Maximising Operational Efficiency: A Financial Evaluation of Automation and Sustainable Energy Integration in MRF Ltd.

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by

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Date: 03/05/2024

Examined by:

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Contents

Executive Summary iv

1 INDUSTRY OVERVIEW 1

1.1 Market Segmentation: 1

1.1.1 Vehicle Type Breakdown: 1

1.2 Design Consideration: 2

1.3 Tyre Type Analysis: 2

1.4 Tyre Size Segmentation: 2

1.5 Price Segment Breakdown: 2

1.6 Key Market Trends: 2

1.7 Key Market Players and Market Share: 3

1.8 Regional Impact: 3

1.9 Government Initiatives: 3

2 COMPANY PROFILE. 4

2.1 Historical Background. 4

2.2 Plant locations: 6

2.3 MRF Ltd Goa Unit 6

2.4 TPM at MRF 7

2.5 Results of the TPM Program 9

2.6 MRF FunSkool 9

2.7 Motorsports 10

2.7.1 MRF Motorsports: Revving Up the Indian Racing Scene 10

2.7.2 A Legacy of Pioneering Spirit: 10

2.7.3 Championing Domestic Talent: 10

2.7.4 Beyond the Racetrack: 10

2.7.5 A Winning Partnership: 11

2.8 MRF Tyre Tok 11

2.9 MRF Muscle Zone 11

2.10 MRF Tyre drome 12

2.11 Cricket Excellence 13

2.11.1 A Longstanding Partnership: 13

2.11.2 Legendary Brand Ambassadors: 13

2.11.3 Beyond Sponsorships: 13

2.11.4 A Winning Formula: 14

2.11.5 Looking Ahead: 14

2.12 Awards and Recognition 14

2.13 Vision of MRF 14
2.14 Organisational Structure 14
2.15 Board of Directors 15
2.16 Product Profile 16
2.16.1 Tyres 16
2.16.2 Tubes 18
2.16.3 Conveyor Belts 18
2.16.4 Pretreads 19
2.16.5 Toys 19
2.16.6 Sporting Goods 20
2.16.7 INDUSTRIAL PAINTS AND COATINGS 20
2.17 Geographical Presence: 21
2.18 Competitive Landscape: 21
2.19 Human Resource Development: 21
2.19.1 Employee Welfare Initiatives: 22
2.19.2 Salaries and Additional Facilities: 22
2.19.3 Transportation and Industry Relations: 22
2.19.4 Reception and Community Initiatives: 22
2.19.5 Family Welfare Division: 22
2.20 Accounts / Finance Department 23
2.20.1 The Key Functions of the Accounts Department 24
2.20.1.1 Payments of bills: 24
2.20.1.2 Payment Freight and recovery of penalty from the transporter for non-delivery of Raw Materials within the scheduled duration 24
2.20.1.3 The main processes followed in the department are as follows: 24
2.20.2 Cost Accounting 25
2.20.3 Shipping Department 26
2.20.3.1 The functions of the shipping department are the following: 26
2.20.4 Stores Department 27
2.21 Financial Strength at a Glance 29
3 SWOT analysis for MRF Ltd 29
3.1 Strengths: 29
3.2 Weaknesses: 30
3.3 Opportunities: 30
3.4 Threats: 30
4 Introduction: 31

5 Literature Review: 32
6 Objective: 33
7 Research Gap: 33
8 Methodology: 34
9 Data Analysis 34
9.1 Sustainable Energy Integration/On-Grid Solar Rooftop Project 35
9.1.1 Calculation of Cashflows in Different Scenarios 36
9.2 Financial Evaluation of Automation 40
9.2.1 Calculation of Cashflows in Different Scenarios 40
10 Findings: Automation & Sustainable Energy at MRF Ltd. 44
11 Limitations of the Study: 45
12 Managerial Implications: 46
13 Conclusion: 47
14 Learning Derived from the Project: 48
14.1 Holistic Financial Analysis: 48
14.2 Risk Assessment and Management: 48
14.3 Strategic Partnerships and Collaboration: 49
14.4 Continuous Learning and Adaptation: 49
14.5 Ethical and Sustainable Investing: 49
15 Tasks handled and learnings derived during the internship: 49
16 Challenges faced: 50
17 References: 51
18 Appendices: 51
18.1 Sample of Work Done: 52
18.2 Photos at work: 52

DECLARATION BY STUDENT

I hereby declare that the data presented in this Internship report entitled, "Maximising Operational Efficiency: A Financial Evaluation of Automation and Sustainable Energy Integration in MRF Ltd." is based on the results of investigations carried out by me in the Management Studies at the Goa Business School, Goa University/ MRF LTD Usgao Ponda Goa under the mentorship of Dr. Suraj Velip and the same has not been submitted elsewhere for the award of a degree or diploma by me. Further, I understand that Goa University or its authorities/Goa Business School will be not be responsible for the correctness of observations / experimental or other findings given the internship report/work.

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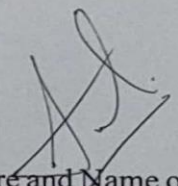

Signature and Name of Student
Yogish Naik
Seat no: 22P0280041

Date: 03/05/2024

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INTERNSHIP CERTIFICATE

This is to certify that Mr./Ms. Yogish Madhu Naik Student of the Goa Business School, Goa University, undergoing MBA Finance has successfully completed Internship between 15th January 2024 to 4th May 2024 at MRF Limited in Accounts Department. He actively participated in the activities during the period of internship and learned the skills needed for various activities such as checking of Engineering/Freight/RM/Service Bills, Monthly Budget, Accounts Schedules, Direct Taxation, Asset Capitalization, Salary Processing etc.

Yours Faithfully

Krishna Warrier
Chief Human Resource Manager

Place : Usgao – Goa
Date : 04.05.2024

COMPLETION CERTIFICATE

This is to certify that the internship report **"Maximising Operational Efficiency: A Financial Evaluation of Automation and Sustainable Energy Integration in MRF Ltd."** is a bonafide work carried out by Mr. Yogish, Madhu, Naik under my mentorship in partial fulfilment of the requirements for the award of the degree of **MBA** in the Discipline of Management Studies at the Goa Business School, Goa University.

Signature and Name of Mentor
Dr. Suraj Velip

Date: 03/05/2024

Goa Business School
Goa University

Signature of Dean of School/HoD
Date: 03/05/2024
Place: Goa University/ Goa Business School.

School/Department Stamp

Executive Summary

This executive summary provides a concise overview of the comprehensive analysis conducted on the integration of automation technologies and sustainable energy solutions at MRF Ltd's Goa plant. The report encompasses financial evaluations, findings, recommendations, managerial implications, and key learnings derived from the project and internship experience.

The financial analysis evaluates three distinct scenarios for both automation and sustainable energy integration. For sustainable energy, scenarios range from normal to best and least favorable conditions, each highlighting varying levels of financial performance. In the case of automation, scenarios consider annual fluctuations in labour costs, with each scenario demonstrating the project's resilience and potential for cost savings amidst changing conditions.

Findings underscore the compelling case for strategic investment in automation and sustainable energy initiatives. The analysis reveals promising opportunities for significant cost reductions, operational efficiency enhancements, and long-term financial benefits. The report emphasizes the importance of holistic financial analysis, risk assessment, strategic partnerships, and continuous learning in driving organizational success and sustainability.

Recommendations focus on pilot testing, collaboration with power sector companies, strategic financing arrangements, stakeholder engagement, and continuous monitoring and evaluation. These recommendations aim to mitigate risks, optimize project strategies, and foster a culture of innovation and sustainability within the organization.

Managerial implications highlight the need for strategic investment prioritization, collaboration, risk management, employee training, and performance monitoring. These implications guide decision-making and operational planning, enabling MRF Ltd to realize its vision of operational excellence and financial success in the tyre manufacturing industry.

Key learnings derived from the project emphasize the importance of holistic financial analysis, risk management, collaboration, continuous learning, and ethical investing. These learnings equip finance professionals with practical skills and insights necessary for navigating complex business environments and driving sustainable growth.

The report concludes with insights into tasks handled during the internship and challenges faced, underscoring the practical experiences gained and the professional development opportunities offered. Despite challenges, overcoming obstacles strengthened skills and instilled confidence and resilience in handling future endeavors.

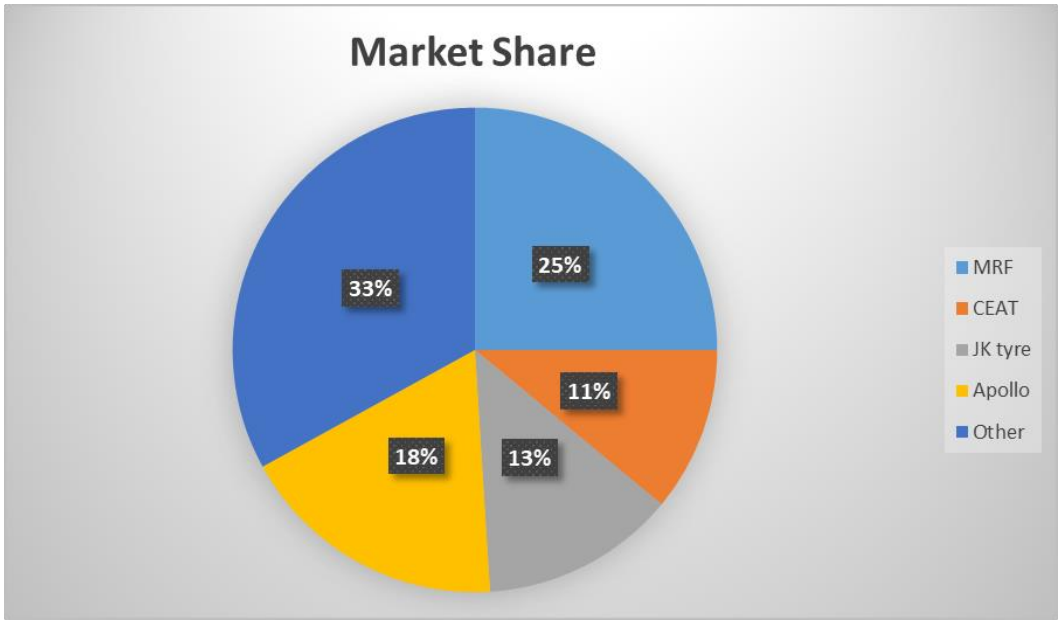
In summary, this executive summary encapsulates the key findings, recommendations, and learnings derived from the project, providing stakeholders with actionable insights and guidance for driving organizational success and sustainability in an evolving business landscape.

Maximising Operational Efficiency: A Financial Evaluation of Automation and Sustainable Energy Integration in MRF Ltd.

1 INDUSTRY OVERVIEW

The Indian tyre industry is a vital component of the country's automotive sector, with a forecast volume of 196.3 million units in 2023 and a compound annual growth rate (CAGR) of 3% until 2032. This market is precisely categorized to reflect the complex factors driving its expansion.

1.1 Market Segmentation:



1.1.1 Vehicle Type Breakdown:

Passenger Car: A substantial market share is attributed to the demand for passenger car tyres, fueled by their compact size and affordability. The trend of personal transportation intensifies this demand.

Commercial Vehicles: With significant investments driving the expansion of commercial fleets, particularly in the e-commerce sector, the commercial vehicle segment anticipates robust growth.

1.2 Design Consideration:

Radial tyres: Dominating the automotive sector, radial tyres showcase fuel efficiency, durability, and exceptional maneuverability. Incorporating rolling resistance technology results in lower fuel consumption, making them a preferred choice.

Bias tyres: This segment, characterized by robustness and puncture resistance, maintains steady growth, offering a reliable alternative in the market.

1.3 Tyre Type Analysis:

Tube and Tubeless: The industry accommodates both tube and tubeless tyre variants, catering to diverse consumer preferences and application requirements.

1.4 Tyre Size Segmentation:

Small, Medium, Large: Tailored to varying vehicle specifications, the industry caters to consumers' diverse needs with different sizes of tyres.

1.5 Price Segment Breakdown:

Low, Medium, High: Catering to a range of consumer budgets, the industry strategically positions tyres across different price segments, ensuring accessibility and options for various market segments.

