



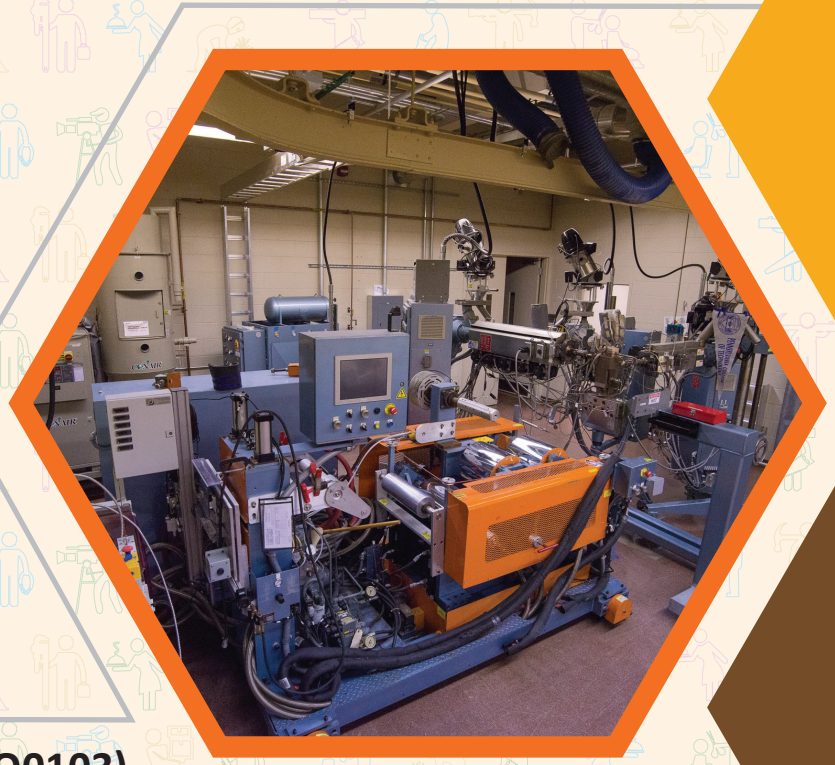
Participant Handbook

Sector
Rubber

Sub-Sector
**Manufacturing/
Plastics Processing**

Occupation
Plastics Processing

Reference ID: **RSC/Q4801 (CPC/Q0103),
Version 1.0, NSQF level: 3**



**Machine Operator
Assistant -
Plastics Processing**

Published by

Rubber Skill Development Council

217, 2nd Floor, Rectangle One, Saket District Centre, New Delhi - 110017

Phone: +91 11 41009347, 41009348

Email: info@rsdcindia.in

Website: www.rsdcindia.in

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Shri Narendra Modi
Prime Minister of India

“ Skilling is building a better India.
If we have to move India towards
development then Skill Development
should be our mission. ”



Certificate

COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

RUBBER SKILL DEVELOPMENT COUNCIL

for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: 'Machine Operator Assistant - Plastics Processing'

QP No. 'RSC/Q4801 (CPC/Q0103), NSQF Level 3'

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The preparation of this handbook would not have been possible without the rubber industry's support. Industry feedback has been extremely beneficial since inception to conclusion and it is with their guidance that we have tried to bridge the existing skill gaps in the industry. This participant handbook is dedicated to the aspiring youth, who desire to achieve special skills that will be a lifelong asset for their future endeavours.

About this book

A machine operator assistant (Plastics Processing) is responsible for helping the operator in calibrating, setting up, and operating the plastic processing machine, for converting plastic raw materials into good quality plastic items for various applications. The individual should be diligent, inclined to learn new things, logical and result-oriented. He or she must have manual dexterity, high physical stamina, good eye for visual quality, and good attention to detail. Among others, the individual must have decent communication skills and be able to prioritise tasks. The trainee will enhance his/her knowledge under the trainer's guidance in the following skills:

- **Knowledge and Understanding:** Adequate operational knowledge and understanding to perform the required task
- **Performance Criteria:** Achieve the required skills via hands-on training and perform the required operations within the specified standards
- **Professional Skills:** Ability to make operational decisions related to the area of work

The handbook incorporates well-defined responsibilities of a machine operator assistant (Plastic Processing).

