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PLASTIC PROCESSOR



TRAINER GUIDE

National Vocational Certificate Level 2

Version 1 - September, 2018



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Introduction

Competence-based training helps to bridge the gap between what is taught in training and what tasks will be performed on the job. Training trainees to perform actual job functions helps to ensure that future front-line workers have the skills, knowledge and abilities required to perform their jobs properly, safely and effectively. In addition to competence-based training, assessment based on the performance of actual work competencies helps to ensure that:

- trainees are performing their work tasks as safely as possible
- performance gaps are recognized prior to serious incidents
- training can be implemented to improve competence.

There are significant benefits to competence-based training:

1. Cost effectiveness

Since training activities and assessments in a competence-based approach are goal-oriented, trainers focus on clearly defined areas of skills, knowledge and understanding that their own industry has defined in the competence standards. At the same time, trainees are more motivated to learn when they realize the benefits of improved performance.

2. Efficiency

The transfer gap between the training environment and working on the job is reduced substantially in a competence-based approach. This is because training and assessment are relevant to what needs to be done on the job. As a result, it takes less time for trainees to become competent in the required areas. This, in turn, contributes to improved efficiency where training and assessment are concerned.

3. Increased productivity

When trainees become competent in the competence standards that their own industry has defined, when they know what the performance expectations are and receive recognition for their abilities through successful assessments, they are likely to be more motivated and experience higher job satisfaction. The result is improved productivity for organizations. The communication and constructive feedback between future employers and employees will improve as a result of a competence-based approach, which can also increase productivity.

4. Reduced risk

Using a competence-based approach to training, development, and assessment, employers are able to create project teams of people with complementary skills. A trainee's record of the skills, knowledge and understanding relating to the competence standards they have achieved can be used by a future employer to identify and provide further relevant training and assessment for new skills areas. Competence standards can shape employee development and promotional paths within an organization and give employees the opportunity to learn more competencies beyond their roles. It can also provide organizations with greater ability to scale and flex as needed, thereby reducing the risk they face.

5. Increased customer satisfaction

Employees who have been trained and assessed using a competence-based approach are, by the definition of the relevant competence standards, able to perform the required tasks associated with a job. The knock-on effect is that, in service-related industries, they are able to provide high service levels, thereby increasing customer satisfaction. In production or manufacturing industries, they are able to work closely to industry standards in a more effective and efficient way.

Lesson plans

This manual provides a series of lesson plans that will guide delivery of each module for the Plastic Processor qualification. It is important for trainers to be flexible and be ready to adapt lesson plans to suit the context of the subject and the needs of their trainees.

Good teachers acknowledge that CBT means each and every trainee in the class learns at a different speed. The good teacher is prepared to throw aside the day's lesson plan and do something different (and unplanned) for the class even if it means 'writing' a lesson plan for each trainee to match their learning pace for that day or week.

Learning by doing is different from learning theory and then applying it. To learn to do something, trainees need someone looking over their shoulder saying, 'it's not quite like that, it's like this', 'you do it like this because ...', or even 'tell me why you chose to do it like this?'

In this way, trainees learn that theoretical knowledge is meaningless if it is not seen in the context of what they are doing. In other words, if a trainee doesn't know why they do something, they will not do it competently (skills underpinned by knowledge = competent performer).

This is how a plastic processor acquires a practical grasp of the standards expected. It's not by learning it in theory, but because those standards are acquired through correction by people who show what the standards are and correct the trainee where they do not meet those standards, and where they repeat it correction until they have internalized those standards.

Demonstration of skill

Demonstration or modeling a skill is a powerful tool, which is used, in vocational training. The instructions for trainers for demonstration are as under:

- a) Read the procedure mentioned in the Trainer Guide for the relevant Learning Unit before demonstration.
- b) Arrange all tools, equipment and consumable material, which are required for demonstration of a skill.
- c) Practice the skill before demonstration to trainees, if possible.
- d) Introduce the skill to trainees clearly at the commencement of demonstration.
- e) Explain how the skill relates to the skill(s) already acquired and describe the expected results or show the objects to trainees.
- f) Carry out demonstration in a way that can be seen by all trainees.
- g) Use the same tools and materials that the learner will be using.
- h) Go through EACH of the steps involved in performing the skill.
- i) Go SLOWLY - describe each step as it is completed.
- j) Encourage the learners to move around and watch what you are doing from a number of different angles.

- k) Identify critical or complex steps, or steps that involve safety precautions to be followed.
- l) Explain theoretical knowledge where applicable and ask questions to trainees to test their understanding.
- m) Try to involve the learners: Ask them questions about why they think the process may work that way.
- n) Repeat critical steps in demonstration, if required.
- o) Summarize the demonstration by asking questions to trainees.

Involvement in the process (actively seeing) is important at this stage. When you work on getting involved, getting people to participate, you make them a part of what is happening. Questions for clarification or explanation are important throughout the demonstration. It is up to the learners to ask questions about things they do not understand, but it is also important for trainers to seek out and elicit questions from learners. A trainer may need to do repeated demonstrations of difficult or complex skills.

FORMAT FOR LESSON PLAN			
Module 6: Produce Injection Moulded Plastic Parts			
Learning Unit 1: Interpret Work Order			
Methods	Key Notes	Media	Time
	<p>Lead a discussion on Interpreting Workorders. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:</p> <ul style="list-style-type: none"> • Obtain work order • Verify production quantity available • Ensure raw material available as per work order • Ensure machine setting for production as per data sheet provided 		
Introduction			
<p>This session will introduce learners to the necessary set of information required to run scheduled production. The process and steps necessary for the acquisition of such information and the relevant paperwork.</p>			
Main Body			
<ul style="list-style-type: none"> • How to obtain workorder • Different sets of information contained in a workorder • Arrangement of raw material as per workorder • Setting up of machine as per workorder 			
Conclusion			
<p>To conclude the session, review the tools, techniques and material used for producing injection moulded plastic parts. Give learners the opportunity to ask questions.</p>			
<u>Assessment</u>			
<p>Question and answer, discussion groups with feedback, observation of practice skills development</p>			
Total time:			

Overview of the program

Course: Plastic Processor Level 2	Total Course Duration: 6 months
Course Overview:	
<p>Plastic Processor curriculum will prepare students to efficiently operate plastic processing machines such as injection moulding, compression, and extrusion, and to perform basic preventive maintenance on most types of plastic processing machines and equipment. Coursework includes Safety, Plastic moulding Machines operations, grades, Legal & environmental concerns & equipment maintenance. Graduates of this program may find employment with state and local government agencies and private contractors engaged in manufacturing or other plastic processing activities.</p>	

