



Participant Handbook

Sector
Rubber Industry

Sub-Sector
Tyre

Occupation
Tyre Retreading

Reference ID: **RSC/Q3502, Version 1.0**
NSQF Level 4



**Tyre Retreading- Building
& Curing Operator**



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

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About this book

Tyre Retreading - Building & Curing is very important and critical job in Tyre Retreading sector. Proper knowledge about the job is needed to ensure quality of retreaded tyre. A good Tyre Retreading - Building & Curing Operator ensures adherence to all procedures of tyre building & curing and save cost by reducing rejections.

This book is designed for up grading the knowledge and basic skills to take up the job of 'Tyre Retreading - Building & Curing Operator' in 'Rubber Industry' sector. All the activities carried out by the operator are covered in this course. Upon successful completion of this course, the candidate will be eligible to work as Tyre Retreading - Building & Curing Operator.

This book is designed to provide the necessary knowledge and skill inputs for an operator to work in an organized and disciplined manner with safe working practices, good housekeeping skills, effective communication skills, good documentation Skills and strong work ethics.

This book will give in-depth knowledge and practical information to candidate, which will be very useful in making them a fine Tyre Retreading - Building & Curing Operator.

This Participant Handbook is designed to enable training for the specific Qualification Pack(QP). Each National Occupational (NOS) is covered across Unit/s.

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS. The symbols used in this book are described below.

Symbols Used



Key Learning Outcomes



Steps



Time



Tips



Notes



Unit Objectives



Activity



Exercise



Summary

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1. Introduction to Rubber & Tyre Retreading

Unit 1.1 – Introduction to Rubber Industry

Unit 1.2 – History of Tyre and Tyre Industry in India

Unit 1.3 – Tyre Basics

Unit 1.4 – Tyre Retreading Basics



Key Learning Outcomes

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

1. Discuss about rubber industry.
2. Explain different sources of rubber.
3. Discuss about major Indian rubber associations.
4. Explain the history of tyre.
5. Discuss the tyre industry in India.
6. Define all major players of tyre manufacturing in India.
7. Identify and define tyre specifications.
8. Explain the difference between cross-ply tyre and radial tyre.
9. Discuss and explain tyre retreading process.

Unit 1.1: Introduction to Rubber Industry

Unit Objectives

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

1. Discuss rubber and rubber industry.
2. Define types of rubber used for rubber part manufacturing.
3. Explain various rubber manufacturing processes.
4. Explain different uses of rubber.
5. Discuss about various rubber bodies and associations in India.

1.1.1 The Rubber

Rubber is a polymer material, which has elastic properties. It is also called as 'Caoutchouc'. It normally has long chain molecules known as "polymers". Rubber being elastic, is also called "elastomers". Products made from rubber have a flexible and stable – three-dimensional chemical structure and are able to withstand higher force and large deformations. For example: the material can be stretched repeatedly to at least twice of its original length and upon immediate release of the stress, will return with force, approximately to its original length. Under load, the product should not show creep or relaxation. Besides these properties, the modulus of rubber ranges from hundred to ten thousand times lower, as compared to other solid materials like steel, plastics and ceramics. This combination of unique properties, gives rubber its specific applications like seals, shock absorbers and tyres.

Based on the source of raw material, there are two kinds of rubber, natural rubber (NR) and synthetic rubber (SR). However, there is third type of Rubber - Reclaimed rubber, which is produced by recycling scrap rubber.



Fig. 1.1.1. Rubber

1.1.1.1 Natural Rubber

Natural rubber is mainly harvested from rubber plants. There are many plant species that generate natural rubber and there are many other plants that contain rubber latex. For quality and economic considerations, Rubber plant is a major source of natural rubber. 'Latex' is a sticky, milky white and liquid material. The process used for extracting latex from rubber trees is called 'Tapping'.



Fig. 1.1.2. Rubber Plant



Fig. 1.1.3. Collection of rubber by tapping process

This latex is further processed for making rubber, which can be used for making some useable products. Latex is processed in following ways –

1. Sheets
2. Creps
3. Block rubber
4. Preserved latex concentrates

Most of the natural rubber is sold in the form of sheets, creps and block rubber.

