Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
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Participant Handbook

Sector
Rubber

Sub-Sector
Rubber Manufacturing

Occupation
Production

Reference ID: **RSC/Q0831, Version 1.0**
NSQF Level 3

Junior Rubber Technician/ Technicial Assistant

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2. Machines Used in Rubber Product Manufacturing

UNIT 2.1: Introduction to Rubber Processing Machinery

Unit Objectives

At the end of the unit, you will be able to:

1. Recognise different machineries used in rubber processing
2. Identify various machines used in rubber processing

2.1.1 Tools and Equipment

In general, the rubber processing machinery can be classified in to 4 and mills form a part of the category of equipments that have been used to mix compounds. Mills are also used for various other applications such as warming, holding and feeding wherein the mills are provided with certain features which make it capable of doing the specified job.

The rubber mixing activity proceeds through certain basic mechanisms for incorporation and dispersion of the ingredients. In mills also, the mixing operation has to be designed for facilitating these basic mechanisms and the skill of the operator is to facilitate it.

Mixing is not the only activity carried out using mills. There are various other activities and the features and attachments of the mills are different to facilitate it. This section covers such aspects also.

In this section, we will be discussing various machineries that are used to process the rubber compounds to make articles out of rubber compounds. We have learnt that by mixing rubber with the required types and quantities of ingredients, we will be able to make useful articles out of, otherwise not so useful rubber.

Such processing equipments of rubber generally can be classified into 4 types Viz.,

Mixing equipments

These are equipments that are used to mix the compound out of selected ingredients. The examples are Mills, Internal Mixers, kneaders etc

Shaping equipments

Shaping equipments are used for shaping the rubber compound into the required definite shapes which is then used to make the articles. Extruders are typical members of this group.

Coating equipments

Coating equipments are used to coat the substrate with the rubber compound dough or rubber compounds which are warmed up to the required levels of plasticity. Coating using dough is more common in the manufacturing of articles using latex preparations. Calender is a typical member of this class.

Moulding equipments / Vulcanising equipments

In many cases converting the rubber compound into final shape and setting it in the shape is a simultaneous operation. The shaping equipments are provided with facilities for heating which ultimately vulcanizes the articles in the given shape. Curing presses, autoclaves, hot baths etc. are some examples of such equipments

We will try to familiarise with the important members of these various rubber processing equipments in a few sessions from now.

UNIT 2.4: Extruders

Unit Objectives

At the end of the unit, you will be able to:

- Recognise with extruders and types of extruders
- Familiarise combination of extruders and major parts of extruders
- Perform extruder operations

2.4.1 Introduction

Extruders are one of the members of the rubber processing machinery, under the category – Shaping Equipments. An Extruder is basically shaping equipment, in the sense that it is used for making different articles using dies.

The basic components of an Extruder are Screw, Barrel, Head and Die, other than Drives and Gears. An Extruder and its components are designed based on basic principle of Polymer Rheology and Visco-elastic behaviour. The operation of an Extruder calls for extra care and strict adherence to Standard Operating Procedure (SOP).

Extruders are used for a variety of applications – "Dump Extruders", which are used for receiving material from an internal mixer, "Mixing extruders" which are used to incorporate and distribute additives and, commonly used shaping or preforming extruders, which as the name suggests, helps in producing continuous strip of rubber components with a definite shape. There are different categorizations for extruders based on the type of 'feed' being used, based on the mechanism by which rubber compound is pushed through the orifice or die, etc.

Let us examine different types of extruders, the basic components of our extruder and the very fundamental rheological principles that govern an extrusion process.

2.4.2 Extruders

An extruder may be formally defined as "a machine designed to produce a continuous strip of material of desired cross section by forcing the material through an orifice or die".

So, an extruder has to force the polymer out through a shaped die using pressure. The process of pushing the material out through the die is called "Extrusion". We will examine the major components of an extruder and the process by which an "Extruder", extrudes in the following sessions. Before that, let us familiarize with different categorization of extruders and their salient features.

2.4.3 Types of Extruders

Based on mechanism of compound pushing

1. **Ram type extruders –** First introduced in around 1800 for plastic extrusion and later in 1845 for extruding rubber component.

   These are generally used for extruding compounds with poor flow properties. In ram extruders, there is no plasticizing action inside the barrel (we will learn about barrel in the succeeding session) and highly power consuming.