the cost of equipment and chemical agents is high and has corrosion problems. It is best used for post-cleaning to remove inorganic residues.

There are 3 ways to clean the head of the blow molding machine. In addition, there are salt bath, oven, or fluidized bed cleaning methods.

7.2. Workplace Housekeeping

Effective housekeeping can help control or eliminate workplace hazards. Poor housekeeping practices frequently contribute to incidents. If the sight of paper, debris, clutter and spills is accepted as normal, then other more serious hazards may be taken for granted.

Housekeeping is not just cleanliness. It includes keeping work areas neat and orderly, maintaining halls and floors free of slip and trip hazards, and removing of waste materials (e.g., paper, cardboard) and other fire hazards from work areas. It also requires paying attention to important details such as the layout of the whole workplace, aisle marking, the adequacy of storage facilities, and maintenance. Good housekeeping is also a basic part of incident and fire prevention.

Effective housekeeping is an ongoing operation, it is not a one-time or hit-and-miss cleanup done occasionally. Periodic "panic" cleanups are costly and ineffective in reducing incidents.

7.2.1. Purpose of workplace housekeeping

Poor housekeeping can be a cause of incidents, such as:

- tripping over loose objects on floors, stairs and platforms
- being hit by falling objects
- slipping on greasy, wet or dirty surfaces
- striking against projecting, poorly stacked items or misplaced material
- cutting, puncturing, or tearing the skin of hands or other parts of the body on projecting nails, wire or steel strapping

To avoid these hazards, a workplace must "maintain" order throughout a workday.

7.2.2 Benefits of good housekeeping practices

Effective housekeeping results in:

- Reduced handling to ease the flow of materials
- Fewer tripping and slipping incidents in clutter-free and spill-free work areas
- Decreased fire hazards
- Lower worker exposures to hazardous products (e.g. dusts, vapours)
- Better control of tools and materials, including inventory and supplies
- More efficient equipment cleanup and maintenance
- Better hygienic conditions leading to improved health
- More effective use of space
- Reduced property damage by improving preventive maintenance
- Improved morale
- Improved productivity (tools and materials will be easy to find)

7.2.3. Elements of an effective housekeeping program

- Maintenance

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. It includes maintaining sanitary facilities and regularly painting and cleaning walls. Broken windows, damaged doors, defective plumbing and broken floor surfaces can make a workplace look neglected; these conditions can cause incidents and affect work practices. So it is important to replace or fix broken or damaged items as quickly as possible. A good maintenance program provides for the inspection, maintenance, upkeep and repair of tools, equipment, machines and processes.

Fig 20. Maintaning process

- Dust and Dirt Removal

Enclosures and exhaust ventilation systems may fail to collect dust, dirt and chips adequately. Vacuum cleaners are suitable for removing light dust and dirt that is not otherwise hazardous. Industrial models have special fittings for cleaning walls, ceilings, ledges, machinery, and other hard-to-reach places where dust and dirt may accumulate. Special-purpose vacuums are useful for removing hazardous products. For example, vacuum cleaners fitted with HEPA (high efficiency particulate air) filters may be used to capture fine particles of asbestos or fibreglass.

Dampening (wetting) floors or using sweeping compounds before sweeping reduces the amount of airborne dust. The dust and grime that collect in places like shelves, piping, conduits, light fixtures, reflectors, windows, cupboards and lockers may require manual cleaning.

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

- Surfaces

Floors: Poor floor conditions are a leading cause of incidents so cleaning up spilled oil and other liquids at once is important. Allowing chips, shavings and dust to accumulate

can also cause incidents. 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 colours 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 colours.

- Maintain Light Fixtures

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

- 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.

Keeping aisles and stairways clear is important. They should not be used for temporary "overflow" or "bottleneck" storage. Stairways and aisles also require adequate lighting.

- 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.

- 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 an orderly arrangement. Returning tools promptly after use reduces the chance of it being

misplaced or lost. Workers should regularly inspect, clean and repair all tools and take any damaged or worn tools out of service.

- 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.

Allowing material to build up on the floor wastes time and energy since additional time is required for cleaning it up. Placing scrap containers near where the waste is produced encourages orderly waste disposal and makes collection easier. All waste receptacles should be clearly labelled (e.g., recyclable glass, plastic, scrap metal, etc.).

- 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 material handling is required. The location of the stockpiles should not interfere with work but they should still be readily available when required. Stored materials should allow at least one metre (or about three feet) of clear space under sprinkler heads.