1.1.1.2 Sheets

This form is easiest to produce; hence it is the most saleable form of natural rubber. There are 2 types of rubber sheets –

1. Ribbed Smoked Sheets (RSS)
2. Air Dried Sheets (ADS)

Out of the above 2 types, ribbed smoked sheets are more common in market. There are five grades of ribbed smoked sheets which is based on its quality. These grades are established by International Rubber Quality and Packing Conference. Only completely dried sheets are allowed to be sold in this category. Based on different conditions, these ratings are called as RSS1, RSS2, RSS3, RSS4 and RSS5.



Fig. 1.1.4. Rubber sheets

1.1.1.3 Creps

Creps are derived from coagulated latex / field Coagulam after getting rolled many times in between rollers and then dried in Air. There are many types of creps, namely – Pale Latex Creps, Estae Brown Creps, Thin Brown Creps, Thick Blanket Creps, Flat Blanket Creps, Standard flat bark crepe and pure smoked blanket crepe.

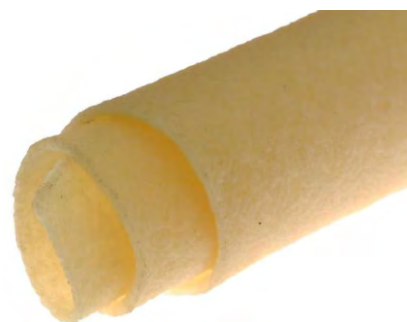


Fig. 1.1.5. Rubber creps

1.1.1.4 Technically Specialized Natural Rubber

Natural dried rubber is graded based on technical specification. It was initially proposed by ISO (International Standard Organisation) and then Malaysia adopted it in 1965. Later on, all natural rubber producing countries adopted this system. In this system, two letters of the country name used for making code. For ex - Indian natural rubber is coded as ISNR (Indian Standard Natural Rubber).



Fig. 1.1.6. TSR rubber

1.1.1.5 Synthetic Rubber

As the name suggest, it is man-made rubber, which is derived from petroleum, coal, oil, natural gas and acetylene. It has more than 10 major classes, many of these are copolymers, i.e. polymers, consisting more than one monomer. Initially, Styrene-butadiene copolymers (SBR) synthetic rubbers were invented. Which is one of the widely used elastomer. Synthetic rubber is used as a replacement for natural rubber in many cases, especially when improved material properties are needed. Commonly used synthetic rubber are –

1. Emulsion Styrene Butadiene (ESBR)
2. Butadiene Rubber (BR)
3. Solution Styrene Butadiene (SSBR)
4. Isobutylene Isoprene Butyl (IIR)
5. Acrylonitrile Butadiene (NBR)
6. Ethylene Propylene diene monomer (EPDM)



Fig. 1.1.7. Synthetic rubber

1.1.1.6 Used or Reclaimed Rubber

Used or reclaimed rubber is the product, which is recovered from the processing of vulcanized scrap rubber tyres, tubes and miscellaneous waste rubber goods. The process includes use of heat and chemical agents. The process also includes heavy mechanical working. This reclaimed rubber has plasticity which is near to the original plasticity. This rubber can be compounded, processed and re-vulcanized as fresh rubber. During the process of reclamation the molecular weight of the elastomeric component is substantially reduced.



Fig. 1.1.8. Reclaimed rubber

1.1.2 Uses of Rubber

Rubber is a widely used product now a days. It is used in automobiles, household and industrial applications. Some of the most common uses are as following -

- **Tyres and tubes** - Automobile and agriculture tyres and tubes are the largest consumers of rubber. This category consume around three fourth of total rubber consumption.
- **'Under the bonnet' products for automobile** - It includes, door and window profiles, noses, bells, matting, flooring and dampeners (anti-vibration mounts).
- **Conveyor Belt** – for various industrial use.
- **Hoses and pipes** – for air and water circulation.
- **Latex products** - Gloves (medical, household and industrial), toy balloons, rubber bands, etc.
- **Adhesives** – Many manufacturing industries and products also use Rubber product as adhesives. It is mostly used in paper and the carpet industry.
- **Textile industry** – Rubber is also widely used in textile industry.
- **Shock absorbers** – Impact absorbing property of rubber is very useful in shock absorber application.
- **Machine mounting pads** – it is widely used as a machine mounting mount, which helps in reducing vibration transfer to floor from the machine.



Fig. 1.1.9. Rubber products

1.1.3 Rubber Industry

Initially rubber industry started in South America during 19th Century. Where it was restricted for a long time from export. In 1876, English brought it to India, Sri Lanka and other parts of Asian countries. Initially Rubber trees were planted in Kolkata and then later it was grown in coastal areas of Kerala, Tamil Nadu and Karnataka.

Rubber products manufacturing started in India, in the year 1920. Now, rubber industry is one of the key industries of the Indian economy.

Following are some of the facts on rubber industries –

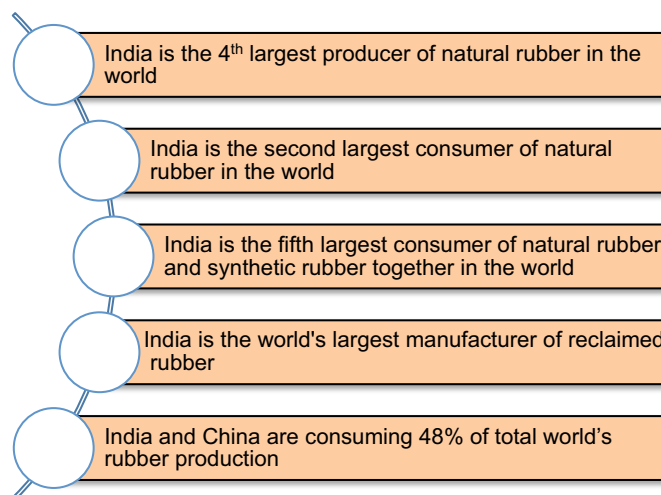


Fig. 1.1.10. Rubber industry facts

1.1.4 Overview of Indian Rubber Industry

India produces approx. 7 Lakh tons of rubber, annually. In India there are approximately 6000 rubber product companies. Out of these some 35 large scale companies, 320 medium scale and more than 5500 small scale industries. These companies do total turnover of around Rs. 12,000 Crore. These units are manufacturing more than 35000 rubber products, employing four crore people, which also includes 22000 technically qualified support personnel. India's rubber industry has growth rate of 8-9% per annum.

India consumes nearly 20 lakh tons of rubber (including natural, synthetic and reclaim) annually (as per data of year – 2018-19) for producing a wide range of rubber products. Tamil Nadu (3.7 lakh tones), Maharashtra (2.09 lakh tones) and Kerala (2.02 lakh tones) are top three rubber consuming states (as per data of year – 2015-16) in the country.

1.1.5 Trend of Rubber Consumption in India

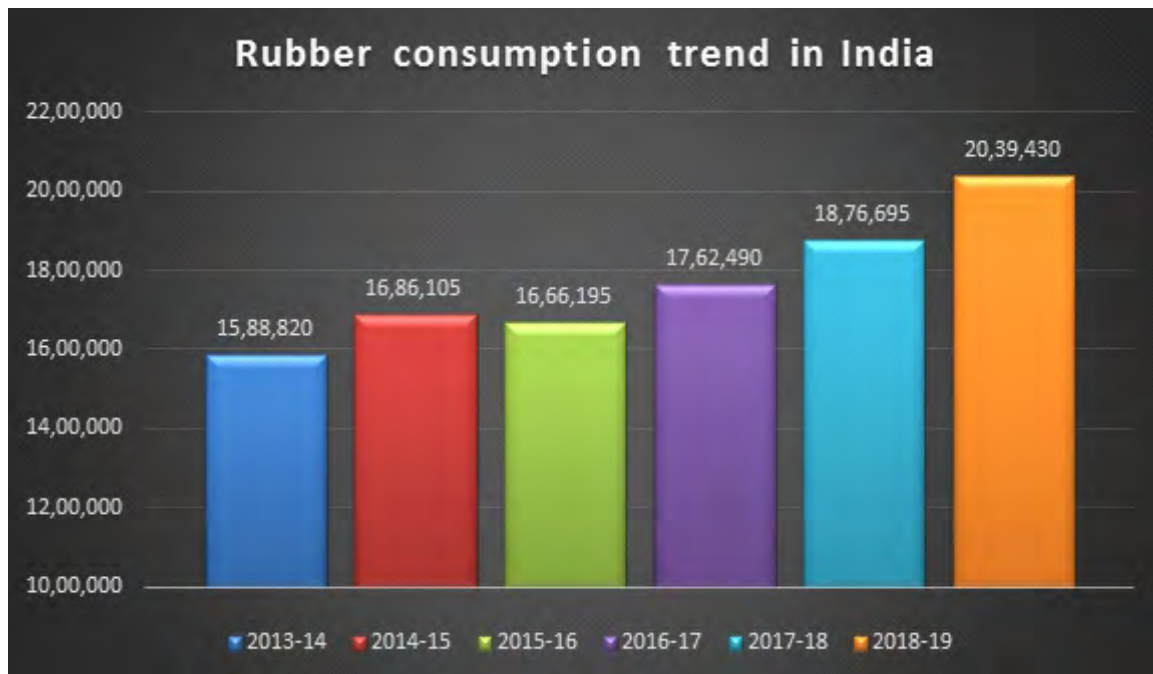


Fig. 1.1.11. Trend of rubber consumption

1.1.6 Rubber Consumption in India

The major rubber consuming sectors in India are as follows:

1. Automotive tyre sector
2. Bicycles tyres and tubes
3. Footwear
4. Camelback and latex products
5. Belts and hoses
6. Rest of the products

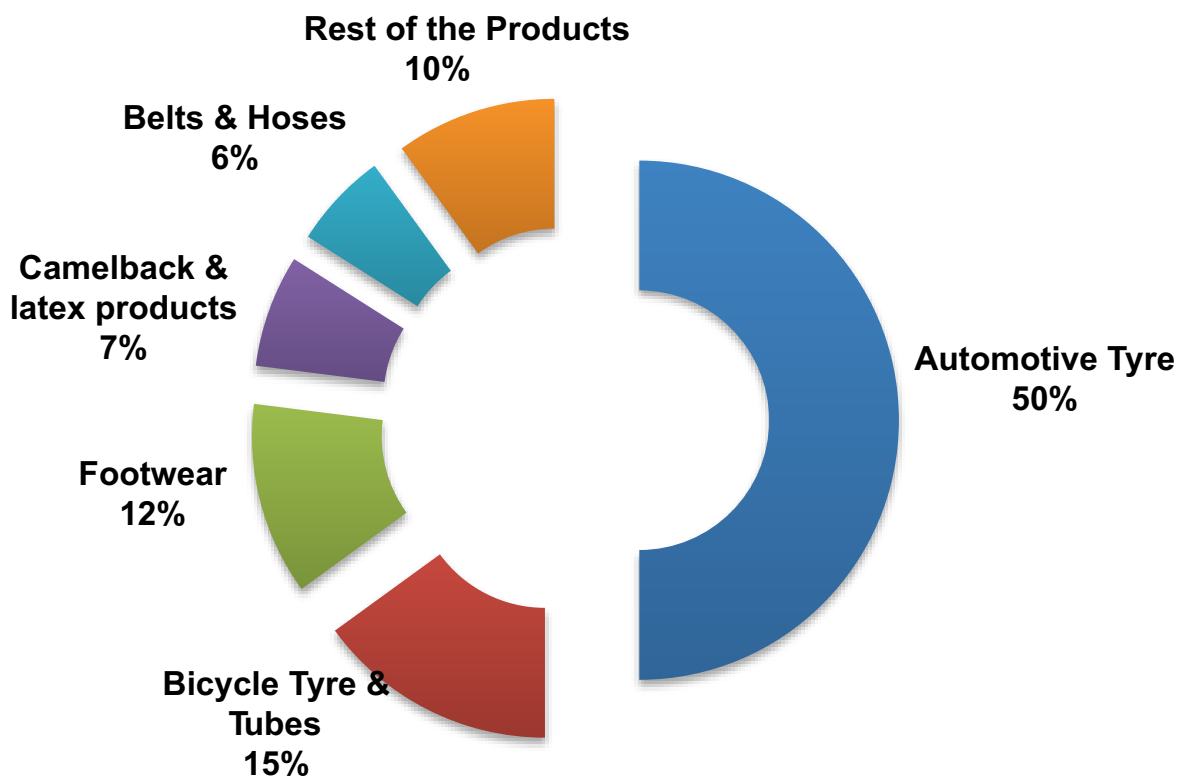


Fig. 1.1.12. Rubber consumption details

1.1.7 Rubber Act, Rubber Promotion and Development Bodies

Indian rubber industry is regulated by some acts. There are some industrial bodies also, which are helping rubber industries in their development.

1.1.7.1 The Rubber Act

This act was made in 1947. With some changes it was named as 'Rubber Board' in 1955. The act was amended in 1960 for making changes in rates and procedure of 'cess' on Rubber. Again the act was amended in 1982, for making provisions for appointing chairman and executive director. All departments of board come under the control of chairman.