Module Title and Aim	Learning Units	Timeframe of modules
<p>Module 1: Comply Personal Health and Safety Guidelines</p> <p>Aim: This Competency Standard identifies the competencies required to protect/apply occupational Safety, Health and Environment at workplace according to the industry's approved guidelines, procedures and interpret environmental rules/regulations. Trainee will be expected to identify and use Personal Protective Equipment (PPE) according to the workplace requirements. The underpinning knowledge regarding Observe Occupational Safety and Health (OSH) will be sufficient to provide the basis for the job at workplace.</p>	<p>LU1: Identify Hazard at workplace LU2: Apply personal protective and safety equipment (PPE). LU3: Observe occupational safety and health (OSH) LU4: Dispose of hazardous waste/materials</p>	30

Module Title and Aim	Learning Units	Timeframe of modules
<p>Module 2: Communicate the Workplace Policy and Procedure</p> <p>Aim: This unit describes the performance outcomes, skills and knowledge required to develop communication skills in the workplace. It covers gathering, conveying and receiving information, along with completing assigned written information under direct supervision.</p>	<p>LU1. Identify workplace communication procedures</p> <p>LU2. Communicate at workplace</p> <p>LU3. Draft Written Information</p> <p>LU4. Review Documents</p>	20
<p>Module 3: Perform Basic Communication (Specific)</p> <p>Aim: This unit describes the skills and knowledge required to assist in the development of communication competence by providing information regarding different forms of communication and their appropriate use.</p>	<p>LU1. Communicate in a team to achieve intended outcomes</p> <p>LU2. Follow Supervisor's instructions as per organizational SOPs</p> <p>LU3. Develop Generic communication skills at workplace</p>	30
<p>Module 4: Perform Basic Computer Application (Specific)</p> <p>Aim: This unit describes the skills and knowledge required to use spreadsheet to prepare a page of document, develops familiarity with Word, Excel, email, and computer graphics basics.</p>	<p>LU1. Create Word Documents</p> <p>LU2. Create Excel Documents</p> <p>LU3. Use internet for Browsing</p>	40

Module Title and Aim	Learning Units	Timeframe of modules
<p>Module 5: Arrange Raw Material for Processing</p> <p>Aim: This competency standard is designed to gain basic knowledge and skills required to arrangement of raw material for processing of manufacturing products and sample.</p>	<p>LU1: Obtain Work Order LU2: Identify Components & Attachments LU3: Apply pre-processing procedure</p>	80
<p>Module 6: Produce Injection Moulded Plastic Parts</p> <p>Aim: The aim of this module to provide skills and knowledge to operate injection moulding machine in accordance with the manufacturer's manual</p>	<p>LU1: Interpret Work Order LU2: Perform Production LU3: Perform follow up procedure for machine production LU4: Submit production report LU5: Transport finish product to Concerned department</p>	150
<p>Module 7: Produce Pipe through extrusion moulding machine</p> <p>Aim: The aim of this module to provide skills and knowledge to operate pipe extrusion machine in accordance with the manufacturer's manual</p>	<p>LU1: Interpret Work Order LU2: Start Production as Per Requirement LU3: Perform Follow up Procedure LU4: Submit Production Report LU5: Transport Finished Product</p>	150
<p>Module 8: Produce Blow moulded plastic parts</p> <p>Aim: The aim of this module to provide skills and knowledge to operate compression moulding machine in accordance with the manufacturer's manual</p>	<p>LU1: Interpret Work Order LU2: Perform Production LU3: Perform Follow up Procedure for Machine Production LU4: Submit Production Report LU5: Transport Finish Product to Concerned Department</p>	150

Module Title and Aim	Learning Units	Timeframe of modules
<p>Module 9: Produce Compression moulded plastic parts</p> <p>Aim: The aim of this module to provide skills and knowledge to operate compression moulding machine in accordance with the manufacturer's manual</p>	<p>LU1: Interpret Work Order</p> <p>LU2: Perform Production</p> <p>LU3: Perform Follow up Procedure for Machine Production</p> <p>LU4: Submit Production Report</p> <p>LU5: Transport Finish Product to Concerned Department</p>	150

Trainer's guidelines:

Module 5: Arrange Raw Material for Processing			
Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Obtain Work Order	<p>Deliver an illustrated presentation on how to obtain work order. Ensure you address the importance of the following points:</p> <ul style="list-style-type: none"> i) Basic literacy skills <ul style="list-style-type: none"> • Be able to read instructions about product, quantity and raw material • Be able to identify rolling required to produce different components as per work order ii) Reporting procedure <ul style="list-style-type: none"> • Understanding the work order contents • Knowledge of units (Kg, inches, etc.) iii) Work order process <ul style="list-style-type: none"> • Understand the top-down stream of task assignment • Knowledge of what the work order represents • Who generates the work order? • Where can it be obtained from? iv) Material handling and storing procedure <ul style="list-style-type: none"> • Understanding where to obtain raw material for the required production quantity • How to handle raw material? • How to transport raw material to machine? <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p>	Classroom / Demonstration room Workshop	Multimedia Handouts Learner's guide White board Board markers Service Manuals Operational Manuals Material data/facts Sheets

Module 5: Arrange Raw Material for Processing			
Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU2: Identify components & attachments	<p>Deliver an illustrated presentation on how to identify components & attachments. Ensure you address the importance of the following points:</p> <p>i) Define Plastics/Polymers</p> <ul style="list-style-type: none"> • Understand basic differences between thermoplastics and thermosets • Basic difference between Engineering plastics and Commodity plastics • Processing parameters of commonly used plastics <p>ii) Explain Drying procedures</p> <ul style="list-style-type: none"> • Be able to identify dryers, mixers and cutters <p>iii) Explain Material mixing procedure</p> <ul style="list-style-type: none"> • Understanding difference between mixing additives and mixing recycled material <p>iv) Explain different attachments</p> <ul style="list-style-type: none"> • Understand difference between pneumatic and hydraulic lines • Understand relationship between filtration mesh and particle size <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Basic Hand tools Measuring tools and instruments Service Manuals Operational Manuals Material data/facts Sheets</p>