Stacking cartons and drums on a firm foundation and cross tying them, where necessary, reduces the chance of their movement. Stored materials should not obstruct aisles, stairs, exits, fire equipment, emergency eyewash fountains, emergency showers, or first aid stations. All storage areas should be clearly marked.

Flammable, combustible, toxic and other hazardous materials should be stored in approved containers in designated areas that are appropriate for the different hazards that they pose. Storage of materials should meet all requirements specified in the fire codes and the regulations of environmental and occupational health and safety agencies in your jurisdiction.

Informationsheet 8- Workplace and emergency procedures

8.1. Workplace and emergency procedures

All employe must be knowledgeable and prepared for an emergency. This includes being aware of evacuation, alarm systems, shutdown protocol, possible hazards with chemicals, equipment, and flammable materials, etc

Each operator shall prepare and follow for each pipeline system a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies..

Fire

When fire is discovered:

- Activate the nearest fire alarm (if installed)
- Notify the local Fire department by calling .
- If the fire alarm is not available, notify the site personnel about the fire emergency by the following means (check applicable):
    - ✓ Voice Communication
    - ✓ Phone Paging
    - ✓ Radio

Fight the fire only if:

- The Fire Department has been notified.
- The fire is small and is not spreading to other areas.
- Escaping the area is possible by backing up to the nearest exit.
- The fire extinguisher is in working condition and personnel are trained to use it.

Upon being notified about the fire emergency;

- Leave the building using the designated escape routes.
- Assemble in the designated area (specify location):
- Remain outside until the competent authority (Designated Official or designee) announces that it is safe to reenter.

If trapped inside working area: Place cloth material around or under the door to prevent smoke from entering. Close as many doors as possible between you and the fire. Be prepared to signal from a window but do not break the window unless absolutely necessary.

If forced to advance through flames: Hold your breath move quickly. Cover head and hair. Keep your head down and eyes closed as much as possible.

If clothing catches fire: immediately;stope,drop,roll

Fig.21 Emergency response if clothing catches fire

Gas leak

1. If it is a gas leak, alarms should not be activated instead mobile phones,hand held radios,electronic equipment or light flammable material have to be used.
2. Turn off ventilation and machinery and extinguish naked flames and switch off the nearest gas isolator.
3. Evacuate the building immediately, avoiding the area of contamination as best as possible, close doors.
4. Follow specific departmental emergency management plans, for example; Engineering & Trades Emergency Response Procedure, after activating the above.

Evacuation procedures

Upon hearing the evacuation alarm or instruction:

- Evacuating the building immediately via the nearest fire exit – unless instructed otherwise.
- Taking phone, keys and wallets only if they are in reach.
- re-entering the building after the all clear has been given by the Building Warden or fire Service.

- Knowing the location of the nearest fire alarm call point, emergency exit, fire alarm panel and assembly areas.

Extended power loss

In the event of extended power loss to a facility certain precautionary measures should be taken depending on the geographical location and environment of the facility:

- Unnecessary electrical equipment and appliances should be turned off in the event that power restoration would surge causing damage to electronics and effecting sensitive equipment.
- Facilities with freezing temperatures should turn off and drain the following lines in the event of a long term power loss.
    - ✓ Fire sprinkler system
    - ✓ Standpipes
    - ✓ Potable water lines
    - ✓ Toilets
- Add propylene-glycol to drains to prevent traps from freezing
- Equipment that contain fluids that may freeze due to long term exposure to freezing temperatures should be moved to heated areas, drained of liquids, or provided with auxiliary heat sources.

Upon Restoration of heat and power:

- Electronic equipment should be brought up to ambient temperatures before energizing to prevent condensate from forming on circuitry.
- Fire and potable water piping should be checked for leaks from freeze damage after the heat has been restored to the facility and water turned back on.

Hazardous material

Chemical spill when large chemical Spill has occurred:

- Immediately notify the designated official and Emergency Coordinator.
- Contain the spill with available equipment (e.g., pads, booms, absorbent powder, etc.).
- Secure the area and alert other site personnel.