1.6 Key Market Trends:

Sustainable tyres: The industry observes a rising trend in sustainable tyres, aligning with the competitive pricing of natural rubbers and the emergence of 3D printed tyres, showcasing a commitment to environmental considerations.

Innovations: The sector experiences rapid innovations, including the development of chip-in tyres, self-inflating tyres, and fossil-free tyres, reflecting a commitment to technological advancements.

Strategic Investments: Major players strategically position themselves to leverage market growth. Notably, Apollo Tyres focuses on enhancing the production of EV tyres, aligning with the rising trend of electric vehicles in India.

1.7 Key Market Players and Market Share:

MRF Limited: Leading the market from Tamil Nadu, India, MRF is a multinational tyre manufacturing company. With a robust legacy since its founding in 1946, it has established itself among the top 20 global tyre manufacturers.

Apollo Tyres Limited: Headquartered in Gurgaon, India, Apollo Tyres is a leading provider specializing in a passenger car, two-wheeler, and truck-bus tyres. It plays a pivotal role in the industry landscape.

CEAT Limited: A multinational tyre provider headquartered in Mumbai, India, CEAT, founded in 1924, offers tyres for trucks, buses, light commercial vehicles, and heavy-duty vehicles, among others.

Continental Tyre Group Limited: Announcing OE approvals for 300 EV models in August 2022, Continental Tyre is strategically positioned to fuel growth in the electric vehicle sector.

Others: The industry also witnesses active participation from other key players, each contributing to the diverse and competitive landscape.

1.8 Regional Impact:

North India holds a significant market share, fueled by the growing vehicle ownership stemming from population growth, rapid urbanization, and rising disposable income in tier 1 and tier 2 cities. The surge in demand for tyres for trucks and buses, driven by increased mobility and industrialization, further propels market growth.

1.9 Government Initiatives:

Favorable government initiatives, such as the Atmanirbhar Bharat Abhiyan and restrictions on pneumatic tyre imports, contribute to the industry's development. The focus on improving

public transportation systems and reducing production costs through favorable policies underscores the government's commitment to fostering a robust tyre manufacturing sector.

2 COMPANY PROFILE.

2.1 Historical Background.

In 1946, MRF Limited originated from the vision of K.M. Mammen Mapillai, who initiated a toy balloon manufacturing plant in Tiruvottiyar, Madras (Chennai). Starting as a regional toy balloon producer, MRF has transformed into one of India's largest and most esteemed corporations.

The company's product range initially included balloons, squeaky toys, industrial gloves, and contraceptives, even though it operated in a modest setup without sophisticated machinery. MRF set up its initial office in Madras at 334 Thambuchetty Street.

In 1952, MRF diversified into tread rubber manufacturing, introducing a rubber mill to its facility. This move positioned MRF as the sole Indian company capable of producing quality extruded, non-blooming, and cushion-backed tread rubber. By 1956, MRF had acquired a 50% share in the Indian tread rubber market.

The pivotal year of 1961 marked MRF's foray into tyre manufacturing, building on its success in tread rubber production. The company established a technological collaboration with Mansfield Tire & Rubber Company of the United States and simultaneously went public. The first trial tyre manufacturing unit was inaugurated in Tiruvottiyar, Madras.

In 1967, MRF achieved a historic milestone by becoming the first Indian company to export tyres to the United States. The company continued to break new ground, introducing nylon tyres and securing its position as a significant player in the industry.

Recognition for MRF's commitment to quality came in 1986 when it received the prestigious award from the National Institute of Quality Assurance. The company earned six Quality

Improvement Awards from the B. F. Goodrich Tyre Company in the USA, surpassing 20 other global tire manufacturers.

By 1979, MRF reached INR one billion in revenue, a remarkable achievement after 33 years of operation. In the late 1980s, MRF tyres were chosen for installation on the Suzuki 800, India's first small contemporary automobile. In 1987, MRF became India's largest tyre company in terms of turnover.

The founder, K.C. Mammen Mapillai, received the Padmashri Award for National Recognition in 1993, acknowledging his contributions to the industry. MRF became the first tyre company in India to surpass the INR 10 billion mark. The company received recognition from the Far Eastern Economic Review as one of the top ten corporate groups in India and Asia. Readers of A&M magazine recognized MRF as one of India's most admired marketing companies.

In 1995, MRF was awarded the Top Export Award by the India Rubber Industries Association. The same year, CAPEXILL awarded the company with a Certificate of Merit for outstanding export performance. MRF continued its winning streak with the Far Eastern Economic Review Award for Excellence for four consecutive years. Credit Analysis and Research Ltd (CARE) awarded MRF Ltd a credit rating of 'PR1+' (Superior) for its projected Rs 100 crore commercial paper (CS) program.

Business World recognised MRF as the most ethical corporation in 1999, attributing its industry leadership to experienced personnel, robust infrastructure, and high-quality products.

In 2001, MRF received its first JD Power award. By 2008, the company's revenue exceeded Rs. 5000 crores. Both Goa and Arkonam factories received the renowned TPM award from the Japanese Institute of Management. Known for its quality and innovation, MRF maintained its position as India's foremost tyre producer.

Founded in 1946 as a toy business, MRF evolved to operate 10 manufacturing sites in India.

2.2 Plant locations:

1. Kottayam Plant in Kerala

2. Puducherry Plant

3. Goa Plant

4. Trichy Radial Plant in Perambalur District, Tamil Nadu

5. Trichy Bias Plant in Perambalur District, Tamil Nadu

6. Arakonam Plant in Tamil Nadu

7. Tiruvottiyur Plant in Chennai, Tamil Nadu

8. Medak Plant in Telangana

9. Ankenpally Plant in Telangana

10. Dahej Plant in Gujrat

The Medak facility has the largest output capacity of all of them. The facility produces about 50,000 units every day.

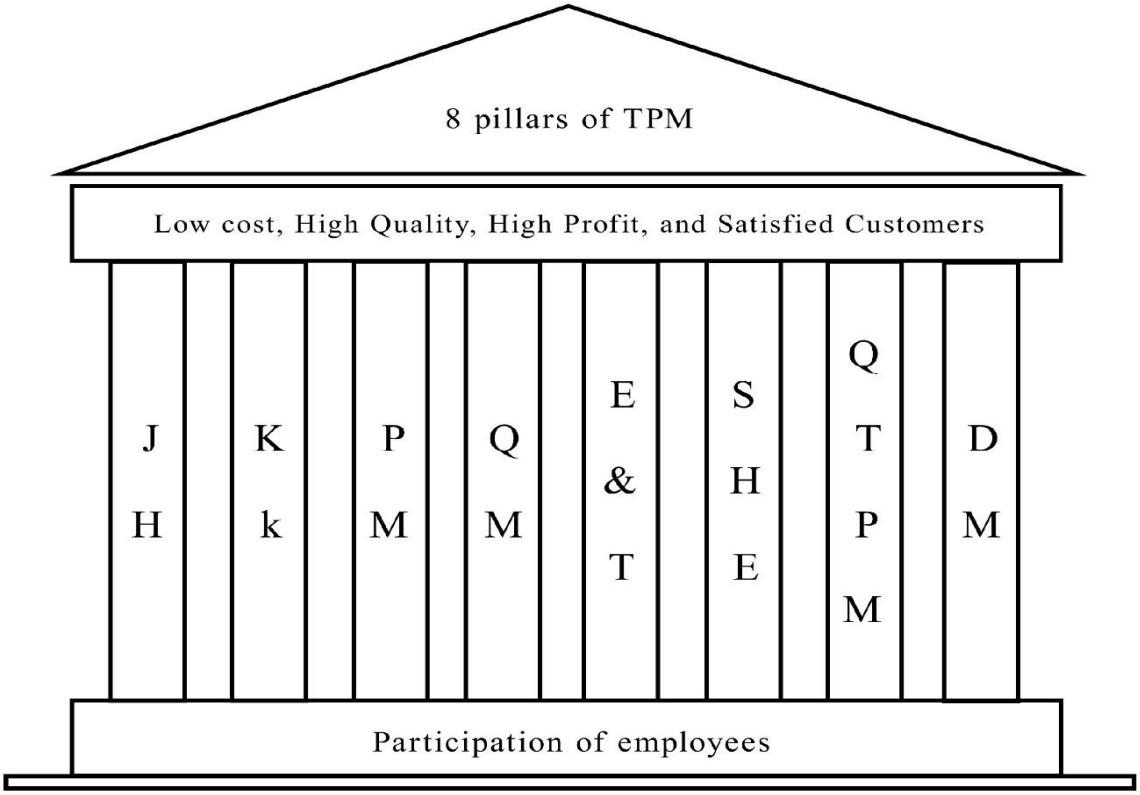
2.3 MRF Ltd Goa Unit

Nestled in the serene village of Usgaon, Goa, the MRF Ltd facility has thrived since its opening on September 29, 1973. The inauguration saw notable figures like Smt. Shashikala Kakodkar and Mr. James Hoffman.

Managed by Mr Gautam Raj, the estate spans 32 hectares with a sizable built-up area of 43,000 square meters. The workforce consists of 1,390 dedicated workmen, along with 999 contract workers and 313 managers and staff members. Working tirelessly in three shifts, they produce an impressive 7,000 tyres daily, contributing to an annual revenue of 2900 crores.

Maintaining high quality, the MRF Goa unit is ISO 9001-certified. Additionally, MRF operates two units in Goa: one for manufacturing bias tyres and the other for tubes and baneberry. Furthermore, the facility includes a baneberry responsible for mixing rubber, chemicals, and carbon to craft tubes and flaps for the tyres.
In 2004, MRF Ltd. Goa introduced Total Productive Maintenance (TPM) to optimise resource use and improve product quality.

2.4 TPM at MRF



1. JH Pillar - (Jishu Hazen) attempts to restore machines to their basic state.
2. KK Pillar - This pillar aims to eliminate losses.
3. PM Pillar - Planned Maintenance. Pillar aspires for 0% machine failures.
4. QM Pillar - The purpose of the Quality Maintenance pillar is to have no product flaws.

5. E&T - The Education and Training Pillar seeks to develop a competent workforce.
6. SHE Pillar: Safety, Health, and Environment. Pillar is to eliminate accidents and maintain a healthy environment.
7. OTPM Pillar - The Office TPM Pillar aims to enhance data retrieval, inventory management, and office cleanliness, and reduce human work.
8. DM Pillar - The Development Maintenance Pillar aims to guarantee that new equipment offers 100% production and quality from the start.

2.5 Results of the TPM Program

Within four years of executing the TPM Program, MRE Itd. Goa achieved the following results.

- Labor productivity increased by 22%
- Customer complaints decreased by 52%
- Manufacturing costs decreased by 6.2%
- Power costs decreased by 18%
- Fuel costs decreased by 18%.
- Maintenance costs decreased by 32%.
- Accidents decreased to 88%.

With this accomplishment, the company was awarded the 2008 TPM Excellent Award.

2.6 MRF FunSkool

Did you know that MRF's influence extends beyond tyres? Their subsidiary, Funskool, is India's leading toy manufacturer, bringing smiles to children nationwide with their commitment

to quality and safety. Interestingly, Funskool boasts a major manufacturing facility located in Goa, a state renowned for its stunning beaches and relaxed atmosphere. This connection adds a unique twist to MRF's story, highlighting its reach across diverse industries and its ability to operate in a vibrant tourist destination.

2.7 Motorsports

2.7.1 MRF Motorsports: Revving Up the Indian Racing Scene

MRF Tyres, a household name in India, has carved a unique niche for itself beyond just rubber. MRF Motorsports stands as a testament to the company's dedication to fostering and promoting motorsports in India. This report delves into MRF's multifaceted involvement in the exhilarating world of racing.

2.7.2 A Legacy of Pioneering Spirit:

MRF's commitment to motorsports is unparalleled in India. They were the first Indian tyre company to develop not only formula car tyres but also world-class offerings for tarmac and dirt rallies, motocross, and even FIA-approved karting. This pioneering spirit has been instrumental in propelling the popularity of various motorsports disciplines in the country.

