



**A STUDY ON INVENTORY MANAGEMENT AND CONTROL
IN
APOLLO TYRES
PROJECT REPORT**

Submitted By

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**In partial fulfilment of the requirement for the award of
MASTER OF BUSINESS ADMINISTRATION**

Under the guidance of

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JUNE 2025

DECLARATION



I ADARSH H (REG NO: 722323631006), here declare that the project report on **A STUDY ON INVENTORY MANAGEMENT AND CONTROL IN APOLLO TYRES LTD** , submitted to the **SAN INTERNATIONAL BUSINESS SCHOOL**, Walayar in partial fulfillment of the requirements for the award of the degree of the Master of Business Administration is a record of original work done by me during JULY, 2025 under the guidance of Ms. ATHIRA U (MBA), Assistant Professor **SAN INTERNATIONAL BUSINESS SCHOOL** I also here by declare that this project report has not been submitted at any time to any university or institute for the award of any degree/diploma/fellow ship or other titles.

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CERTIFICATE

This is to certify that project work titled **A STUDY ON “A Study on Inventory Management and Control”**, is submitted to the **SAN INTERNATIONAL BUSINESSSSCHOOL** partial fulfilment of the requirement for the award of the degree of **MASTER OF BUSINESS ADMINISTRATION** is record of project report done by **MR. ADARSH H (Reg No:722323631006)** during 21/02/2025 to 27/05/2025. The project report has not copied from for the award of any Degree / Diploma/ fellowship or other similar title to any candidate of any University.

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. ADARSH H** , a 4th Semester MBA student of **SAN INTERNATIONAL BUSINESS SCHOOL COIMBATORE** has successfully completed his project work in our Organization for a period of 60 days starting from 1st February 2025 to 31st March 2025 on the topic "A Study on Inventory Management & Control at Apollo Tyres Ltd".

We found her performance as excellent good during the mentioned period with us and wish her all the success.

For APOLLO TYRES LTD

A handwritten signature in blue ink, appearing to read "Maneesh MS", written over a blue circular stamp.

MANEESH MS
MANAGER – Human Resources



ACKNOWLEDGEMENT

I would like to thank the Management of **SAN INTERNATIONAL BUSINESS SCHOOL** for extending constant support for the completion of the project work.

It's my pleasure in thanking our beloved **Founder & Chairperson Tmt.T. JAYALAKSHMI, M.A, Secretary Ar. T. GIRI M.Arch** and **Managing Director Adv. T. BALAKUMAR MBA, LLB, Sree Amman Trust** for their permission to carry out the main project.

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I also thank all my faculty members, family members and friends from whom I received encouragement and suggestions to complete this project successfully.

ADARSH H

BONAFIDE CERTIFICATE

This is to certify that **ADARSH H , Reg No: 722323631006**: is a bonafide student of Second Year MBA, for management studies, SAN international.

As a part of the university curriculum, the student has undergone project study in **APOLLO TYRES LTD, Kalamassery Plant**. During the period from 01/02/2025 to 31/03/2025 in the partial fulfilment of the requirement for the award of degree of "Master in Business Administration (MBA)" in the academic year 2023-2025.

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TABLE OF CONTENT

CHAPTER	DESCRIPTION	PAGE NO
	ABSTRACT	1
	INTRODUCTION	2
1	STATEMENT OF THE PROBLEM	3
	1.1 Background of the Study	4
	1.2 Statement of the Problem	4
	1.3 Relevance and Scope of the Study	5
	1.4 Objectives of the Study	5
	1.5 Significance of the Study	5
	1.6 Limitations of the Study	6
2	INDUSTRY	7
	2.1 Industry Profile	8
	2.2 Prospects and Challenges of the Industry	20
	2.3 Recent Global Disruptions and Their Impact on the Tyre Industry (2020–2024)	25
	2.4 Key Drivers of Industry	27
3	COMPANY PROFILE	33
	3.1 COMPANY PROFILE: APOLLO TYRES LTD	34
	3.2 FINANCE AND FUTURE	39
	3.3 SWOT ANALYSIS	40
	3.4 PRODUCTS OF THE COMPANY	42
	3.5 CURRENT MARKET STATUS	42
	3.6 FUTURE EXPANSION	42

	3.7 CORPORATE SOCIAL RESPONSIBILITY (CSR)	43
4	REVIEW OF LITERATURE	48
	4.1 BRIEF THEORETICAL CONSTRUCT RELATED TO THE PROBLEM	47
	4.2 INVENTORY MANAGEMENT PROCESS	47
	4.3 LITERATURE SURVEY	52
	4.3UNIQUENESS OF RESEARCH	56
5	METHODOLOGY OF THE STUDY	57
	5.1 Research Approach and Design	58
	5.2 Sampling Design	58
	5.3 Data Analysis Tools	59
	5.4 Limitations of the Study	59
6	ABC ANALYSIS AND DATA INTERPRETATION WITH POWER BI	63
7	FINDINGS AND CONCLUSION	61
	7.1 Findings	64
	7.2 Conclusion	65
8	APPENDIX	66
	8.1 Questionnaire	67
	8.2 Annexure	70
	8.3 Bibliography	75
	8.4 Webliography	76

ABSTRACT

The project titled “*A Study on Inventory Management and Control in Apollo Tyres*” focuses on examining and improving the efficiency of inventory practices within Apollo Tyres Limited, a leading player in the tyre manufacturing industry. Effective inventory management is critical to maintaining uninterrupted production, minimizing costs, and meeting customer demand. This study aims to analyze the current inventory control systems, identify gaps, and propose solutions through the application of data analytics and visualization tools.

Primary data was collected through company records and discussions with the supply chain and inventory teams. Secondary data was gathered from industry reports, journals, and prior research studies. The data underwent detailed analysis, including ABC analysis, to categorize inventory based on consumption value and criticality. Power BI was employed to design interactive dashboards and reports that display key performance indicators such as inventory turnover ratio, lead time, reorder levels, stock ageing, and carrying costs. These visualizations enabled clearer interpretation of trends, bottlenecks, and inefficiencies in the existing processes.

The findings reveal that while Apollo Tyres maintains a structured approach to inventory management, there is scope for improvement in real-time monitoring and control of high-value items. The use of Power BI has significantly enhanced visibility into inventory performance, allowing managers to make informed, timely decisions. Recommendations from this study include adopting dynamic safety stock policies, automating reorder processes for fast-moving items, and integrating advanced analytics dashboards into routine operations.

This project demonstrates how combining traditional inventory management techniques with modern business intelligence tools can optimize resources, reduce operational costs, and improve overall supply chain effectiveness. The insights derived serve as a roadmap for Apollo Tyres to strengthen its inventory control framework and maintain a competitive edge in the market.

INTRODUCTION

Inventory management plays a pivotal role in the operational success of manufacturing organizations. It involves planning, controlling, and monitoring inventory levels to ensure the uninterrupted availability of materials while minimizing costs associated with storage and handling. In a highly competitive and dynamic industry such as tyre manufacturing, efficient inventory management is essential to sustaining production schedules, meeting customer expectations, and maintaining profitability.

Apollo Tyres Limited is one of India's largest tyre manufacturers, renowned for its wide product portfolio and extensive distribution network. The company operates in a complex supply chain environment that demands rigorous inventory control to balance demand fluctuations, production lead times, and cost considerations. Despite adopting established inventory practices, evolving market conditions and increased operational complexities necessitate the integration of advanced analytical tools to enhance decision-making and operational visibility.

This study aims to examine the existing inventory management and control practices at Apollo Tyres and explore how business intelligence tools, particularly Microsoft Power BI, can be leveraged to improve efficiency. Power BI provides dynamic data visualization and reporting capabilities, enabling organizations to transform raw data into actionable insights. By applying techniques such as ABC analysis within Power BI, this project seeks to classify inventory effectively, identify trends, and highlight areas where process improvements can be implemented.

The introduction of data-driven approaches to inventory management supports more accurate forecasting, better resource utilization, and stronger alignment with strategic goals. This project underscores the importance of integrating technology into traditional inventory control frameworks to achieve sustainable operational excellence at Apollo Tyres.

CHAPTER 1:
STATEMENT OF THE PROBLEM

1.1 Background of the Study

Inventory management plays a pivotal role in the operations of any manufacturing company. It encompasses the planning, coordination, and control of materials, components, and finished goods to ensure timely availability while minimizing holding and shortage costs. Proper inventory management leads to improved customer satisfaction, reduced costs, and enhanced profitability. In today's rapidly evolving business environment, traditional inventory methods often fall short of delivering the accuracy and insights required for competitive advantage.

With the emergence of Business Intelligence (BI) tools, organizations now have access to advanced capabilities for analyzing and interpreting vast amounts of data. Power BI, a powerful BI tool developed by Microsoft, enables users to visualize real-time data, create interactive dashboards, and derive meaningful insights. It transforms complex datasets into intuitive visual reports, allowing businesses to make faster and more accurate decisions.

In the case of Apollo Tyres, a leading manufacturer of tyres with a strong presence in the Indian and global markets, managing inventory efficiently is critical. As a company with extensive production and distribution networks, Apollo Tyres handles large volumes of raw materials, work-in-progress (WIP), and finished goods. Effective inventory management is crucial to ensure production continuity, avoid overstocking or understocking, and meet customer demand on time.

The company's traditional inventory system, though functional, lacks real-time visibility and analytical depth. Therefore, modernizing the inventory management process using Power BI can offer a significant strategic advantage. This study aims to explore how Power BI dashboards can simulate and improve inventory management at Apollo Tyres, providing deeper insights and more agile decision-making capabilities.

1.2 Statement of the Problem

The core problem addressed in this study is the lack of real-time, data-driven inventory management practices at Apollo Tyres, Kalamassery. The company continues to rely heavily on conventional methods, which may lead to issues such as overstocking, stockouts, inefficient procurement, and high inventory carrying costs.

This research investigates how Power BI can be used as a decision-support tool to overcome these challenges by visualizing and analyzing inventory data more effectively. Mock data was modeled in Power BI to simulate realistic scenarios involving stock movement, procurement patterns, and production trends. The main issues explored include:

- Detecting inefficiencies in stock levels and procurement cycles.
- Monitoring raw material price fluctuations and their impact on production costs.
- Identifying inventory categories requiring stringent control and frequent reviews.

By addressing these areas, the study seeks to demonstrate how Power BI can enhance Apollo Tyres' inventory control mechanisms and contribute to operational excellence.

1.3 Relevance and Scope of the Study

This study is particularly relevant in the current digital transformation era, where industries seek to automate and optimize their operations. It focuses on Apollo Tyres' Kalamassery unit and utilizes Power BI to simulate the inventory management process using mock datasets.

The scope of the study includes:

- **Raw Materials Analysis:** Understanding the consumption and ordering patterns of key inputs.
- **Work-in-Progress (WIP) Analysis:** Monitoring inventory held during production stages.
- **Finished Goods Tracking:** Analyzing stock readiness for dispatch and demand fulfillment.
- **ABC Analysis:** Categorizing inventory items based on consumption value to prioritize high-impact items.
- **Economic Order Quantity (EOQ):** Calculating the optimal order quantity to balance ordering and holding costs.
- **Just-in-Time (JIT) Review:** Evaluating the feasibility of reducing inventory levels while maintaining supply continuity.
- **Stock Review System:** Ensuring regular monitoring of stock levels to prevent over- or under-stocking.

Power BI dashboards provide dynamic visualizations that help identify trends, anomalies, and performance gaps, aiding management in faster, evidence-based decision-making.

1.4 Objectives of the Study

Primary Objectives:

1. To analyze the existing inventory management practices at Apollo Tyres using Power BI.
2. To develop dashboards that simulate ABC and EOQ models.
3. To evaluate the effectiveness of inventory control through visual analytics.

Secondary Objectives:

1. To identify inefficiencies in the procurement and inventory management process.
2. To improve the tracking of stock levels using BI-driven insights.
3. To classify inventory items based on their criticality and suggest improvements.

1.5 Significance of the Study

This study contributes to the practical understanding of how Business Intelligence tools can transform traditional inventory practices in a manufacturing setup. For Apollo Tyres, the adoption of Power BI can streamline inventory operations, reduce waste, and improve planning. The outcomes of this study may also serve as a reference for similar manufacturing units aiming to modernize their inventory systems.

1.6 Limitations of the Study

The primary limitation of the study is its reliance on mock data and simulated conditions, rather than real-time operational data from Apollo Tyres. Therefore, while the analysis offers insights into the potential improvements, the actual implementation may require further customization and real-time testing. Moreover, the study is geographically limited to the Kalamassery unit and may not reflect the practices at other locations

CHAPTER 2

INDUSTRY

2.1 INDUSTRY PROFILE

TYRE INDUSTRY

The origin of the Indian Tyre Industry dates back to 1926 when Dunlop Rubber Limited set up the first tyre company in West Bengal. MRF followed suit in 1946. Since then, the Indian tyre industry has grown rapidly. Indian Tyre Industry now provides direct and indirect employment to nearly 1 million persons, including dealers, retraders, growers of Natural Rubber, employment in raw material sector etc. The Indian tyre industry has become one of the most competitive markets in the world and with the help of new technology, ultra-modern production facilities and availability of raw materials at lower rate, the sector is set to grow further. At present, India has forty large and medium tyre manufacturing companies, of which the top 10 account for over 90 percent of the country's total tyre production.

During 2013-14, the Indian tyre industry witnessed a turnover of Rs 47,500 crore, producing 123 million tyres. The industry has witnessed muted growth during the period largely aided by the two wheeler and tractor segments. Overall demand from the replacement segment was modest, while original equipment makers (OEM) demand increased just by 2-4 percent. Industry-wide revenues during 2013-14 have been higher than before at around 6 percent on the back of the improvement in product mix, limited price discounting despite the falling input costs and higher realisations in the export markets.

The Indian tyre industry has matured into a robust and competitive sector that supports the nation's automotive and logistics ecosystem. As of 2025, it is valued at over ₹85,000 crores and continues to grow at a compound annual growth rate (CAGR) of around 8-10%. This sector contributes approximately 3% to India's manufacturing GDP and plays a critical role in both domestic vehicle production and the replacement market.

NATURE OF INDUSTRY

Tyre Industry is highly raw-material intensive. Raw materials cost accounts for approx. 63% of tyre industry turnover and 72% of production cost. The industry is a major consumer of the domestic rubber market. Natural rubber constitutes 80% while synthetic rubber constitutes only 20% of the material content in Indian tyres, 62% of total Natural Rubber consumption is by the Tyre Sector, balance by rubber based non-tyre industries. Interestingly, world-wide, the proportion of natural to synthetic rubber in tyres is 30:70. The Indian Tyre Industry is an integral part of the Auto Sector – It contributes to ~3% of the manufacturing GDP of India and ~0.5% of the total GDP directly. Indian tyre industry has almost doubled from ~Rs 30,000 crores in 2010-11 to ~Rs 59,500 crores in 2017-18 of which 90-95% came from the domestic markets. The top three companies – MRF, Apollo Tyres and JK Tyres have ~60% of the market share in terms of revenue. In terms of segmentation tyres can be divided in two ways – based on end market and based on product.

Indian tyres have good acceptance in global markets. Compounded Average Growth Rate (CAGR) of tyre exports in the last one decade has been 8%. Exports to over 65 countries

worldwide. 17% export to highly quality conscious US market. Other major export markets are - (countries in) Latin America; UAE, Bangladesh, Iran, Philippines, Vietnam, etc. Over 20% of truck and bus tyres (bias) produced domestically are exported. Emphasis now is on export of radial tyres, including Passenger Car radial tyres. All large tyre companies are exporting as a long term commitment.

2.1.1 BUSINESS PROCESS OF INDUSTRY

Tires for most vehicles are pneumatic; air is held under pressure inside the tire. Until recently, pneumatic tires had an inner tube to hold the air pressure, but now pneumatic tires are designed to form a pressure seal with the rim of the wheel.

Scottish inventor Robert Thomson developed the pneumatic tire with inner tube in 1845, but his design was ahead of its time and attracted little interest. The pneumatic tire was reinvented in the 1880s by another Scotsman, John Boyd Dunlop, and became immediately popular with bicyclists.

Natural rubber is the main raw material used in manufacturing tires, although synthetic rubber is also used. In order to develop the proper characteristics of strength, resiliency, and wear resistance, however, the rubber must be treated with a variety of chemicals and then heated. American inventor Charles Goodyear discovered the process of strengthening rubber, known as vulcanization or curing, by accident in 1839. He had been experimenting with rubber since 1830 but had been unable to develop a suitable curing process. During an experiment with a mixture of india rubber and sulfur, Goodyear dropped the mixture on a hot stove. A chemical reaction took place and, instead of melting, the rubber-sulfur mixture formed a hard lump. He continued his experiments until he could treat continuous sheets of rubber.

Today, large, efficient factories staffed with skilled workers produce more than 250 million new tires a year. Although automation guides many of the steps in the manufacturing process, skilled workers are still required to assemble the components of a tire.

Raw Materials

The tyre is an assembly of numerous components that are built up on a drum and then cured in a press under heat and pressure. Raw material cost forms the largest cost head in the tyre industry accounting for about 65-70 per cent of the total. The main raw materials used to manufacture tyres are natural rubber, poly butadiene rubber (PBR), styrene butadiene rubber (SBR) and nylon tyre cord fabric.

Rubber is a major component in manufacturing of a tyre. There are three categories of rubber used in the manufacturing process viz natural rubber (NR), styrene butadiene rubber (SBR) and poly butadiene rubber (PBR).

Rubber including (natural and synthetic), nylon tyre cord fabric (NTC) and carbon black constitute a significant portion i.e. 60-65 per cent of the overall raw material cost of the

industry, Care Ratings said, adding hence any change in the prices of these materials impact the overall industry's profitability.