- Do not attempt to clean the spill unless trained to do so.
- Attend to injured personnel and call the medical emergency number, if required.
- Call a local spill cleanup company or the Fire Department (if arrangement has been made) to perform a large chemical (e.g., mercury) spill cleanup.
- Evacuate building as necessary

When a Small Chemical Spill has occurred:

- Notify the Emergency Coordinator and/or supervisor (select one).
- If toxic fumes are present, secure the area (with caution tapes or cones) to prevent other personnel from entering.
- Deal with the spill in accordance with the instructions described in the MSDS.
- Small spills must be handled in a safe manner, while wearing the proper PPE.
- Review the general spill cleanup procedures.

Selfcheck-8	Written test

Name…… ID…… Date…….

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

I.answer the questions as required

1. Explain emergency procesdure for fire(5pts)
2. Explain emergency procedure for hazardouse spill(5pts)

Note: Satisfactory rating above– 5 points Unsatisfactory - below 5 points

Operation Sheet 2– Recycling plastic

Objective: to recycle plastic

List of Materials needed:personal protective equipment

Procedures:

1. **Collection:** collection of plastic waste or scrapes from processing line ,post-consumer materials from homes, businesses, and institutions.
2. **Sorting and categorizing**:plastics sorted by properties such as color, thickness, and use to avoid the contamination of end products.
3. **Washing:** The impurities targeted in this step commonly include things such as product labels and adhesives as well as dirt and food residue.
4. **Shredding:** fed the plastic into shredders, which break it down into much smaller pieces.
5. **Identification and separation:**the plastic pieces are tested for their class and quality.
6. **Extruding and compounding**: particles of shredded plastic are transformed into a usable product for manufactures.

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 **4** hour. The project is expected from each student to do it.

Task 1: Recycle plastic

LG #36	LO#4 Resolve routine problems

Instruction sheet

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

- Identifying faults during the operation
- Identifying causes of routine faults and taking action
- Ensuring appropriate records and log books of equipment operations are maintained
- Identifying and reporting non-routine problems

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 faults during the operation
- Identifying causes of routine faults and taking action
- Ensuring appropriate records and log books of equipment operations are maintained
- Identifying and reporting non-routine problems

Learning Instructions:

Read the specific objectives of this Learning Guide.

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

Informationsheet 1-Identifying faults during the operation

1.1. Identifying faults

A logical and systematic method of dealing with faults is most desirable, and many practical moulders have their own scheme of operation. In compiling such a scheme, it is important to ensure that all the terms used are unambiguous and are understood by all concerned. Faults should be clearly described, and all the possible causes should be examined.

The effect of the fault should be taken into account and when the cause has been identified the necessary steps should be taken to eliminate it and to prevent its recurrence the following seven steps are used.

Name the fault: This may seem obvious but some faults are given a variety of names. For example, " splash marking" is variously referred to as "mica marking", " silvering" or "silver streaking". It is advisable to decide which of the names will be used and to stick to that decision.

Describe the fault: In describing a fault, a possible cause may be included- For example, a "short moulding", i.e. an incomplete moulding, may be described as "insufficient pressure to fill the mould, or "not enough material to fill the mould It is a useful practice to try to describe all the common faults in the simplest possible terms without ascribing any possible cause. In this way the mind is cleared of any possible prejudice for the next stage of the scheme, which is finding the cause of the fault.

Find the cause of the fault: This is a long process since it requires consideration of material, machine, mould and process.The following guide lines are used during the process:

- Material:Check for grade or type, examine for contamination, and make sure it complies with the manufacturer's specification.
- Machine: Check the functioning of all parts of the machine in accordance with the recommendations given, taking into account anything that could influence pressure temperature, rate and time.

- Mould: Make sure that the mould is properly set and is at the correct temperature, and that all the parts function smoothly and correctly.
- Process:Check that the pressure, temperature, rate, and time are set as recommended by the materials supplier.

Determine the effect of the fault: If the fault renders the component unusable or unsaleable it must obviously be rectified. If it is only of minor significance it may be unnecessary to try to eliminate it entirely.

Determine where the responsibility lies: This may be only of academic interest, but if the fault recurs the operator as well as the material, machine, mould and process—needs to be checked.

Take action to avoid the fault: Failure to take the appropriate action can result in the unnecessary production of faulty mouldings and its consequent detrimental effect on the profitability of the project.

Take steps to prevent a recurrence: Make sure that full records are taken of conditions when the fault has been eliminated. Note any repairs and alterations which are made to the mould or the machine and any variations in type, grade or quality of material. If rework (i.e., reground scrap) is used, note the proportion and quality. These steps for dealing with faults may seen superfluous but no fault-finding exercise is complete unless all seven points have been considered- Making faulty mouldings, even though they can all be recovered and re-ground and the material used again, is very uneconomic and is a short route to bankruptcy.