2.7.3 Championing Domestic Talent:

MRF doesn't just manufacture tyres; they actively nurture domestic racing talent. The marquee event, the MRF MMSC FMSCI Indian National Car Racing Championship (commonly known as the MRF Challenge), is a prime example. Held on the Madras Motor Racing Track (MMRT), this series utilizes the MRF Formula 2000 car. Featuring a mix of young guns and seasoned racers, the MRF Challenge provides a platform for Indian drivers to hone their skills and compete on an international level. Similar championships exist for two-wheeler racing, further solidifying MRF's commitment to inclusivity.

2.7.4 Beyond the Racetrack:

MRF's reach extends beyond circuit racing. They are the largest promoter of rallying in India, sponsoring events like the FMSCI Indian National Rally Championship. Internationally, their tyres have secured victories in the prestigious FIA European Rally Championship, a testament to their quality and performance. For off-road enthusiasts, MRF actively promotes the MRF

MOGRIP FMSCI National Supercross Championship and National Dirt Track Championship, showcasing their dedication to diverse motorsports disciplines.

2.7.5 A Winning Partnership:

MRF's success in motorsports is not solely due to their efforts. Partnerships with prestigious organizations like the Madras Motor Sports Club (MMSC) and the Federation of Motor Sports Clubs of India (FMSCI) have been instrumental in establishing a robust motorsports ecosystem in the country.

2.8 MRF Tyre Tok

MRF Tyre Tok is a special store where you can get MRF tires and tubes. They also provide top-notch car services like using robots to align your wheels and fixing or recharging your car's air conditioning. It's a one-stop shop for your car needs!

2.9 MRF Muscle Zone

MRF Muscle Zone is a modern tyre care facility for commercial vehicles. Services include wheel balancing, nitrogen filling, and more.

2.10 MRF Tyre drome

MRF Tyre Drome in Ernakulam offers top-notch automobile care services. MRF Tyre Drome offers a wide range of services, including robotic wheel alignment, diagnostic wheel balancing, and automated vehicle wash with robotic under-chassis cleaning, to assure safety and comfort throughout every drive.

MRF introduced FASST (Friendly After Sales Service Team). A new approach to tyre

maintenance for its passenger vehicle and two-wheeler consumers. It has established service centres in Pune, Indore, Nagpur, Jaipur, and Delhi. There are plans to construct more of these service facilities in other major cities to provide unparalleled tyre care services.

2.11 Cricket Excellence

The Unbeaten Partner of Indian Cricket MRF Limited, a titan of Indian industry, has woven itself into the very fabric of Indian cricket. This report explores MRF's multifaceted involvement in the sport, showcasing its strategic partnerships, iconic brand ambassadors, and unwavering commitment to nurturing cricketing excellence.

2.11.1 A Longstanding Partnership:

MRF's association with cricket stretches back decades, solidifying its position as one of the sport's most enduring sponsors. Their logo, prominently displayed on the helmets and bats of some of India's legendary cricketers, has become synonymous with cricketing passion. This long-term commitment has not only provided financial stability to the sport but also fostered a deep connection with cricket fans across the nation.

2.11.2 Legendary Brand Ambassadors:

MRF's brand ambassadors are carefully chosen, becoming iconic figures who embody the spirit of Indian cricket. Sachin Tendulkar, the "Master Blaster," enjoyed a 13-year association with MRF, his iconic bat strikes synonymous with the brand. Currently, Virat Kohli, India's modern-day batting phenomenon, carries the torch, inspiring young players with his on-field dominance. These strategic partnerships not only leverage the immense popularity of these cricketing greats but also position MRF at the forefront of cricketing excellence.

2.11.3 Beyond Sponsorships:

MRF's influence extends beyond traditional sponsorships. They have actively promoted grassroots initiatives through the MRF Pace Foundation, a dedicated academy focused on unearthing and nurturing young cricketing talent. This commitment to the future of Indian cricket ensures a consistent pipeline of exceptional players, benefiting the sport for years to come.

2.11.4 A Winning Formula:

MRF's success in cricket lies in its multi-pronged approach. By forging long-term partnerships, strategically selecting iconic brand ambassadors, and actively supporting talent development, MRF has become an integral part of the cricketing ecosystem. This winning formula has not only bolstered the sport's popularity but also cemented MRF's position as a brand synonymous with Indian cricketing passion.

2.11.5 Looking Ahead:

As Indian cricket continues to evolve on the global stage, MRF's commitment shows no signs of waning. Their continued support for the sport promises to inspire future generations of cricketers and solidify India's position as a dominant force in the cricketing world.

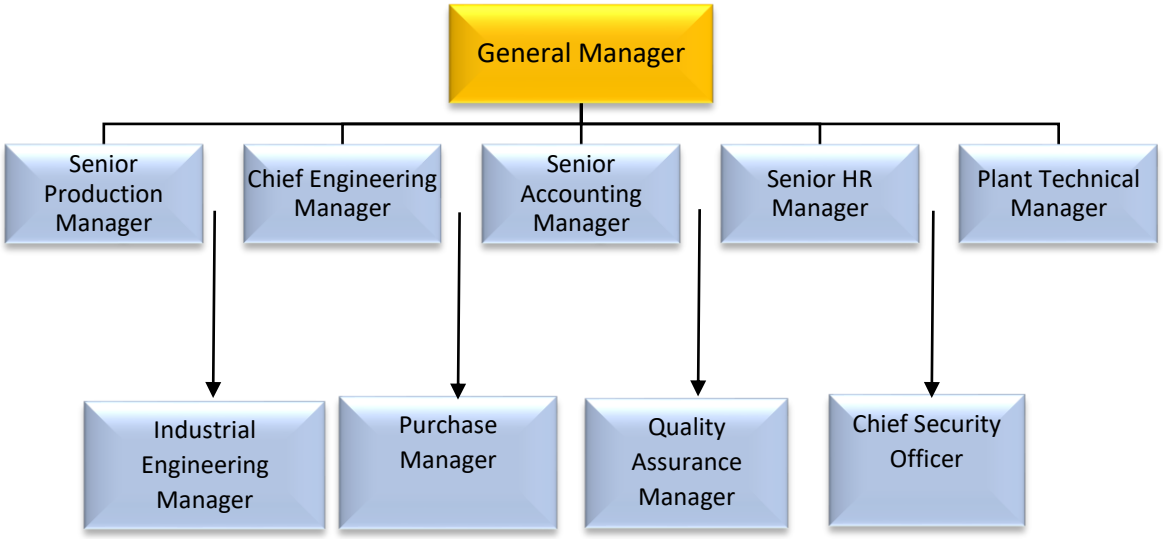
2.12 Awards and Recognition

In 2014, MRF clinched the JD Power Award for the 11th time, setting a record. The company earned recognition for its achievements, such as the 'Highest Export Awards (Auto Tyre Sector)' from AIRIA and the 'Top Export Award' from CAPEXIL in 2009–10. Additionally, MRF secured the 48th position among India's most trusted brands in 2014, as per the Brand Trust Report by Trust Research Advisory.

2.13 Vision of MRF

MRF envisions becoming a major global company, satisfying clients worldwide through technological leadership, manufacturing excellence, and world-class systems. Driven by a committed high-performance staff, MRF aims for profitable growth. Driven by a committed high-performance staff, we aim for profitable growth.

2.14 Organisational Structure



2.15 Board of Directors

K.M. MAMMEN
Chairman & Managing Director

ARUN MAMMEN
Vice Chairman & Managing Director

RAHUL MAMMEN MAPPILLAI
Managing Director

SAMIR THARIYAN MAPPILLAI
Whole-Time Director

VARUN MAMMEN
Whole-Time Director

ASHOK JACOB	***JACOB KURIAN***	***RAMESH RANGARAJAN***
V. SRIDHAR	***Dr. CIBI MAMMEN***	***DINSHAW KEKU PARAKH***
VIJAY R. KIRLOSKAR	***AMBIKA MAMMEN***	***ARUN VASU****
RANJIT I. JESUDASEN	***VIMLA ABRAHAM***	***VIKRAM CHESETTY****
Dr. SALIM JOSEPH THOMAS	***VIKRAM TARANATH HOSANGADY***	***PRASAD OOMMEN****

Company Secretary
S. DHANVANTH KUMAR

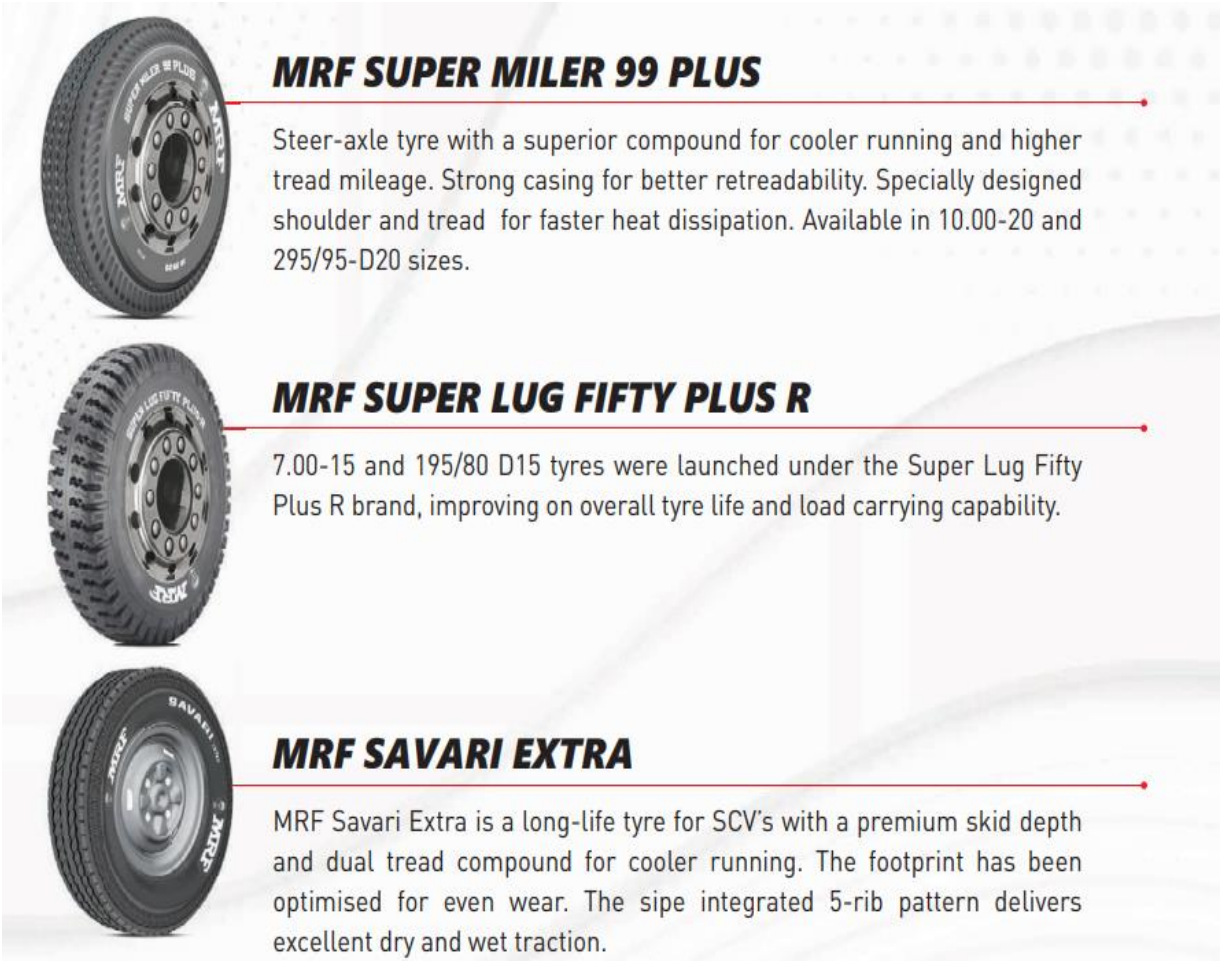
Auditors
M M NISSIM & CO LLP, *Mumbai*
SASTRI & SHAH, *Chennai*

Registered Office: No.114, Greams Road, Chennai - 600 006.

2.16 Product Profile

MRF manufactures four categories of goods, which are as follows

2.16.1 Tyres



MRF PERFINZA

New sizes were introduced in the premium and luxury MRF Perfinza series of tyres for Audi, BMW, Jaguar, Mercedes-Benz and Volvo cars in 245/50 ZR18, 245/40 ZR18 and 235/55 ZR17 sizes.