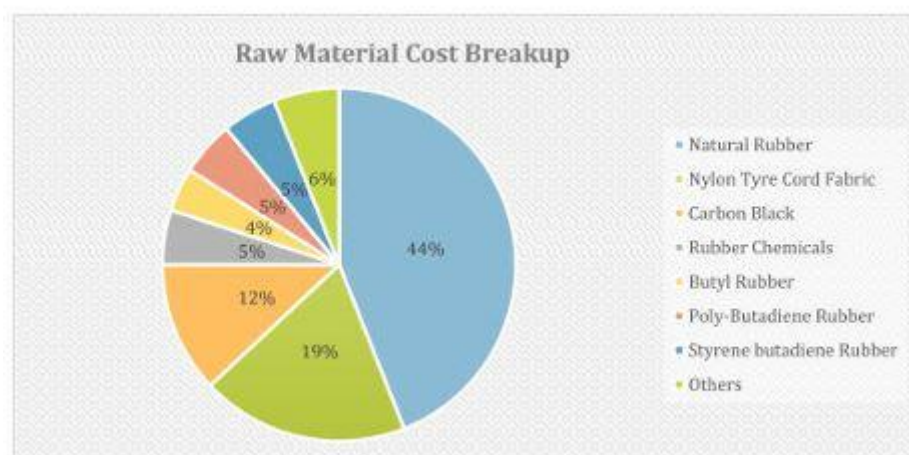


Fig:2.1 Raw material cost breakup

The price of rubber is prone to fluctuations and in the previous fiscal year, domestic and international rubber prices increased by about 28 per cent. It had declined by 24 per cent and 15 percent y-o-y for previous two consecutive years.

The reason for high natural rubber price in the domestic market is due to the demand-supply gap in production and consumption of rubber in the country. A competitive price in the international market also leads to high imports.

2.1.2 MARKET DEMAND AND SUPPLY – CONTRIBUTION TO GDP – REVENUE GENERATION

With the growing insistence to lower emission levels and enhance fuel efficiency in vehicles, besides reducing weight, the Indian tyre industry is embracing new trends in the manufacturing process to meet the changing market dynamics and cater to the latest demands of the OEMs (Original Equipment Manufacturers). The heavy investment driven tyre industry contributes 3 per cent of the manufacturing GDP when the entire automotive sector accounts for 7.1 per cent of the GDP and almost 49 per cent to the nation's manufacturing GDP (FY 2018-19). The tyre makers in India are gearing up to intensify their role in the modernisation phase, largely driven by demand and supply conditions as also directly proportional to automobile sales to some extent.

Besides, with increasing focus on corporate average fuel efficiency (CAFE) norms to curb the alarming levels of pollution, companies have immense pressure to build products which have minimal friction and offers higher fuel efficiency. In this direction, the tyre manufacturers have been grappling to alter manufacturing mechanisms to meet changing trends and demands. Latest trends in the industry include finer tolerances in the manufacturing process, inclusion of

more radials which consume less fuel, low rolling resistance and focus on better traction and on road performance which increases fuel efficiency.

A radial tire allows the sidewall and the tread to function as two independent features of the tire. A bias tire consists of multiple rubber plies over lapping each other. The crown and sidewalls are interdependent. The companies are stepping up the manufacturing facilities with technologies that improve heat development in tyres with effort towards less usage of carbon black, which in turn contributes in lowering emissions.

Other impactful trend in the manufacturing of tyres include usage of higher component of 'silica' which helps in the manufacturing process and in improving tyre performance by lowering the rolling resistance as well as improving cut and chip resistance. Tyre manufacturing and tyre performance are directly linked to the emission levels

DEMAND FOR TYRES

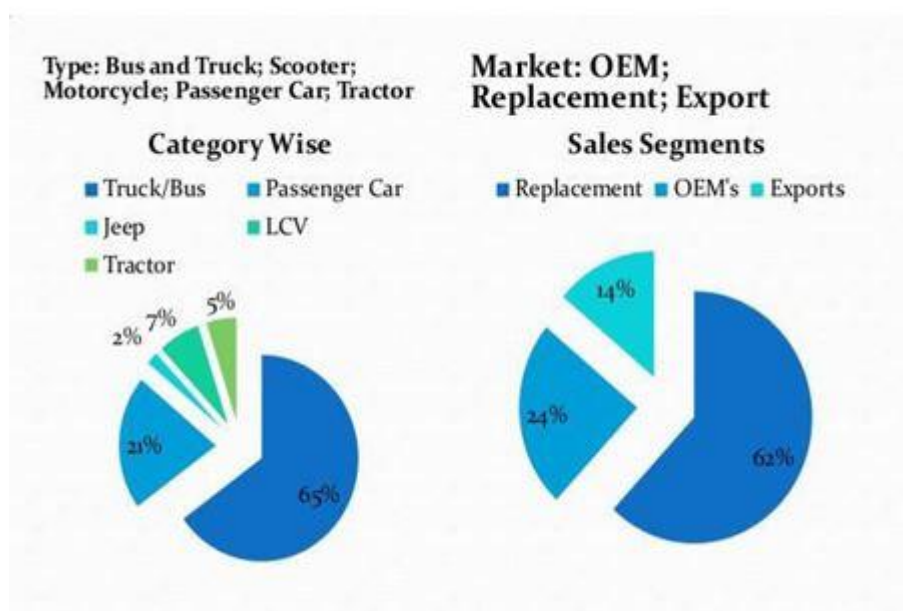


Fig:2.2 Demand for tyres.

Tyre originates from two end-user categories -- OEMs and the replacement segment. Demand from the replacement segment dominates the Indian tyre market contributing about 56 per cent of the total volume, while the OEMs account for the rest 44 percent.

Consumption by OEMs is dependent on new automobile sales trend while the replacement segment is linked to usage patterns and replacement cycles. In the overall sales of tyres in unit terms, the commercial segment contributes about 21 per cent while the remaining comes from sales of personal vehicles which includes passenger vehicles, two and three wheelers.

Under personal segment, two and three wheelers constitute about 55 per cent sales while the passenger cars made up for the balance sales.

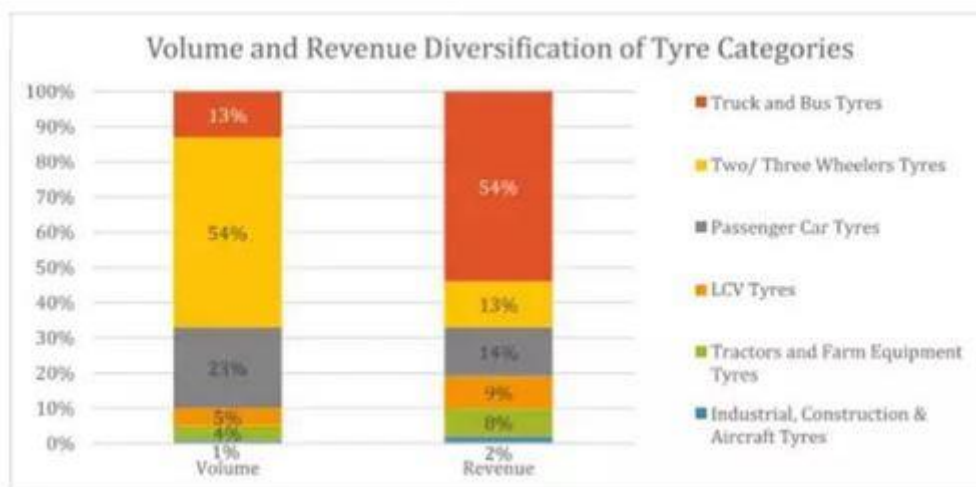


Fig:2.3 Volume and revenue diversification of tyre categories.

T&B (Trucks&Buses) dominates overall commercial usage segment with followed by LCV segment. Tractor front and rear tyre segment constitute the remaining Top 10 companies account for about 80 per cent of the market share. Top three companies -- MRF, Apollo Tyres and JK Tyres -- have 55 per cent of the market share of the Indian tyre industry and figure among the top 25 global companies in terms of revenue.

Exports

Tyre exports are estimated to grow by 8-10 per cent over the next three years led by stable demand and increased acceptance of Indian tyres in overseas markets, both in terms of quality and pricing. It was around 9 per cent in FY 2018. However, with rising penetration of low cost Chinese tyres in overseas markets, especially post the removal of anti-dumping duty (ADD) by the US on the Chinese tyres in February 2017, competition from China (both in terms of volumes and pricing) will remain a key challenge, as per and ICRA note. For FY 2019, the unit and tonnage growth is pegged at 8-8.5 per cent and 6.5-7 per cent, 24 respectively.

Currently, India's contribution to the global tyre trade is USD 1.5 billion (1.72 per cent) out of the \$80 billion market. ATMA expects export share to increase to about 5 per cent given that the industry is highly competitive and there is headroom for tyre exports. Top destinations for exports include US, Germany, France, UK, Italy, Spain, Turkey, Netherlands, UAE, Brazil and Australia. The US and EU countries are the top potential markets for exports, and the driving factor would be the Government signing trade agreements with these countries which can provide concessional tariff for tyres.

2.1.3 LEVEL AND TYPES OF COMPETITION- FIRMS OPERATING IN THE INDUSTRY.

TYRE INDUSTRY: OLIGOPOLISTIC NATURE

1. Very few producers, homogeneous market, pure oligopoly
2. Huge investment to start oligopolistic markets.
The established companies discourage the new entrants in various ways. The existing firms may have a number of advantages like access to inputs or processes, cost advantage, exclusive dealerships and arrangements to get inputs at lower prices. Moreover, the new firms will take time to establish their brand in the market. The barriers may take the form of technology patents. Even the Governments may put up barriers such as limits to the number of licenses issued. In these ways entry for new producers becomes difficult.
3. They face indeterminate demand curve
There is a lot of interdependence among the oligopoly producers. The decisions of producers depend on the decisions and strategies followed by other competitors. This interdependence makes it difficult to draw a definite demand curve like that of perfect competition and monopoly. For example, an oligopoly firm lowers the price of its product. It's not sure how the competitors will react. They may reduce the price to the same extent or even lower to capture the market. Thus demand curve is indeterminate.

This is because these companies that are dominating the market have enough power and resources not to let new companies to steal their piece of the pie. They are competing among each other and there are huge amounts of money involved in this “fight”. Also it is very hard to exit the market for a company because exit of the company from this market can actually make lots of economic problems for economy in the country where company is situated.

There are even other barriers for new companies to enter the market and one of them is legal barrier. Sometimes these companies that are the oligopoly collude in a cartel, that is a secret (against the law in most countries) cooperation with each other so they can control the market and keep prices high. When cartel is in action producing results are similar that to a monopoly, sometimes they are anti-competitive only by default, because they fear that direct competition would damage all of them. Their actions, therefore, try to take account of the reaction of other oligopolists; this usually happens when cartel is secret. Since it is uncertain, how will each company behave, whether they will cheat on cartel to make bigger profit or they will not, the behaviour of an oligopoly is hard to predict. If companies realize that cartel is not working and other companies are breaking the rules of the cartel and cheat a price war breaks out. Oligopolists will produce and price much as a perfectly competitive industry would; at other times they act very like a monopoly.

Some small firms may operate at the periphery in national markets dominated by a few, with their actions failing to elicit any reactions, but a giant firm must anticipate reactions from its fellows when it introduces a change.

FIRMS OPERATING IN THE INDUSTRY

Top Players in the tyre industry are:

- MRF India Ltd
- Apollo Tyres Ltd
- JK Tyre & Industries
- CEAT Ltd
- Bridgestone India Ltd
- Goodyear India Ltd
- TVS Srichakra Ltd
- Falcon Tyres Ltd
- Kesoram Industries Ltd (Birla Tyres)

MRF –MADRAS RUBBER FACTORY

MRF (Madras Rubber Factory) is India's largest tyre manufacturer, with a legacy that began in the mid-1940s as a balloon factory in Chennai. Today, it has grown into a global brand with a presence in over 65 countries and operates eight advanced manufacturing plants located in Goa, Ankenpally, Medak, Arakkonam, Trichy, Tiruvottiyur, Kottayam, and Puducherry. MRF's extensive product portfolio includes tyres for passenger cars, motorcycles, trucks, buses, farm equipment, OTR vehicles, LCVs, SCVs, pickups, and three-wheelers.

The brand is widely recognized for its high-performance and OEM-specific tyre solutions, maintaining the #1 position in overall tyre sales in India while holding a strong presence in the replacement segment. For FY 2023–24, MRF recorded total revenue of ₹18,542 crore and a net profit of ₹1,365.42 crore. With continued investments in R&D, EV-compatible tyres, sustainability, and digital initiatives, MRF remains a dominant force in both domestic and international tyre markets.

APOLLO TYRES

Apollo Tyres, headquartered in Gurgaon and established in 1972, continues to strengthen its position as one of India's top tyre manufacturers with a growing global presence across over 100 countries. As of FY 2023–24, Apollo has maintained its leadership in the Original Equipment (OE) segment, supplying the highest volume of factory-fitted tyres for new vehicles across categories.

The company's stronghold in the Commercial Vehicle (CV) sector also remains unmatched, supported by its state-of-the-art manufacturing facilities in Chennai, Perambra, Limbda, and Kalamassery in India, along with international plants in Hungary and the Netherlands. Apollo operates global R&D centres in India and Europe, and an overseas corporate office in Amsterdam to support innovation and international expansion. Its diverse product portfolio spans all vehicle types — two-wheelers, passenger cars, commercial vehicles, off-road vehicles — under brands like Apollo, Vredestein, Kaizen, and Regal. Known for combining affordability with performance, Apollo also offers high-performance and luxury radials for premium segments. In FY 2023–24, the company recorded revenue of ₹15,284 crore and a net profit of ₹834.6 crore, reflecting its continued momentum in both domestic and international markets.

BRIDGESTONE

Bridgestone, a globally renowned tyre brand, has been actively serving the Indian market since 1996 and has built a strong reputation for quality and performance over nearly three decades. As of FY 2023–24, Bridgestone India continues to be a trusted choice for passenger car and SUV tyres under the Bridgestone brand, while its Bridgestone Commercial division caters to trucks and buses. Although its product range is narrower compared to some domestic competitors, Bridgestone's focus on premium value and technological advancement has earned it a loyal customer base.

+The company is also investing heavily in smart tyre technology, offering solutions with embedded strain sensors that enable fleet operators to remotely monitor tyre health — including air pressure, load, and wear — significantly enhancing safety and efficiency. Bridgestone currently operates two major manufacturing plants in Pithampur (Madhya Pradesh) and Chakan (Maharashtra), which support both the OE (Original Equipment) and replacement markets. With a distribution network of nearly 3,000 dealers across India, the brand has steadily expanded its reach.

In a strategic move to boost production, Bridgestone India announced a ₹350 crore expansion plan last year to scale up daily passenger tyre output to 20,000 units per day. Now under the EMEA (Europe, Middle East & Africa) business unit, Bridgestone India remains committed to delivering technologically advanced, globally benchmarked tyre solutions tailored to Indian road and market conditions

CEAT

CEAT, a globally recognized tyre brand and part of the RPG Group, has solidified its position as a leading player in India's tyre industry. Although originally established in Italy in 1958, CEAT has grown into a trusted Indian brand over the years, with its headquarters now located in Mumbai. As of FY 2023–24, CEAT produces over 15 million tyres annually, catering to a wide range of vehicles including passenger cars, two-wheelers, SUVs, pickups, agricultural machinery, construction equipment, and commercial vehicles. The company's robust manufacturing infrastructure includes state-of-the-art plants in Ambarnath, Halol, Bhandup,

Nagpur, Chennai, and Nashik. CEAT maintains a strong presence in both the OE (Original Equipment) and aftermarket segments, supported by a vast network of over 4,500 dealers across India. The brand is especially known for its focus on value and performance, making it a preferred choice in the budget-conscious segments. With a global footprint spanning 130 countries, CEAT has steadily expanded its export markets while continuing to innovate in tyre durability and safety. In FY 2023–24, CEAT recorded revenue of ₹9,176 crore and reported an EBITDA of ₹832 crore, reflecting a healthy growth trajectory and strong demand across key product lines.

GOODYEAR TIRE & RUBBER COMPANY

Goodyear, though an American brand, has become a trusted household name in India with a legacy that dates back to the early 1960s. Its long-standing presence in the country reflects its deep understanding of Indian road conditions and customer expectations. As of FY 2023–24, Goodyear India continues to operate two major manufacturing facilities — one in Aurangabad (Maharashtra) and the other in Ballabgarh (Haryana) — serving both the Original Equipment (OE) and replacement markets.

The company offers a well-rounded product portfolio for the Indian market, including value-focused passenger car tyres, high-performance radials, and rugged, off-road-capable tyres. Additionally, Goodyear remains a major supplier in the agricultural tyre segment, catering to tractors and farm equipment. Globally, Goodyear maintains production facilities in **21 countries**, underlining its position as a leading tyre manufacturer.

In FY 2023–24, Goodyear India reported total sales of ₹2,362 crore, including strong contributions from tyre, tube, and flap segments, and recorded a **net** profit of ₹143 crore. The company continues to focus on technology, durability, and customer-centric innovation, securing its place as a premium brand in both urban and rural Indian markets.

TVS EUROGRIP (TVS SRICHAKRA LTD.)

TVS Eurogrip, the two-wheeler tyre brand of TVS Srichakra Ltd., a member of the TVS Group, has grown significantly since its founding in 1982. Rebranded from “TVS Tyres” to TVS Eurogrip, the company now caters to over 70 countries globally and maintains a robust dealer network of 3,000+ across India.

With manufacturing units in Madurai (Tamil Nadu) and Rudrapur (Uttarakhand), the brand produces over 15 million **tyres** annually, specializing in tyres for two-wheelers, three-wheelers, farm implements, industrial equipment, and off-road vehicles.

TVS Eurogrip has carved a niche in motorcycle tyres, offering everything from daily commuter to high-performance and off-road ranges.

As of FY 2023–24, TVS Srichakra registered revenues of ₹3,148 crore and a net profit of ₹127 crore, strengthening its hold in both the OE and aftermarket segments.

JK TYRE & INDUSTRIES LTD.