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: Answer Questions as required (5pts)

1. Explain the guide lines used in finding the cause of fault.
2. List the steps used in identifying fault during blow moulding operation.

Note: Satisfactory rating above– 5 points Unsatisfactory - below 5 points

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

Score = _____
Rating: _____

Informationsheet 2- Identifying causes of routine faults and taking action

2.1 Routin faults

The main routine problems that happen in blow moulding process are discussed in the following table

Table 2.1. Routine faults and corrective action

Problem	Possible causes	Possible Solutions
1. Parison not being blown	Defective blow timer, clogged blow lines, or too sharp pinch- offs	• Clean blow lines • Clean tooling • Replace blow timer • Reset cushion • Stone pinch-offs to create more pinch area
2. Parison curling	Mandrel and bushing not flush, bushing too cold, low container weight, or stock resin temperature too low temperature too low	• Remachine tooling • Increase container weight • Check screw tip design • Raise bushing temperature • Increase stock resin temperature • Check heat controllers • Center mandrel in die
3. Drawdown, parisonsag/stretch	Too high parison temperature, melt index of resin too high, or mold open time too high	• Increase extrusion pressure/rate • Decrease extrusion back pressure • Use lower melt index resin • Reduce mold open time • Decrease container weight • Decrease stock temperature
5. Parison tail sticking to parts	Parison too long	• Shorten parison length or increase pinch-off land area to cool compressed tail
5. Rough parison surface/uneven	Extrusion speed too fast, coldparison, stock	• Adjust extrusion rate • Check mold alignment

parison thickness	temperature too loose mandrel, or insufficientventing	• Add venting by either sandblasting the mold surface channels or venting the interior of the mold • Increase stock temperature • Check tool design • Use resin with higher melt index
6. Black specks in containers	Resin hang-up in die, or material contamination	• Clean die surface and tooling • Check material for contamination
7. Bubbles/fish eyes	Blow air orifice too small orrestricted, low stock temperature, mold temperature too low, tooling damage, or wet and contaminated resin	• Check the orifice for restrictions and size • Increase air pressure • Increase melt temperature • Increase mold temperature • Check tooling • Check resin for moisture • Check for contamination Check for resin lines and/or streamers
8.streaks	Stock temperature too high, contamination in die head, or degraded material on tooling	• Decrease stock resin temperature • Check heat controllers • Clean die head • Check for contamination in material • Clean tooling • Decrease extrusion back pressure • Decrease regrind level • Check design of flow path in die
9. Scratches and die lines	Stock temperature too low, die surface poorly polished, extrusion rate too slow, or damaged	• Increase stock temperature • Clean die surface • Increase extrusion rate • Check tooling for damage

	tooling	• Check tooling for burnt materials • Check tooling for contamination
10. Orange peel	Parison temperature too low, sweat on mold surface, or melt index too low	• Increase melt temperature • Increase mold temperature • Check mold vent surface • Decrease cycle time • Use higher MFI resin
11. Containers stick in mold	Parison and mold temperature too high, blowing air pressure too low, part wall too thick	• Decrease stock temperature • Decrease mold temperature • Increase blowing air pressure • Check mold for damage • Center mandrel in die • Check for contamination in tooling
12. Parts blow-out	Blow-up ratio too large, mold separation, pinch-off too sharp or hot, or parts blow too fast	• Use large die • Increase clamp pressure or decrease blow pressure • Provide wider land in pinch-off • Cool mold pinch-off • Use low pressure blow followed by high pressure blow
13. Excessive shrinkage	Stock or mold temperature too high, cooling cycle too short, blowing air pressure too low, or uneven parison wall thickness	• Decrease stock temperature • Decrease mold temperature • Check mold cooling • Increase blowing pressure and delay air release • Align mandrel and die • Program parison
14.poor weld or seal at pinch-off	Stock temperature too low, mold temperature too high,mold closing	• Increase stock temperature • Decrease mold temperature • Increase mold closing time

	speed too fast,incorrect design of pinch-off blade, or improper mold venting	• Check pinch-off blade land size • Check pinch-off of mold for clearance and damage • Check mold alignment • Check mold venting
15. Excessive flash	Melt too hot, blowing air pressure too high, clamping mechanism out of adjustment, or excessive material being forced into mold	• Decrease melt temperature • Decrease extrusion back pressure • Decrease pre-blow air pressure • Decrease pre-blow time • Reset clamp or increase clamp pressure • Increase recess at pinch-off areas to accommodate more material
16. Warpage	Stock or mold temperature too high, blowing air pressure too low, material density too low, tooling condition, or part wall too thick	• Decrease stock temperature • Increase cycle time • Check mold for cooling • Reduce cycle time to obtain proper mold cooling • Increase blow air pressure • Use resin of proper density • Check tooling design • Center mandrel • Decrease container weight