Module 5: Arrange Raw Material for Processing

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p>LU3: Apply pre-processing procedure</p>	<p>Deliver an illustrated presentation on how to apply pre-processing procedure. Ensure you address the importance of the following points:</p> <ul style="list-style-type: none"> i) Plastics/Polymers <ul style="list-style-type: none"> • Understand and identify requirements for a plastic to be dried or pre-processed into processing compound ii) Additives of plastics <ul style="list-style-type: none"> • Understand difference of pigments and masterbatches • Be able to determine mixing ratios of pigments and masterbatches • Be able to understand mixing of other additives iii) Drying procedures <ul style="list-style-type: none"> • Understand the concept of moisture absorption • Problems associated with moist raw material • Drying conditions and procedures iv) Explain crushing tools & techniques <ul style="list-style-type: none"> • Understanding tools required for crushing and re-granulating v) Difference in usability of crushed and re-granulated material <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p>	<p>Classroom / Demonstration room Workshop</p>	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Basic Hand tools Measuring tools and instruments Service Manuals Operational Manuals Material data/facts Sheets</p>

Module 6: 072200911 Produce Injection Moulded Plastic Parts

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Interpret Work Order	<p>Deliver an illustrated presentation on how to interpret work order. Ensure you address the importance of the following points:</p> <ul style="list-style-type: none"> i) Basic literacy skills <ul style="list-style-type: none"> • Be able to read instructions about product, quantity and raw material • Be able to identify rolling required to produce different components as per work order ii) Reporting procedure <ul style="list-style-type: none"> • Understanding the work order contents • Knowledge of units (Kg, inches, etc.) iii) Work order process <ul style="list-style-type: none"> • Understand the top-down stream of task assignment • Knowledge of what the work order represents • Who generates the work order? • Where can it be obtained from? iv) Material handling and storing procedure <ul style="list-style-type: none"> • Understanding where to obtain raw material for the required production quantity • How to handle raw material? v) Set machine parameters as per data sheet provided <ul style="list-style-type: none"> • Be able to input machine parameters as mentioned in work order or datasheet <p>In the end of the presentation include some multiple-</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Injection Moulding Machine Mould Utility documentation. Service Manuals. Operational Manuals. Basic Hand tools Job card/PPS</p>

Module 6: 072200911 Produce Injection Moulded Plastic Parts			
Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
	choice questions for the feedback of students		
LU2: Perform Production	<p>Deliver an illustrated presentation about how to perform production. Ensure that the presentation focuses on the following key points:</p> <p>i) Machine operation in automatic mode</p> <ul style="list-style-type: none"> • Be able to perform dry-run • Be able to perform semi-auto operation • Up on successfully obtaining required product, switching the machine to auto mode <p>ii) Maintaining product quality as per specifications</p> <ul style="list-style-type: none"> • Be able to measure components for identification of dimensional defects • Usage of measurement tools is critical: Vernier caliper, micrometer gauge, scale, etc. <p>iii) Recognize different defects and their causes</p> <ul style="list-style-type: none"> • Be able to visually identify commonly occurring defects, such as gating, flashing, orange-peel, etc. • Gain knowledge of rectification of commonly occurring defects. <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p> <p>After the presentation take the students to the workshop and show them what are the steps to set</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Injection Moulding Machine Mould Utility documentation. Service Manuals. Operational Manuals. Basic Hand tools Job card/PPS</p>

Module 6: 072200911 Produce Injection Moulded Plastic Parts			
Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
	<p>the machine on auto-cycle and how perform periodic quality checks.</p> <p>Ensure that all students can clearly observe the process and encourage them to ask the questions Ask each trainee to perform workpiece setting and continue monitor that each student has properly understood the method</p>		
LU3: Perform follow-up procedure for machine production	<p>Deliver an illustrated presentation about perform follow-up procedure for machine production. Ensure that the presentation focuses on the following key points:</p> <p>i) Knowledge of product packaging</p> <ul style="list-style-type: none"> • Understand different types of packaging, e.g.; flexible packaging, packing in cartons, etc. • How to pack final product? <p>ii) Raw material input in moulding machine</p> <ul style="list-style-type: none"> • Ensure consistent raw material feed into hopper/feeder • Be able to use overhead crane or moveable lifts/ladders • Understand the importance of cutting tools in opening raw material bags. • Concept of 'clean slits' using sharp tools to ensure particles of bag don't get mixed in raw 	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Utility documentation. Service Manuals. Operational Manuals. Basic Hand tools</p>

Module 6: 072200911 Produce Injection Moulded Plastic Parts			
Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
	<p>material</p> <p>iii) Lubrication requirements and procedure of machine</p> <ul style="list-style-type: none"> • Understand the concept of lubricating moveable parts of machines • Carefully use mould lubricant sprays • Ensure spray cans are stored in a secure location after pre-shot application • Be able to identify different mould release agents as per raw material • Be able to provide first-hand feedback to maintenance department for periodic machine maintenance <p>Ask students to observe all the process. Learners must be able to practice and develop their knowledge and skills relating to parting in an appropriate practical setting.</p>		
LU4: Submit Production report	<p>Begin this session with an illustrated presentation on submission of production report. Ensure that the presentation addresses the following points, including demonstrations of preparation and methods where appropriate:</p> <p>i) Production report writing</p> <ul style="list-style-type: none"> • Understand the importance of reporting accurate production quantity 	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Injection Moulding Machine</p>

Module 6: 072200911 Produce Injection Moulded Plastic Parts			
Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
	<ul style="list-style-type: none"> • Be able to fill-in relevant production reports • Be able to identify waste generated along with identification of machine downtime with reasons ii) Data sharing with relevant departments <ul style="list-style-type: none"> • Understanding the concept of producing accurate data and benefits of the same on a larger scale Submission of production reports to production planning department or the supervisor for timely actions. Arrange a question and answer session to clarify trainee understanding.		Mould Utility documentation. Service Manuals. Operational Manuals. Basic Hand tools
LU5: Transport finished product to concerned department	Deliver an illustrated presentation on how to transport finished product to concerned department. Ensure you address the importance of the following points: <ul style="list-style-type: none"> i) Understand QC protocols <ul style="list-style-type: none"> • Understand and appreciate the importance of producing products as per specification • Be able to implement the first quality control protocol on machine to ensure elimination of defective products at sight ii) Inter-department co-ordination <ul style="list-style-type: none"> • Be able to co-ordinate with QC department with produced batches for relevant approvals iii) Be able to hand over final products to store 	Classroom / Demonstration room Workshop	Multimedia Handouts Learner's guide White board Board markers Injection Moulding Machine Mould Utility documentation. Service Manuals. Operational Manuals. Basic Hand tools