MRF MARKUS

New sizes were introduced in the premium SUV tyre brand MRF Markus for the premium SUV's of Audi, BMW, Mercedes-Benz, Volvo, Jeep, Hyundai and VW in 225/50 R18, 225/55 R18 and 235/50 R18 sizes.

MRF CITIBUS

MRF Citibus was introduced exclusively for the Force Traveller and Toyota Innova. The tyre delivers outstanding comfort, superior grip in all road conditions and high mileage.

110/90-18
MRF MOGRIP METEOR M TT

Block pattern rear tube-type tyre developed for Royal Enfield Classic 350.

110/90-10
MRF ZAPPER TL

Tubeless rear tyre for Yamaha Fascino125 BS6 scooter.

110/70-12, 90/90-12, 100/80-12
MRF ZAPPER N TL

Tubeless tyre developed for Electric Scooters.

2.16.2 Tubes

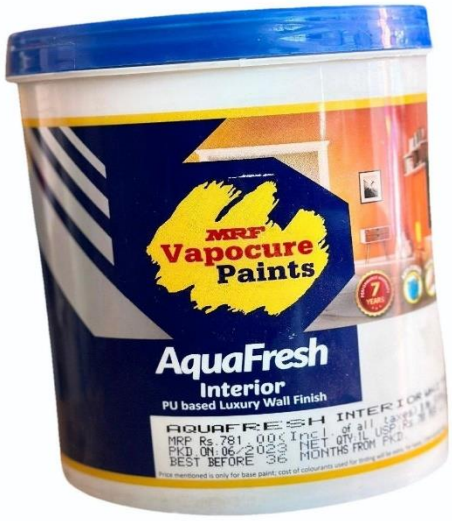
2.16.3 Conveyor Belts

2.16.4 Pretreads

2.16.5 Toys

2.16.6 Sporting Goods

2.16.7 INDUSTRIAL PAINTS AND COATINGS



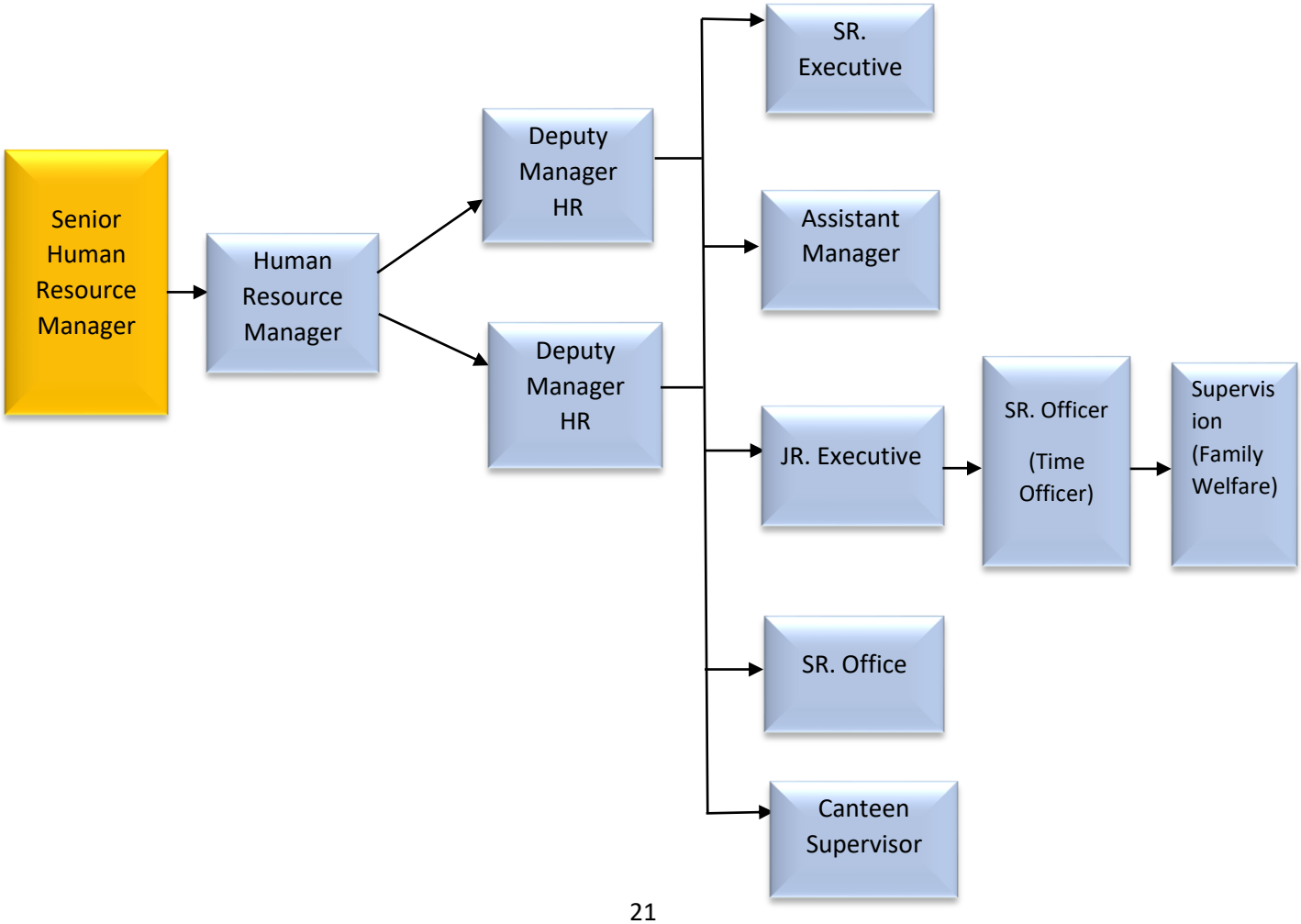
2.17 Geographical Presence:

MRF operates in both domestic and international markets, exporting products to over 70 countries. The company's global reach reflects its commitment to delivering quality products worldwide.

2.18 Competitive Landscape:

In a highly competitive industry, MRF faces competition from well-established players such as CEAT Ltd, JK Tyre & Industries Ltd, Apollo Tyres Ltd, Balkrishna Industries Ltd, TVS Srichakra Ltd, Goodyear, and Falcon Tyres Ltd. Despite the competitive environment, MRF consistently maintains its leadership position in the tyre sector.

2.19 Human Resource Development:



As a labour-intensive firm, MRF places significant emphasis on Human Resource Development (HRD). The HRD department plays a pivotal role in recruitment, training, discipline management, and employee welfare.

2.19.1 Employee Welfare Initiatives:

MRF goes beyond conventional HR practices by offering extensive welfare measures under the Factory Act. The company ensures the well-being of its workforce through provisions such as housing, transportation, educational and medical benefits, rest and recreation, cooperative societies, paid holidays, social insurance schemes, provident funds, gratuity schemes, and more.

2.19.2 Salaries and Additional Facilities:

MRF maintains a robust salary structure, ensuring timely and appropriate payments. The company provides over seven days of paid holidays annually, three limited holidays, 28 privilege holidays, and 12 days of casual sick leave. Additional facilities include hold-up salaries during machinery downtime and a well-equipped cafeteria.

2.19.3 Transportation and Industry Relations:

MRF's organized transportation system, with nine buses, ensures safe and timely commuting for workers across different shifts. The company places great importance on maintaining good industry relations to optimize productivity.

2.19.4 Reception and Community Initiatives:

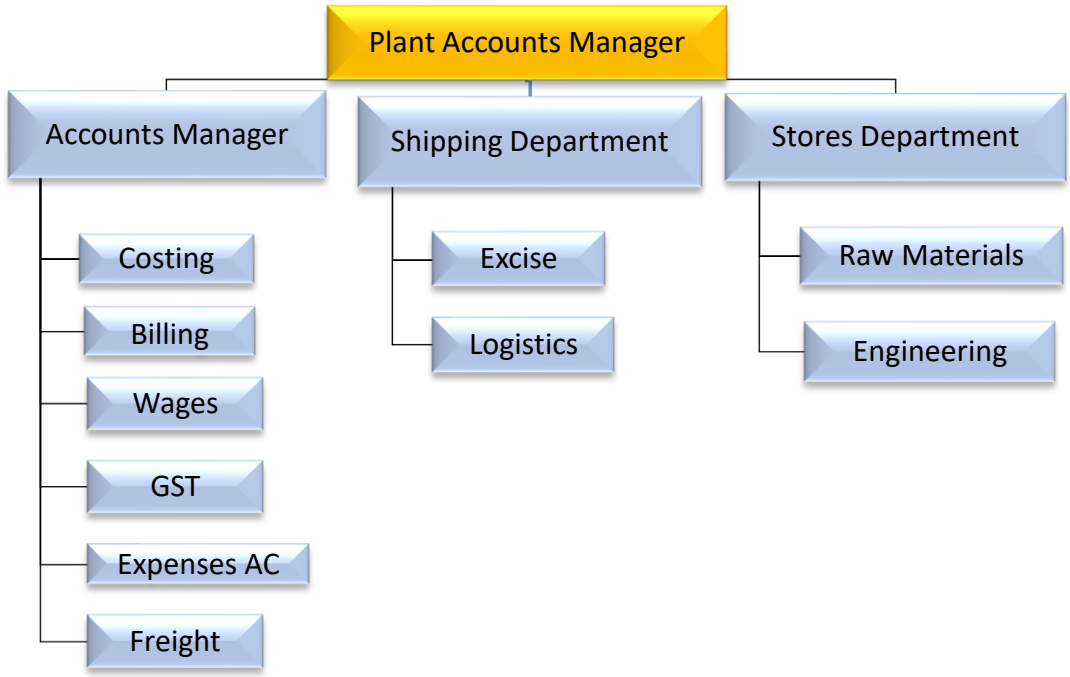
MRF's reception desk at the workplace entrance ensures a welcoming environment for visitors. The company actively engages in community initiatives such as health checks, yoga sessions, and environmental care.

2.19.5 Family Welfare Division:

MRF distinguishes itself as the only corporation in Goa with a family division, extending welfare benefits to employees' families. The company operates summer camps, offers family counselling, and provides family medical coverage under the ESI program. The firm participates in several community initiatives, such as health checks, 4IPS, yoga sessions, and environmental care.

In acknowledgement of sporting excellence, the Ravi Mammen scholarship is granted to deserving young talents among both workers and employees. Similarly, the KC Mammen scholarship appreciates academic accomplishments, specifically targeting students from the labourer and staff community. Significant holidays, including Women's Day and Children's Day, are celebrated with fervour within the corporation. The MRF, Goa unit, currently hosts five active trade unions: MRF Employees Union, Goa MRF Union, and MRF Employees' Union. The workforce at the MRF Goa Plant comprises 330 employees and an additional 1870 workers, contributing to the vibrant and diverse composition of the unit.

2.20 Accounts / Finance Department



The accounting department appears to be the backbone of any corporation. This department is crucial for payments in several sectors, including IT, science, and management.

2.20.1 The Key Functions of the Accounts Department

2.20.1.1 Payments of bills:

The accounting department must check and pay all invoices, from transportation to telephone bills and raw material bills.

2.20.1.2 Payment Freight and recovery of penalty from the transporter for non-delivery of Raw Materials within the scheduled duration:

Raw materials are purchased from vendors and the transporters are delivering the RM at plants. MRF enters into contracts with the approved transporters on the basis that they will pay them a predetermined freight rate on agreed terms and conditions. Freight rates are fixed for the approved carriers; this rate is fixed by the HO Logistics department. Once GRN is made for the materials, the freight is accounted for by accounts, and payments are made to the carrier. If the raw material is not received on the scheduled time for the specified destinations, the penalty is being recovered from the transporters for the delayed delivery at the destinations beyond the scheduled time as specified in the agreement for the sizes of the truck.

2.20.1.3 The main processes followed in the department are as follows:

1. The store department prepares the goods receipt note (GRN) once the material is received at the plant.
2. GRN along with invoice copy and weighment slip are forwarded to the accounts department.
3. The accounting department validates the quantity on both the bill and GRN matching with the PO quantity.
4. Invoices are accounted for using MIRO (SAP software) for payment purposes.
5. Payments are released to vendors on the due date as per PO.