Symbols Used



Key Learning
Outcomes



Unit
Objectives



Exercise



Tips



Notes



Activity



Summary

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सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
**National
Skill Development
Corporation**

Transforming the skill landscape



1. Introduction

Unit 1.1 - History of Plastic

Unit 1.2 - Industrial Association



Key Learning Outcomes



At the end of this module, trainees will be able to:

1. Describe the history of the development of plastic products
2. Identify the major industrial associations related to Blow Moulding

UNIT 1.1: History of Plastic

Unit Objectives

At the end of this unit, trainees will be able to:

1. State the history of the development of plastic
2. Recognise the current industrial scenario of plastic
3. Compare different types of plastic

1.1.1 Developmental History of Plastic

The word 'plastic' is derived from pliable and easily shaped. The Plastics are made of several polymers. Polymers are composed of long molecular chains. One of the examples of natural polymer is cellulose, which makes up the cell wall of plants. Synthetic polymers are made using plentiful carbon atoms provided by petroleum and other fossil fuels. The synthetic polymers are made of long-chain of atoms arranged in repeating units. Some of the examples of a synthetic polymer are- nylon, polyethylene, polyester, Teflon, etc. Depending on the length of these chains and the pattern in which they are arrayed, the polymers are strong, lightweight or flexible

The first synthetic polymer was invented in the year 1869 by John Wesley Hyatt. It was revolutionary discovery as the discovery of plastic came as a replacement of natural ivory, which was obtained through the slaughter of wild animals. The development of plastic also helped reduce the constraints imposed by the scarcity of natural resources.

In 1907, Leo Baekeland invented Bakelite, which was the first fully synthetic plastic. Bakelite was durable, heat resistant, and unlike celluloid suited for mechanical mass production. Nylon invented by Wallace Carothers in 1935 as synthetic silk was used during World War II for parachutes, ropes, body armour, helmet liners and more. During World War II, the production of plastic increased by 300% in the United States.

Plastics are critical to modern life and have made possible the development of computers, cell phones, and most modern-day lifesaving drugs. Plastics are lightweight and good for insulation. They help save fossil fuels used in heating and transportation. Inexpensive plastics raised the standard of living and made material abundance more easily available. The replacement of natural material with plastics has made many of our possessions cheaper, lighter, safer and stronger. Recent technologies focus upon the development of bioplastics made from plant crops instead of fossil fuel. A scientist has been working towards the development of a technology, which converts plastic back into fossil fuels.

1.1.2 Current Industrial Scenario of Plastics

Plastic products form an important part of global economic growth. Plastic processing serves as the pillar of the economy. World per capita consumption of plastic is 28 kg, whereby the consumption of India is 11kg, China 38 kg, Brazil 32 kg. This means India has big potential to grow, as it's per capita consumption of plastic is the lowest in Asia.

India's per capita consumption of Virgin plastic (Resin produced directly from petrochemical feed-stock such as natural gas or crude oil is 11kg and recycled plastic is 3.8 kg. Few of the statistics related to plastic production have been discussed below:

1. Virgin polymer consumption in the year 14-15= 14 MMT
2. No. of converting/processing units in the organised sector= 30,000 plus
3. No. of converting/processing units in the unorganised sector= 20,000
4. No. of processing machines= 113,000
5. Processing Capacity= 30 MMT
6. Processing capacity CARG= 13% last 5 years
7. No. of plastic machinery manufacturing units in India= 200 plus
8. Investment in machinery= US \$ 5 Billion
9. Investment required for next 5 years= Around 10 billion US\$
10. Size of plastic and polymer industry= 1,44,000 crores