Fig. 1.1.13. Rubber board

1.1.7.1.1 Functions of Rubber Board

1. Promotion of activities for development of rubber in India.
2. Without prejudice to the generality of the foregoing provision the measures referred to therein may provide for:
 - I. Undertaking, assisting or encouraging scientific, technological or economic research.
 - II. Training students in improved methods of planting, cultivation, manuring and spraying.
 - III. The supply of technical advice to rubber growers.
 - IV. Improving the marketing of rubber.
 - V. The collection of statistics from owners of estates, dealers and manufacturers.
 - VI. Securing better working conditions and the provision and improvement of amenities and incentives to workers.
 - VII. Carrying out any other duties, which may be vested with the Board as per rules made under this Act.
- 3- It shall also be the duty of the Board:
 - I. To advise the central government on all matters relating to the development of the rubber industry, including the import and export of rubber.
 - II. To advise the central government with regard to participation in any international conference or scheme relating to rubber.
 - III. To submit to the central government and other such authorities as may be prescribed, half yearly reports on its activities and the working of this act, and to prepare and furnish such other reports relating to the rubber industry as may be required by the Central Government from time to time.

1.1.7.2 Chemical and Allied Product Export Promotion Council

This organisation was made for promoting export of rubber and chemical based products and related products. Capexil is engaged in making export promotion strategies. Capexil carry out in-depth research of overseas markets and promote exports through participation in various trade fairs and bilateral meets.



Fig. 1.1.14. CAPEXIL

1.1.7.3 All India Rubber Industries Association

AIRIA is one of the premier industrial associations. It was established in 1945 and since then, it is working for promoting rubber and tyre industry. It has pan India presence and more than 1200 members. AIRIA organizes 'The India Rubber Expo'. This event is biannual event, which provides a platform for suppliers, machine manufacturers, raw material suppliers, rubber testing equipment suppliers, consultants and exporters.



Fig. 1.1.15. AIRIA

1.1.7.4 Automotive Tyre Manufacturers Association

As the name suggest, this is an association of Automotive Tyre manufacturers. Having headquarter in New Delhi, it is a not-for-profit organization which works for safeguarding the interests of the tyre industry. It works as a liaising agency between tyre industry and government. Also, it actively works for promoting and raising tyre industry voice in media. It represents companies, producing 90% of tyre production of India. Main objectives of ATMA are –



Fig. 1.1.16. ATMA

- To promote and protect the interests, growth and development of the rubber industry.
- To foster co-operation among individuals and units engaged in the manufacturing of rubber goods with a view to advancing and safeguarding the interest of the industry.
- To provide common forum to exchange views amongst the members.
- To arrange conferences, exhibitions, trade delegations, factory visits, techno-commercial talks and allied activities.
- To investigate, collect and circulate information and statistics relating to the industry.
- To represent tyre industry officially to Government. Also, represent the views of the industry on all matters affecting or likely to affect the industry.
- To help the members in solving the difficulties faced in procuring raw materials.
- To support or oppose legislative or other measures likely to affect the industry.
- To disseminate information through the official organ, periodicals, circulars, etc.

1.1.7.5 Rubber Skill Development Council

RSDC has been constituted under the aegis of National Skill Development Corporation (NSDC), in collaboration with All India Rubber Industries Association (AIRIA) and Automotive Tyre Manufacturers Association (ATMA). Main motto of RSDC is to identify and fulfill skill development needs in the rubber sector. The RSDC encourages the industry to employ skilled and certified manpower.



Fig. 1.1.17. RSDC

It is identifying labour market skill gaps, frame occupational standards, facilitate development of practical and high quality training content, ensure adequate availability of faculty through 'train-the-trainer' initiatives, build accreditation and certification mechanisms and encourage capacity building through private sector participation. In this process, RSDC is also preparing catalogue of skill sets, range and depth of skills to facilitate individuals to choose from.

The purpose of RSDC is to ensure the generation of skilled manpower in both the tyre and the non-tyre sectors, provide employment opportunities to youth across the nation, create career paths in roles existing within the unorganized and organized segments of the rubber industry and ensure active participation of the industry in absorption of skilled manpower generated through RSDC.

Q.1

Differentiate between the following:

1. Natural rubber and synthetic rubber

2. Sheets and creps

3. Synthetic rubber and reclaimed rubber

Q.2 

Write five uses of rubber:

Notes 

Unit 1.2: History of Tyre and Tyre Industry in India

Unit Objectives

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

1. Discuss the history of tyre development.
2. Explain types of tyre being sold in India.
3. Describe the major tyre brands in India.
4. Describe the ratio of tyre sales in terms of vehicle segment and customer segment.
5. Describe the share of business of all major tyre sellers in India.

1.2.1 History of Tyre

After long use of initially made fully rubber tyre, in 1845 RW Thomson invented and patented Pneumatic tyre. In this tyre it was possible to fill air and it absorbs jerks coming from road. In 1895, pneumatic tyre was first time used in automobiles. Michelin invented radial tyres in 1948.



Fig. 1.2.1. Tyre history

1.2.2 Consumption of Tyre

Tyre is one of the fastest consuming parts of any automobile, be it truck, bus, car, bike or scooter. Apart from these vehicles, it also gets consumed in other equipment like, bicycle, rickshaw or other unconventional vehicles.

1.2.3 Tyre Companies in India

Dunlop was the first tyre company, to put up a tyre manufacturing plant in India in 1926 in West Bengal. After that in 1961 Madras Rubber Factory also called 'MRF' started manufacturing tyres in Chennai. Now approximately 40 big organisations are producing tyres in India, apart from these big companies many un-organised sector companies are also producing tyre in India. Major tyre producers in India are:

1. Apollo Tyres
2. Bridgestone
3. Ceat
4. Goodyear
5. JK tyres
6. Michelin
7. MRF
8. TVS Srichakra

TIP



Currently more than 10 Crore tyres are being produced per annum in India. Total turnover of industry is more than 30,000 Crores. From India, tyres are also being exported to 65 countries worldwide.

1.2.4 Tyre Demand in India

Tyre Demand - By Vehical Segment in 2015

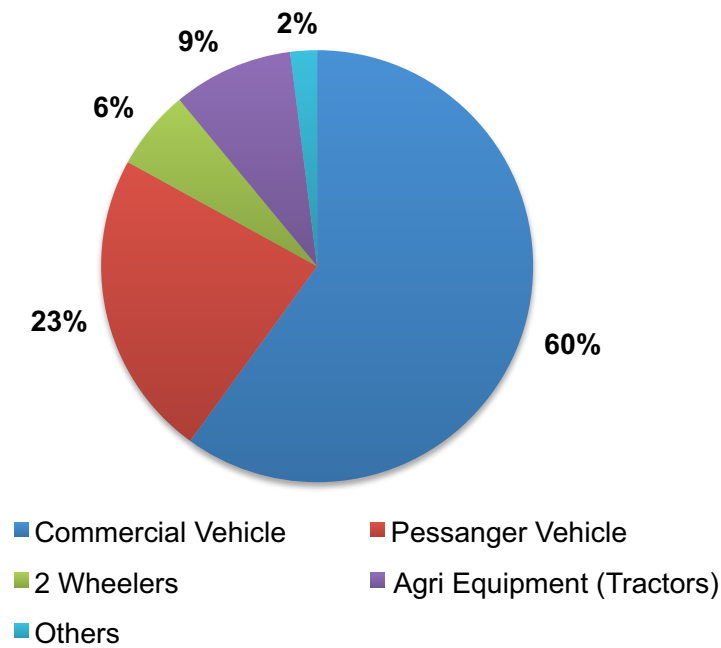


Fig. 1.2.2. Tyre demand by vehicle segment

Tyre Demand - By Customer Segment in 2015

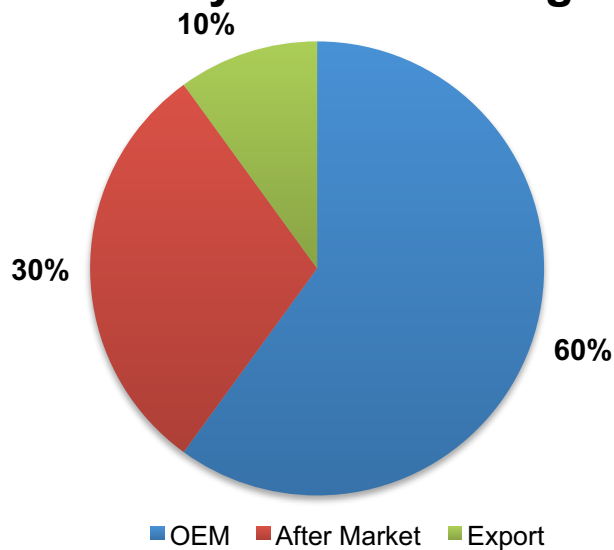


Fig. 1.2.2. Tyre demand by customer segment



Skill India
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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



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