2.20.1.4 Engineering Bill Payment:

When engineering spares are procured, GRN is made for the received spares and forwards the invoices to accounts departments along with delivery challan received from the vendor. Invoices are accounted for using MIRO (SAP software) for payment purposes and payments are released to vendors.

2.20.1.5 Wages:

The department's division pays all of the workers' salaries. The salaries are computed using a price-based approach. It also contains numerous plans for staff and employees' salaries and earnings, such as PF, ESI, and bonuses. Workmen's salaries are determined by the amount of output they produce. If the labourers surpass the production, they are paid more for excess.

2.20.1.6 The numerous additional facilities include:

Over 7 days of the year are paid holidays.

3 limited holidays per year

28 privilege holidays per year.

12 days of sick leave (casual).

The corporation pays the workers' hold-up salaries. This is given to workers when machinery fails due to power outages, breakdowns, or other causes. Wherein the workers are not judged to be defective. (At this point, keeping in mind the TPM policy, the manager uses this time to give them seminars on safety, enhancing productivity, etc.)

2.20.2 Cost Accounting

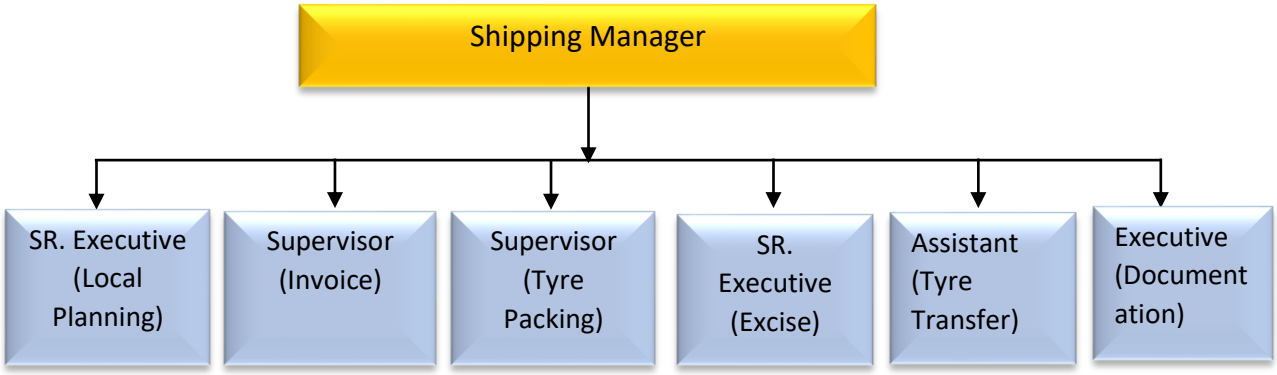
2.20.2.1 Cost accounting's key duties include creating the following reports:

1. An annual revenue and capital budget is developed.
2. Every month, a revenue expenditure report is prepared.
3. Material usage and loss report
4. Power and Fuel Report
5. Scrap the report.

6. Using trial balance, a financial timetable is constructed.
7. Costing Schedule
8. Asset Capitalization.

All financial accounting vouchers must be kept on file for 16 years and can thereafter be destroyed if there are no problems with the income tax agency.

2.20.3 Shipping Department



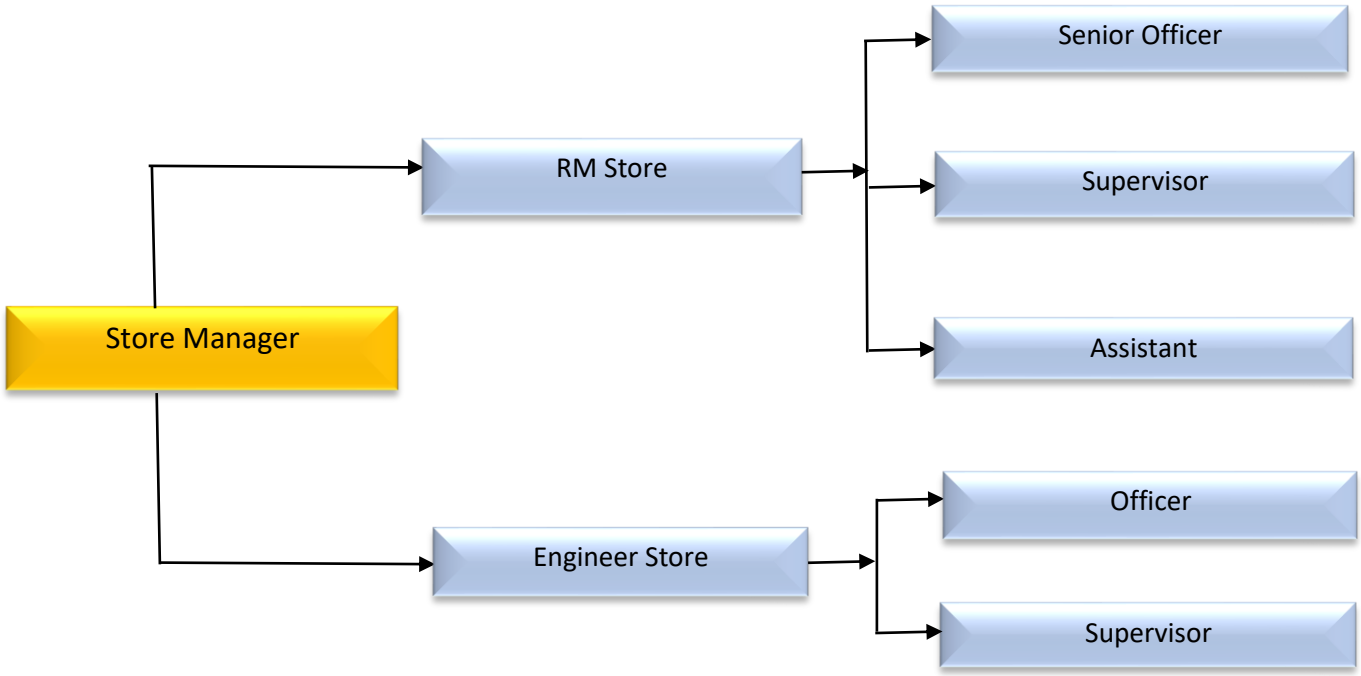
2.20.3.1 The functions of the shipping department are the following:

Product accounting: All items moved into the shipping department are finished and must be sent from the unit to depots.

Packaging of items: The products must be packed in sets of tyres, tubes, and flaps by trade practices before being sent to clients. Ensure that all items are properly wrapped and meet the requirements of the customer.

Dispatch: The completed gods are shipped to MRF's 73 facilities across India. The department must adhere to central excise procedures.

2.20.4 Stores Department



The store department's primary role is to accept items and store them in various bins and cabins based on their codification numbers. Checking them and then moving them inside the inspection room. The demand is delivered by the appropriate manager, who inspects the supplies before issuing them to the retailer.

The store's section keeps all of the machine's spare components on hand and ready to use as needed. All of the objects are coded and put in specified order and placement. The department keeps track of the things and how they move in and out. Raw materials and other resources are brought in according to the Head Office's timetables.

2.20.4.1 The primary functions of the store department are as follows:

- Store raw materials, engineering materials, and stationery goods.
- Maintaining stock levels to ensure consistent manufacturing material availability.

- Inform the purchasing department to acquire the necessary supplies.
- Proper unloading and storage of raw materials.
- Return unneeded materials and dispose of rubbish at the scrap yard.
- RMOP (Returnable Material Outside Parties) These are the products that are sent to other parties for repair.

2.20.4.2 Procedure for Receiving Material:

- Check the purchase order in SAP.
- Check delivery challans.
- Check the quantity against the delivery challan.
- Accept and store the goods in the examined area.
- Prepare goods received note (GRN) based on the delivery challan.
- Inform the department and record the BIN number on the material receipt card (TAG).
- Store items in the specified BIN NO. location.

2.20.4.3 Procedure for Issuing Raw Materials:

- Verify the reservation number.
- Enter the reservation number into the computer.

- Check bin location and availability.
- Enter the reservation quantity.
- Enter the location code manually on the reservation slip.

2.21 Financial Strength at a Glance

MRF Ltd. boasts a robust market capitalization of ₹58,982 Crore (as of March 14, 2024), solidifying its position as a leading player in the Indian market. This impressive figure reflects the company's overall value based on its outstanding shares. Furthermore, MRF Ltd. demonstrates consistent revenue generation, with a Trailing Twelve Months (TTM) revenue of ₹24,662 Crore. While the recent growth rate may be moderate, this consistent revenue stream signifies a financially stable and reliable business.

3 SWOT analysis for MRF Ltd

3.1 Strengths:

Brand reputation: MRF is a well-established brand known for its quality tyres, enjoying strong brand loyalty in the market.

Wide product range: MRF offers a diverse range of tyres catering to various vehicles and applications, giving it a competitive edge.

Extensive distribution network: The company has a widespread distribution network across India, facilitating easy access to its products.

Strong financial performance: MRF has consistently delivered robust financial results, indicating its operational efficiency and stability.

Technological capabilities: The company invests in R&D, allowing it to innovate and develop high-performance tyres, staying ahead of competitors.

3.2 Weaknesses:

Dependency on raw materials: MRF is susceptible to fluctuations in raw material prices, especially rubber, impacting its profitability.

Geographic concentration: While MRF has a significant presence in India, its limited international footprint exposes it to risks associated with regional economic conditions.

High competition: The tyre industry is highly competitive, with numerous domestic and international players, putting pressure on pricing and market share.

Vulnerability to economic cycles: MRF's business is sensitive to economic downturns, as demand for tyres tends to decrease during periods of economic contraction.

Limited product diversification: Although MRF offers a wide range of tyres, its business remains focused on the tyre segment, limiting diversification opportunities.

3.3 Opportunities:

Emerging markets: Expanding into emerging markets presents growth opportunities for MRF, tapping into increasing vehicle sales and infrastructure development.

Technological advancements: Investing in innovative technologies such as green tyres, IoT integration, and automation can enhance MRF's product offerings and efficiency.

Strategic partnerships: Collaborating with automotive manufacturers or other industry players can create opportunities for product development and market expansion.

Sustainable practices: Embracing sustainability initiatives such as eco-friendly manufacturing processes and recycling programs can enhance MRF's brand image and appeal to environmentally conscious consumers.

E-commerce expansion: Leveraging e-commerce platforms can enable MRF to reach a wider customer base and improve its distribution channels.

3.4 Threats:

Economic uncertainties: Macroeconomic factors such as inflation, currency fluctuations, and geopolitical tensions can adversely affect MRF's financial performance and operations.

Regulatory challenges: Compliance with stringent environmental regulations and trade policies poses a challenge to MRF's manufacturing processes and international operations.

Price competition: Intense competition in the tyre industry can lead to price wars, eroding MRF's profit margins and market share.

Substitute products: The emergence of alternative transportation technologies such as electric vehicles could reduce the demand for traditional tyres, posing a threat to MRF's core business.

Supply chain disruptions: Disruptions in the supply chain, whether due to natural disasters, political unrest, or pandemics, can disrupt MRF's production and distribution, affecting its ability to meet customer demand.

This SWOT analysis provides a comprehensive overview of MRF Ltd's internal strengths and weaknesses, as well as external opportunities and threats, aiding in strategic decision-making and risk management.

4 Introduction:

In the bustling operations of MRF Ltd.'s Goa plant, a significant challenge has come to light — cost inefficiencies. Almost half of the total variable costs (47%) are earmarked for wages, while 22% is dedicated to power and electricity, and another 20% to fuel and gas. Addressing this issue is not just a necessity but an opportunity to elevate overall operational efficiency.

This project delves into the heart of MRF Ltd.'s Goa plant, aiming to meticulously analyze the financial intricacies entwined with the integration of automation technologies and sustainable energy solutions in the tyre manufacturing processes. With the tyre industry navigating through dynamic market shifts, the spotlight on cost optimization becomes increasingly crucial. The focus on the Goa plant is intentional — it's about unravelling the distinctive challenges and opportunities inherent to this operational sphere.