The Indian plastics market comprises of 25,000 companies and employs 3 million people. The domestic capacity for polymer production was 5.72 tonnes in the year 2009. The state of Gujarat in Western India is the leading plastic processing hub and accounts for the largest number of plastic manufacturers, with over 5,000 plastic firms. The growth rate of the Indian Plastics industry is one of the highest in the world with plastic consumption growing at a rate of 16% per annum. It is assumed that plastic consumption is likely to reach 16kg per head by 2015. Plastic companies have reported problems with labour shortages. This has led to increased investment in technology, such as automation and conveyor belt systems. Reliance Industries stated in January that India's poly-olefin market is expected to grow 12 percent to about 7.5 million metric tonnes in 2011 with growth in consumption of polypropylene and polyethylene. It is estimated that 75-80% of propylene demand in India is met by Reliance Industries with around 20% coming from four Government-run companies Indian Oil Corporation Ltd (IOCL), Haldia Petrochemicals, Bharat Petroleum Ltd. (BPCL) and the Gas Authority of India Ltd. (GAIL). The demand for PVC is exceptionally high with domestic production meeting 50% of the demand. The break-up of plastic consumption in In-dia has been given below as:

Plastic consumption by application:

- Building- 8%
- Packaging- 24%
- Electronic- 16%
- Transportation-4%
- Furniture-1%
- Agriculture- 23%
- Houseware-10%
- Others-14%

1.1.3 Types of Plastic

The different kinds of plastics, along with their uses and recyclable properties, have been discussed below:








Sl. no.	Polymer name	Abbreviation	Symbol	Used to make	Recyclable
1	Polyethylene Terephthalate	PETE or PET	 01 PETE	Textiles, carpets, pillow, life jackets, storage containers, clothing, boat sails, sleeping bags, shoes, winter coats	Yes
2	Polyvinyl Chloride	PVC	 03 PVC	Flooring, window frames, sewage pipes, squeezable bottles	Yes
3	High-density Polyethylene	HDPE	 02 HDPE	Plastic crates, fencing, Tote bags, plumbing pipes, Grocery bags, tiles, etc.	Yes
4	Low-density Polyethylene	LDPE	 04 LDPE	Garbage cans, Lumber, flexible container, kitchenware, Tupperware	Yes
5	Polypropylene	PP	 05 PP	Ice scrapers, rakes, battery cables, prescription bottles, bottle caps, Take-out containers, disposable cups and plates, plastic food boxes	No
6	Polystyrene	PS	 06 PS	Insulation, licence plate frames, rulers, plastic cutlery, packing foam	No
7	Miscellaneous plastics	N/A	 07 OTHER	They are often used in outdoor decks, moulding and park benches, baby bottles, medical storage containers, exterior lighting fixtures	Yes/No

Table 1.1.1: Types of Plastic

1.1.4 Equipment Used for Plastic Processing

The different kinds of equipment used in plastic processing have been discussed below:





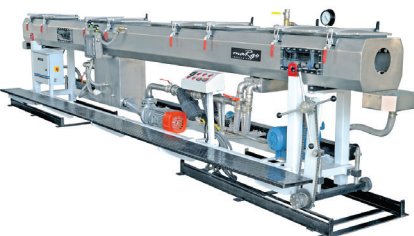
Different equipment used in plastic processing		
Mixers and blenders	<ul style="list-style-type: none"> Blending systems is integrated, multi- dispensing mixing devices designed to combine materials to-gether. 	
Cooling tank	<ul style="list-style-type: none"> Chillers and cooling tanks are used to transfer heat out of the mould The cooler protects the machine from getting overheated 	
Melt pump	<ul style="list-style-type: none"> The Melt pump is known as an accurate metering device, which eliminates surging of the extruder screw The Melt pump reduces back pressure and increases the output of the complete line by up to 20% 	
Granulators and Shredders	<ul style="list-style-type: none"> Granulators and shredders increase recycling efficiency by reducing waste Shredders are specifically designed for scrap size-reduction 	
Vacuum tank	<ul style="list-style-type: none"> A vacuum is used to improve the shape and of the plastics Water is used within a vacuum sizing tank for cooling and lubrication of the plastics 	

Table 1.1.2: Equipment used in plastic processing

UNIT 1.2: Industrial Association

Unit Objectives

At the end of this unit, trainees will be able to:

1. Compare the equipment used for Injection Moulding

1.2.1 Major Industrial Associations Related To Plastics Processing

The rubber sector is driven by the following organizations:

- Ministry of commerce
- The Rubber Board
- All India Rubber Industries Association
- Automotive Tyre Manufacturer's Association
- Rubber Skill Development Council
- Indian Rubber Institute

The Rubber Board

The Rubber Board is a statutory body constituted under the Rubber Act 1947. The rubber growers were encouraged to produce maximum rubber required for use during the Second World War. After the Second World War, there were growing demands from the growers for setting up a permanent organization to look after the interests of the industry. On the recommendation of this ad-hoc committee, the Government passed the Rubber (Production and Marketing) Act, on 18th April 1947 and the Indian Rubber Board was constituted forthwith. The Rubber Production and Marketing (Amendment) Act, 1954, amended the name of the board as 'The Rubber Board'.

All India Rubber Industries Association (AIRIA)

The All India Rubber Industries Association (AIRIA) is a non-profit making organization serving the rubber industry. AIRIA trade with the objective of safeguarding and promoting interests of the industry. Some of the objectives of AIRIA are as follows:

- To promote and protect the interest, growth and development of the rubber industry
- To foster cooperation among individuals and units engaged in the manufacture of rubber with a view to safeguarding the interest of the industry
- To provide a common forum for the exchange of views among the members
- To arrange conferences, exhibitions, trade delegations, factory visits, techno-commercial talks
- To investigate, collect and circulate information and statistics relating to the industry
- To help the members in solving difficulties faced in procuring raw materials
- To support or oppose legislative or other measures likely to affect the industry
- To disseminate information through official organ, periodicals, circulars, etc.

Automotive Tyre Manufacturers Association (ATMA)

Automotive Tyre Manufacturers Association (ATMA) was set up in 1975. It was registered under the Companies Act, as the representative body of the automotive tyre industry in India. The association with the guidance of the Managing Committee functions through various committees set up, such as Marketing, Export, Purchase, Taxation, Technical, etc.

Rubber Skill Development Council (RSDC)

RSDC has been formed under the umbrella of National Skill Development Corporation (NSDC) in collaboration with All India Rubber Industries Association (AIRIA) and Automotive Tyre Manufacturer's Association (ATMA) with an aim to fulfil skill development needs within the Rubber Sector. The purpose of RSDC is to generate skilled manpower in both tyre and non-tyre sectors, provide employment opportunities to youth, create career paths in roles existing within the organized and unorganized sectors of the rubber industry.

Summary



- History of the development of plastic
- Current industrial scenario of plastic
- Different types of plastic
- Equipment used for Injection Moulding

Activity

Objectives:



To get an idea of different kinds of polymers and its products

Materials Required:

- Pencil
- Eraser

Instructions:

Match the following polymers with the correct product/s which can be obtained through it:

	Plastic crates
	Prescription bottles
	Disposable cups
	Plastic Cutlery

Conclusion:

From this activity, we learned about the different kind of polymers and the plastic product that can be obtained from it

Exercise

Choose the correct alternative

- Which of the following type/s of plastic/s can be used for making life jackets?
a) HDPE b) LDPE c) PVC d) PETE
- Which of the following transfers heat out of a mould?
a) Melt Pump b) Mixers
c) Blenders d) Chillers and Cooling Tank
- Which of the following types of plastic is used in making window frame?
a) HDPE b) LDPE c) PVC d) PS
- Which of the following types of plastic can be used for making disposable cups?
a) PS b) PP c) LDPE d) PETE
- Which of the following is used to reduce the size of scrap plastics?
a) Shredders b) Chillers c) Mixers d) Blenders

Notes



Lined area for taking notes.



2. Basic Concepts, Job Requirements & Basic Related Process



Unit 2.1 - Process Requirements

Unit 2.2 - Material to be Processed and Apparatus Required

Unit 2.3 - Cleaning of Mould/Die



Key Learning Outcomes



At the end of this module, trainees will be able to:

1. Identify the process requirements
2. Compare the material to be processed and different apparatus required
3. Practice the cleaning of mould
4. Practice escalation of queries and coordinating with various departments