JK Tyre, part of the JK Organisation, is one of India's most diversified and globally active tyre companies. With operations in 100+ countries, it runs 12 manufacturing plants — 9 in India (Mysore, Banmore, Kankroli, Chennai, Haridwar) and 3 in Mexico. Backed by a powerful distribution network of over 4,000 dealers and 500+ brand shops, JK Tyre manufactures a complete portfolio including tyres for passenger cars, motorcycles, trucks, buses, farm vehicles, three-wheelers, and retreads. It was a pioneer in introducing radial tyre technology in India (1977).

The Smart Tyre range, equipped with IoT-based tyre health monitoring, reflects its tech-forward approach. Supported by the Raghupati Singhania Centre of Excellence in Mysore, JK Tyre posted revenues of ₹9,206 crore and net profits of ₹326 crore in FY 2023–24, showing robust growth across segments.

RALCO TYRES (RALSON INDIA LTD.)

Ralco, a subsidiary of Ralson India, entered the two- and three-wheeler tyre space in the early 2000s and has since expanded to cover farm and light commercial vehicles. With a strong OE presence — including partnerships with Renault Triber and Hyundai Venue — Ralco has built a reputation for durability and affordability. It operates two manufacturing facilities in Ludhiana, and is currently setting up a new HCV tyre plant in Indore, marking its entry into the heavy commercial vehicle segment. With over 5,000 dealers and growing acceptance among electric vehicle OEMs, Ralco is positioning itself as a rising challenger in the Indian tyre ecosystem. As of FY 2023–24, the company achieved an estimated turnover of ₹1,048 crore, backed by consistent double-digit growth.

CONTINENTAL TYRES INDIA

A global powerhouse, Continental AG entered the Indian market over five decades ago. In India, it operates a high-tech manufacturing plant in Modipuram, Uttar Pradesh, producing tyres for hatchbacks, sedans, SUVs, and luxury vehicles. Globally, Continental manufactures across 13 countries, with 3 global HQs in Hanover (Germany), Petaling Jaya (Malaysia), and Fort Mill (USA).

Its Indian product lineup includes popular models like the ContiComfortContact, ContiCrossContact, and ContiSportContact. With a rising demand for premium and safe tyres in India, Continental continues to expand its OE ties and aftermarket reach. As of FY 2023–24, Continental Tyres India recorded revenue of approximately ₹1,760 crore, supported by increasing demand in the premium vehicle segment.

MICHELIN INDIA

Michelin, headquartered in France and best known for its mascot **Bibendum**, is among the world's most admired tyre brands. Present in **171 countries**, with **69 R&D centres** (including one in India), Michelin caters to motorcycles, scooters, passenger vehicles, commercial fleets, and off-road vehicles. It operates a production facility in **Chennai** for truck and bus tyres, while high-performance and passenger vehicle tyres are imported. The Indian office is located in **Gurgaon**. Michelin offers innovative products focused on energy efficiency, superior grip, and ride comfort — like the **Michelin Primacy**, **Energy XM2**, and **Pilot Sport series**. In **FY 2023–24**, Michelin India reported **revenues of ₹1,932 crore** and a **net profit of ₹168 crore**, maintaining a premium positioning in the competitive tyre market.

INDUSTRY SNAPSHOT: LEADING PLAYERS

The Indian tyre industry is a dynamic and competitive sector with both domestic giants and multinational players actively contributing to its growth. Leading manufacturers include **MRF (Madras Rubber Factory)**, **Apollo Tyres**, and **JK Tyre & Industries**, along with strong contenders like **CEAT**, **Goodyear India**, and niche-focused firms such as **Balkrishna Industries Ltd. (BKT)**.

MRF maintains its position as the **market leader**, commanding a market share of approximately **30%**. With a turnover of **₹8,589.68 crore**, MRF demonstrates solid business fundamentals, although its **average margin of 3.37%** is slightly lower than the industry average of ~4%. Nevertheless, MRF's growth trajectory is strong — it has achieved a **5-year CAGR of 18% in net sales** and an impressive **68.3% CAGR in net profit**, underscoring its operational efficiency and brand dominance.

In contrast, **Balkrishna Industries Ltd. (BKT)** outperforms most peers in profitability. Operating in the specialized **Off-The-Road (OTR) tyre** segment, BKT has recorded a **5-year net sales CAGR of 27.87%** and leads the industry with an **average profit margin of 10.55%** — significantly above the sector norm. Its niche focus enables higher pricing power and reduced competition.

Apollo Tyres has a strong presence in both **Original Equipment (OE)** and **Commercial Vehicle (CV)** segments and continues to gain ground globally with facilities in India and Europe. **JK Tyre & Industries**, with its expansive product portfolio and motorsport legacy, retains a solid position in both domestic and export markets.

CEAT, under the RPG Group, and **Goodyear India**, with its strong brand equity and OE partnerships, round out the list of top players, contributing to both the value and premium segments.

In summary, while MRF remains the largest player by market share, **Balkrishna Industries leads in profitability**, and other brands like **Apollo**, **JK Tyre**, **CEAT**, and **Goodyear** offer diversified strengths across categories and regions, making the Indian tyre sector highly competitive and innovation-driven.

2.1.4 PRICING STRATEGIES IN THE INDUSTRY

Pricing is extremely important when it comes to selling tires as consumers continually look for the “cheapest tire in town.” However, offering top-notch service and telling customers that paying just a little more for their tires will help ensure quality and durability can go a long.

Establishing price is based on three things:

1. Your costs
2. The profit you hope to make
3. The price your customers are willing to pay

Tyres are priced at a premium owing to their quality and brand image. The premium tyres are kept at a high price to assure quality. The other prices are maintained based on the market conditions. As the tyre market is very price elastic, the maintenance of the price has to be proper as the customers can switch easily. Most of the firms have followed a strategy of raising price and decreasing the cot which proved beneficial to them. Following this they could sell a lesser number of tyres but the profit margin was high. The pricing remained stable with a decline in the raw material cost. The customers are very happy with the pricing of the company. Only the price in the European market has increased due to the Euro and US issues. Tires were ordered as needed and they take advantage of specials and seasonal trends.

Here are several pricing strategies to consider:

- ❖ **Discounts** – Generally, businesses discount prices to introduce products, encourage early- bird buyers, reward prompt payment, extend the selling season, clear out slow-moving inventory, and promote volume sales. Base discounts on the return they will produce. Just be wary of discounting too much too often, training people to only buy when there’s a sale.
- ❖ **Price margins** – This strategy typically involves pricing products at a set percentage above cost, setting margins as a group rather than individually. For example, you might establish different margins for different tire brands. You may price one tire line low as a loss leader, then make up the revenue by spreading a price increase across the rest of your lines.
- ❖ **Captive pricing** – Companies that use this strategy sell a basic item at a low cost, then make up for it by selling the necessary accessories and service at a higher profit. Tire dealers that use this strategy would presumably make their real profits on service, not just on tires.
- ❖ **Bundled or a la carte** – Consider, also, whether your wisest pricing strategy is to sell a set of tires as one unit or separate tires as several units that are slightly more expensive. You need to weigh the benefit of making the buying choice easy for customers vs. giving them more choices.

No matter which pricing strategy you choose to implement, remember that settling on the “right” price is an ongoing process; it’s not a task you handle once a year and then forget about it.

Costs, customer perceptions, market conditions and competitors' pricing change continually. That doesn't mean you should drop your prices immediately just because the tire dealer down the street does; in fact, taking a wait-and-see approach is often the best response.

2.2 PROSPECTS AND CHALLENGES OF THE INDUSTRY

India holds certain prospects and opportunities which are crucial for the growth of the tyre industry. However, there are a number of roadblocks to its growth which need to be overcome, as the industry looks to contribute to the Government's "Make in India" programme. This section focuses on these prospects, and the challenges of tire industry.

Prospects of tire industry

The Indian Tyre industry is expected to show a healthy growth rate of 9-10% over the next five years, according to a study by Credit Analysis and Research Limited (CARE). While the truck and bus tyres are set to register a compounded annual growth rate (CAGR) of 8%, the light commercial vehicles (LCV) segment is expected to show a CAGR of about 14 %. However, we have to also take account of the effect of the global recession on the sector in making these assessments.

The growth of the sector is closely linked to the expansion plans of the automobile companies, the government's thrust on development of road infrastructure and the sourcing of auto parts by the global Original Equipment Manufacturers (OEMs). Some significant hurdles towards attaining these projected growth rates could be raw material related price volatility, rupee appreciation and the looming threat of cheap Chinese imports.

The Indian tyre companies need to make active efforts to explore newer markets as the existing markets for bus-truck tyres, which account for about 45 % of the total export volume, is nearing saturation. There is also an urgent need to increase the degree of radialization in order to safeguard their share in the export market. Global tyre manufacturers have been making constant efforts to innovate and offer a diverse range of products such as tyres with pressure warning systems, run flat tyres, eco-friendly tyres and energy efficient tyres. In this context, the Indian domestic companies have to pursue a growth strategy of continuous innovation and increasing emphasis on product differentiation.

Rising Income Levels

A study by the McKinsey Global Institute suggests that if India continues on its current high growth path, over the next two decades, the Indian market will undergo a major transformation. Average household incomes will triple over the next 20 years and India will become the fifth largest consumer economy in the world by 2025. Another report by PwC 35 estimates that by 2021, India's emerging and middle-class segments combined will comprise nearly 900 million people. India is one of the most attractive markets with the rising incomes of the middle class. Emergence of the middle class will drive the passenger car industry which will subsequently fuel the growth of the industry.

Passenger Car Penetration in India

India's passenger car market remains significantly under-penetrated compared to global and even emerging-market standards. As of 2024, the vehicle ownership rate is approximately **15** cars per 1,000 people, a modest increase from around 10/1,000 in the late 2010s. This figure still falls far below the global average of over 130 per 1,000 people, with China at nearly 70 per 1,000 and developed nations such as the USA, Japan, and Germany crossing 250–600 cars per 1,000.

This relatively low penetration rate, combined with rising aspirations, increasing household incomes, improving road infrastructure, and expanding financing options, indicates immense untapped potential. The Indian middle class is projected to double by 2030, and vehicle affordability is improving year-on-year. The automobile industry expects a steady surge in first-time buyers from smaller towns and cities — a shift that will directly boost demand for passenger car tyres in both the OEM and replacement markets.

Urbanisation & Youth-Driven Demand

India is undergoing rapid urbanisation, with the urban population expected to rise from 36% in 2023 to nearly 45% by 2030, according to United Nations projections. As more people move into cities and urban clusters, personal mobility becomes a necessity. The lack of efficient public transport systems in many Tier 2 and Tier 3 cities has further accelerated the purchase of personal vehicles, especially two-wheelers and compact cars.

Another powerful driver is India's youth demographic. Over 50% of the population is under the age of 25, and more than 65% is under 35. This young population is aspirational, tech-savvy, and more inclined to seek convenience, comfort, and independence — all of which favor personal vehicle ownership. Additionally, rising participation of women in the workforce and the shift toward nuclear family structures are leading to multi-vehicle households, creating a multiplying effect on vehicle and tyre demand.

Economic Growth, Infrastructure, and Policy Support

India continues to rank among the fastest-growing major economies, with an expected GDP growth rate of 6–7% annually over the next five years. This growth is underpinned by strong momentum in infrastructure development, real estate expansion, housing, and industrial production.

Flagship government programs like Make in India, PM Gati Shakti, National Infrastructure Pipeline, and Smart Cities Mission are enhancing connectivity, logistics, and manufacturing. This has led to increased deployment of commercial vehicles and construction machinery, pushing demand for heavy-duty and industrial tyres. Simultaneously, the push toward farm mechanisation is expected to boost the sales of agricultural and tractor tyres. The development of regional air travel infrastructure will also create opportunities in aviation tyres over time.

Radialisation: A Structural Shift

Radial tyre adoption has seen significant progress, especially in the **passenger vehicle segment, which is now over 98% radialised**. However, in the **truck and bus (T&B)** segment, radialisation stands at around **45%**, and in **light commercial vehicles (LCVs)** at **50%**, highlighting a large conversion potential.

Increased awareness of radial benefits — better fuel efficiency, longer life, and improved ride comfort — along with **government enforcement of axle load norms** and improving highways, is encouraging commercial fleet operators to adopt radial tyres. Industry projections suggest radialisation in the T&B space could reach **65–70% by 2028**, creating steady demand for high-margin tyres.

Future Outlook

With increasing car ownership, urban migration, youth-fueled consumption, industrial expansion, and radialisation, the **Indian tyre industry is poised for multi-dimensional growth**. Analysts expect the sector to grow at a **12–14% CAGR**, with **specialised segments like EV tyres, off-road tyres, and premium radials** showing even higher growth rates. The shift towards safer, more durable, and eco-friendly tyres is also shaping future product development and consumer expectations.

Challenges

While the global tyre industry is poised for significant growth, it faces increasing complexity and pressure to innovate. The expanding variety of vehicle types, the shift towards **electric mobility (eMobility)**, and the advent of **autonomous driving technologies** are transforming the nature of tyre design and production. These global trends demand **flexible manufacturing capabilities**, reduced time-to-market, strict adherence to **quality, safety, and environmental standards**, and the ability to operate competitively on an international scale. To stay ahead, tyre manufacturers must embrace **digitalization**, adopt **intelligent automation**, and evolve new business models that enhance productivity and lower total cost of ownership (TCO).

In India, despite a promising future driven by increasing demand and favourable demographics, the tyre industry faces **multiple structural and operational challenges** that hinder its global competitiveness and sustainable growth.

One of the most pressing challenges is the **influx of cheap tyre imports from China**, often sold at prices that undercut domestic products. A **DIPP (Department for Promotion of Industry and Internal Trade)** report notes that due to economic slowdown in China, their manufacturers frequently **dump surplus tyres** into the Indian market. While **anti-dumping duties** have been imposed, these are typically based on “loss of profit” and have not proven to be a strong deterrent.

According to **Automotive Tyre Manufacturers' Association (ATMA)**, the share of Chinese tyres in India's import basket surged from **20% to over 50%** in the last five years. In addition to legal imports, **illicit or under-invoiced shipments** further erode market share for domestic producers. This has led to a decline in **capacity utilisation** and **domestic production volumes**, placing additional financial strain on Indian manufacturers.

India's tyre industry suffers from an **inverted duty structure**, where **key raw materials like natural rubber** attract a **higher customs duty** than the **finished product (imported tyres)**. This contradiction penalizes local manufacturers who rely on imported raw materials and are forced to compete with lower-cost finished tyres from FTA partner countries.

Moreover, **natural rubber imports** require a **license and prior declaration**, resulting in increased holding costs and procurement delays. In contrast, finished tyres enter more freely under lower customs duties due to **Free Trade Agreements (FTAs)**. The mismatch in duty treatment creates a **non-level playing field**, pushing up the production costs of domestic players and reducing their competitiveness.

Several **Free Trade Agreements** (e.g., with ASEAN nations) have provisions that allow **lower or zero customs duty on imported tyres**, but these concessions do **not apply to natural rubber** — the primary raw material. As **natural rubber is on India's "negative list"** for FTAs, it continues to attract standard or elevated import duties. This imbalance allows foreign manufacturers to benefit from cheaper inputs and finished tyre pricing, while domestic producers remain burdened with higher costs.

Both **natural rubber** and **crude oil derivatives** (used in synthetic rubber and carbon black) are key components of tyre production and are highly sensitive to global price fluctuations. Since these commodities are largely influenced by **international supply-demand dynamics**, geopolitical factors, and weather conditions, domestic manufacturers have **limited control** over their input costs. This results in **volatility in margins** and challenges in long-term pricing strategies.

India's **corporate income tax rates**, although recently reduced, remain higher than in some competing manufacturing economies. Higher taxation impacts **net margins** and restricts the reinvestment capacity of firms into **R&D, capacity expansion, and technology upgrades**. Further, **multiple regulatory clearances**, complex compliance procedures, and delays in approvals create bottlenecks for scaling operations efficiently.

While global competitors are embracing **Industry 4.0**, automation, and data-driven manufacturing, a large section of the Indian tyre industry — especially small and mid-sized players — is still reliant on **traditional production methods**. This widens the productivity and efficiency gap, especially in high-volume exports and OE partnerships.

Inverted Duty Structure

Inverted duty structure is a key challenge for the Indian tyre industry. Inverted duty structure is where the key raw material (natural rubber) attracts higher customs duty than its finished product (tyres). The table below shows that India is the only country that has an inverted duty structure for the tyre industry. Even when basic customs duty is 10% for tyres, it is actually

much lower than that under various trade agreements for the duty (on tyres) when compared with the basic custom duty of its principal raw material, natural rubber.

Negative Impact of Trade Agreements Foreign trade agreements (FTAs) and regional trade agreements (RTAs) of India will negatively affect the Indian tyre industry and add to its challenges. Trade agreements affect the domestic tyre industry by providing concession on customs duty on finished tyres. Although tyres can be imported to India at preferential/concessional duties under various FTAs/RTAs, they practically provide no concession on import duty of the natural rubber.

High tariff rates on Indian exported tyres

India has few trade agreements such SAARC preferential trade agreement (SAPTA), India-MERCOSUR Pref. Trade Agreement among its top destinations. Most of the key destinations of Indian tyre exports attract the highest general duty tariff. Absence of any trade agreements with these countries reduces the competitiveness of the Indian tyre industry in relation to other countries.

Greater Import Dependence on Raw Materials

Greater import dependence on raw material and volatility in the prices imposes challenges for the Indian tyre industry. The tyre industry is a raw material intensive industry. Raw materials account for nearly 72% of the total production cost. Natural rubber is the primary raw material in the production process of tyres and results in 44% of the total raw material cost. However, the Indian tyre industry has to depend upon the imported natural rubber due to a mismatch between production and consumption of domestic natural rubber. India consumes more than 80,000 tons of natural rubber, out of which the tyre industry consumes about two-thirds of the natural rubber. In relation to this, only 40,000-50,000 tons of natural rubber is produced in India. ⁷⁷In addition, both natural rubber and crude prices are controlled by the external environment and little can be done to control the raw material price movement internally.

Price Arbitrage of the Natural Rubber

The price of natural rubber in India is quite volatile and is higher than world rubber prices (Bangkok benchmark). The prices of natural rubber are about 10-20% higher than the prices in the international market which is a challenge for the tyre industry. Price arbitrage of natural rubber reduces the competitiveness of the Indian tyre industry in the international market.