This study is not just an academic pursuit; it's a strategic roadmap for MRF Ltd. The goal is clear: aligning decisions with financial wisdom, technological advancements, and long-term sustainability objectives. Through a thoughtful blend of academic insights and industry-

specific analysis, this research aims to chart a course that optimizes variable costs, considers the impacts of automation, and explores the feasibility of integrating sustainable energy practices.

The ultimate aim is actionable recommendations — tailored steps that will not only improve the financial efficiency of MRF Ltd.'s Goa plant but also fortify its competitive stance within the tyre manufacturing sector. This is a journey into the intersection of financial prudence, technological innovation, and sustainability goals, all to steer MRF Ltd. toward operational excellence and financial success.

5 Literature Review:

In the contemporary landscape of industrial operations, the quest for operational excellence has become inseparable from the strategic success of companies. This pursuit is particularly pertinent for the tyre manufacturing sector, as evidenced by the challenges faced by MRF Ltd.'s Goa plant. A primary concern revolves around cost inefficiencies, with substantial percentages attributed to wages, power, and fuel. This literature review synthesizes insights from eight relevant articles to inform the financial evaluation of integrating automation and sustainable energy solutions within MRF Ltd.'s Goa plant.

The integration of automation technology emerges as a pivotal theme in scholarly discourse (Atkinson, 2019). Notably, the transition towards a production system characterized by increased automation is projected to create a virtuous cycle of investment, productivity growth, and higher wages(Atkinson, 2019). This perspective sets the stage for MRF Ltd. to consider the potential benefits of automated processes in enhancing overall operational efficiency.

Understanding the intricate dynamics of manufacturing costs is pivotal, and research by (Rüßmann et al., 2015) challenges conventional concerns related to job losses with increased automation. Their findings suggest that integrating robots into manufacturing processes may lead to increased productivity without substantial job losses. Such insights are relevant for MRF Ltd. as it seeks to balance cost reduction with workforce sustainability.

Sustainable energy integration emerges as another cornerstone for modern industries. Studies by (Sreekumar, 2018) and (Deetjen et al., 2018) underscore the importance of sustainable practices in mitigating the environmental impact of industrial operations. These sources

advocate for a nuanced approach to sustainable energy, emphasizing industry-specific strategies tailored to enhance efficiency while adhering to environmental responsibility(Goel, 2016). Such considerations align with MRF Ltd.'s goals of long-term viability and environmental responsibility.

Assessing global trends in manufacturing is paramount for MRF Ltd. The works of (Acemoglu & Restrepo, 2019) and (Rüßmann et al., 2015) shed light on the shifting economics of global manufacturing and the adjustment mechanisms for workers in the face of automation (BCG, 2015; Dauth et al., 2018). These insights contribute to a comprehensive understanding of the broader landscape within which MRF Ltd. operates, providing context for potential strategies.

Furthermore, government policies play a pivotal role in shaping the adoption of automation and sustainable practices. Studies by (Goel, 2016) and (Bany Mousa et al., 2019) emphasize the impact of policy frameworks on fostering innovation and supporting small and medium-sized enterprises (SMEs) in adopting advanced manufacturing technologies (Arnette, 2013). Understanding these external factors becomes crucial for MRF Ltd. as it navigates the integration of advanced technologies.

In conclusion, the synthesis of these scholarly perspectives, enriched with relevant data from the provided articles, lays the groundwork for a comprehensive financial evaluation of automation and sustainable energy integration at MRF Ltd.'s Goa plant. By integrating these insights, the project aims to provide a nuanced and context-specific roadmap that aligns with MRF Ltd.'s goals of operational efficiency, cost optimization, and long-term sustainability.

6 Objective:

To systematically assess the financial viability and strategic implications of integrating automation technologies and sustainable energy solutions within MRF Ltd.'s tyre manufacturing processes in the Goa Plant to optimize variable costs.

7 Research Gap:

In examining the financial implications of integrating automation and sustainable energy solutions in MRF Ltd.'s Goa plant, a noticeable research gap emerges. While existing literature

provides valuable insights into the benefits of automation and sustainable practices, there is a dearth of studies specifically tailored to the tyre manufacturing sector. Consequently, this project aims to bridge this gap by offering a sector-specific financial evaluation, considering the nuances and challenges unique to MRF Ltd.'s operational landscape.

8 Methodology:

This study employs a multifaceted approach to assess the financial implications of automation and sustainable energy integration in MRF Ltd.'s tyre manufacturing. Initial insights will be drawn from an extensive literature review, encompassing academic research and industry reports. Subsequently, data collection will involve extracting detailed financial records from MRF Ltd, supplemented by qualitative inputs through interviews with key stakeholders. Variable costs will be meticulously analyzed, focusing on labour and energy expenditures. The impact of automation will be assessed through historical data and forecasting, considering upfront investment and efficiency gains. A feasibility study will explore the integration of a grid solar system to mitigate energy costs. Financial models will then quantify the costs and benefits of both automation and sustainable energy solutions, culminating in strategic recommendations for optimizing operational efficiency.

9 Data Analysis

9.1 Sustainable Energy Integration/On-Grid Solar Rooftop Project

Considering that the predominant share of electricity consumption, totalling 3,763,200 units, transpires during normal operating hours, this analysis primarily centres on this segment. Notably, it's worth mentioning that solar power generation largely aligns with normal operating hours, making it particularly relevant to our assessment

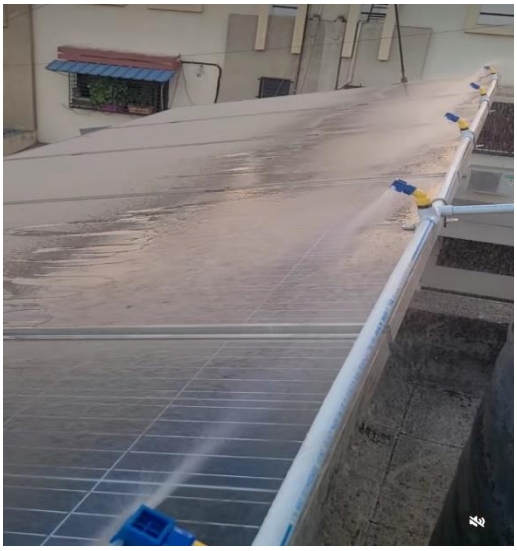
The project entails significant financial investment, with total costs reaching ₹1,25,43,22,000.00. This includes all expenses incurred from the initial planning stages to the completion of implementation, with the sprinklers system to clean the solar panels as shown in the picture.

In support of renewable energy initiatives, the government provides a subsidy of ₹78,000 for the first 10 kilowatts of capacity. This incentive encourages companies to invest in sustainable electricity generation infrastructure.

By generating its power, the company can enjoy considerable savings on electricity bills. The projected monthly savings from this endeavour amount to ₹1,84,39,680.00. These savings are realized through the lower cost of self-generated electricity compared to purchasing from the grid.

Electricity rates in Goa vary based on the time of day. Normal hours are charged at ₹4.9 per unit, off-peak hours at ₹4.41 per unit, and peak hours at ₹5.88 per unit. This rate structure influences the company's overall expenditure on electricity.

montly normal units consumed by company	3763200
capacity	31360
cost of plant	40000
costs	₹ 1,25,44,00,000.00
subsidy upto 1st 10kw	78000
total cost	₹ 1,25,43,22,000.00
savings	
goa gov electricity rate	
normal	4.9
offpeak	4.41
peak	5.88
total savings on this project monthly	₹ 1,84,39,680.00



The calculation of the plant's capacity at 31,360 kilowatts is based on an assumption of consuming 4 units of electricity daily for every 1 kilowatt of capacity. This calculation provides insight into the company's capacity needs relative to its electricity consumption patterns.

9.1.1 Calculation of Cashflows in Different Scenarios

Normal Condition @4kwh per kw/Day							
year	Initial investment	Annual Units inflow (Kwh)	Electricity price per Kwh	Annual Units Revenue/Savings	FPPA @ 0.93/UNIT	Public Lighting @ 0.8/Unit	Total Revenue/ Savings
0	1254322000						
1	0	45785600	4.9	224349440	42580608	36628480	303558528
2	0	45785600	4.9	224349440	42580608	36628480	303558528
3	0	45785600	4.9	224349440	42580608	36628480	303558528
4	0	45785600	4.9	224349440	42580608	36628480	303558528
5	0	45785600	4.9	224349440	42580608	36628480	303558528
6	0	45785600	4.9	224349440	42580608	36628480	303558528
7	0	45785600	4.9	224349440	42580608	36628480	303558528
8	0	45785600	4.9	224349440	42580608	36628480	303558528
9	0	45785600	4.9	224349440	42580608	36628480	303558528
10	0	45785600	4.9	224349440	42580608	36628480	303558528
						payback period(years)	4.132059831
						NPV	₹ 46,08,51,385
						IRR	19%

In the normal scenario @ 4 kWh units/ kW system/ Day, the project involves an initial investment of ₹1,25,43,22,000. Over 10 years, the plant generates an annual inflow of 45,78,5600 kWh of electricity, priced at ₹4.9 per kWh, resulting in an annual revenue/savings of ₹2,24,34,9440.

Additionally, considering the (FPPA) at ₹0.93 per unit and Public Lighting at ₹0.8 per unit, the total revenue/savings amount to ₹3,03,55,8528 annually, and no maintenance cost since the solar panels don’t require much maintenance, its requires just the cleaning process so already the cleaning system is included in the project and if required there are gardening and cleaning workers are working on the regular bases so they can do the work of cleaning with mopes ones in a week or ones in 2 weeks so does not requires additional costs.

This scenario indicates a consistent revenue stream over the 10 years, with no additional investments beyond the initial outlay. The payback period for this scenario is calculated to be approximately 4.13 years, suggesting that the initial investment is recouped within this timeframe.

Moreover, the Net Present Value (NPV) of the project is estimated to be ₹46,08,51,385, indicating the total present value of all cash inflows and outflows associated with the project.

Furthermore, the Internal Rate of Return (IRR) for this scenario is calculated at 19%, which signifies the rate at which the project's net present value equals zero, indicating the project's profitability.

Overall, in the normal scenario, the project demonstrates strong financial viability, with a relatively short payback period, positive NPV, and attractive IRR, making it a favourable investment opportunity from a financial perspective.

Best Condition @5.5kwh per kw/Day							
year	Initial investment	Annual Units inflow (Kwh)	Electricity price per Kwh	Annual Units Revenue/Savings	FPPA @ 0.93/UNIT	Public Lighting @ 0.8/Unit	Total Revenue/ Savings
0	1254322000						
1	0	62955200	4.9	308480480	58548336	50364160	417392976
2	0	62955200	4.9	308480480	58548336	50364160	417392976
3	0	62955200	4.9	308480480	58548336	50364160	417392976
4	0	62955200	4.9	308480480	58548336	50364160	417392976
5	0	62955200	4.9	308480480	58548336	50364160	417392976
6	0	62955200	4.9	308480480	58548336	50364160	417392976
7	0	62955200	4.9	308480480	58548336	50364160	417392976
8	0	62955200	4.9	308480480	58548336	50364160	417392976
9	0	62955200	4.9	308480480	58548336	50364160	417392976
10	0	62955200	4.9	308480480	58548336	50364160	417392976
						payback period(years)	3.005134423
						NPV	₹ 1,10,40,41,405
						IRR	31%

In the 2nd Scenario which is the best scenario @ 5.5 kWh units/ kW system/ Day, the project still requires an initial investment of ₹1,25,43,22,000. However, the annual unit's inflow increases to 62,95,5200 kWh, with an electricity price of ₹4.9 per kWh, resulting in an annual revenue/savings of ₹3,08,48,0480.

Taking into account the (FPPA) at ₹0.93 per unit and Public Lighting at ₹0.8 per unit, the total revenue/savings amount to ₹4,17,39,2976 annually.

This scenario presents an even stronger financial performance compared to the normal scenario. With an increased annual unit inflow and revenue/savings, the payback period for this scenario is significantly reduced to approximately 3.01 years.

Moreover, the Net Present Value (NPV) of the project is estimated to be ₹1,10,40,41,405, indicating a substantially higher present value of all cash inflows and outflows associated with the project compared to the normal scenario.

Additionally, the Internal Rate of Return (IRR) for this scenario is calculated at an impressive 31%, indicating a higher rate of return on investment compared to the normal scenario.