Module 6: 072200911 Produce Injection Moulded Plastic Parts

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
	<ul style="list-style-type: none">Familiarize with handing-over protocols and paperwork. <p>Prepare either:</p> <ul style="list-style-type: none">A flip chartA PowerPoint slideA handout <p>...showing key topics. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify three main points that related to each key topic.</p> <p>After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified.</p> <p>Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics.</p> <p>End the group discussion activity with a summary.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to product transportation and QC protocols. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		

Module 7: 072200912 Produce Pipe Through Extrusion Moulding Machine

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Interpret Work Order	<p>Deliver an illustrated presentation on how to interpret work order. Ensure you address the importance of the following points:</p> <ul style="list-style-type: none"> i) Basic literacy skills <ul style="list-style-type: none"> • Be able to read instructions about product, quantity and raw material • Be able to identify rolling required to produce different components as per work order ii) Reporting procedure <ul style="list-style-type: none"> • Understanding the work order contents • Knowledge of units (Kg, inches, etc.) iii) Work order process <ul style="list-style-type: none"> • Understand the top-down stream of task assignment • Knowledge of what the work order represents • Who generates the work order? • Where can it be obtained from? iv) Material handling and storing procedure <ul style="list-style-type: none"> • Understanding where to obtain raw material for the required production quantity • How to handle raw material? v) Set machine parameters as per data sheet provided <ul style="list-style-type: none"> • Be able to input machine parameters as mentioned in work order or datasheet 	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Extruder Mixer Pipe Extrusion Downstream line Extruded product samples Utility documentation. Service Manuals. Operational Manuals. Basic Hand tools Job card/PPS</p>

	In the end of the presentation include some multiple-choice questions for the feedback of students		
LU2: Start production as per requirement	<p>Deliver an illustrated presentation about how to start production as per requirement. Ensure that the presentation focuses on the following key points:</p> <ol style="list-style-type: none"> i) Machine controls <ul style="list-style-type: none"> • Learn to input processing parameters in the machine and peripheral components ii) Machine operation in automatic mode <ul style="list-style-type: none"> • Be able to perform semi-auto operation • Up on successfully obtaining required product specification, switching the machine to auto mode iii) Peripheral equipments such as air compressors, chillers, vacuum pump, printer, dryer, etc. <ul style="list-style-type: none"> • Ensure working and operation of all affiliated equipment <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p> <p>After the presentation take the students to the workshop and show them what are the steps to set the extruder and how different sizes of pipes are produced</p> <p>Ensure that all students can clearly observe the process and encourage them to ask the questions Ask each trainee to perform workpiece setting and continue monitor that each student has properly</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Extruder High speed mixer Pipe extrusion downstream line Extruded product samples Operation manual Basic Hand Tools</p>

	understood the method		
LU3: Perform follow up procedure	<p>Deliver an illustrated presentation about follow-up procedures. Ensure that the presentation focuses on the following key points</p> <p>i) Knowledge of pipe standards (BS 3505, etc.)</p> <ul style="list-style-type: none"> • Understand the difference in producing pipes as per multiple standards • Memorize dimensions of pipes as per commonly used standards <p>ii) Maintaining product quality as per specifications</p> <ul style="list-style-type: none"> • Be able to measure components for identification of dimensional defects • Usage of measurement tools is critical: Vernier caliper, micrometer gauge, scale, etc. <p>iii) Raw material input in machine</p> <ul style="list-style-type: none"> • Ensure consistent raw material feed into hopper/feeder • Be able to use overhead crane or moveable lifts/ladders • Understand the importance of cutting tools in opening raw material bags. • Concept of 'clean slits' using sharp tools to ensure particles of bag don't get mixed in raw material <p>iv) Lubrication requirements and procedure of machine</p> <ul style="list-style-type: none"> • Understand the concept of lubricating moveable parts of machines • Be able to provide first-hand feedback to maintenance department for periodic machine 	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Extruder High speed mixer Pipe extrusion downstream line Extruded product samples Operation manual Basic Hand Tools</p>

	<p style="text-align: center;">maintenance</p> <p>v) Recognize different defects and their causes</p> <ul style="list-style-type: none"> • Be able to visually identify commonly occurring defects, such as eccentricity, burn lines, blistering, etc. • Gain knowledge of rectification of commonly occurring defects. <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p> <p>After the presentation take the students to the workshop and show them all types of extruders and their method of identification</p> <p>Demonstrate the extrusion process by producing a pipe to the students ensure that all students can clearly observe the process, encourage them to ask the questions.</p>		
<p>LU4: Submit production report</p>	<p>Begin this session with an illustrated presentation on submission of production report. Ensure that the presentation addresses the following points, including demonstrations of preparation and methods where appropriate:</p> <p>i) Production report writing</p> <ul style="list-style-type: none"> • Understand the importance of reporting accurate production quantity • Be able to fill-in relevant production reports • Be able to identify waste generated along with identification of machine downtime with reasons <p>ii) Data sharing with relevant departments</p> <ul style="list-style-type: none"> • Understanding the concept of producing 	<p>Classroom / Demonstration room Workshop</p>	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Extruder High speed mixer Pipe extrusion downstream line Extruded product samples Operation manual Basic Hand Tools</p>

	<p>accurate data and benefits of the same on a larger scale</p> <p>Submission of production reports to production planning department or the supervisor for timely actions.</p> <p>Arrange a question and answer session to clarify trainee understanding.</p>		
<p>LU5: Transport finished product to concerned department</p>	<p>Deliver an illustrated presentation on how to transport finished product to concerned department. Ensure you address the importance of the following points:</p> <p>i) Understand QC protocols</p> <ul style="list-style-type: none"> • Understand and appreciate the importance of producing products as per specification • Be able to implement the first quality control protocol on machine to ensure elimination of defective products at sight <p>ii) Inter-department co-ordination</p> <ul style="list-style-type: none"> • Be able to co-ordinate with QC department with produced batches for relevant approvals <p>iii) Be able to hand over final products to store</p> <ul style="list-style-type: none"> • Familiarize with handing-over protocols and paperwork. <p>Prepare either:</p> <ul style="list-style-type: none"> • A flip chart • A PowerPoint slide • A handout <p>...showing key topics. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify three</p>	<p>Classroom / Demonstration room Workshop</p>	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Extruder High speed mixer Pipe extrusion downstream line Extruded product samples Operation manual Basic Hand Tools</p>

	<p>main points that related to each key topic.</p> <p>After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified.</p> <p>Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics.</p> <p>End the group discussion activity with a summary.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to product transportation and QC protocols. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
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Module 8: 072200913 Produce Blow Moulded Plastic Parts

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Interpret Work Order	<p>Deliver an illustrated presentation on how to interpret work order. Ensure you address the importance of the following points:</p> <ul style="list-style-type: none"> i) Basic literacy skills <ul style="list-style-type: none"> • Be able to read instructions about product, quantity and raw material • Be able to identify rolling required to produce different components as per work order ii) Reporting procedure <ul style="list-style-type: none"> • Understanding the work order contents • Knowledge of units (Kg, inches, etc.) iii) Work order process <ul style="list-style-type: none"> • Understand the top-down stream of task assignment • Knowledge of what the work order represents • Who generates the work order? • Where can it be obtained from? iv) Material handling and storing procedure <ul style="list-style-type: none"> • Understanding where to obtain raw material for the required production quantity • How to handle raw material? v) Set machine parameters as per data sheet provided <ul style="list-style-type: none"> • Be able to input machine parameters as mentioned in work order or datasheet <p>In the end of the presentation include some multiple-</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner’s guide White board Board markers</p> <p>Blow moulding machine Machine mould Air compressor Vacuum machine De-humidifier Chiller for cold water Utility documentation Service manual Operation manual Basic hand tools</p>

	choice questions for the feedback of students		
LU2: Perform Production	<p>Deliver an illustrated presentation about how to perform production. Ensure that the presentation focuses on the following key points:</p> <p>i) Maintaining product quality as per specifications</p> <ul style="list-style-type: none"> • Be able to measure components for identification of dimensional defects • Usage of measurement tools is critical: Vernier caliper, micrometer gauge, scale, etc. <p>ii) Recognize different defects and their causes</p> <ul style="list-style-type: none"> • Be able to visually identify commonly occurring defects, such as flashing, pin-holes, short-shots, etc. • Gain knowledge of rectification of commonly occurring defects. <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p> <p>After the presentation take the students to the workshop and show them what are the steps to set the machine on auto-cycle and how perform periodic quality checks.</p> <p>Ensure that all students can clearly observe the process and encourage them to ask the questions Ask each trainee to perform workpiece setting and continue monitor that each student has properly understood the method</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Blow moulding machine Machine mould Air compressor Vacuum machine De-humidifier Chiller for cold water Utility documentation Service manual Operation manual Basic hand tools</p>

<p>LU3: Perform follow up procedure</p>	<p>Deliver an illustrated presentation about follow-up procedures. Ensure that the presentation focuses on the following key points</p> <ul style="list-style-type: none"> i) Knowledge of product packaging <ul style="list-style-type: none"> • Understand different types of packaging, e.g.; flexible packaging, packing in cartons, etc. • How to pack final product? ii) Raw material input in moulding machine <ul style="list-style-type: none"> • Ensure consistent raw material feed into hopper/feeder • Be able to use overhead crane or moveable lifts/ladders • Understand the importance of cutting tools in opening raw material bags. • Concept of 'clean slits' using sharp tools to ensure particles of bag don't get mixed in raw material iii) Lubrication requirements and procedure of machine <ul style="list-style-type: none"> • Understand the concept of lubricating moveable parts of machines • Carefully use mould lubricant sprays • Ensure spray cans are stored in a secure location after pre-shot application • Be able to identify different mould release agents as per raw material • Be able to provide first-hand feedback to maintenance department for periodic machine maintenance <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p>	<p>Classroom / Demonstration room Workshop</p>	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Blow moulding machine Machine mould Air compressor Vacuum machine De-humidifier Chiller for cold water Utility documentation Service manual Operation manual Basic hand tools</p>
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	<p>After the presentation take the students to the workshop and show them all types of blow moulding machines and their method of identification</p> <p>Demonstrate the blowing process by producing a sample to the students ensure that all students can clearly observe the process, encourage them to ask the questions.</p>		
LU4: Submit production report	<p>Begin this session with an illustrated presentation on submission of production report. Ensure that the presentation addresses the following points, including demonstrations of preparation and methods where appropriate:</p> <p>i) Production report writing</p> <ul style="list-style-type: none"> • Understand the importance of reporting accurate production quantity • Be able to fill-in relevant production reports • Be able to identify waste generated along with identification of machine downtime with reasons <p>ii) Data sharing with relevant departments</p> <ul style="list-style-type: none"> • Understanding the concept of producing accurate data and benefits of the same on a larger scale <p>Submission of production reports to production planning department or the supervisor for timely actions.</p> <p>Arrange a question and answer session to clarify trainee understanding.</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Blow moulding machine Machine mould Air compressor Vacuum machine De-humidifier Chiller for cold water Utility documentation Service manual Operation manual Basic hand tools</p>
LU5: Transport finished product to concerned	<p>Deliver an illustrated presentation on how to transport finished product to concerned department. Ensure you address the importance of the following points:</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts</p>

<p>department</p>	<p>i) Understand QC protocols</p> <ul style="list-style-type: none"> • Understand and appreciate the importance of producing products as per specification • Be able to implement the first quality control protocol on machine to ensure elimination of defective products at sight <p>ii) Inter-department co-ordination</p> <ul style="list-style-type: none"> • Be able to co-ordinate with QC department with produced batches for relevant approvals <p>iii) Be able to hand over final products to store</p> <ul style="list-style-type: none"> • Familiarize with handing-over protocols and paperwork. <p>Prepare either:</p> <ul style="list-style-type: none"> • A flip chart • A PowerPoint slide • A handout <p>...showing key topics. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify three main points that related to each key topic.</p> <p>After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified.</p> <p>Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics.</p> <p>End the group discussion activity with a summary.</p>		<p>Learner's guide</p> <p>White board</p> <p>Board markers</p> <p>Blow moulding machine</p> <p>Machine mould</p> <p>Air compressor</p> <p>Vacuum machine</p> <p>De-humidifier</p> <p>Chiller for cold water</p> <p>Utility documentation</p> <p>Service manual</p> <p>Operation manual</p> <p>Basic hand tools</p>
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	Learners must be able to practice and develop their knowledge and skills relating to product transportation and QC protocols. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module 9: 072200914 Produce Compression Moulded Plastic Parts