Quality of Infrastructure

The Global Competitiveness Report of 2014-15 depicts India poorly among the BRICS and other developing countries on the quality of infrastructure with a score of 3.7 (out of 7), and ranks it 90 among 144 countries. Lack of adequate physical infrastructure (roads, ports, airports, railways, water and energy, etc.) has been identified as one of the biggest challenges

that India faces. The mid-term appraisal of the 11th Five-Year plan noted that the country has been adversely impacted on an average by 1-2% points due to infrastructure bottlenecks. An empirical study by Gupta et al. reveals that the manufacturing sectors that are largely dependent upon the availability of infrastructure are hurt. Indian states with poor infrastructure have not performed well in the manufacturing sector.

Growth of the tyre industry is constrained by some challenges faced by the industry:

- Inverted duty structure reduces the competitiveness of the domestic industry and encourages volumes of cheap imported tyres despite adequate domestic capacity already in place.
- Negative impact of trade agreements where tyres can be freely imported whereas natural rubber is in the negative list across all FTAs/RTAs except with Sri Lanka.
- Most of the key destinations of Indian tyre exports attract the highest general duty tariff and the absence of any trade agreements with these countries reduces the competitiveness of the Indian tyre industry in relation to other countries.
- Greater import dependence on raw material (natural rubber and crude oil) and volatility in their prices imposes challenges for the industry.
- Due to an increase in the cheap imports of tyres from China, the production of tyres in India has declined and the capacity utilisation of plants has remained subdued.
- Lack of adequate infrastructure (India ranks 90 among 140 countries) in comparison to other countries reduces the competitiveness of the manufacturing industry.

2.3 RECENT GLOBAL DISRUPTIONS AND THEIR IMPACT ON THE TYRE INDUSTRY (2020–2024)

1. COVID-19 Pandemic: A Global Supply Chain Crisis

The outbreak of COVID-19 in 2020 marked the beginning of one of the most disruptive periods in the history of the tyre industry. With widespread lockdowns, travel restrictions, and manufacturing halts across the globe, the Indian tyre sector faced an estimated **₹5,000 crore loss** during the first few months of the pandemic alone. Major manufacturers such as **MRF, Apollo Tyres, JK Tyre, CEAT, and international players like Michelin, Bridgestone, and Goodyear** suspended production temporarily to comply with public health directives and protect workforce safety.

Indian companies quickly shifted to **remote working models**, implemented **social distancing**, and reduced operating capacities. In solidarity with employees, **Apollo and JK Tyre's leadership voluntarily took pay cuts** of 15–25% across their global management. The lockdown not only disrupted domestic operations but also slowed exports, delayed projects, and weakened consumer demand, especially in the OEM segment.

Even after the easing of lockdowns, **tyre demand recovery remained sluggish** due to continued restrictions, reduced automotive sales, and low freight movement. Tyre companies

also had to invest heavily in **sanitation infrastructure, digital transformation, and flexible manufacturing protocols** to future-proof their operations.

2. Post-COVID Geopolitical Tensions and Trade Shocks

The pandemic was soon followed by rising **geopolitical instability**, including the **Russia–Ukraine conflict** that began in 2022, which impacted global oil and rubber markets. Supply chain routes through Europe were severely affected, delaying raw material deliveries such as **synthetic rubber, steel wires, and carbon black**. Rising fuel prices also affected logistics costs, making tyre distribution more expensive domestically and globally.

Countries also began **tightening trade barriers** to promote self-reliance, reducing access to cheaper imports. India imposed stricter monitoring on Chinese imports, while simultaneously facing retaliatory measures on its exports in some markets. These shifts forced Indian manufacturers to **rethink global sourcing strategies** and increase dependence on local suppliers, sometimes at a higher cost.

3. Global Inflation and Raw Material Volatility

From 2022 to 2023, the global economy experienced sharp **inflationary trends**, driven by supply shortages and rising energy prices. The tyre industry, which is **raw material intensive (72% of production costs)**, was directly hit by price hikes in natural rubber, crude derivatives, and shipping charges.

India's continued **dependence on imported natural rubber**—due to a supply-demand mismatch—added to the vulnerability. With only around **50,000 tonnes of domestic production against 80,000 tonnes of consumption**, prices of natural rubber in India remained **10–20% higher than international benchmarks**, reducing competitiveness for Indian exporters.

4. Semiconductor Shortage and Automotive Slowdown

An often-overlooked challenge was the **global semiconductor shortage**, which affected vehicle production from 2021 through 2023. As OEMs reduced output, tyre manufacturers saw a corresponding **drop in OE orders**, further impacting revenues. This created a temporary surplus in tyre inventory, forcing companies to depend more heavily on the replacement market.

5. Environmental Regulations and ESG Pressures

As governments push toward **carbon neutrality and green mobility**, tyre companies globally are facing rising **ESG (Environmental, Social, and Governance)** compliance pressures. From

investing in **low rolling resistance tyres** to adopting **eco-friendly manufacturing processes**, tyre makers must now navigate the dual challenge of cost and sustainability.

Mandatory Extended Producer Responsibility (EPR) laws, regulations on **scrap tyre disposal**, and increasing demand for **sustainable raw materials** are driving up investment requirements in R&D and compliance systems, especially for mid-sized domestic players.

6. Digital Disruption and Changing Consumer Behavior

The post-COVID era has seen a **digital revolution in the auto and tyre sectors**. Customers now prefer **online research, doorstep fitment services, and digital servicing platforms**. Tyre companies have had to invest in **e-commerce channels, B2B dealer management systems, and mobile-based tyre health monitoring** to stay relevant.

Brands like CEAT, Apollo, and JK Tyre have launched **mobile service vans, virtual fitment tools, and connected tyre solutions**, marking a shift from traditional retail-centric models to **digitally enabled hybrid experiences**

Conclusion

The years 2020 to 2024 have reshaped the tyre industry in India and globally. From pandemic-induced shutdowns and raw material price shocks to climate pressures and digital evolution, companies have been compelled to **adapt, innovate, and reimagine their operations**. The firms that have embraced **supply chain resilience, sustainability, and digital agility** are now better positioned to lead in a more volatile but opportunity-rich market.

2.4 KEY DRIVERS OF INDUSTRY

Performance drivers

→ **Riding on India's automobile sector's growth: A global auto manufacturing hub**

With increasing per capita income, infrastructure development and growing urbanization in India, the automobile industry has grown significantly in this decade. The outlook for the domestic automobile industry in India remains robust supported by India's growing importance as an automotive export hub for small cars. Most of the overseas automobile players are planning to set up their manufacturing plants in India. Therefore, the growing demand for automobile products is expected to fuel the growth in the tyre industry.

→ **Increasing radialisation level on back of infrastructure development**

Based on their construction, tyres are of two types – ‘cross-ply or bias tyres’ and the fuel- efficient ‘radial tyres’. The Indian tyre industry was mainly a cross-ply/bias tyre industry. Now, the market has been shifting towards radial tyres. While bias tyres are sturdier and better suited for extreme road conditions, radial tyres provide better mileage and have a higher life.

(The table given below gives the radialisation levels in different segments in India.)

Passenger Car tyres	98%
Light Commercial Vehicles	18%
Heavy Vehicles (Truck & Bus)	12%

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India has historically had a low level of radialisation in the truck and bus (T&B) tyre segment, primarily due to poor and inconsistent road conditions across the country. Unlike global markets where radialisation exceeds 70%, India stood at just 12% a decade ago and has only recently improved to around 45% as of 2024. T&B tyres in India must perform across extreme and varied terrains—from unpaved village roads to high-speed expressways—which made fleet operators cautious about adopting radial tyres. However, the government's major investments in infrastructure through initiatives like Bharatmala, the National Infrastructure Pipeline, and the Gati Shakti programme are significantly improving road quality and connectivity. With over 80,000 km of highways built since 2014 and strict enforcement of axle-load norms, radialisation in the commercial segment is now accelerating. Tyre manufacturers are also developing India-specific radial products, and awareness about fuel efficiency and long-term cost benefits is rising. As a result, India is expected to reach 65–70% radialisation in the T&B segment by 2028, bringing it closer to international standards and driving long-term growth in the tyre industry.

→ **Robust capacity expansion: A key growth driver**

As of FY 2024–25, India's tyre manufacturing industry has significantly expanded its production capacity to meet rising demand from both the OEM and replacement segments. The total **installed capacity now exceeds 200 million tyres annually**, reflecting cumulative investments made over the past decade. According to recent estimates by **ICRA and Automotive Tyre Manufacturers' Association (ATMA)**, a

fresh wave of investments—estimated at over **₹25,000 crore between 2021 and 2025**—has been directed primarily toward enhancing **Truck and Bus Radial (TBR)** capacity, as well as supporting the growing demand for **passenger car, two-wheeler, and electric vehicle (EV) tyres**. The TBR segment alone continues to attract nearly **50% of total capex**, given its strong growth trajectory and increasing radialisation. Leading players such as **MRF, Apollo, JK Tyre, CEAT, and Bridgestone** have launched major greenfield and brownfield expansion projects across Tamil Nadu, Gujarat, Madhya Pradesh, and Telangana.

Tyre Industry Investment Overview (2021-2025)

Players	Investment (In Crore)	Products	Expected date of Completion
MRF Ltd.	4200	PCR, TBR & EV	FY 2025
Apollo Tyres	3800	TBR, EV & OTR	FY 2025
JK Tyre	3500	TBR & PCR	FY 2024
CEAT Ltd.	3100	2W, PCR & EV	FY 2024
Bridgestone India	2800	TBR & PCR	FY 2025
Balkrishna Industries	2600	Speciality, OTR & Agri	FY 2024

While these expansions position the industry for long-term growth and export competitiveness, they also introduce **short-term margin pressures** due to elevated **raw material costs, high logistics expenses, and rising debt servicing obligations**. Nonetheless, the sector remains optimistic, driven by rising vehicle penetration, infrastructure growth, and the push toward EV-compatible tyres.

— **Vast Distribution Network**

The Indian tyre industry has developed a **robust and extensive distribution and marketing network** that ensures deep market penetration across urban, semi-urban, and rural areas. Most tyre companies operate through a multi-tiered system comprising **national distributors, large regional dealers, sub-dealers, and retail outlets**. As of 2024, there are **over 6,500 tyre dealers** operating across the country, including service hubs and fitment centers.

This well-structured distribution network plays a crucial role, particularly in the **replacement market**, which accounts for a significant share of overall tyre sales in India. Tyres of all categories — including **passenger vehicles, commercial vehicles, two-wheelers, agricultural, and OTR tyres** — are now readily available even in **remote villages and Tier-3 towns**, ensuring timely availability and aftermarket support. Companies have also enhanced their reach through **digital dealer platforms**,

doorstep delivery services, and tyre servicing mobile vans, making tyre access more convenient for end-users.

This widespread distribution capability has become a **key competitive advantage** for Indian tyre manufacturers, enabling them to maintain high customer retention, ensure brand presence across geographies, and respond swiftly to market demands.

SO, IS THERE ANYTHING TO BE CONCERNED ABOUT?

Despite strong growth prospects, the Indian tyre industry continues to face several challenges that could impact its long-term profitability and competitiveness. These concerns are rooted in **cost volatility, pricing pressure, weak exports, and capital constraints**.

1. Volatile Raw Material Prices

Natural rubber remains the most critical raw material for tyre manufacturing, accounting for a significant portion of production costs. However, rubber prices have historically been **highly volatile**, influenced by seasonal production cycles, global commodity markets, and geopolitical developments. As of FY 2024–25, fluctuations continue to pose a **major risk to margins**. For instance, the price of natural rubber has ranged between **₹140–₹190 per kg** in the past year, creating uncertainty in cost planning. Limited domestic supply and heavy dependence on imports further exacerbate this issue. The price volatility of other inputs like **synthetic rubber, carbon black, and crude derivatives** also adds to the burden.

2. Inability to Pass on Cost Increases to OEMs

Tyre manufacturers often face **limited pricing power with OEMs (Original Equipment Manufacturers)** due to high volume commitments and competitive pressure. When raw material prices surge, tyre companies are unable to immediately revise prices for their OEM clients, leading to margin compression. While manufacturers traditionally had stronger pricing power in the **replacement market**, this has recently weakened due to the **influx of cheaper Chinese imports**, which offer lower-priced alternatives to Indian tyres. Increased import penetration and the risk of **backward integration by vehicle manufacturers** (producing tyres in-house) could further dilute industry pricing flexibility.

3. Stagnant Exports Due to Low-Cost Global Competition

Although Indian tyres are known for their **quality and performance**, export growth has remained relatively **stagnant**, contributing only **5–10% of the industry's total turnover**. The primary reasons include **capacity limitations, higher input costs, and stiff competition from low-cost manufacturing hubs** like China, Vietnam, and Thailand. These countries have an edge in tyre exports due to **economies of scale, government subsidies, and cheaper raw materials**, making it difficult for Indian manufacturers to compete on price in global markets. This has limited the international

growth potential for Indian tyre companies despite strong brand acceptance in regions like Africa, Latin America, and Southeast Asia.

4. Rising Interest Rates and Cost of Capital

The tyre industry is **highly capital-intensive**, with companies investing thousands of crores into capacity expansion, technology upgrades, and R&D. Much of this capex is financed through debt, exposing firms to the risk of **rising interest rates**. In recent years, the **Reserve Bank of India (RBI)** has steadily increased benchmark lending rates to manage inflation, making borrowing more expensive. For tyre manufacturers carrying large debt loads, this results in **higher financing costs**, which erodes profit margins and slows the return on investment for large-scale projects. Companies that are over-leveraged may also face **credit risk** or delays in expansion timelines.

DEMAND DRIVERS OF THE INDIAN TYRE INDUSTRY

The Indian tyre industry is closely linked to the overall performance of the automotive sector and the economy at large. Demand is driven by a combination of industrial activity, consumer purchasing trends, infrastructure development, and technological shifts like radialisation. Below are the key demand drivers shaping the industry in 2025:

1. Industrial and Freight Activity

The **Truck and Bus (T&B)** segment remains one of the most significant contributors to tyre demand in India. Although it accounts for only about **20% of tyres produced by volume**, it contributes the **highest share by value** due to the premium pricing of truck and bus radials (TBRs), which are often **8–10 times more expensive than passenger car tyres**. Each new truck or bus manufactured creates an immediate demand for approximately **seven tyres** (including spares), and additional ongoing replacement demand is driven by logistics, e-commerce, and freight movement. With India investing heavily in infrastructure and highways, this segment is poised for further growth.

2. Personal Purchasing Power and Middle-Class Expansion

India's growing middle class continues to drive demand in the **passenger car and two-wheeler segments**. Rising **disposable income**, greater access to credit, and aspirations for private vehicle ownership have led to steady growth in automobile purchases. This trend directly translates into increased tyre demand both from **OEMs (Original Equipment Manufacturers)** and the **replacement market**. In 2024–25, the surge in **urban car sales and rural two-wheeler adoption** has further reinforced this upward trend, making personal mobility a key demand driver.

3. Automobile Production and OEM Demand

Tyre demand from OEMs is **derived demand**, directly tied to the production of vehicles across categories — including two-wheelers, cars, commercial vehicles, and agricultural machinery. While the industry experienced a temporary slowdown during the COVID-19 years and due to the global chip shortage, production has now bounced back strongly, supported by **Make in India, PLI schemes**, and EV policy incentives. OEMs are increasingly sourcing **radial and EV-compatible tyres**, creating new opportunities for specialised product lines.

4. Replacement Market Demand

The **replacement market contributes nearly 60–65% of tyre sales by volume** and remains a stable source of demand. Unlike OEM demand, it is not seasonal and is spread throughout the year. Increased vehicle parc (on-road population), extended vehicle usage cycles, and growing road connectivity are ensuring consistent growth in replacement tyre sales. As consumer awareness around **tyre safety, fuel efficiency, and ride comfort** increases, premium replacement tyres are also gaining popularity.

5. Radialisation Opportunity

Radialisation continues to be a major structural growth driver in the Indian tyre industry. While the **passenger vehicle segment is nearly 98% radialised**, the **T&B segment still has scope to grow from the current 45% to 70%** over the next few years. With improved road infrastructure, rising fleet sophistication, and awareness of the long-term cost benefits of radial tyres, this trend is expected to accelerate, particularly in the commercial vehicle space.

6. Export Potential

Although exports currently account for around **10–12% of the industry's turnover**, the demand for high-quality Indian tyres is increasing in markets like **Africa, Latin America, and Southeast Asia**. However, the sector faces strong competition from **China, Vietnam, and Thailand**, which benefit from lower production costs and state subsidies. Promoting **“Brand India”** for tyres, highlighting their quality and reliability, can help expand global market share. Enhanced trade agreements and competitive pricing will be key to tapping global demand more effectively.

7. Road and Infrastructure Development

India's massive investment in **highway expansion, rural connectivity, and logistics corridors** continues to boost commercial vehicle movement and, by extension, tyre demand. Initiatives like **Bharatmala, Gati Shakti**, and **Smart Cities Mission** are laying the foundation for long-term growth in tyre consumption across vehicle categories. Better roads also support radialisation, fuel efficiency, and increased tyre life.

CHAPTER 3

COMPANY PROFILE

3.1 COMPANY PROFILE: APOLLO TYRES LTD

Apollo Tyres Ltd. is one of India's most prominent tyre manufacturers and currently ranks among the top 10 global tyre companies by revenue. Headquartered in Gurugram, Haryana, the company has built a strong reputation for delivering high-performance tyres across vehicle segments, including passenger vehicles, commercial trucks, two-wheelers, and off-road equipment.

Founded on 28th September 1972, Apollo began its operations with its first manufacturing facility in Perambra, Thrissur, Kerala, which became operational in 1977. Since then, the company has grown exponentially, expanding both its product range and global footprint.

Its domestic manufacturing strength now includes four major plants located in Kerala, Gujarat, Tamil Nadu, and Andhra Pradesh, with additional international facilities in Enschede (Netherlands) and Gyöngyöshalász (Hungary).