In conclusion, the best scenario presents a highly favorable investment opportunity, with a shorter payback period, significantly higher NPV, and attractive IRR, making it a compelling choice for investors seeking strong financial returns.

least Condition @3.5kwh per kw/Day							
year	Initial investment	Annual Units inflow (Kwh)	Electricity price per Kwh	Annual Units Revenue/Savings	FPPA @ 0.93/UNIT	Public Lighting @ 0.8/Unit	Total Revenue/ Savings
0	1254322000						
1	0	40062400	4.9	196305760	37258032	32049920	265613712
2	0	40062400	4.9	196305760	37258032	32049920	265613712
3	0	40062400	4.9	196305760	37258032	32049920	265613712
4	0	40062400	4.9	196305760	37258032	32049920	265613712
5	0	40062400	4.9	196305760	37258032	32049920	265613712
6	0	40062400	4.9	196305760	37258032	32049920	265613712
7	0	40062400	4.9	196305760	37258032	32049920	265613712
8	0	40062400	4.9	196305760	37258032	32049920	265613712
9	0	40062400	4.9	196305760	37258032	32049920	265613712
10	0	40062400	4.9	196305760	37258032	32049920	265613712
						payback period(years)	4.722354093
						NPV	₹ 24,64,54,712
						IRR	17%

In the least favourable scenario, which is @ 3.5 kWh units/kW system/ Day, the project still necessitates the initial investment of ₹1,25,43,22,000.00. However, the annual unit's inflow is reduced to 40,06,2400 kWh, with an electricity price of ₹4.9 per kWh, resulting in an annual revenue/savings of ₹1,96,30,5760.

Taking into consideration the (FPPA) at ₹0.93 per unit and Public Lighting at ₹0.8 per unit, the total revenue/savings amount to ₹2,65,61,3712 annually.

This scenario presents a less robust financial performance compared to the previous scenarios. With a reduced annual unit inflow and revenue/savings, the payback period for this scenario is slightly extended to approximately 4.72 years.

Moreover, the Net Present Value (NPV) of the project is estimated to be ₹24,64,54,712, indicating a lower present value of all cash inflows and outflows associated with the project compared to the previous scenarios.

Additionally, the Internal Rate of Return (IRR) for this scenario is calculated at 17%, indicating a lower rate of return on investment compared to the previous scenarios.

In summary, while the least-case scenario still demonstrates a positive financial outcome, it presents a longer payback period, lower NPV, and less attractive IRR compared to the more favourable scenarios. Nonetheless, it still represents a viable investment opportunity, albeit with reduced financial returns.

After analyzing the three scenarios, it's evident that the project presents varying levels of financial performance under different conditions. Let's assess whether the company should invest in this project based on the comparison:

Normal Scenario:

Payback Period: Approximately 4.13 years

Net Present Value (NPV): ₹46,08,51,385

Internal Rate of Return (IRR): 19%

Best Scenario:

Payback Period: Approximately 3.01 years

Net Present Value (NPV): ₹1,10,40,41,405

Internal Rate of Return (IRR): 31%

Least Scenario:

Payback Period: Approximately 4.72 years

Net Present Value (NPV): ₹24,64,54,712

Internal Rate of Return (IRR): 17%

Considering these metrics, the best scenario offers the most favourable outcome, with the shortest payback period, highest NPV, and most attractive IRR. This suggests that under

optimal conditions, the project would provide substantial benefits to the company in terms of electricity cost savings and financial returns.

However, even in the least favourable scenario, the project still demonstrates positive financial performance, albeit with a longer payback period and lower financial returns. This indicates that the project has the potential to benefit the company, albeit to a lesser extent under adverse conditions.

Overall, based on the analysis of all three scenarios, it appears that investing in this project would likely benefit the company in terms of reducing electricity costs and generating positive financial returns. The best scenario offers the most promising outcome, but even in the least-case scenario, the project still presents a viable investment opportunity. Therefore, the company should consider proceeding with the project, especially if conditions align with or are more favourable than the normal scenario.

9.2 Financial Evaluation of Automation

In analysing the financial implications of the automation project, we have considered three distinct scenarios of labour cost increases: 10%, 12%, and 8%. These scenarios represent potential annual fluctuations in labour expenses, where the first scenario entails a 10% increase in labour costs/savings annually, followed by the second scenario with a 12% increase, and the third scenario with an 8% increase. These variations account for factors such as changes in production demands and shifts in labour rates. By examining the project's performance under each scenario, we aim to provide a comprehensive understanding of its resilience and potential for cost savings amidst fluctuating labour costs.

9.2.1 Calculation of Cashflows in Different Scenarios

Normal Condition @%10 increase in yearly savings/contract workmen cost				
year	Initial investment	Yearly Savings/Contract Workmen Cost including OT and allowances on tyre	Yearly maintenance Cost/ Electricity	Total Revenue/ Savings
0	150000000			
1		19048000	60000	18988000
2		22296800	66000	22230800
3		25870480	72600	25797880
4		29801528	84860	29716668
5		34125680.8	98346	34027335
6		38882248.88	113181	38769068
7		44114473.77	129499	43984975
8		49869921.14	147449	49722473
9		56200913.26	167193	56033720
10		63165004.59	188913	62976092
			Avg Yearly Cashflow	38224701
			payback period(years)	3.9
			NPV	₹ 19,13,34,949
			IRR	17%

In the first scenario, which assumes a 10% increase in yearly savings/contract workmen cost, the cash flow analysis reveals a robust financial outlook for the automation project.

Beginning with an initial investment of ₹150,000,000, the project generates substantial yearly savings and revenue throughout the ten-year analysis period. Yearly savings, inclusive of overtime and allowances on tyres, escalate annually, resulting in a cumulative revenue of ₹63,165,004.59 by the project's conclusion.

Despite yearly maintenance costs and electricity expenses, the project consistently yields positive cash flows, with an average yearly cash flow of ₹38,224,701. The payback period, indicating the time required to recoup the initial investment, is notably short at approximately 3.9 years, reflecting the project's efficiency in generating returns.

Furthermore, the project exhibits a compelling Net Present Value (NPV) of ₹19,13,34,949, calculated at a discount rate of 12%. This positive NPV signifies that the project's expected

cash inflows exceed the initial investment, reinforcing its financial attractiveness. The Internal Rate of Return (IRR) is determined to be 17%, indicating a rate of return surpassing the cost of capital and further supporting the project's viability.

In summary, the analysis of the first scenario underscores the significant benefits of investing in the automation project. With strong cash flows, a short payback period, and favourable NPV and IRR metrics, the project presents a compelling opportunity for the company to achieve substantial cost savings and enhance its financial performance.

Best Condition @%12 increase in yearly savings/contract workmen cost				
year	Initial investment	Yearly Savings/Contract Workmen Cost including OT and allowances on tyre	Yearly maintenance Cost/ Electricity	Total Revenue/ Savings
0	150000000			
1		19048000	60000	18988000
2		22677760	66000	22611760
3		26743091	72600	26670491
4		31296262	84860	31211402
5		36395814	98346	36297468
6		42107311	113181	41994131
7		48504189	129499	48374690
8		55668691	147449	55521243
9		63692934	167193	63525741
10		72680086	188913	72491174
			Avg Yearly Cashflow	41768610
			payback period(years)	3.6
			NPV	₹ 20,62,24,747
			IRR	19%

In the second scenario, characterized by a 12% increase in yearly savings/contract workmen cost, the cash flow analysis indicates a highly favourable financial outlook for the automation project.

Commencing with an initial investment of ₹150,000,000, the project generates substantial yearly savings and revenue over the ten-year analysis period. Yearly savings, which include overtime and allowances on tyres, experience consistent growth annually, resulting in a cumulative revenue of ₹72,680,086 by the project's conclusion.

Despite yearly maintenance costs and electricity expenses, the project consistently delivers positive cash flows, with an average yearly cash flow of ₹41,768,610. The payback period is notably short at approximately 3.6 years, demonstrating the project's efficiency in generating returns on the initial investment.

Furthermore, the project exhibits a compelling Net Present Value (NPV) of ₹20,62,24,747, calculated at a discount rate of 12%. This positive NPV indicates that the project's expected cash inflows exceed the initial investment, reaffirming its financial attractiveness. The Internal Rate of Return (IRR) is determined to be 19%, indicating a rate of return surpassing the cost of capital and underscoring the project's strong financial viability.

In summary, the analysis of the second scenario highlights the significant benefits of investing in the automation project. With robust cash flows, a short payback period, and favourable NPV and IRR metrics, the project presents a compelling opportunity for the company to realize substantial cost savings and enhance its financial performance.

Worst Condition @%8 increase in yearly savings/contract workmen cost				
year	Initial investment	Yearly Savings/Contract Workmen Cost including OT and allowances on tyre	Yearly maintenance Cost/ Electricity	Total Revenue/ Savings
0	150000000			
1		19048000	60000	18988000
2		21915840	66000	21849840
3		25013107	72600	24940507
4		28358156	84860	28273296
5		31970808	98346	31872462
6		35872473	113181	35759292
7		40086271	129499	39956772
8		44637172	147449	44489724
9		49552146	167193	49384953
10		54860318	188913	54671405

Avg Yearly Cashflow	**35018625**
payback period(years)	**4.3**
NPV	**₹ 17,77,49,049**
IRR	**16%**

In the third scenario, characterized by an 8% increase in yearly savings/contract workmen cost, the cash flow analysis reveals a favourable financial outlook for the automation project, albeit with slightly moderated metrics compared to the previous scenarios.

Beginning with an initial investment of ₹150,000,000, the project generates consistent yearly savings and revenue over the ten-year analysis period. Yearly savings, which encompass overtime and allowances on tyres, experience gradual growth annually, resulting in a cumulative revenue of ₹54,860,318 by the project's conclusion.

Despite yearly maintenance costs and electricity expenses, the project maintains positive cash flows throughout, with an average yearly cash flow of ₹35,018,625. The payback period is approximately 4.3 years, indicating a reasonable timeframe for recouping the initial investment.

Furthermore, the project demonstrates a Net Present Value (NPV) of ₹17,77,49,049, calculated at a discount rate of 12%. This positive NPV suggests that the project's expected cash inflows exceed the initial investment, supporting its financial feasibility. The Internal Rate of Return (IRR) is determined to be 16%, indicating a rate of return surpassing the cost of capital and confirming the project's financial viability.

In summary, while the third scenario presents slightly moderated financial metrics compared to the previous scenarios, the analysis highlights the favourable benefits of investing in the automation project. With positive cash flows, a reasonable payback period, and favourable NPV and IRR metrics, the project remains a viable opportunity for the company to realize cost savings and enhance its financial performance.

10 Findings: Automation & Sustainable Energy at MRF Ltd.

Based on a comprehensive analysis of the financial implications of integrating automation technologies and sustainable energy solutions at MRF Ltd.'s Goa plant, the findings underscore

a compelling case for strategic investment in these initiatives. The study meticulously examined the potential cost savings and returns associated with both automation and sustainable energy integration, considering various scenarios and their respective financial outcomes.

In the realm of sustainable energy integration, particularly focusing on an on-grid solar rooftop project, the analysis revealed promising opportunities for significant cost reductions and long-term financial benefits. By harnessing solar power to meet a substantial portion of the plant's electricity needs, the company stands to enjoy considerable savings on electricity bills, with projected monthly savings reaching notable figures. Furthermore, the financial metrics, including payback period, Net Present Value (NPV), and Internal Rate of Return (IRR), demonstrated the project's robust financial viability across different scenarios, with the best scenario offering particularly attractive returns.

Similarly, the evaluation of automation technologies showcased compelling opportunities for cost optimization and operational efficiency enhancements. Through the automation of key manufacturing processes, the company can mitigate labour cost fluctuations and improve productivity, thereby achieving substantial cost savings over time. The analysis revealed that even under scenarios of labour cost increases, the automation project maintained positive cash flows, short payback periods, and favourable financial metrics, reinforcing its potential as a strategic investment for the company.

Overall, the findings of this study highlight the synergistic benefits of integrating automation technologies and sustainable energy solutions in MRF Ltd.'s Goa plant. By strategically aligning decisions with financial prudence, technological innovation, and long-term sustainability objectives, the company can unlock opportunities to elevate operational efficiency, reduce costs, and fortify its competitive stance within the industry. Embracing automation and sustainable energy integration represents not only a sound financial investment but also a strategic imperative for driving operational excellence and ensuring long-term financial success in an evolving business landscape.