Selfcheck 3	Written test

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

1.List alleast 5 faults and their posibble solution in blow molding operation.(10pts)

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

Informationsheet4-Ensuring appropriate records and log books of equipment operations

Introduction

Equipment maintenance is any process used to keep a business's equipment in reliable working order. It may include routine upkeep as well as corrective repair work.

Equipment may include mechanical assets, tools, and computer systems. The resources needed to keep it all in good repair will vary by type. For instance, repairs made on heavy construction equipment won't look the same as those performed on automated food processing machines. A documented record of machinery operation is called a logbook.

4.1.Importance of logbooks

Keeping equipment at optimum working condition minimises the risk of having unscheduled downtime.

But more importantly, ensures any risks to the operator from faulty equipment are controlled. If maintenance is needed (scheduled or unscheduled), it gets documented.

Wider benefits here:

- Forecast operational and maintenance costs
- Improve and upgrade technology and mechanical components
- Schedule future maintenance requirements
- It is your tool to check and see what has been done to the machine before you operate it.

4.2. Contents of logbook

Below are list of things that should be included in logbook

1. Date and location
2. Machinery type and size (tonnes)
3. Attachments used
4. Tasks completed
5. Supervisor on duty (Don't overlook this – it's critical information in case anything ever needs to be verified for future reference)

Fig 22 completing logbook

Selfcheck 4	Written test

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

1.identify contents of logbook .(5pts)

2.why does industries need logbook?(5pts)

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

Informationsheet5-Identifying and reporting non-routine problems

Introduction

Non-routine work are jobs and tasks that are performed irregularly or being performed for the first time. Since these tasks and jobs are not performed regularly, it is difficult to understand all of the hazards associated with the job.

Non-routine work includes jobs or tasks that are:

- Performed infrequently
- Outside of normal duties
- Do not have a documented procedure
- Performed in a different way from documented procedure
- Have never been performed before

Points to consider before doing nonroutine work:

- Chemicals and safely .
- Tools lifted
- Electrical equipment in the area
- lockout/tagout
- Electricity or moving machine parts
- working environment (hot or cold)
- pipes containing high pressure, temperature fluids, or gases

4.1.Identifying and reporting non-routine problems

Job Safety Analysis (JSA) is used to assess and document the hazards associated with a job. Non-routine work can be unscheduled and unplanned, and may need to be completed immediately. No matter the urgency of completing a job, all Environmental Health and Safety Policies (Lockout/tagout,Confined space,Hot work,) must be followed.

To identify the non routin problems the following procedures are followed.

- Perform a quick risk assessment
- Develop a rough procedure on how to complete the job
- Conduct a pre-job discussion with supervisor and everyone involved
- Inform everyone about the associated hazards and how to prevent them

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: Answer Questions

1. List the procedures required to identify non routine problems
2. List what conditions considered before starting non routin works

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

Operation Sheet 3– Identifying faults during the operation

Objectives: to identify faults during the operation

Materials:personal protective equipment(PPE), notebook and pen,camera

Procedures to identify faults

Step1.Name the fault

Step2.Describe the fault

Step3.find cause of fault

Step4.Determine the effect of the fault

Step5. Determine where the responsibility lies

Step6. Take action to avoid the fault

Step7. Take steps to prevent a recurrence

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 : Identify faults

Reference Materials

Book:

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AKNOWLEDGEMENT

We would like to express our appreciation to the TVET instructors and experts of regional TVET bureau, TVET College, and Federal Technical and Vocational Education and Training Agency (FTVETA) who made the development of this learning module with required standards and quality possible.

We wish thanks and appreciation to the representatives of BEAR II UNESCO PROJECT who covers the financial expenses, scarifying their time and commitments to develop this learning module.

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With the support of Republic of Korea Funds-in Trust