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Interpret Work Order	<p>Deliver an illustrated presentation on how to interpret work order. Ensure you address the importance of the following points:</p> <ul style="list-style-type: none"> i) Basic literacy skills <ul style="list-style-type: none"> • Be able to read instructions about product, quantity and raw material • Be able to identify rolling required to produce different components as per work order ii) Reporting procedure <ul style="list-style-type: none"> • Understanding the work order contents • Knowledge of units (Kg, inches, etc.) iii) Work order process <ul style="list-style-type: none"> • Understand the top-down stream of task assignment • Knowledge of what the work order represents • Who generates the work order? • Where can it be obtained from? iv) Material handling and storing procedure <ul style="list-style-type: none"> • Understanding where to obtain raw material for the required production quantity • How to handle raw material? v) Set machine parameters as per data sheet provided <ul style="list-style-type: none"> • Be able to input machine parameters as mentioned in work order or datasheet <p>In the end of the presentation include some multiple-</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Compression moulding machine & mould Weighing scale Plastic raw material Product samples Machine manual Job card</p>

	choice questions for the feedback of students		
LU3: Perform Production	<p>Deliver an illustrated presentation about how to perform production. Ensure that the presentation focuses on the following key points:</p> <p>i) Machine operation in automatic mode</p> <ul style="list-style-type: none"> • Be able to perform dry-run • Be able to perform semi-auto operation • Up on successfully obtaining required product, switching the machine to auto mode <p>ii) Maintaining product quality as per specifications</p> <ul style="list-style-type: none"> • Be able to measure components for identification of dimensional defects • Usage of measurement tools is critical: Vernier caliper, micrometer gauge, scale, etc. <p>iii) Recognize different defects and their causes</p> <ul style="list-style-type: none"> • Be able to visually identify commonly occurring defects, such as gating, flashing, orange-peel, etc. • Gain knowledge of rectification of commonly occurring defects. <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p> <p>After the presentation take the students to the workshop and show them what are the steps to set the machine on auto-cycle and how perform periodic quality checks.</p> <p>Ensure that all students can clearly observe the process and encourage them to ask the questions</p>	Classroom / Demonstration room Workshop	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Compression moulding machine & mould Weighing scale Plastic raw material Product samples Machine manual Job card</p>

	Ask each trainee to perform workpiece setting and continue monitor that each student has properly understood the method		
LU4: Perform follow up procedure	<p>Deliver an illustrated presentation about follow-up procedures. Ensure that the presentation focuses on the following key points</p> <p>i) Knowledge of product packaging</p> <ul style="list-style-type: none"> • Understand different types of packaging, e.g.; flexible packaging, packing in cartons, etc. • How to pack final product? <p>ii) Raw material input in moulding machine</p> <ul style="list-style-type: none"> • Ensure consistent raw material feed into hopper/feeder • Be able to use overhead crane or moveable lifts/ladders • Understand the importance of cutting tools in opening raw material bags. • Concept of 'clean slits' using sharp tools to ensure particles of bag don't get mixed in raw material <p>iii) Lubrication requirements and procedure of machine</p> <ul style="list-style-type: none"> • Understand the concept of lubricating moveable parts of machines • Carefully use mould lubricant sprays • Ensure spray cans are stored in a secure location after pre-shot application • Be able to identify different mould release agents as per raw material • Be able to provide first-hand feedback to 	Classroom / Demonstration room Workshop	<p>Multimedia</p> <p>Handouts</p> <p>Learner's guide</p> <p>White board</p> <p>Board markers</p> <p>Compression moulding machine & mould</p> <p>Weighing scale</p> <p>Plastic raw material</p> <p>Product samples</p> <p>Machine manual</p> <p>Job card</p>

	<p>maintenance department for periodic machine maintenance</p> <p>In the end of the presentation include some multiple-choice questions for the feedback of students</p> <p>After the presentation take the students to the workshop and show them all types of compression moulding machines and their method of identification</p> <p>Demonstrate the compression process by producing a sample to the students ensure that all students can clearly observe the process, encourage them to ask the questions.</p>		
LU5: Submit production report	<p>Begin this session with an illustrated presentation on submission of production report. Ensure that the presentation addresses the following points, including demonstrations of preparation and methods where appropriate:</p> <p>i) Production report writing</p> <ul style="list-style-type: none"> • Understand the importance of reporting accurate production quantity • Be able to fill-in relevant production reports • Be able to identify waste generated along with identification of machine downtime with reasons <p>ii) Data sharing with relevant departments</p> <ul style="list-style-type: none"> • Understanding the concept of producing accurate data and benefits of the same on a larger scale <p>Submission of production reports to production planning department or the supervisor for timely actions.</p> <p>Arrange a question and answer session to clarify trainee understanding.</p>	Classroom / Demonstration room Workshop	<p>Multimedia</p> <p>Handouts</p> <p>Learner's guide</p> <p>White board</p> <p>Board markers</p> <p>Compression moulding machine & mould</p> <p>Weighing scale</p> <p>Plastic raw material</p> <p>Product samples</p> <p>Machine manual</p> <p>Job card</p>

<p>LU6: Transport finished product to concerned department</p>	<p>Deliver an illustrated presentation on how to transport finished product to concerned department. Ensure you address the importance of the following points:</p> <ul style="list-style-type: none"> i) Understand QC protocols <ul style="list-style-type: none"> • Understand and appreciate the importance of producing products as per specification • Be able to implement the first quality control protocol on machine to ensure elimination of defective products at sight ii) Inter-department co-ordination <ul style="list-style-type: none"> • Be able to co-ordinate with QC department with produced batches for relevant approvals iii) Be able to hand over final products to store <ul style="list-style-type: none"> • Familiarize with handing-over protocols and paperwork. <p>Prepare either:</p> <ul style="list-style-type: none"> • A flip chart • A PowerPoint slide • A handout <p>...showing key topics. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify three main points that related to each key topic.</p> <p>After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their</p>	<p>Classroom / Demonstration room Workshop</p>	<p>Multimedia Handouts Learner's guide White board Board markers</p> <p>Compression moulding machine & mould Weighing scale Plastic raw material Product samples Machine manual Job card</p>

	<p>group had not identified.</p> <p>Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics.</p> <p>End the group discussion activity with a summary.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to product transportation and QC protocols. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
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Frequently Asked Questions

<p>1. What is Competency Based Training (CBT) and how is it different from currently offered trainings in institutes?</p>	<p>Competency-based training (CBT) is an approach to vocational education and training that places emphasis on what a person can do in the workplace as a result of completing a program of training. Compared to conventional programs, the competency-based training is not primarily content based; it rather focuses on the competence requirement of the envisaged job role. The whole qualification refers to certain industry standard criterion and is modularized in nature rather than being course oriented.</p>
<p>2. What is the passing criterion for CBT certificate?</p>	<p>You shall be required to be declared “Competent” in the summative assessment to attain the certificate.</p>
<p>3. How can I progress in my educational career after attaining this certificate?</p>	<p>You shall be eligible to take admission in the National Vocational Certificate Level-2 in Plastic Processor. You shall be able to progress further to National Vocational Certificate Level-3 in Plastic Processor; and take admission in a level-4, DAE or equivalent course. In certain case, you may be required to attain an equivalence certificate from The Inter Board Committee of Chairmen (IBCC).</p>
<p>4. What is the importance of this certificate in National and International job market?</p>	<p>This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTTC). These standards are also recognized worldwide as all the standards are coded using international methodology and are accessible to the employers worldwide through NAVTTTC website.</p>
<p>5. Which jobs can I get after attaining this certificate? Are there job for this certificate in public sector as well?</p>	<p>Plastic Processors are employed in the manufacturing engineering and production sector especially in automobile, household goods, electrical and electronics appliances etc. Experienced Plastic Processor may advance through promotions with the same employer or by moving to more advanced positions with other employers. They can become:</p> <ul style="list-style-type: none"> • Process Operator • Process Technician

	<ul style="list-style-type: none"> • Process/Machine Tool Setter/Fitter
<p>6. What are possible career progressions in industry after attaining this certificate?</p>	<p>You shall be able to progress up to the level of supervisor after attaining sufficient experience, knowledge and skills during the job. Attaining additional relevant qualifications may aid your career advancement to even higher levels.</p> <p>Some experienced Plastic Processor achieve a highly respected level of salaries. There are good prospects for travel both within Pakistan and abroad. The employment outlook in this occupation will be influenced by a wide variety of factors including:</p> <ul style="list-style-type: none"> • Trends and events affecting overall employment (especially in the manufacturing industry) • Location in Pakistan • Employment turnover (work opportunities generated by people leaving existing positions) • Occupational growth (work opportunities resulting from the creation of new positions that never existed before) • Size of the industry • Flexibility of the applicant (concerning location and schedule of work)
<p>7. Is this certificate recognized by any competent authority in Pakistan?</p>	<p>This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTTC). The official certificates shall be awarded by the relevant certificate awarding body.</p>
<p>8. Is on-the-job training mandatory for this certificate? If yes, what is the duration of on-the-job training?</p>	<p>On-the-job training is not a requirement for final / summative assessment of this certificate. However, taking up on-the-job training after or during the course work may add your chances to get a job afterwards.</p>
<p>9. What is the examination / assessment system in this</p>	<p>Competency based assessments are organized by training institutes</p>

<p>program?</p>	<p>during the course which serve the purpose of assessing the progress and preparedness of each student. Final / summative assessments are organized by the relevant qualification awarding bodies at the end of the certificate program. You shall be required to be declared “Competent” in the summative assessment to attain the certificate.</p>
<p>10. Does this certificate enable me to work as freelancer?</p>	<p>You can start your small business as a Plastic Processor. You may need additional skills on entrepreneurship to support your initiative.</p>

Short Questions/Answers

Q1. Which plastics are used in injection molding?	Thermoplastics
Q2. What types of polymeric materials (plastics and elastomers) are there?	Amorphous and Semi-crystalline
Q3. What is the difference between parallel and conical twin screw extruders?	Conical twin screws are used for better throughput and parallel twin screws are used for better mixing.
Q4. Complex shape of parts or components cannot be formed by the injection moulding process.	False
Q5. Components from injection moulding process are made very expensive due to the application of very costly equipment.	False
Q6. The moulding directions in injection moulding can affect the cost of equipments used in the process.	True
Q7. The flow of plastic in the mould cavity is more proper and smooth if the thickness of the component made is very small.	False
Q8. Shrinkage of the plastic parts in mould cavity can results in generation of sink holes in the plastic.	True
Q9. A heavy surface finishing is always required for components made in injection moulding machine.	False
Q10. In injection moulding process, ribs are generally provided for the reinforcement to avoid sink marks from the component.	True
Q11. The barrel is used for opening and closing of	False

the mold.	
Q12. There is a varied pressure provided in the solidification unit of injection molding process.	False
Q13. Calendering is mostly suited for making PVC	True
Q14. Tubes having U shape cannot be manufactured by polymer extrusion process.	False
Q15. Extrusion is a process which uses an electric system for processing various polymers.	False
Q16. Thermosetting polymers can be processed by extrusion process by forming cross-linking in the extruder.	True
Q17. In processing polymers, injection moulding process is almost similar to extrusion process except for the screw operation.	True
Q18. Extruder is a device used for the finishing of processed polymer products in the extrusion process.	False
Q19. Continuous type of extruder is generally equipped with rotating parts in the extrusion process.	True
Q20. Multiple screw extruders are mostly preferred than the single screw extruders in the extrusion process.	False
Q21. In the extrusion process, a cast type barrel is mainly used for the heating of polymer material.	False
Q22. Extruder die is a machine part that gives final shape to the polymer material used in the extrusion	True

process.	
Q23. In the extrusion process, a water-cooling system is used which automatically controlled by a sensor.	True
Q24. Speed of production in transfer molding is higher than that of compression molding?	True
Q25. Thermosetting materials are the polymeric materials which get soften on heating with or without pressure.	False
Q26. Thermosetting plastics are generally used for making products of high strength and rigidness.	True
Q27. Polyurethanes plastics can be made in flexible foams even after belonging to thermosetting polymers.	True
Q28. Polyethylene, polypropylene and polyvinyl chloride (PVC) are the main example of thermosetting polymers.	False
Q29. Thermosetting plastics like epoxies can be used for filament wound rocket motor casings in missiles by combining with glass fibers.	True
Q30. Polyurethane plastics are highly reactive to chemical compounds due to lack of elasticity in this plastics.	False
Q31. Phenolic plastics can also be used as binder for holding plies of wood in making of plywood.	True
Q32. Thermosetting plastics can be used for manufacturing of windshield for airplane.	False

Q33. Mechanical properties of any plastics are mainly dependent on the temperature, force and time of load applied.	True
Q34. The heater in vacuum forming process is heated up to 90°C.	True
Q35. The initial cost in blow molding is low.	True
Q36. Blow moulding is a very slow process, however economical for producing products with better quality.	False
Q37. In extrusion blow moulding process, it is very difficult to trim away excess of plastics	True
Q38. Single stage stretch blow moulding is always preferred than two stage stretch blow moulding for increase in production rate.	False
Q39. Single stage stretch blow moulding process is mostly used for small level production.	True
Q40. Thermoforming process involves injecting of molten plastic into a mould cavity by application of compressed air.	False
Q41. In thermoforming process, it is very difficult to control thickness of moulded parts or sheets.	True
Q42. In thermoforming, it is very easy to mould the plastic materials which are of crystalline nature.	False
Q43. Thermoforming is basically a cheap process as compared to injection and blow moulding process.	True
Q44. Which material is mostly used for making of thermoforming moulds?	Aluminum

Test Yourself (Multiple-choice Questions)

MODULE 6

- Question 1** Three overall classes of plastics are distinguished from one another. They include thermosets, thermoplastics and _____
- A Monomers
 - B Synthesis
 - C Elastomers
 - D Fibers
- Question 2** Thermoplastics are soluble and _____
- A Densely cross-linked
 - B Fusible
 - C Non-fusible
 - D Crystalline

Question 3 Amorphous thermoplastics are _____ when they are not combined with fillers or similar additives.

A Transparent

B Milky opaque

C Translucent

D Black

Question 4 Polycarbonate (PC), from which Compact Disks are molded, is a(n) _____ thermoplastic.

A Amorphous

B Semi-crystalline

C Liquid Crystal

D Immiscible

Question 5 _____ cannot be fused or dissolved but can be swelled.

A Thermoplastics

B Elastomers

C Thermosets

D Composites

Question 6 Thermosets are non-fusible and _____

A Soft

B Densely cross-linked

C Dense

D Irregular shaped

Question 7 The intermolecular forces which operate in the crystalline state are considerably _____ than those in the amorphous state.

A Weaker

B Stronger

C Complex

D Diverse

Question 8 The abbreviation for polyamide, as specified by ISO 1043, is _____

A PS

B PA

C PC

D PVA

Question 9 Processing temperatures are _____ for thermoplastics than for metals.

A Higher

B Lower

C Left

D Right

Question 10 Viscosity is a measure of the _____ of a melt.

A Hardness

B Flow properties

C Density

D Visco-elasticity

Question 11 As temperature decreases, the viscosity of the melt _____

A Increases

B Decreases

C Varies

D Eliminates

MODULE 7

Question 12 Which of the following material is not used in extrusion?

A Wax

B Granules

C Powder

D Pellets

Question 13 In extrusion process, extra shearing occurs in which part of the system?

A Feed section

B Pumping section

C Collapse section

D Transition section

Question 14 Melting section is another name for which section?

- A Feed Section
- B Transition section
- C Transition section
- D Collapse section

Question 14 How are extruded materials cooled?

- A Water
- B Contact with chilled surface
- C Air
- D Oil

Question 15 Which of the following is not an important factor of cooling in extrusion?

- A Reduction in shrinkage
- B Reduction in distortion
- C Ease of adding colors
- D Rate of cooling

Question 16 Which of the following is not an application of polymer extrusion?

- A Door insulation
- B Chewing gums
- C Cables
- D Circuit boards

Question 17 Film extrusion process, best involves film having thickness below what length?

- A 0.2mm
- B 0.3mm
- C 0.4mm
- D 0.5mm

Question 18 In cable extrusion process, what is the speed of product winding?

- A 40m/s
- B 50m/s
- C 60m/s
- D 70m/s

- Question 19** Which of the following equipment is used for controlling the temperature of polymer material in the extrusion process?
- A Thermoresister
 - B Thermometer
 - C Thermocouple
 - D Glasstube

MODULE 8

- Question 21** In blow molding, to inflate soft plastic, which medium is used?
- A Air
 - B Water
 - C Oil
 - D Alcohol

- Question 22** Which of the following plastics is not used in blow molding?
- A Terephthalate
 - B Polypropylene
 - C Polyethylene
 - D PVC
- Question 23** What is the minimum air pressure required in blow molding process?
- A 350KPa
 - B 400KPa
 - C 450KPa
 - D 500KPa
- Question 24** What can be the maximum pressure to be given to a plastic for blow molding process?
- A 700KPa
 - B 750KPa
 - C 800KPa
 - D 850KPa

- Question 25** Which of the following is not a type of blow molding process?
- A Injection blow moulding
 - B Extrusion blow moulding
 - C Multi-smaller blow moulding
 - D Multi-larger blow moulding
- Question 26** Which of the following is not an application of blow molding process?
- A Toy bodies
 - B Door liners
 - C Bottles
 - D Pipes
- Question 27** What is the maximum thickness that can be allowed for a plastics sheet in vacuum forming process?
- A 3mm
 - B 3.1mm
 - C 3.2mm
 - D 3.3mm

- Question 28** What is the minimum thickness required by the plastic for vacuum forming?
- A 0.125mm
 - B 0.25mm
 - C 0.375mm
 - D 0.5mm

MODULE 9

- Question 29** What is the minimum pressure required in a compression molding process?
- A 0.5MPa
 - B 1MPa
 - C 1.5MPa
 - D 2MPa

Question 30 What is the minimum temperature required in a compression molding process?

A 120°C

B 125°C

C 130°C

D 135°C

Question 31 What is the maximum pressure required in a compression molding process?

A 35MPa

B 40MPa

C 45MPa

D 50MPa

Question 32 What is the maximum temperature required in a compression molding process?

A 240°C

B 245°C

C 250°C

D 255°C

Question 33 In compression molding, the curing time does not depend on which of the following factors?

A Material

B Curing temperature

C Geometry

D Thickness

Multiple-choice Questions Answer scheme

Module 6:

Q1: C

Q2: B

Q3: B

Q4: B

Q5: C

Q6: B

Q7: B

Q8: B

Q9: B

Q10: B

Q11: A

Module 7:

Q12: A

Q13: B

Q14: B

Q15: B

Q16: C

Q17: B

Q18: D

Q19: B

Q20: C

Module 8

Q21: A

Q22: A

Q23: B

Q24: C

Q25: C

Q26: D

Q27: C

Q28: A

Module 9

Q29: A

Q30: B

Q31: D

Q32: C

Q33: B