3.1.1 GLOBAL OPERATIONS AND MARKET PRESENCE

As of FY 2023–24, Apollo Tyres reported consolidated revenues of over ₹21,600 crore (~USD 2.6 billion), with India contributing 67% of total revenue, followed by Europe at 28%, and the remainder from other international markets. The company sells its products in more than 120 countries through a network of 6,000+ dealers, including over 2,800 exclusive outlets across India.

Apollo's European operations were significantly bolstered through its 2009 acquisition of Vredestein Banden B.V. (Netherlands), and the 2015 acquisition of Reifencom GmbH in Germany, a leading tyre distributor with both offline and e-commerce retail platforms. In a strategic move, Apollo shifted its European regional headquarters to Amsterdam, streamlining operations and decision-making across its European business.

Manufacturing & R&D Capabilities

Apollo continues to invest in state-of-the-art R&D infrastructure, with two Global R&D Centres—one in Enschede, Netherlands and the other in Chennai, India.

These centres focus on advanced tyre technologies, EV-compatible tyres, rolling resistance reduction, and smart tyre systems. The company has also introduced tyres embedded with sensors for fleet tracking and wear detection, targeting logistics and commercial fleet customers.

Its newest manufacturing facility in Chinnapanduru village near Sri City, Andhra Pradesh, inaugurated in phases since 2022, is built over 200 acres with an estimated investment of ₹1,800 crore.

This plant focuses on Passenger Car Radial (PCR) and two-wheeler tyres, with an initial capacity of 5.5 million units per year, serving both domestic and export markets. Apollo is also exploring expansion of this site to accommodate future demand, especially in the EV segment.

Two-Wheeler Segment and Southeast Asia Expansion

Apollo entered the two-wheeler tyre segment in 2016 and has since gained a firm foothold in the category through contract manufacturing and strategic plant integration.

The company's first international service centre in Malaysia marked its foray into Southeast Asia's competitive retail market, aligning with its global expansion strategy.

Sustainability and Strategic Direction

In line with global ESG trends, Apollo Tyres has committed to sustainability initiatives, including reducing its carbon footprint, adopting renewable energy at its plants, and implementing green tyre technologies.

The company is also working toward meeting UN Sustainable Development Goals (SDGs) by enhancing worker safety, water conservation, and waste reduction practices across its production sites.

Apollo's Vision 2026 strategy outlines its ambitions to double exports, expand into North America, and launch next-gen EV tyres.

It also plans to digitize its dealer and service network, launch AI-driven tyre diagnostics, and strengthen its position in the premium and performance tyre segment globally.

From a single plant in Kerala to becoming a global tyre powerhouse, Apollo Tyres Ltd. has evolved into a diversified, innovation-led multinational with a strong presence in both mature and emerging markets.

With its commitment to quality, innovation, and sustainability, Apollo is well-positioned to meet the demands of modern mobility in an increasingly competitive and technology-driven world.

Year	Event
1976	Apollo Tyres was registered
1977	1st plant established at Perambra, Kerala, India
1991	2nd plant established at Limda, Gujarat, India
1994	Started selling tyres for 2-wheelers
1995	3rd plant established at Kalamassery, Kerala, India
2000	Exclusive radial capacity set up in Baroda
2004	Launched Apollo Acelere 'H' Speed Rated Car Radials
2005	Perambra plant completed 30 years
2006	Acquired Dunlop's Africa operations
2008	New plant inaugurated at Chennai, Tamil Nadu, India
2009	Acquired Netherlands-based Vredestein Banden B.V. (VBBV)
2015	Acquired Germany's Reifencor for €45.6 million
2017	Started first Greenfield plant in Hungary with advanced technology
2018	Foundation laid for ₹1,800 crore plant in Andhra Pradesh (Sri City)
2022	Commenced production at Andhra Pradesh plant (PCR and 2W tyres)
2024	Launched connected smart tyres and EV-specific models in India

VISION

A global leader in the tyre industry, Apollo Tyres aims to be the brand of choice by delivering exceptional value to customers, driving innovation, and continually enhancing stakeholder satisfaction across geographies.

OBJECTIVE

Apollo Tyres remains committed to sustainable growth by maximizing output while minimizing resource consumption. With a long-term vision, the company emphasizes eco-conscious manufacturing, efficient energy usage, and responsible sourcing to create value for the present and preserve resources for future generations.

GOAL

The core goal of Apollo Tyres is to build a sustainable, innovation-driven business that creates long-term value for its stakeholders. This includes achieving strategic global expansion, excelling in technological advancement, and operating with integrity and environmental responsibility.

VALUES

- **Customer First** – Deliver superior quality and service
- **Business Ethics** – Uphold transparency and accountability
- **Care for Society** – Act responsibly towards communities and the environment
- **Empowerment** – Foster growth and learning at all levels
- **Communicate Openly** – Encourage dialogue and collaboration
- **One Family** – Promote unity across global teams

3.1.2 MANUFACTURING CENTERS

Plants Located in India:

- Apollo Tyres Ltd., **Perambra**, Kerala
- Apollo Tyres Ltd., **Kalamassery**, Kerala
- Apollo Tyres Ltd., **Limda**, Gujarat
- Apollo Tyres Ltd., **Chennai**, Tamil Nadu
- Apollo Tyres Ltd., **Chinnapanduru (Sri City)**, Andhra Pradesh

Plants Located Abroad:

- Apollo Tyres **Vredestein B.V.**, Netherlands
- Apollo Tyres, **Gyöngyöshalász**, Hungary
- Apollo Tyres (Contract Operations), **Malaysia, Thailand, and UAE**

PERAMBRA PLANT

The Perambra plant remains Apollo's flagship facility and is recognized as India's largest truck and bus tyre plant. Spanning 95 acres, it operates with a daily capacity of 3.3 metric tonnes. The plant employs over 3,000 personnel, including 2,043 permanent employees, 677 contract workers, and 280 apprentices. It contributes an estimated ₹2,800 crore annually to the company's revenue and plays a crucial role in servicing Apollo's TBR and PCR segments.

CORPORATE STRATEGY

Apollo Tyres' strategy centers on product diversity, global expansion, and technology leadership. With dedicated Global R&D Centres in India and Europe, the company is actively innovating for EV-compatible tyres, low rolling resistance models, and smart tyre systems. Apollo leverages advanced automation, digital integration, and sustainability initiatives to meet global demand while remaining cost-efficient and competitive.

MARKETING STRATEGY

Apollo Tyres continues to strengthen its market leadership in the passenger vehicle segment through the success of its Apollo Aspire 4G and Amazer XP series. The company holds over 17% share in the domestic replacement market, up from 13.5% two years ago.

With a daily production capacity of over 40,000 passenger vehicle tyres, Apollo serves a wide spectrum — from entry-level hatchbacks like Maruti Alto to premium sedans like the Audi A4.

Its marketing strategy focuses on premium positioning, digital consumer engagement, and expanding its presence in Tier 2 and Tier 3 cities, while aggressively pursuing export opportunities in Europe, Southeast Asia, and the Middle East.

3.2 FINANCE AND FUTURE

1. Raw Material Price Volatility

Natural rubber continues to be the most cost-sensitive component in tyre production, and its pricing remains volatile due to agricultural supply fluctuations, climate impact, and international demand. Additionally, a large portion of other raw materials, such as synthetic rubber, carbon black, and chemicals, are crude oil derivatives, making them susceptible to global crude price volatility. In 2024–25, this has been further complicated by geopolitical tensions and shipping disruptions, leaving manufacturers exposed to sharp input cost swings, with limited scope for internal mitigation.

2. Ability to Pass on Increasing Cost in a Timely Manner

While tyre manufacturers strive to maintain margins, their ability to pass on cost escalations—especially in India—is constrained. OEM clients negotiate at bulk rates and are resistant to price hikes, even when input costs rise. Though the replacement market offers slightly more pricing flexibility, rising competition from imported low-cost tyres (mainly from China and Southeast Asia) has limited headroom for significant price revisions. As a result, margin pressure remains, particularly in price-sensitive product segments.

3. Continued Economic Growth

The tyre industry is directly influenced by GDP growth, infrastructure investment, and automotive production trends. Any slowdown in economic activity, whether domestic or global, impacts demand across OEM and replacement segments. In Europe, Apollo's winter tyre sales remain vulnerable to mild weather conditions, which reduce seasonal demand. In India, inflationary pressures and interest rate fluctuations also impact vehicle sales, particularly in the two-wheeler and commercial vehicle categories.

4. Radialisation Levels in India

The pace of radialisation in the Truck and Bus (T&B) segment has increased in recent years, now standing around 45–50%, but it still trails global standards. A slower-than-expected increase in radialisation can lead to underutilization of radial production capacity and impact overall profitability. Conversely, if radialisation accelerates rapidly, cross-ply production lines may become obsolete faster, requiring urgent capital expenditure for capacity restructuring. Balancing this transition remains a strategic priority for Apollo and the broader industry.

5. Future Growth

Apollo Tyres' future growth depends on managing cost structures, investing in technology, and responding to global competition. Global majors such as Michelin, Bridgestone, Continental, and Pirelli are expanding their presence in India, intensifying pricing and distribution competition. Lower margins due to raw material costs and pricing constraints could limit Apollo's ability to invest aggressively in expansion, R&D, and innovation. Maintaining profitability while expanding global market share will be key to sustaining long-term growth and shareholder value.

3.3 SWOT ANALYSIS

3.3.1 STRENGTHS

- **Diversified global footprint:** Apollo Tyres has a strong presence in both domestic and international markets, reducing dependency on any single geography. It operates in over 120 countries, with manufacturing in India, Hungary, and the Netherlands.
- **Robust brand portfolio:** The company's two core brands – **Apollo** (emphasizing value and performance) and **Vredestein** (positioned as a premium brand in Europe) – cater to different customer segments across markets.
- **Strong distribution network:** Apollo maintains a network of over 6,000 dealers in India, including 2,800 exclusive outlets, and a well-developed B2C channel in Europe, ensuring wide accessibility of its products.
- **Established premium presence in Europe:** Vredestein is well-recognized in UHP, winter, and all-season segments, giving Apollo a premium edge in developed markets.
- **Leadership in Indian commercial tyre segment:** Apollo has long held a dominant position in the **truck-bus radial (TBR)** category, benefiting from early adoption and ongoing demand from India's logistics and infrastructure sectors.

3.3.2 WEAKNESSES

- **Low presence in the 2–3 wheeler segment:** Despite its market size, Apollo has **limited penetration** in India's massive two- and three-wheeler tyre market, ceding space to rivals like CEAT, MRF, and TVS Eurogrip.
- **Margin pressure due to raw material cost pass-through challenges:** Competitive pricing and bulk contracts with OEMs limit Apollo's ability to quickly **adjust prices** in response to rising input costs, particularly for **natural rubber and crude-derived materials**.
- **Limited OEM presence in European PV segment:** Apollo lacks meaningful participation in the **European OEM passenger vehicle space**, which restricts downstream growth in the **replacement tyre market** on that continent.

3.3.3 OPPORTUNITIES

- **First-mover advantage in India's TBR radialisation:** Apollo's capacity and market share in the truck and bus radial segment provide it with a **strategic advantage** as radialisation increases in India.
- **Passenger vehicle tyre expansion in Europe:** Apollo-branded PV tyres are gaining traction in Europe, leveraging **existing distribution and service infrastructure** built for Vredestein.
- **Hungary plant as a competitive edge:** The **Greenfield facility in Hungary** supports Apollo's ambitions to expand in **Europe** while maintaining cost efficiency in production and logistics.
- **Expansion in new geographies:** The company is actively entering **South America, the Middle East, and Southeast Asia**, which are **growth markets for replacement and budget tyre segments**.
- **Product diversification via capacity conversion:** Excess bias-ply capacity could be converted to produce **OHT (Off-Highway Tyres)** or **industrial tyres**, tapping into niche but growing categories.
- **OEM partnerships in Europe:** Apollo is pursuing tie-ups with **European auto manufacturers**, which would boost **brand visibility**, volume, and acceptance in competitive PV and CV segments.
- **New product segments:** Apollo aims to enter the **European truck, bus, and OHT markets**, especially with demand shifting toward **smart and EV-compatible tyres**.

3.3.4 THREATS

- **Macroeconomic slowdowns:** Economic uncertainty in key markets such as **India and the EU** can directly impact tyre demand, especially in OEM and commercial categories.
- **Rising competition from global players:** **Michelin, Bridgestone, Continental, and Pirelli** continue to expand in India, putting pressure on both premium and mid-tier segments.
- **Import pressure from China:** A surge in **cheap radial tyre imports** from China threatens domestic market share and may accelerate the obsolescence of Apollo's remaining cross-ply facilities.
- **Volatile raw material prices:** Fluctuations in **natural rubber and crude oil derivatives** remain a key concern for margin stability.
- **Currency risk:** As a net importer of raw materials and components, Apollo faces foreign exchange risk, particularly during **rupee depreciation**.
- **Growth of budget brands in Europe:** The increasing popularity of **low-cost Tier 2 and Tier 3 brands**, especially from Eastern Europe and Asia, poses a threat to Vredestein's premium market share.

3.4 PRODUCTS OF THE COMPANY

Apollo Tyres offers a wide and evolving range of products catering to multiple vehicle segments and terrains. The company's diversified portfolio includes:

- **Passenger Car Tyres**
- **Alloy Wheels (select premium variants)**
- **SUV and Sports Utility Tyres**
- **Van and Light Commercial Vehicle (LCV) Tyres**
- **Passenger Winter Tyres** (especially under the Vredestein brand in Europe)
- **Heavy Commercial Vehicle (HCV) Tyres**
- **Small Commercial Tyres**
- **Agricultural and Off-Highway Tyres (OHT)**
- **Tubeless Tyres** (standard across most product lines)
- **EV-Compatible Tyres** (latest addition for electric cars and two-wheelers)
- **Smart Connected Tyres** with sensors (for fleet and logistics operators)

Apollo continues to invest in product innovation, particularly for high-performance, fuel-efficient, and electric vehicle applications.

3.5 CURRENT MARKET STATUS

As of 2025, **Apollo Tyres Ltd. ranks among the world's top 10 tyre manufacturers**, with annual consolidated revenues exceeding **₹21,600 crore (US\$2.6 billion)**. It remains **India's third-largest tyre company** after **MRF and CEAT**, with a strong presence in both domestic and global markets. The company now operates:

- **Five manufacturing facilities in India** (Perambra, Kalamassery, Limda, Chennai, Sri City)
- **Two advanced international plants** (Hungary and Netherlands)

Apollo has a global workforce of **over 19,000 employees from 25+ nationalities** and exports to **over 120 countries**, supported by a vast dealer network and strategic partnerships.

3.6 FUTURE EXPANSION

Apollo Tyres is strategically focused on both **organic and inorganic growth**, aiming to expand manufacturing, enter new markets, and invest in sustainability.

- The rising acceptance of **re-treading** poses a medium-term challenge to the **replacement tyre market**, but Apollo views this as an opportunity to **develop high-quality retreadable radials**.
- Growing **OEM demand** for two-wheelers and passenger vehicles in India is expected to **boost tyre demand** in both the OEM and replacement segments.

- The company is strengthening its global export strategy through **outsourcing agreements** and partnerships in **Southeast Asia, Eastern Europe, and Latin America**.
- **Cross-ply truck and bus tyre exports** to developing nations are on the rise, especially as developed markets phase out production in that category.
- Apollo is expanding **dealership networks** in Tier 2 and Tier 3 cities and rolling out **innovative outreach initiatives** such as "**Dial-a-Tyre**" services, roadshows, and mobile fitment vans.

The company is also expected to play an active role in the **consolidation of the Indian tyre industry** through **alliances, M&As, and strategic collaborations**. Its future growth strategy includes expanding its OHT (Off-Highway Tyres) production and building on **digital transformation and sustainable practices**.

Apollo also continues to demonstrate its commitment to community development through "**Mission 2024**", the successor to its earlier sports initiative, focusing on **youth empowerment, skill development, and sports infrastructure**.

3.7 CORPORATE SOCIAL RESPONSIBILITY (CSR)

Apollo Tyres Ltd. strongly believes that the sustainability of its business depends on the sustainability of the environment and the communities in which it operates. The company's **Corporate Social Responsibility (CSR)** initiatives are rooted in its long-standing commitment to "**continuously enhancing stakeholder value**"—a principle that goes beyond business performance and financial returns.

CSR at Apollo is not a peripheral activity, but a core strategic function that aligns with its **vision, values, and long-term goals**. The company recognises that no business can thrive in isolation and that a strong, healthy, and skilled community is essential for inclusive growth. As a result, Apollo's CSR framework is designed to ensure **community upliftment, environmental stewardship, and social innovation** through sustainable, measurable, and impactful interventions.

The CSR philosophy is built around the **3I Framework** — **Involve, Influence, and Impact** — reflecting the company's focus on creating deep community relationships, encouraging behaviour change, and driving long-term transformation. The **Apollo Tyres Foundation (ATF)** is the dedicated arm that conceptualizes, implements, and monitors CSR programmes across multiple regions.

Most initiatives under CSR are designed to span **three to five years**, with Apollo entering into strategic partnerships with **NGOs, local authorities, academic institutions, healthcare providers, and multilateral organizations** to scale up the effectiveness and reach of its interventions.

3.7.1 Focus Areas of CSR Initiatives

Apollo Tyres concentrates its CSR efforts in **two major verticals**:

1. Social Development

- **Health Awareness and Preventive Care:**
Apollo runs continuous programmes focused on **HIV/AIDS, malaria, tuberculosis, COVID-19 recovery, and reproductive health**—especially among **truckers, rural populations, and factory workers**. Apollo’s Mobile Health Units (MHUs) and health camps are deployed in high-risk corridors to ensure access to basic healthcare.
- **Vision Care Programme:**
Targeted at long-haul drivers and underserved populations, this initiative offers **free eye check-ups, prescription glasses, and referrals for surgeries**.
- **Road Safety Education:**
Apollo conducts **school-based road safety programs**, training for commercial drivers, and city-wide awareness campaigns to reduce road fatalities.
- **Skill Development & Livelihood Generation:**
The company runs **vocational training centres** focusing on automotive repair, tyre services, retail, and computer literacy to **empower youth and women**, especially in Tier-2 and rural regions.
- **Women's Empowerment & Menstrual Health:**
Focused interventions include **sanitation awareness, menstrual hygiene training, and micro-entrepreneurship models** for women-led enterprises in Apollo’s plant communities.

2. Environmental Sustainability

- **Climate Action Initiatives:**
Apollo integrates **carbon reduction strategies** into both CSR and business operations, such as using **solar panels, rainwater harvesting, and energy-efficient machinery** at plant sites.
- **Water Resource Management:**
Projects include **watershed restoration, dead pond rejuvenation, check dam construction, and groundwater recharge** systems in drought-prone villages near its facilities.
- **River and Mangrove Conservation:**
Apollo supports **mangrove reforestation, riverbank stabilization, and wetland revival projects**, contributing to biodiversity and disaster resilience.
- **Waste and Plastic Management:**
Initiatives include **community waste segregation training, paper recycling, and plastic-free village campaigns**, with measurable reductions in waste output.
- **Tree Plantation and Green Belts:**
Under the “**Habitat at Apollo**” programme, thousands of trees have been planted in and around factory locations, contributing to carbon sequestration and microclimate improvement.

Flagship and Thematic Programs

- **Cancer Awareness and Screening Camps**
- **Safe Mobility and Tyre Care Awareness Drives**
- **Sustainable Farming Workshops for Rural Communities**
- **Digital Literacy and Financial Inclusion Workshops**

Apollo also encourages **employee volunteering**, aligning individual passion with corporate purpose through structured **CSR engagement days**, allowing staff to contribute to social change first-hand.

Impact and Way Forward

Apollo's CSR vision is to build **resilient, healthy, and self-sustaining communities**. Through its holistic programmes, the company aims to **not only mitigate operational risks** but also **create shared value** for all stakeholders. Apollo measures the impact of its CSR initiatives through **independent evaluations, community feedback, and key performance indicators** (KPIs) to ensure transparency and continuous improvement.

As the company expands its global footprint, it remains committed to implementing CSR programmes that **align with the UN Sustainable Development Goals (SDGs)**, particularly those related to **Good Health & Well-being (SDG 3)**, **Clean Water (SDG 6)**, **Climate Action (SDG 13)**, and **Decent Work & Economic Growth (SDG 8)**.

CHAPTER 4

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The review of literature is a vital component of any scientific research as it provides a comprehensive understanding of previous studies, highlights research gaps, and offers a solid foundation for the current investigation. It enables the researcher to gain insights into existing theories, concepts, and methodologies, thereby aiding in the development of a suitable analytical framework. In the context of this study, the focus is on inventory management, which refers to the stock of goods, raw materials, and finished products held by a company to support production and sales operations. Inventory is considered a current asset in accounting and plays a crucial role in ensuring operational efficiency. This review explores past studies related to inventory control techniques such as EOQ, JIT, and ABC analysis, and emphasizes the growing relevance of digital tools like Power BI in optimizing inventory processes. By integrating real-time data visualization and analytics, modern inventory management systems have evolved to support faster decision-making, reduce holding costs, and improve overall supply chain performance.

4.1 BRIEF THEORETICAL CONSTRUCT RELATED TO THE PROBLEM

Inventory management refers to the strategic oversight and control of a company's non-capitalized assets and stock items, serving as a critical component of supply chain management. It ensures a smooth flow of goods from manufacturers to warehouses and ultimately to the point of sale, maintaining accurate records of products as they enter or exit inventory locations. Effective inventory management is essential for the operational efficiency and long-term success of any goods-based business, as it helps balance carrying and ordering costs, avoids stockouts, supports seamless production and sales operations, and prevents product losses or mismanagement.

A well-implemented inventory system enhances visibility across storage locations, facilitates timely stock replenishment, and provides real-time insights into inventory valuation. Key benefits include accurate order fulfillment, which reduces customer dissatisfaction and returns; better inventory planning, which avoids overstocking or understocking; and improved customer satisfaction through timely and error-free deliveries.

In the modern retail and e-commerce environment, robust inventory control not only optimizes storage space and reduces costs but also builds customer loyalty by ensuring reliability and responsiveness.

4.2 INVENTORY MANAGEMENT PROCESS

Inventory management is a critical operational function that involves tracking and controlling the flow of goods from the point of receipt to final delivery. While the complexity of the process may vary depending on the size and structure of the organization, the fundamental steps remain consistent. Typically, goods enter the warehouse as raw materials or components through a receiving area and are stored in designated stock locations. In smaller

enterprises, where space and process layers are limited, goods may be moved directly to the stock area. In wholesale distribution models, these items are often finished products rather than raw materials. As needed, materials are pulled from stock for use in production, where they are transformed into finished goods. These finished items are either returned to inventory for storage or shipped directly to customers. Throughout this cycle, inventory management systems record key data such as lot and serial numbers, quantity, movement dates, and cost of goods. This information ensures accurate tracking, reduces errors, and supports timely and efficient inventory flow across the supply chain.

4.2.1 INVENTORY MANAGEMENT SOFTWARE SYSTEM

Inventory management software systems have evolved significantly from basic spreadsheets used to track stock levels to sophisticated platforms that integrate deeply with accounting and enterprise resource planning (ERP) systems. Modern inventory software not only monitors quantities across multiple warehouse locations but also manages data on costs, currencies, batch numbers, and movement histories, providing businesses with real-time insights into inventory value and availability. These systems support inventory tracking across various geographic regions and help maintain financial accuracy by syncing inventory valuations with accounting records.

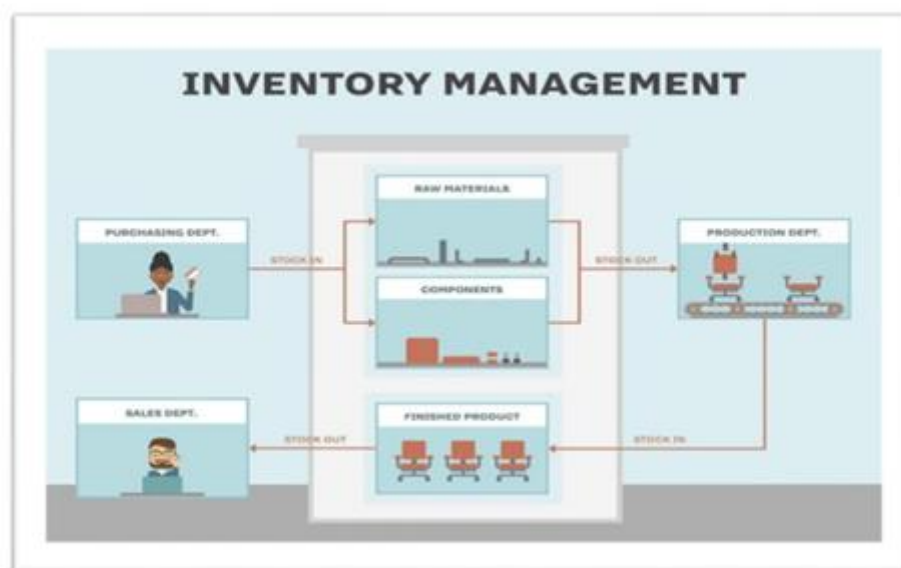


Fig 3.1 inventory management

Large enterprises often implement customized, feature-rich solutions that may operate on-premises or in cloud-based environments, including public, private, or hybrid clouds. In contrast, small and mid-sized businesses usually prefer more affordable, streamlined systems offered as Software-as-a-Service (SaaS), which provide essential inventory functionalities

without the need for extensive IT infrastructure. Regardless of the scale, inventory management software plays a pivotal role in improving operational efficiency, reducing stock discrepancies, and enabling data-driven decision-making.

4.2.2 INVENTORY MANAGEMENT TECHNIQUES

Inventory management employs various techniques and methodologies to ensure that the right products are available in the right quantities at the right time—minimizing costs while meeting customer demands. This task becomes increasingly complex in modern organizations managing thousands of stock keeping units (SKUs) across multiple warehouses and supply chains. Technological advancements like **Power BI dashboards**, **ERP systems**, **AI-based forecasting tools**, and **IoT-enabled tracking** have revolutionized traditional practices, making them more data-driven and responsive. Below are the key techniques still relevant today, now enhanced with modern tools for smarter inventory control:

1. Stock Review

Stock review is the most basic yet essential method, typically used by smaller businesses. It involves regularly analyzing current stock against projected demand. With tools like **Power BI**, businesses can automate stock-level monitoring, receive alerts when stock hits minimum thresholds, and generate real-time reorder recommendations. While still somewhat manual, stock review is increasingly being automated using **barcode systems** and **inventory control modules** in **cloud-based platforms** like **Zoho Inventory**, **QuickBooks**, or **Microsoft Dynamics 365**.

2. Just-in-Time (JIT)

Just-in-Time inventory is a lean methodology aimed at reducing inventory waste and storage costs by receiving goods only when they are needed in the production process or for sales. This technique has gained new momentum with the adoption of **AI-based demand forecasting**, **location-based analytics**, and **machine learning algorithms** integrated into platforms like **SAP S/4HANA**, **Oracle NetSuite**, and **Power BI**. Despite its advantages—like lower holding costs and improved cash flow—JIT remains sensitive to **supply chain disruptions** and **logistics delays**, which were highlighted during the COVID-19 pandemic and the global shipping crisis of 2021–2022.

Advantages:

- Reduced holding costs and inventory waste
- Enhanced cash flow and working capital
- Streamlined operations

Disadvantages:

- High risk during supply disruptions
- Dependence on accurate forecasting
- Potential for stockouts

3. ABC Analysis

ABC analysis categorizes inventory into three segments based on their value and frequency of use:

- **A:** High-value, low-quantity items
- **B:** Moderate-value, moderate-quantity
- **C:** Low-value, high-quantity items

In 2025, ABC analysis is frequently automated through **AI-powered inventory classification tools** and **Power BI visualizations**, which dynamically adjust categories based on real-time consumption patterns, product velocity, and profit margins. Retailers and manufacturers are also using **predictive analytics** to reevaluate category weights seasonally or monthly.

Advantages:

- Better demand forecasting
- Improved inventory optimization
- Efficient resource allocation

Disadvantages:

- May overlook emerging or trending products
- Requires regular updates and manual oversight

4. Economic Order Quantity (EOQ)

EOQ calculates the ideal quantity to order that minimizes total inventory costs—specifically holding and ordering costs—under conditions of consistent demand. Today’s ERP systems, including **TallyPrime**, **Odoo**, and **SAP**, include EOQ calculators, and platforms like **Power BI** can visualize the trade-off between order frequency and carrying cost. While EOQ is useful for stable environments, its assumptions limit its utility during market volatility or seasonal demand shifts.

5. VED Analysis

VED Analysis classifies inventory based on criticality to production:

- **Vital:** Absence leads to immediate halt in operations
- **Essential:** Stockouts cause high losses and delays
- **Desirable:** Stockouts have minor impact

Modern VED systems are now supported by **priority tagging in inventory management software**, where items are digitally flagged for auto-replenishment. **Power BI dashboards** and **cloud ERP tools** allow production planners to visualize risk impact, reorder timelines, and critical item availability instantly.

6. SDE Analysis

SDE Analysis classifies items based on procurement complexity:

- **Scarce:** Items hard to procure or sourced from limited suppliers
- **Difficult:** Require long lead times or are geographically restricted
- **Easy:** Readily available with minimal procurement effort

This analysis is especially useful for **global supply chain risk assessment**. Today, companies use **supplier management modules in ERP systems**, enhanced with **geospatial analytics** and **lead-time tracking**, to evaluate and rank vendors. Power BI, paired with procurement data, offers visual SDE matrices to support risk-informed purchasing decisions.

4.2.3 TOOLS & TECHNOLOGIES USED IN MODERN INVENTORY PROJECTS

- **Power BI:** Interactive dashboards for inventory levels, reorder alerts, category-wise stock status, and lead-time tracking
- **ERP Systems:** SAP, Oracle, Odoo, Zoho, Microsoft Dynamics 365
- **Forecasting Tools:** Google Cloud Forecasting, IBM SPSS, Tableau with ML plugins
- **Inventory Apps:** Zoho Inventory, QuickBooks Commerce, Cin7, Unleashed
- **Cloud Platforms:** Amazon Web Services (AWS), Microsoft Azure, Google Cloud
- **Barcoding & RFID:** Zebra Technologies, Honeywell Scanning Solutions
- **IoT-based Monitoring:** Real-time stock level sensors in cold chain and pharma inventory

In summary, **Power BI acts as the analytical backbone** of modern inventory projects. When integrated with ERP systems, AI forecasting tools, warehouse management software, and IoT devices, Power BI transforms static inventory data into **actionable insights**, helping

businesses minimize cost, reduce waste, improve accuracy, and respond swiftly to demand fluctuations. Its flexibility, scalability, and cross-platform compatibility make it an indispensable tool for inventory optimization in 2025 and beyond.

4.3 LITERATURE SURVEY

- ▶ **L.Vinesh (1943)** articulated the fact that based on the study how to plan an inventory management, says that we keep all of our sales histories by month, and this data is all we need to make good forecast for inventory planning.
- ▶ **Hari R. Swami(1954)** in his research work "Materials Management in Public Undertakings" has evaluated the performance of materials management in the central public undertakings in Rajasthan such as, Instrumentation Limited, Kota unit; HMT,Ajmer unit; Hindustan Zink Limited, Debari unit; Hindustan Copper Limited, Kerri unit and Sandbar Salts Limited. The study covered various aspects of materials management in these enterprises from 1977-78 to 1981-82. The research opined that, materials management should not cover the inspection function, as it requires an autonomous and independent status in the organization. The study revealed that the lead- time in the selected public enterprises was considerably long and suggested to reduce administrative lead-time by expediting purchase files. The study also revealed that the inventory of selected public enterprises had been accumulated due to the following reasons; faulty purchases, heavy rejections, high lead time, uncongenial organization, lack of scientific and modern techniques of materials management, defective inventory control and inflationary tendencies in the economy. He suggested that the inventory holdings could be reduced by adopting integrated system of materials management, appointing qualified and trained inventory managers, reducing lead time, setting and regulating consumption and stocking norms of raw materials and other goods, applying modern techniques of materials management and identifying slow and non-moving items
- ▶ **Krishnamurthy's study (1964)** was aggregative and dealt with inventories in the private sector of the Indian economy as a whole for the period 1948-1961. This study used sales to represent demand for the product and suggest the importance of accelerator. Short- term rate of interest had also been found to be significant.
- ▶ **Dcshayis study (1965)** a study on inventory management system explains. The more expensive a software system is, the better it will help us to control over inventory.
- ▶ **Trinky.M (1965)** articulated the study that, inventory management is not limited to documenting the delivery of raw materials and the movement of those materials into operational process. The movement of those materials as the) go through the various stages of the operation is also important. Typically known as a goods or work in progress inventory, tracking materials as they are used to create finished goods also helps to identify the need to adjust ordering amounts before the raw materials inventory gets dangerously low or is inflated to an unfavorable level.

- ▶ **Krishnamurthy and Sastry's study in (1970)** was perhaps the comprehensive study on manufacturing inventories. They collect the comprehensive manufacturing inventory data and consolidate balance sheet data of public limited company published by RBI they say that material management is needed both micro and macro levels of an organisation.
- ▶ **K.Rajakumar(1976)** in his study on sales data and inventory management. the sales data that we have in our company records, is all we needed for inventory management.
- ▶ **Rajesh Sharma (1976)** in his study ,Just-in-Time is an inventory management philosophy that aims to reduce inventories by implementing systems and processes to supply a product or service exactly when it is needed, and how it is needed in the production process.
- ▶ **In the year (1976) Shameela Raj** in his study "Inventory" to many small business owners is one of the more visible and tangible aspects of doing business. Raw materials, goods in process and finished goods all represent various forms of inventory.
- ▶ **Rosenblatt (1977)** says: "The cost of maintaining inventory is included in the final price paid by the consumer. Good in inventory represents a cost to their owner. The manufacturer has the expense of materials and labour. The wholesaler also has funds tied up". Therefore, the basic goal of the researchers is to maintain a level of inventory that will provide optimum stock at lowest cost.
- ▶ **Paniswara (1985)** produced a research work entitled to inventory management in Andhra Pradesh State Road Transport Corporation. He mainly suggests the reclassification of stores items based on the criticality, the reification of reorder level and reorder quantities. The study also showed the wastage caused by maintenance of unnecessary stock records relating to items, which were no longer used.
- ▶ **Basel G.D., (1987)** in his study on Material Management, A Case Study of Bharat Heavy Electrical Limited, Bhopal unit, (BHEL)', has evaluated the existing systems of inventory management. He emphasized the need for automatic replenishment system in the undertaking. He also studied the application of ABC analysis and EOQ technique of inventory control. He also pointed out the accumulation of surplus stores and non- moving items in the organization. He recommended that the surplus and obsolete stores, which are no longer required, should be disposed off as early as possible at the best available price. Further, he has suggested the preparation of monthly class wise statements on inventories for effective 70 control over them. And he suggested the introduction of reconciliation of stores' ledgers with account ledgers to avoid misappropriation of stores. The study also revealed that raw material, components and Stores, and spares for production and operation are above their actual consumption level. The inventories in general are found to be above their routine requirements. The holdings of stores and spares generally are of the order of two to three years requirements and these are considered as excess.
- ▶ **Rakhav (1987)** articulated the fact that Inventory management is the process of efficiently overseeing the constant flow of units into and out of an existing inventory. This process usually involves controlling the transfer in of units in order to preventthe inventory from becoming too high, or dwindling to levels

that could put the operation of the company into jeopardy. Competent inventory management also seeks to control the costs associated with the inventory, both from the perspective of the total value of the goods included and the tax burden generated by the cumulative value of the inventory.

- ▶ **Rama Krishna Rao B study in (1987)** articulated the fact that, in his thesis inventory management in Heavy Engineering Industry a case study of Bharath Heavy Plate and vessels limited evaluated the performance of inventory. He has evaluated the existing purchase system and lead-time involved in procurement of inventory and suggests that the long lead time should be avoided.
- ▶ **According to K.Poli (1989)** from its article inventory management is a science primarily about specifying the shape and percentage of stocked goods. It is required at different location within a facility or within many location of a supply network to precede the regular and planned course of production and stock of material.
- ▶ **Keith (1994)** in their text also stated that the major objective of inventory management and control is to inform managers how much of a good to re-order, when to re-order the good, how frequently orders should be placed and what the appropriate safety stock is, for minimizing stock outs. Thus, the overall goal of inventory is to have what is needed, and to minimize the number of times one is out of stock.
- ▶ **Morris (1995)** stressed that inventory management in its broadest perspective is to keep the most economical amount of one kind of asset in order to facilitate an increase in the total value of all assets of the organization human and material resources
- ▶ **Sastry's study (1996)** was a cross-section analysis of total inventories of companies across several heterogeneous industries using balance sheet data of public limited companies in the private sector. The study brought out the importance of accelerator represented by change in sales. It also showed negative influence of fixed investment on inventory investment.
- ▶ **Drury (1996)** defined inventory as a stock of goods that is maintained by a business in anticipation of some future demand. This definition was also supported by Schroeder who stressed that inventory management has an impact on all business functions, particularly operations, marketing, accounting, and finance. He established that there are three motives for holding inventories, which are transaction, precautionary and speculative motives. The transaction motive occurs when there is a need to hold stock to meet production and sales requirements. A firm might also decide to hold additional amounts of stock to cover the possibility that it may have under estimated its future production and sales requirements. This represents a precautionary motive, which applies only when future demand is uncertain. The speculative motive for holding inventory might entice a firm to purchase a larger quantity of materials than normal in anticipation of making abnormal profits. Advance purchase of raw materials in inflationary times is one form of speculative behavior. In the year (1996), Pamela Devi did a research work entitled "Materials Management in Public Sector Heavy Engineering Industry. A Case Study of Bharat Heavy Plates and Vessels Limited, Vishakhapatnam." She did a comparative study of inventor} management practices of BHPV with the public sector heavy engineering units. She also observed that the

number of items in the inventory is on the increase and she suggested that enforcing strict control on the delegation of powers should curb it. For determination of the appropriate quantity to be procured and minimum capital without any delay in the production is of importance, in satisfying the conflicting interests. For it, she gave some solutions like SIM (selective inventory management) which consists of Pareto analysis (ABC analysis), criticality analysis (VED analysis), movement analysis (FSN analysis) and availability analysis (SED, GOLF, SOS etc.). Adoption of inventory control methods like classification, codification, and standardization, variety reduction, value analysis, ABC analysis is not systematically implemented. Economic order quantity was not adopted. Vender rating techniques and value analysis were not followed. Materials management manuals were not even prepared in BHPV. Buying cost or inventory carrying cost of materials was not worked out systematically. Computerization was not extensively done.

- ▶ **According to Keller (2000)**, inventory management refers to all the activities involved in developing and managing the inventory levels of raw materials, semi-finished materials (work in- progress) and finished goods so that adequate supplies are available and the costs of over or under stocks are low.
- ▶ **Julius A. Sharma, Danish K. Sharma and Hari P (2004)** discussed Supply Chain (SC), which involves the configuration, coordination, and improvement of sequentially related set of operations in establishments, integrates technology and human resource capacity for optimal management of operations to reduce inventory requirements and provide support to enterprises in pursuance of a competitive advantage in the marketplace. This paper addresses the structures of supply chain management (SCM) and the activities involved in SCM decisions that help promote profound improvement in efficiency and effectiveness in business operations. In broader context, the paper examines the types of activities involved in SCM decisions; the dynamics of the traditional SCM, the complementarities of technology in achieving effective management of Operations through enablers of electronic data interchange (EDI) and quick response (QR) disciplines to implement Just-in Time (JIT) management techniques; and integrated SC and inventory control as it relates to capacity imbalances and transaction costs.
- ▶ **BJ. Grablowsky, (2005)** in his paper "Financial management of inventory" surveyed small business inventory management practices and compared with techniques commonly employed by large corporations. It appears that smaller firms rely on simple controls. Large businesses rely more on quantitative techniques, such as EOQ and linear programming, to provide additional information for decision-making, while small firms are more likely to use management judgment without the quantitative back-up. Of those small firms which did not use quantitative methods for determining inventory order and stock levels, the most common qualitative methods were "past experience" and "executive judgment,".
- ▶ **Vikram Tiwari and SrinagcshGavirncni, (2007)** in their article "ASP, The Art and Science of Practice: Recouping Inventory Control Research and Practice: Guidelines for Achieving Synergy" focused on the widening

disconnect between inventory control research and practice, people debate the value of incremental theory building. While practitioners make decisions in a complex and uncoordinated environment, researchers often adopt a simplistic environment for the sake of rigorous analysis. The stakeholders mismatched objectives and motivations may cause this lack of synergy. Controlling and reducing this disconnects would benefit both practitioners and researchers. The existing empirical analysis of companies' business improvements based on academic inventory-management theories is inconclusive. Even so, some businesses have successfully implemented inventory theory; however in most cases, they have greatly modified the inventory models developed by academics.

- **Brent D. Williams and Travis Toker, (2008)** in their study "A review of inventory management research in major logistics journals: Themes and future directions", discussed that logistics researchers have focused considerable attention on integrating traditional logistics decisions, such as transportation and warehousing, with inventory management decisions, using traditional inventory control models. Logistics researchers have more recently focused on examining inventory management through collaborative models.

4.4 UNIQUENESS OF RESEARCH

Study This study is unique in its every aspect because through this study the need and capability of the organization to adopt Inventory Management system is thoroughly analysed. The study data is entirely online data based and the is collected from reliable sources. Most of the data from the company was collected over phone, emails and soft copies. The tools were used for analysis are updated as well as have advanced techniques.

CHAPTER 5

METHODOLOGY OF THE STUDY

5.1 Research Approach and Design

Research design is a framework or the blueprint for conducting the research report. Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Here the research is analytical research. Analytical data based on the collection of secondary data published by Apollo tyres and the design of the research is based on the balance sheet and profit and loss account of the company.

4.2 Sources of Online Data

Sources of online data in this study are:

- Company website
- Online journals
- Online magazines
- Online articles like blogs.

5.2 Sampling Design

The sampling design is a crucial component of the research methodology that outlines how data is selected and collected from the overall population. In this study, the sampling technique has been chosen to ensure that the data accurately represents the operational behavior and inventory characteristics of the organization under study.

For this project, the sampling method adopted is **purposive sampling**, a non-probability sampling technique in which elements are selected based on specific criteria and the judgment of the researcher. The focus was on selecting inventory data from critical product categories—classified under ABC analysis, stock ageing reports, and reorder point levels—to understand patterns of movement, demand fluctuation, and inventory turnover.

The sample data was extracted from operational records and dashboards using **Power BI**, based on the organization's inventory from the past **12 months**. The time frame was selected to incorporate both seasonal and non-seasonal inventory fluctuations. A total of **10 SKU entries** were selected, covering all three ABC categories (A, B, and C), and spanning across product segments such as fast-moving, slow-moving, and obsolete stock.

The rationale behind choosing this design is its ability to provide focused insights, especially when working with analytical tools like Power BI, where targeted data visualization aids in identifying inventory inefficiencies and optimization opportunities. This design supports qualitative and quantitative interpretation and aligns with the objective of evaluating and enhancing inventory control practices.

5.3 Data Analysis Tools

In this study, the primary analytical tool used for inventory management is **Power BI**, a business intelligence platform that allows real-time data visualization, interactive dashboards, and automated classification models. Among the various inventory control techniques implemented through Power BI, **ABC Analysis (Always Better Control)** plays a central role.

ABC Analysis is based on the principle that a small percentage of inventory items account for a large portion of inventory value. It segments stock items into three categories—**A**, **B**, and **C**—based on their annual consumption value (Unit Cost \times Annual Usage). This categorization helps prioritize control and resource allocation.

- **A Category Items** are high-value items (around 10% of items, but 70% of value). These require strict control, low safety stock, frequent reviews, and are managed directly by top management.
- **B Category Items** are medium-value items (approximately 20% of items, contributing to 20% of value). They need moderate control and are usually handled by middle-level management with periodic monitoring.
- **C Category Items** are low-value items (about 70% of inventory items, but only 10% of value). These items are managed with basic control and higher safety stock levels, often overseen by store personnel or junior-level staff.

In this project, Power BI was used to import inventory data, calculate annual consumption values, and apply ranking formulas to categorize items automatically into A, B, and C types. The tool enabled the creation of **interactive dashboards** showing real-time classification, category-wise stock distribution, and reorder recommendations. This approach not only enhanced data accuracy but also provided a visual basis for managerial decisions related to procurement, cost control, and inventory optimization.

The dynamic and filterable nature of Power BI dashboards allowed real-time inventory tracking, ensuring the business can react promptly to stock imbalances or demand shifts. This modern application of ABC Analysis using Power BI has proven to be effective, scalable, and suitable for real-time inventory decision-making in this study.

5.4 Limitations of the Study

- As the study was primarily based on **secondary data sources** and information collected through phone calls and email correspondence, the inherent limitations of online data sharing and remote communication may have affected the precision of the findings.
- This research represents a **partial analysis** relying significantly on online primary data collection methods, which can introduce gaps in data comprehensiveness and consistency.
- The **accuracy of the results depends directly on the accuracy and reliability** of the information provided by respondents during online interactions.
- Due to the nature of remote data collection, it was not possible to conduct in-person discussions or obtain immediate clarifications from the company's representatives regarding certain aspects of the secondary data.

CHAPTER 6

**ABC ANALYSIS AND DATA INTERPRETATION WITH
POWER BI**

DATA ANALYSIS, INTERPRETATION AND INFERENCES ABC ANALYSIS

ABC analysis is a strategic inventory management methodology that classifies stock into three categories based on **consumption value, cost significance, and impact on overall inventory investment**. This approach follows the Pareto principle—where a small proportion of items account for the majority of inventory value—and helps companies apply differentiated control measures.

Category A items are **high-value, low-quantity** products that typically constitute around 70–80% of inventory value but only 5–10% of items. These items require the tightest control, precise forecasting, and regular monitoring.

Category B items are **medium-value, moderate-quantity** products, often accounting for about 15–25% of inventory value and 15–25% of items. They need moderate control and periodic review.

Category C items are **low-value, high-quantity** goods, usually representing only 5–10% of inventory value but over 60–70% of the total inventory count. These items are managed with simpler controls and higher safety stocks to avoid shortages.

Advantages of ABC Analysis

- **Supports demand forecasting** by highlighting which items require more frequent reordering and tighter planning.
- **Improves inventory optimization**, reducing carrying costs and avoiding capital lock-up.
- **Enhances resource allocation** by allowing management to focus on high-impact items.
- **Enables strategic pricing and supplier negotiation** for critical, high-consumption products.
- **Facilitates tiered service levels** for different inventory classes.

ABC Analysis Applied to Apollo Tyres

For Apollo Tyres, ABC Analysis was implemented using **Power BI**, leveraging its advanced visualization and calculation capabilities. Inventory data was imported from the ERP system into Power BI, where dynamic measures and ranking functions automatically classified items into A, B, and C segments based on **annual consumption value** (Unit Cost × Annual Usage).

Modern Power BI dashboards provided:

- **Interactive classification tables and pie charts** showing the proportion of items by category.
- Real-time **drill-down capabilities** to review SKU-level details.

- Automated **alerts for Category A stock levels**, improving responsiveness to demand fluctuations.

Usage of ABC Analysis in Modern Sourcing and Inventory Strategy

In today's context, ABC Analysis is integrated across multiple steps of the sourcing value chain:

- **Demand Aggregation:** Consolidates annual spend data from multiple plants or warehouses to prioritize sourcing for high-impact items.
- **Opportunity Assessment:** Identifies savings or optimization potential by focusing negotiations and vendor development on Category A products.
- **Dynamic Monitoring:** Through Power BI, ABC classifications are automatically updated as usage and pricing evolve, ensuring decisions are always based on the latest data.

Steps Followed in ABC Analysis Using Power BI

1. Extracted historical inventory data (usage and unit price) from the ERP system.
2. Loaded data into Power BI using **Power Query** for cleaning and shaping.
3. Created calculated columns to determine **annual consumption value** for each SKU.
4. Ranked SKUs by total value and categorized them into A, B, and C using DAX formulas.
5. Developed visuals including bar charts, pie charts, and summary tables to illustrate category distribution and usage trends.
6. Published dashboards to stakeholders for continuous monitoring.

Interpretation of Results

In the Apollo Tyres inventory portfolio:

- About **4% of the materials account for nearly 70% of the total inventory value** and are classified as Category A, requiring strict control.
- Approximately **6–7% of materials contribute about 20% of the value**, falling into Category B.
- The remaining **90% of materials contribute only 10% of the value** and are grouped into Category C.

This modern approach ensures that the most critical and high-cost items are prioritized for tighter management while maintaining adequate controls over the larger volume of low-value stock.

CHAPTER 7

FINDINGS AND CONCLUSION

7.1 FINDINGS

1. The company's inventory turnover ratio has been declining year by year, indicating either slower sales movement or the accumulation of surplus inventory that ties up working capital.
2. Despite the declining turnover, overall sales performance has remained strong over the past three years, reflecting consistent market demand for key product segments.
3. The Perambra plant operates with three main stores:
 - Raw Material Store (RMS)
 - Engineering Store
 - Finished Goods Store (FGS)
4. The procurement process for RMS—from vendor selection to purchase order placement—is managed centrally by the head office, whereas all functions of the Engineering Store are administered locally within the Perambra plant.
5. The plant maintains a safety stock equivalent to 10 days of average requirement to buffer against demand fluctuations and supply delays.
6. The organization operates with a lead time of approximately 30 days from procurement to replenishment.
7. Inventory items are classified into PR (Purchase Requisition) items and regular Stock items, enabling differentiated handling and control.
8. ABC Analysis is applied systematically, using consumption value as the primary classification criterion to prioritize control and monitoring of critical inventory categories.

7.2 CONCLUSION

In today's competitive and customer-driven marketplace, customer satisfaction remains the core objective for every organization. This makes it inevitable to adopt integrated inventory management approaches that not only support day-to-day operations but also contribute to strategic goals such as new product development and long-term growth.

Financial and material management in manufacturing is a dynamic, interrelated decision-making process that requires continuous improvement. In this dynamic environment, benchmarks are not static—they must be challenged, refined, and surpassed to drive operational excellence.

A well-designed and effectively implemented inventory control system is essential to maintain balance between material availability, carrying costs, and service levels. This study emphasizes that inventory management is not merely about reducing stock levels; it is about aligning procurement, forecasting, and materials handling with broader organizational objectives.

To achieve this, organizations must adopt a combination of scientific inventory control models, process optimization, and digital tools. Measures such as standardization of materials, supplier development and rating, reduction of lead times, and improved demand forecasting are equally important to ensure cost-effectiveness and responsiveness.

In conclusion, selective, data-driven, and technology-enabled inventory management practices—such as those implemented through Power BI and ERP systems—are critical for sustaining profitability and meeting evolving customer expectations. Effective inventory control is not a one-time effort but a continuous journey requiring strategic alignment, resource commitment, and a culture of improve

CHAPTER 8

APPENDIX

8.1 QUESTIONNAIRE

1. **Do you currently use any digital tools to manage inventory?**
 - a. Yes
 - b. No
2. **Which digital tools are used in your inventory management? (Select all that apply)**
 - a. ERP Software (e.g., SAP)
 - b. Excel/Spreadsheets
 - c. Power BI
 - d. Custom In-house Software
3. **How frequently is inventory reviewed and updated?**
 - a. Daily
 - b. Weekly
 - c. Monthly
 - d. As needed
4. **How effective is the current inventory management system in preventing stockouts?**
 - a. Very effective
 - b. Effective
 - c. Somewhat effective
 - d. Ineffective
5. **How would you rate the accuracy of your inventory data?**
 - a. Very accurate
 - b. Accurate
 - c. Somewhat accurate
 - d. Inaccurate
6. **What challenges do you face in inventory management? (Select all that apply)**
 - a. Inaccurate records
 - b. Delayed procurement
 - c. Overstocking
 - d. Lack of visibility
 - e. Manual errors
7. **How important is real-time inventory tracking in your operations?**
 - a. Extremely important
 - b. Important

- c. Neutral
 - d. Not important
8. **Have you received training on using Power BI for inventory management?**
- a. Yes
 - b. No
9. **How reliable do you consider Power BI dashboards?**
- a. Highly reliable
 - b. Moderately reliable
 - c. Not reliable
10. **To what extent has Power BI improved your decision-making?**
- a. Significantly improved
 - b. Somewhat improved
 - c. No impact
11. **Has Power BI helped reduce inventory costs?**
- a. Yes, significantly
 - b. Yes, slightly
 - c. No impact
12. **Do you believe the integration of Power BI should be expanded?**
- a. Yes
 - b. No
 - c. Not sure
13. **On a scale of 1–10, how satisfied are you with the current inventory management system?**
- Score: _____
14. **On a scale of 1–10, rate the usefulness of Power BI for inventory analysis:**
- Score: _____
15. **In your view, what is the biggest benefit of using Power BI? (Select one)**
- a. Real-time visibility
 - b. Better forecasting
 - c. Easier reporting
 - d. Improved cost control
16. **What impact has Power BI had on operational efficiency?**
- a. Greatly improved efficiency
 - b. Slightly improved efficiency

- c. No impact
- d. Decreased efficiency

17. What is your level of confidence in data-driven decision-making?

- a. Very confident
- b. Confident
- c. Somewhat confident
- d. Not confident

18. How would you describe employee acceptance of Power BI?

- a. Very positive
- b. Generally positive
- c. Neutral
- d. Negative

19. Would you recommend further investments in analytics tools for inventory management?

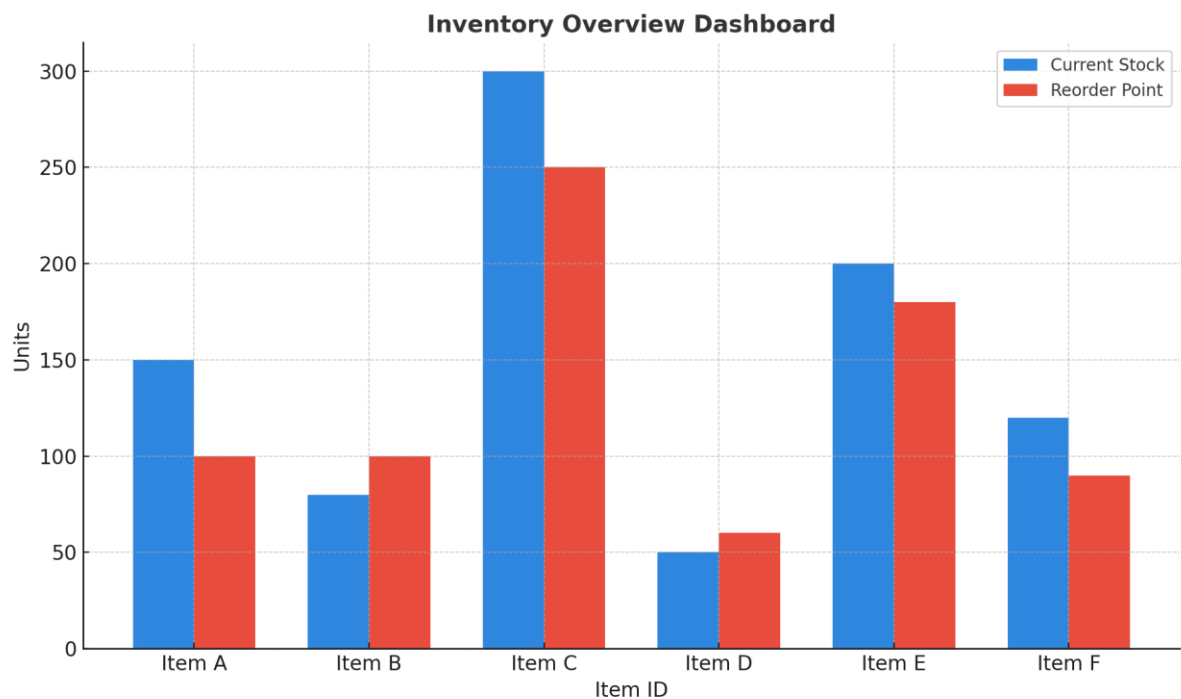
- a. Yes
- b. No
- c. Maybe

8.2 ANNEXURE

INVENTORY OVERVIEW DASHBOARD

Description:

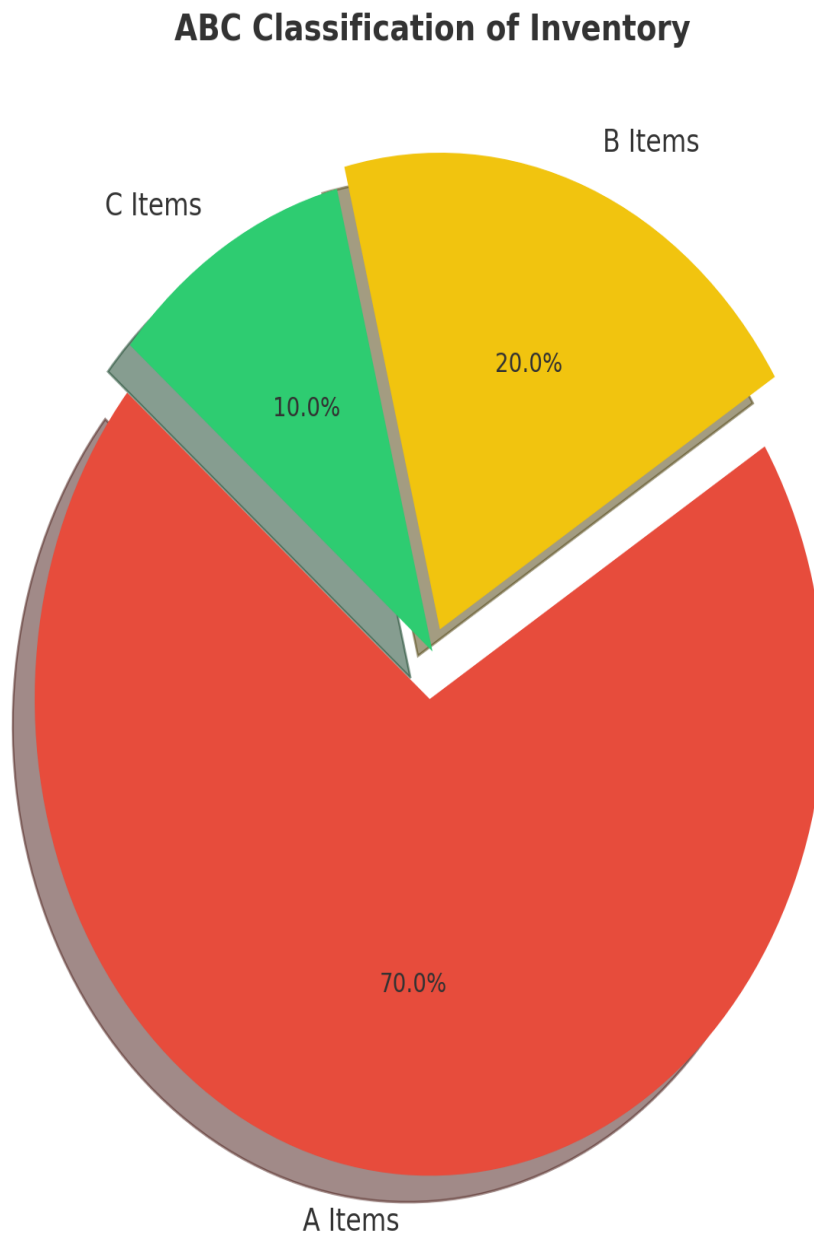
This dashboard shows the comparison of Current Stock and Reorder Points for key inventory items, highlighting where replenishment action is needed.



ABC CLASSIFICATION PIE CHART

Description:

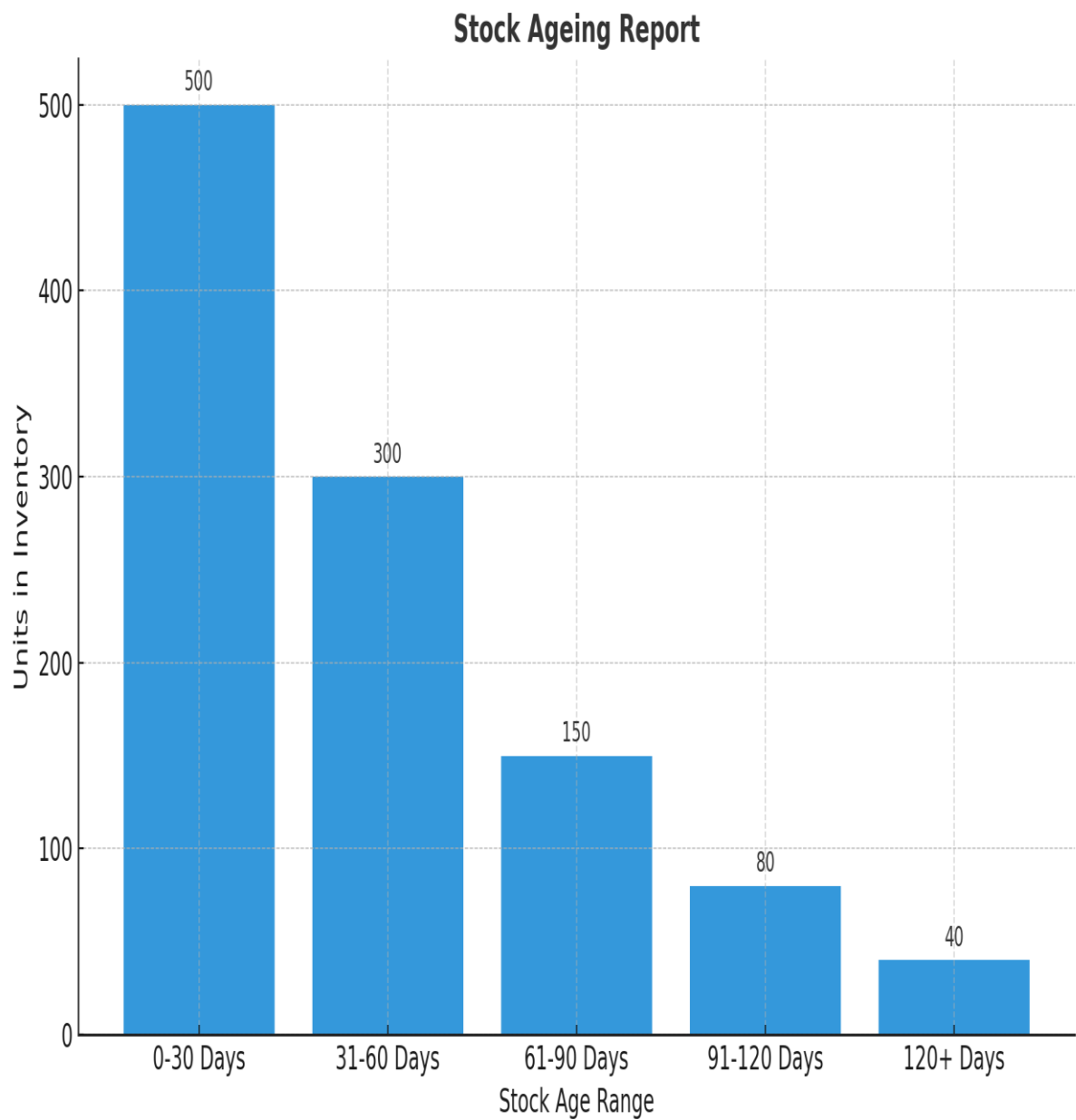
The pie chart categorizes items into A, B, and C classes based on annual consumption value, illustrating the relative contribution of each category to total inventory value.



STOCK AGEING REPORT

Description:

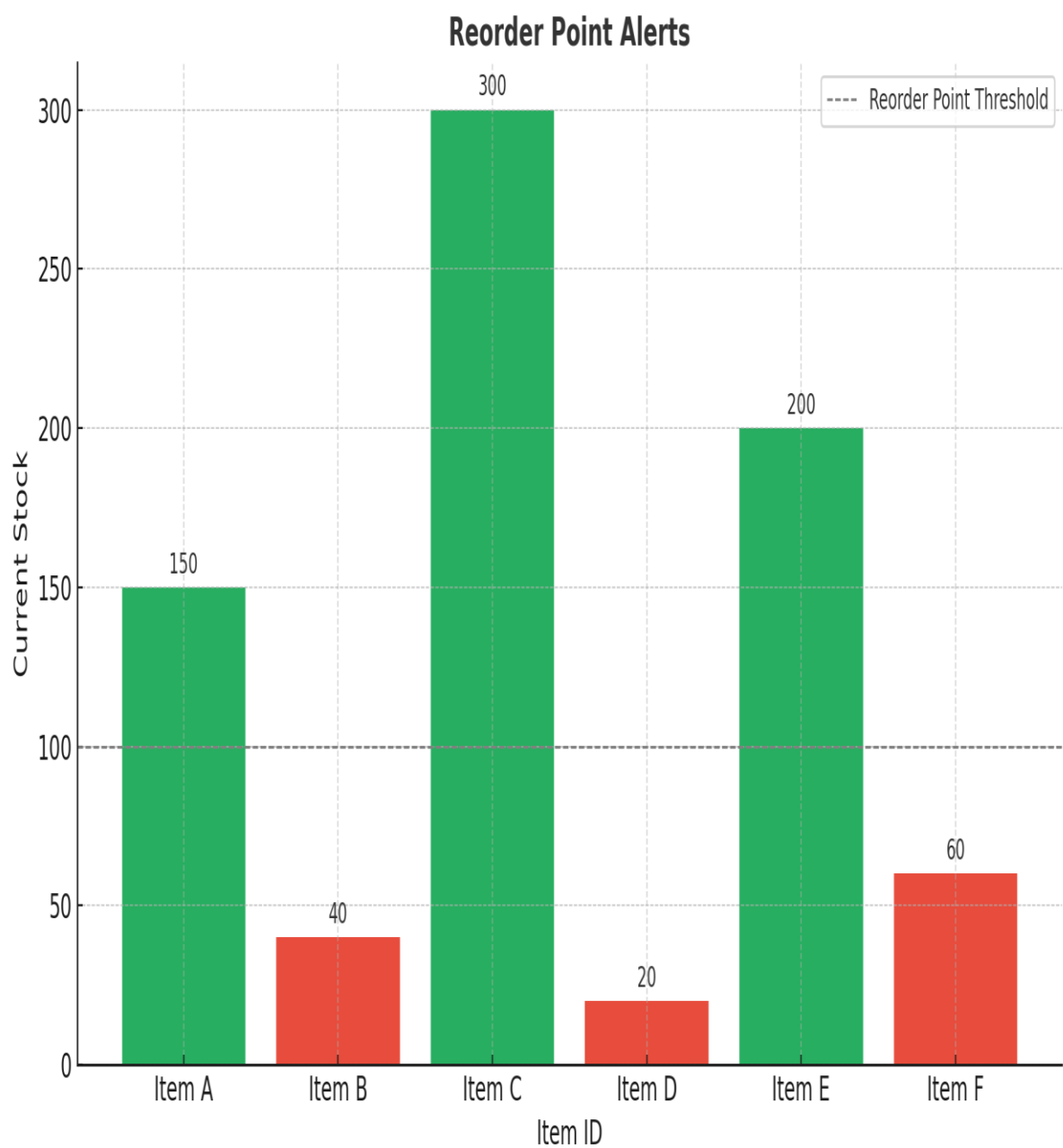
This chart displays the ageing distribution of stock, indicating how much inventory falls into each age bracket (0–30 days, 31–60 days, etc).



REORDER POINT ALERTS

Description:

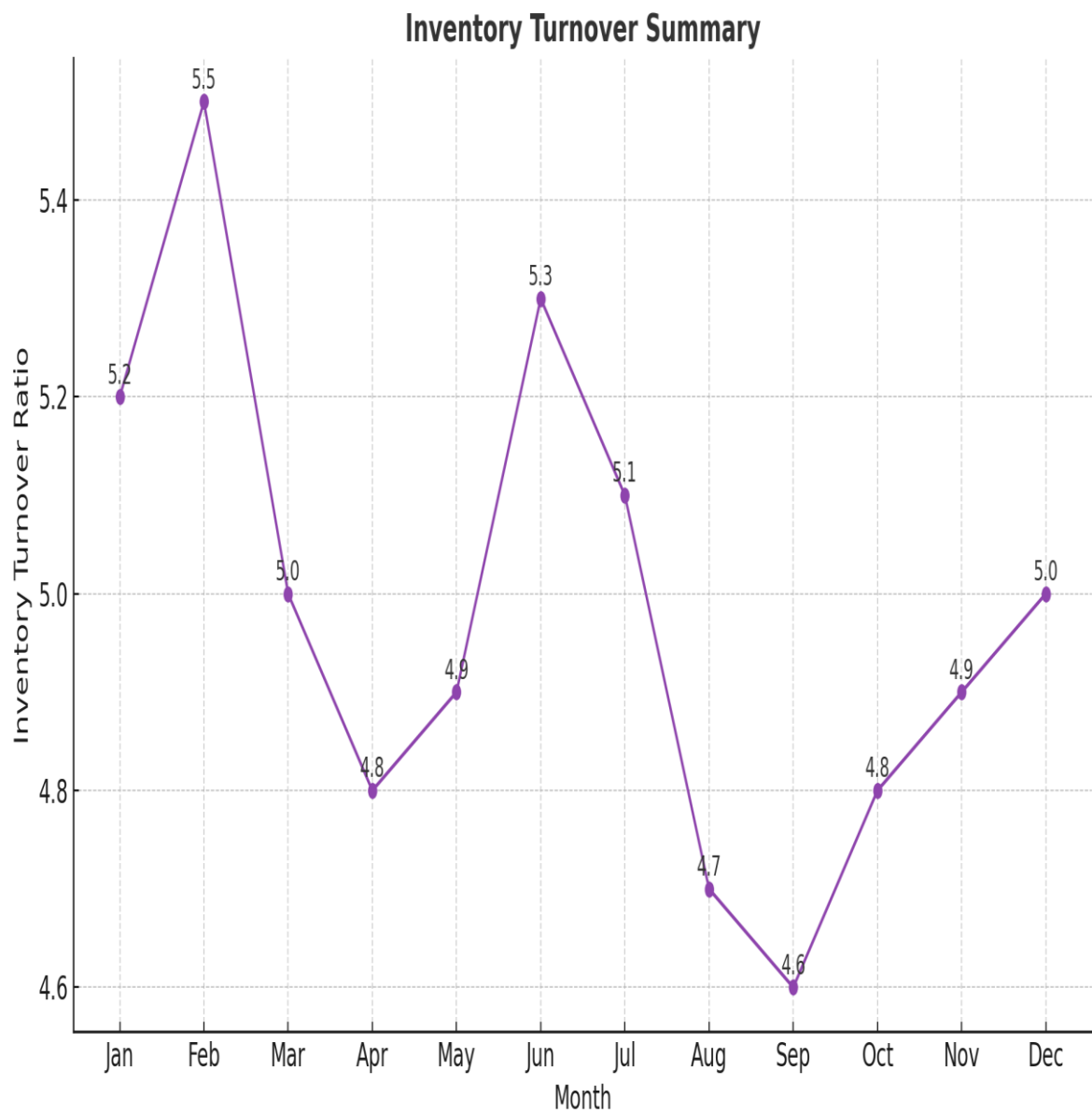
Highlights which items are below reorder levels (shown in red), aiding timely replenishment decisions.



INVENTORY TURNOVER SUMMARY

Description:

Line chart summarizing monthly inventory turnover ratios, showing how efficiently stock is cycled over the year.



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