11 Limitations of the Study:

This study's reliance on historical data for solar energy integration and assumptions in cost estimation may lead to overestimation of project expenses. The analysis extrapolated costs from small-scale projects, potentially inflating the true expenses for MRF Ltd.'s larger capacity installations. Additionally, the units per day per kW system, derived from solar regional maps, have not been empirically tested, introducing uncertainty into the projected energy generation. The lack of formal quotations or bidding processes further adds to this uncertainty, impacting the accuracy of cost projections and potentially overestimating project expenses. Furthermore, static assumptions fail to account for potential fluctuations in labour costs, energy prices, and regulatory frameworks, impacting the accuracy of financial projections. Lastly, the scale and scope of MRF Ltd.'s projects may introduce complexities not fully addressed in the analysis. Addressing these limitations requires a more comprehensive approach to project planning, including formal procurement processes, scenario-based risk assessments, and ongoing monitoring and evaluation.

12 Managerial Implications:

Pilot Testing and Collaboration with Power Sector Companies: MRF Ltd. should consider initiating pilot testing of sustainable energy solutions, such as the on-grid solar rooftop project, through collaboration with established power sector companies like Adani Power and Tata Power. This partnership would enable MRF to leverage the expertise and resources of these industry leaders to conduct feasibility studies and assess the viability of solar energy integration at its Goa plant. By engaging in collaborative efforts, MRF can minimize risks and explore innovative financing models to mitigate the initial investment cost.

Cost-Efficient Test Systems: To mitigate the financial risk associated with large-scale investments in sustainable energy infrastructure, MRF could explore the option of implementing cost-efficient test systems. By starting with smaller-scale installations or pilot projects, MRF can evaluate the performance and feasibility of sustainable energy solutions on a smaller budget. This phased approach allows for incremental investments based on proven results, reducing upfront capital expenditure and providing valuable insights for future scalability.

Strategic Partnerships for Financing: If the initial investment cost of sustainable energy integration is deemed prohibitive, MRF should explore strategic partnerships with power sector

companies to facilitate financing arrangements. One approach could involve partnering with these companies to co-invest in the solar energy project, with MRF paying them a portion of the savings realized from reduced electricity costs. This innovative financing model not only mitigates the financial burden on MRF but also aligns the interests of both parties in achieving mutual benefits from sustainable energy integration.

Stakeholder Engagement and Advocacy: MRF should proactively engage with key stakeholders, including government agencies, regulatory bodies, and local communities, to advocate for policies and incentives that support the adoption of sustainable energy solutions. By actively participating in industry forums, lobbying efforts, and public outreach campaigns, MRF can contribute to shaping a conducive regulatory environment for sustainable energy investment while enhancing its corporate reputation as a responsible and forward-thinking organization.

Continuous Monitoring and Evaluation: As MRF progresses with the implementation of automation and sustainable energy initiatives, it is imperative to establish robust monitoring and evaluation mechanisms to track the performance and impact of these projects. Regular assessments of key performance indicators, such as energy consumption, cost savings, and environmental sustainability metrics, will enable MRF to identify areas for improvement and optimize its strategies for long-term success.

13 Conclusion:

In conclusion, this study has provided a thorough examination of the financial implications associated with integrating automation technologies and sustainable energy solutions at MRF Ltd.'s Goa plant. Through meticulous analysis, it has become evident that these initiatives present compelling opportunities for cost optimization, operational efficiency enhancement, and long-term sustainability. Despite the inherent limitations, including reliance on historical data, assumptions in cost estimation, and uncertainties surrounding energy generation projections, the findings underscore the potential benefits of strategic investment in automation and sustainable energy integration.

Moving forward, MRF Ltd. must adopt a strategic and proactive approach to implementing these initiatives. This entails leveraging partnerships with power sector companies for pilot

testing and collaboration, exploring innovative financing models to mitigate upfront investment costs, and engaging in ongoing stakeholder dialogue to advocate for supportive regulatory frameworks. Furthermore, continuous monitoring and evaluation will be essential to track the performance and impact of these projects, allowing for timely adjustments and optimization of strategies.

Ultimately, by embracing automation technologies and sustainable energy solutions, MRF Ltd. can position itself as a leader in sustainable manufacturing practices while realizing significant cost savings and operational efficiencies. This journey toward operational excellence and financial success requires a steadfast commitment to innovation, collaboration, and continuous improvement. Through strategic decision-making and prudent resource allocation, MRF Ltd. can navigate the complexities of the evolving business landscape and emerge as a trailblazer in driving sustainable growth and competitive advantage within the tyre manufacturing industry.

14 Learning Derived from the Project:

As an MBA finance student or a finance professional, several valuable learning insights can be derived from this project:

14.1 Holistic Financial Analysis:

This project underscores the importance of conducting a holistic financial analysis when evaluating strategic initiatives such as automation and sustainable energy integration. By considering various scenarios, estimating costs accurately, and assessing key financial metrics such as payback period, Net Present Value (NPV), and Internal Rate of Return (IRR), finance professionals can make informed investment decisions that align with organizational objectives and maximize shareholder value.

14.2 Risk Assessment and Management:

The project highlights the significance of rigorous risk assessment and management in mitigating uncertainties associated with large-scale projects. Finance professionals should proactively identify, analyze, and address potential risks, including technological, regulatory,

and market risks, to safeguard against adverse impacts on project outcomes and financial performance.

14.3 Strategic Partnerships and Collaboration:

Collaboration with external stakeholders, such as power sector companies and technology providers, can play a crucial role in project success. Finance professionals should actively seek strategic partnerships to leverage expertise, resources, and financing options, thereby enhancing project feasibility and accelerating implementation timelines.

14.4 Continuous Learning and Adaptation:

The dynamic nature of business environments necessitates continuous learning and adaptation. Finance professionals should remain vigilant to emerging trends, regulatory changes, and technological advancements in the fields of automation and sustainable energy. By staying informed and adaptable, finance professionals can proactively identify new opportunities, optimize project strategies, and drive innovation within their organizations.

14.5 Ethical and Sustainable Investing:

Finally, the project underscores the growing importance of ethical and sustainable investing practices in corporate finance. Finance professionals should consider not only financial returns but also environmental and social impacts when evaluating investment opportunities. By incorporating environmental, social, and governance (ESG) criteria into financial analysis and decision-making processes, finance professionals can contribute to long-term value creation and promote sustainable development.

In summary, this project offers valuable learning experiences for MBA finance students and finance professionals alike, emphasizing the importance of holistic financial analysis, risk management, strategic collaboration, continuous learning, and ethical investing in driving organizational success and sustainability.

15 Tasks handled and learnings derived during the internship:

During my internship at MRF Ltd, in addition to handling tasks such as bill verification, creating reports, and managing inventory, I also had the opportunity to delve into asset capitalization with the guidance of the costing executive. With his assistance, I learned how

assets are capitalized in SAP according to the company's standards. This experience provided me with insight into the financial processes involved in asset management and familiarized me with the use of SAP, a widely used enterprise resource planning system.

Throughout my internship, I gained hands-on experience that went beyond the theoretical knowledge acquired in the classroom. Working on tasks such as bill verification, where I meticulously examined invoices, underscored the importance of attention to detail and precision in financial transactions. The rigorous three-person verification process emphasized the significance of accuracy in handling substantial amounts of money.

Creating Goods Receipt Notes (GRN) in the stores department further deepened my understanding of inventory management practices, highlighting the importance of maintaining accurate records to support organizational efficiency. Compiling monthly overtime reports for the workmen not only showcased their dedication but also sharpened my data analysis skills, fostering transparency and accountability in reporting processes.

Overall, my internship at MRF Ltd provided me with invaluable opportunities to witness firsthand the intricacies of corporate operations and the practical application of theoretical concepts. It equipped me with practical skills and insights that will undoubtedly prove beneficial in my future endeavours.

16 Challenges faced:

During my internship at MRF Ltd, I encountered several challenges that tested my abilities and pushed me to adapt and learn. One of the main challenges was managing the high-pressure environment of bill verification, where the stakes were particularly high due to the substantial amounts involved. Ensuring meticulous accuracy in the face of such pressure required sharp attention to detail and the ability to work efficiently under tight deadlines.

Additionally, learning to navigate the complexities of SAP for asset capitalization posed its own set of challenges. While I had the guidance of the costing executive, mastering the intricacies of the software and adhering to the company's standards required patience and perseverance.

Moreover, coordinating with multiple stakeholders for the verification and approval of bills sometimes led to communication hurdles and delays. Effectively communicating and collaborating with team members and managers to streamline processes and address any discrepancies became crucial in overcoming these challenges.

Despite these obstacles, each challenge presented an opportunity for growth and learning. Overcoming them not only strengthened my skills but also instilled in me a greater sense of confidence and resilience in the face of adversity.

17 References:

Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labour. In *Journal of Economic Perspectives* (Vol. 33, Issue 2, pp. 3–30). American Economic Association. https://doi.org/10.1257/jep.33.2.3

Arnette, A. N. (2013). Integrating rooftop solar into a multi-source energy planning optimization model. *Applied Energy*, *111*, 456–467. https://doi.org/10.1016/j.apenergy.2013.05.003

Atkinson, R. D. (2019). *Robotics and the Future of Production and Work*.

Bany Mousa, O., Taylor, R. A., & Shirazi, A. (2019). Multi-objective optimization of solar photovoltaic and solar thermal collectors for industrial rooftop applications. *Energy Conversion and Management*, *195*, 392–408. https://doi.org/10.1016/j.enconman.2019.05.012

Deetjen, T. A., Vitter, J. S., Reimers, A. S., & Webber, M. E. (2018). Optimal dispatch and equipment sizing of a residential central utility plant for improving rooftop solar integration. *Energy*, *147*, 1044–1059. https://doi.org/10.1016/j.energy.2018.01.110

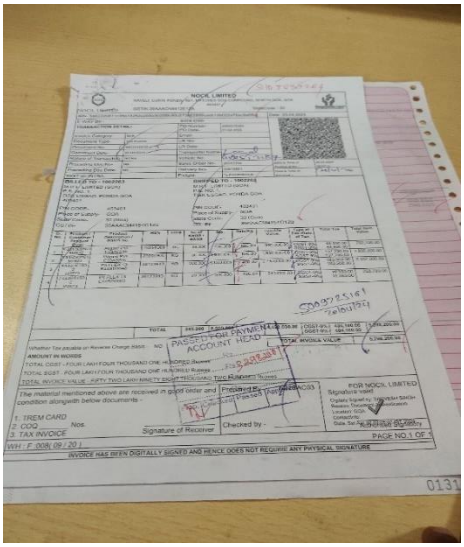
Goel, M. (2016). Solar rooftop in India: Policies, challenges and outlook. *Green Energy and Environment*, *1*(2), 129–137. https://doi.org/10.1016/j.gee.2016.08.003

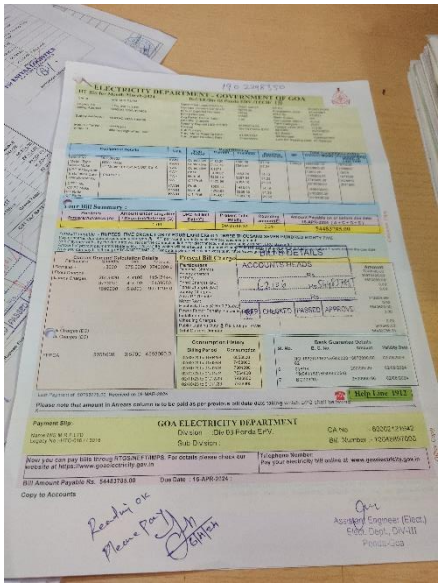
Rüßmann, M., Lorenz, M., Gerbert, P., Waldner, M., Justus, J., Engel, P., & Harnisch, M. (2015). *Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries*.

Sreekumar, M. D. (2018). Productivity in Manufacturing Industries. In *International Journal of Innovative Science and Research Technology* (Vol. 3, Issue 10)

18 Appendices:

18.1 Sample of Work Done:





18.2 Photos at work: