

Automotive Piston Market by Shape (Flat-top, Bowl, Dome), Material (Steel, Aluminum), Coating (Thermal Barrier, Dry Film, Oil Shedding), Component (Pin, Ring, Head), Fuel Type, Vehicle Type, Aftermarket by Component, & Region - Global Forecast to 2035

<https://marketpublishers.com/r/A89F53CD5593EN.html>

Date: April 2025

Pages: 264

Price: US\$ 4,950.00 (Single User License)

ID: A89F53CD5593EN

Abstracts

The automotive piston market is projected to grow from USD 2.46 billion in 2025 to USD 2.79 billion by 2035, at a CAGR of 1.3% during the forecast period. The passenger car segment is estimated to witness the highest piston demand in the coming years. In recent years, the demand for GDI engines has significantly increased, particularly for those using 3-cylinder configurations that can deliver comparable performance. This rising demand for GDI engines is expected to boost the need for bowl-shaped pistons. These pistons enhance turbulence, improve fuel atomization, and promote better airflow in line with the cylinder near the spark plug during ignition. Additionally, the growing sales of mid-size and full-size SUVs in countries such as China, Japan, India, and the US are further driving the demand for automotive pistons.

Several OEMs, such as Volkswagen, Renault, BMW Group, and Land Rover from Europe, offer GDI passenger cars with 3 or 4-cylinder configurations. As OEMs increasingly focus on GDI technology with 3 and 4-cylinder configurations, the demand for automotive pistons is projected to grow at a steady rate during the forecast period.

“The demand for steel pistons is expected to grow at a high rate globally during the forecast period”

Steel pistons are primarily made from alloy steel and are produced through advanced methods such as forging and precision casting, ensuring high durability and performance. They are highly durable and are usually used in heavy-duty applications

and high-performance engines due to their ability to withstand heavy temperatures and pressure. Carbon steel pistons, alloy steel pistons, and lightweight steel pistons are the primary construction materials in steel pistons.

Heavy commercial vehicles use steel pistons predominantly. Their low thermal conductivity and capacity to reduce fuel consumption more than aluminum help the engine achieve a high temperature and improve the vehicle's efficiency. Steel pistons also have a lower compression height, which allows the use of longer connecting rods for a further frictional performance advantage. Several OEMs are incorporating steel pistons in their high-performance vehicles, such as the Mercedes-Benz E-class, which uses steel pistons on the present V6 diesel engine. Asia Pacific accounted for the largest production of heavy commercial vehicles due to growth in infrastructure development, e-commerce, and logistics industries. With the rising demand for heavy commercial vehicles in regions like Asia Pacific, the demand for steel pistons is expected to grow in the coming years. Steel pistons are also preferred for heavy commercial vehicles due to their durability, fuel efficiency benefits, and improved engine performance. Hence, the demand for steel pistons will grow during the forecast period.

"Piston rings are projected to be the largest aftermarket component over the forecast period"

Piston rings accounted for the highest aftermarket demand for automotive pistons in 2024, owing to a maximum number of counts and a reasonably frequent replacement compared to other components. In commercial vehicles and high-performance passenger cars, engine overhauls are common. Piston rings get replaced during a major engine rebuild or overhauling, making them a necessary aftermarket replacement component in the piston aftermarket industry. Heavy-duty trucks have a higher demand for piston ring replacement due to the higher average running miles per year across the world. According to the US Department of Energy, semi-trucks typically travel nearly 62,000 miles per year, while long-haul trucks cover an average distance of 100,000 to 130,000 miles annually in the US. With such long-distance travel per year, the engine components, including piston heads, piston rings, and piston pins, go through greater mechanical stress, requiring major overhauling of engines after a certain period. During the overhauling of engines, the piston ring gets replaced. Thus, with increasing average distance traveled, specifically by heavy commercial vehicles globally, the demand for automotive piston rings will increase in the coming years.

'Asia Pacific is expected to be the largest market for automotive pistons during the forecast period'

The Asia Pacific region is primarily characterized by a strong presence of economic passenger vehicles, which include hatchbacks, compact and mid-size SUVs, and a limited number of compact sedans. Approximately 80-85% of the demand in this region is for gasoline-powered passenger cars. Major markets such as China, India, Japan, and South Korea show a particularly high demand for gasoline-based vehicles. While there has been a growing interest in electric vehicles over the past 3-4 years, most countries, with the exception of China, are expected to continue relying on gasoline-dominant engines. The demand for 3-cylinder and 4-cylinder engines is high in Asia as it is a significant hub for economy car production. The rapid growth in gasoline-powered compact & mid-size SUVs with GDI engines fuels the demand for automotive pistons.

Additionally, several regional countries are experiencing demand for CNG-based vehicles due to lower fuel costs and minimal maintenance expenses. In 2024, China and India led the production of both light and heavy commercial vehicles, accounting for approximately 82% of the market. Currently, almost all heavy trucks and buses are powered by diesel, and this trend is expected to continue with steady growth through 2035. To comply with emissions regulations, manufacturers are adopting strategies such as lightweighting. Engine downsizing and the use of aluminum alloy-based pistons are examples of this trend, which is anticipated to persist in the coming years.

Considering these factors, the passenger car segment is estimated to witness the highest piston demand in the coming years in the Asia Pacific region. Hybrid vehicles have also been adopted considerably in China, Japan, and South Korea, demonstrating a strong demand for automotive pistons in this car segment. Stringent emission regulations and rising gasoline prices drive the adoption of alternative fuel vehicles in developing nations such as India and Thailand. Vehicles powered by CNG are gaining traction as consumers seek cleaner alternatives to traditional fuels at a lower cost. Diesel engines drive heavy commercial vehicles with mostly 6 and 8-cylinder in-line configurations across all countries in the regional market.

In-depth interviews were conducted with CEOs, marketing directors, other innovation and technology directors, and executives from various key organizations operating in this market.

By Company Type: Piston Manufacturers – 70% and OEM – 30%

By Designation: C-Level – 40%, Director Level – 40%, and Others – 20%

By Region: North America – 20%, Europe – 25%, Asia Pacific - 45%, and Rest of the World – 10%

Key players in the automotive piston market include MAHLE GmbH (Germany), Tenneco Inc. (US), AISIN CORPORATION (Japan), Kolbenschmidt (Germany), and Shriram Pistons & Rings Limited (India). These companies engaged in expansions, product launches, partnerships, and mergers & acquisitions to gain traction in the automotive piston market.

Research Coverage:

The report covers the automotive piston market in terms of component (piston heads, piston rings, and piston pins), coating (dry film lubricant, thermal barrier, and oil shedding), shape (flat-top pistons, bowl pistons, and dome pistons), fuel type (gasoline, diesel, and alternate fuels), material (steel and aluminum), vehicle type (passenger cars, light commercial vehicles, and heavy commercial vehicles), aftermarket component (piston heads, piston rings, and piston pins), and region. It covers the competitive landscape and company profiles of the significant automotive piston market ecosystem players.

The study also includes an in-depth competitive analysis of the key market players with their company profiles, key observations related to product and business offerings, recent developments, and key market strategies.

Key Benefits of Buying the Report:

The report will help market leaders/new entrants with information on the closest approximations of revenue numbers for the overall automotive piston market and its subsegments.

This report will help stakeholders understand the competitive landscape and gain more insights to position their businesses better and plan suitable go-to-market strategies.

The report also helps stakeholders understand the market pulse and provides information on key market drivers, restraints, challenges, and opportunities.

The report also helps stakeholders understand the automotive piston market's

current and future pricing trends.

The report provides insight into the following pointers:

Analysis of key drivers (Increased demand for gasoline vehicles and rising demand for lightweight pistons), restraints (Increase in adoption of electric vehicles and growing trend of engine downsizing), opportunities (Manufacturing of pistons using alternative materials and advanced manufacturing processes), and challenges (Manufacturing high-quality, cost-effective pistons).

Product Development/Innovation: Detailed insights on upcoming technologies and research & development activities in the automotive piston market.

Market Development: Comprehensive information about lucrative markets - the report analyses the automotive piston market across varied regions.

Market Diversification: Exhaustive information about untapped geographies, recent developments, trends & disruptions impacting customer business, trade analysis, case study analysis, buying criteria, key stakeholders, pricing analysis, key conferences & events, patent analysis, and investments in the automotive piston market.

Competitive Assessment: In-depth assessment of market share, growth strategies, and product offerings of leading players in the automotive piston market, such as MAHLE GmbH (Germany), Tenneco Inc. (US), AISIN CORPORATION (Japan), Kolbenschmidt (Germany), and Shriram Pistons & Rings Limited (India).

Contents

1 INTRODUCTION

- 1.1 STUDY OBJECTIVES
- 1.2 MARKET DEFINITION
- 1.3 INCLUSIONS AND EXCLUSIONS
- 1.4 MARKET SCOPE
 - 1.4.1 MARKETS COVERED
 - 1.4.2 YEARS CONSIDERED
- 1.5 CURRENCY CONSIDERED
- 1.6 UNITS CONSIDERED
- 1.7 STAKEHOLDERS
- 1.8 SUMMARY OF CHANGES

2 RESEARCH METHODOLOGY

- 2.1 RESEARCH DATA
 - 2.1.1 SECONDARY DATA
 - 2.1.1.1 Secondary sources for vehicle production and market sizing
 - 2.1.1.2 Key data from secondary sources
 - 2.1.2 PRIMARY DATA
 - 2.1.2.1 Primary participants
 - 2.1.3 SAMPLING TECHNIQUES AND DATA COLLECTION METHODS
- 2.2 MARKET SIZE ESTIMATION
 - 2.2.1 AUTOMOTIVE PISTON OE MARKET: BOTTOM-UP APPROACH
 - 2.2.2 BOTTOM-UP APPROACH
 - 2.2.3 AUTOMOTIVE PISTON OE MARKET: TOP-DOWN APPROACH
 - 2.2.4 AUTOMOTIVE PISTON AFTERMARKET: BOTTOM-UP APPROACH
- 2.3 DATA TRIANGULATION
- 2.4 RESEARCH ASSUMPTIONS AND RISK ASSESSMENT
- 2.5 RESEARCH LIMITATIONS

3 EXECUTIVE SUMMARY

4 PREMIUM INSIGHTS

- 4.1 ATTRACTIVE OPPORTUNITIES FOR PLAYERS IN AUTOMOTIVE PISTON MARKET

- 4.2 AUTOMOTIVE PISTON MARKET, BY COMPONENT
- 4.3 AUTOMOTIVE PISTON MARKET, BY SHAPE
- 4.4 AUTOMOTIVE PISTON MARKET, BY FUEL TYPE
- 4.5 AUTOMOTIVE PISTON MARKET, BY COATING
- 4.6 AUTOMOTIVE PISTON MARKET, BY MATERIAL TYPE
- 4.7 AUTOMOTIVE PISTON MARKET, BY VEHICLE TYPE
- 4.8 AUTOMOTIVE PISTON MARKET, BY AFTERMARKET COMPONENT
- 4.9 AUTOMOTIVE PISTON MARKET, BY REGION

5 MARKET OVERVIEW

5.1 INTRODUCTION

5.2 MARKET DYNAMICS

5.2.1 DRIVERS

5.2.1.1 Increased demand for gasoline vehicles

5.2.1.2 Rise in demand for lightweight pistons

5.2.2 RESTRAINTS

5.2.2.1 Increase in adoption of electric vehicles

5.2.2.2 Growing trend of smaller 3-cylinder engine

5.2.3 OPPORTUNITIES

5.2.3.1 Manufacturing of pistons using alternative materials and advanced manufacturing processes

5.2.3.2 Implementation of H2-ICE in Heavy commercial vehicles

5.2.4 CHALLENGES

5.2.4.1 Manufacturing high-quality, cost-effective pistons

5.3 TRENDS AND DISRUPTIONS IMPACTING CUSTOMER BUSINESS

5.4 ECOSYSTEM ANALYSIS

5.5 SUPPLY CHAIN ANALYSIS

5.5.1 RAW MATERIAL SUPPLIERS

5.5.2 COMPONENT SUPPLIERS

5.5.3 ENGINE MANUFACTURERS

5.5.4 OEMS

5.6 KEY STAKEHOLDERS AND BUYING CRITERIA

5.6.1 KEY STAKEHOLDERS IN BUYING PROCESS

5.6.2 KEY BUYING CRITERIA

5.7 KEY CONFERENCES AND EVENTS, 2025–2026

5.8 SUPPLIER ANALYSIS

5.9 TECHNOLOGY ANALYSIS

5.9.1 KEY TECHNOLOGIES

5.9.1.1 Material innovation in automotive pistons

5.9.1.2 3D printing of automotive pistons

5.9.2 ADJACENT TECHNOLOGIES

5.9.2.1 Developments in cylinder liners

5.9.3 COMPLEMENTARY TECHNOLOGIES

5.9.3.1 Digital twin technology

5.10 PATENT ANALYSIS

5.11 TRADE ANALYSIS

5.11.1 IMPORT SCENARIO OF AUTOMOTIVE PISTONS

5.11.2 EXPORT SCENARIO OF AUTOMOTIVE PISTONS

5.12 CASE STUDY ANALYSIS

5.12.1 IMPACT OF PISTON NODE MASS ON DIESEL ENGINE PERFORMANCE

5.12.2 DESIGN AND ANALYSIS OF AUTOMOTIVE BIMETALLIC PISTON

5.12.3 OPTIMIZATION OF PISTON COOLING OIL JET USING PARTICLEWORKS

5.13 REGULATORY LANDSCAPE

5.13.1 REGULATORY BODIES, GOVERNMENT AGENCIES,
AND OTHER ORGANIZATIONS

5.14 PRICING ANALYSIS

5.14.1 BY SHAPE

5.14.2 BY VEHICLE TYPE

5.14.3 BY REGION

6 AUTOMOTIVE PISTON MARKET, BY VEHICLE TYPE

6.1 INTRODUCTION

6.2 PASSENGER CARS

6.2.1 SHIFT TOWARD SUVs AND HYBRID VEHICLES TO DRIVE MARKET

6.3 LIGHT COMMERCIAL VEHICLES

6.3.1 INCREASING DEMAND FOR LAST-MILE DELIVERY AND
INFRASTRUCTURAL DEVELOPMENTS TO DRIVE MARKET

6.4 HEAVY COMMERCIAL VEHICLES

6.4.1 GROWING TRANSPORTATION, MANUFACTURING, MINING,
AND CONSTRUCTION ACTIVITIES TO DRIVE MARKET

6.5 INDUSTRY INSIGHTS

7 AUTOMOTIVE PISTON MARKET, BY FUEL TYPE

7.1 INTRODUCTION

7.2 GASOLINE

7.2.1 HIGHER ADOPTION IN PASSENGER CARS AND LCVS TO DRIVE MARKET
7.3 DIESEL

7.3.1 DEMAND FOR HIGH POWER AND TORQUE IN HCVS TO DRIVE MARKET
7.4 ALTERNATE FUELS

7.4.1 EMISSION REGULATIONS AND DIESEL BANS TO DRIVE MARKET
7.5 INDUSTRY INSIGHTS

8 AUTOMOTIVE PISTON MARKET, BY MATERIAL TYPE

8.1 INTRODUCTION

8.2 STEEL

8.2.1 HIGH STRENGTH WITH HIGHER TEMPERATURE RESISTANCE TO DRIVE DEMAND

8.3 ALUMINUM

8.3.1 LIGHTWEIGHT AND LOWER MANUFACTURING COSTS TO DRIVE MARKET
8.4 INDUSTRY INSIGHTS

9 AUTOMOTIVE PISTON MARKET, BY SHAPE

9.1 INTRODUCTION

9.2 FLAT -TOP

9.2.1 SIMPLE DESIGN AND HIGHER EFFICIENCY DRIVE MARKET GROWTH

9.3 BOWL

9.3.1 INCREASED DEMAND FOR LAST-MILE DELIVERY AND INFRASTRUCTURAL DEVELOPMENTS DRIVES MARKET

9.4 DOME

9.4.1 INCREASE IN SPORTS CARS MARKET DRIVES DEMAND
9.5 INDUSTRY INSIGHTS

10 AUTOMOTIVE PISTON MARKET, BY COATING

10.1 INTRODUCTION

10.2 THERMAL BARRIER COATING

10.2.1 NEED FOR HEAT TRANSFER REDUCTION FROM COMBUSTION CHAMBER TO DRIVE DEMAND

10.3 DRY FILM LUBRICANT COATING

10.3.1 NEED TO MINIMIZE PISTON WEAR AND TEAR TO DRIVE DEMAND
10.4 OIL SHEDDING COATING

10.4.1 NEED TO CURTAIL OIL ACCUMULATION IN PISTONS TO DRIVE DEMAND

10.5 INDUSTRY INSIGHTS

11 AUTOMOTIVE PISTON MARKET, BY COMPONENT

11.1 INTRODUCTION

11.2 PISTON HEADS

11.2.1 DEMAND FOR ENHANCED ENGINE EFFICIENCY TO DRIVE MARKET

11.3 PISTON RINGS

11.3.1 DEVELOPMENT OF EFFICIENT AND RELIABLE ENGINES TO DRIVE MARKET

11.4 PISTON PINS

11.4.1 NEED FOR REPLACEMENT PARTS TO DRIVE DEMAND FOR PISTON PINS

11.5 INDUSTRY INSIGHTS

12 AUTOMOTIVE PISTON AFTERMARKET, BY COMPONENT

12.1 INTRODUCTION

12.2 PISTON HEADS

12.2.1 HIGH DEMAND FROM ENGINE OVERHAULS AND REBUILDING DRIVES MARKET

12.3 PISTON RINGS

12.3.1 HIGH WEAR RATE REQUIRING FREQUENT REPLACEMENTS SUPPORTS MARKET GROWTH

12.4 PISTON PINS

12.4.1 HIGH WEAR & TEAR DRIVES DEMAND

12.5 INDUSTRY INSIGHTS

13 AUTOMOTIVE PISTON MARKET, BY REGION

13.1 INTRODUCTION

13.2 ASIA PACIFIC

13.2.1 MACROECONOMIC OUTLOOK

13.2.2 CHINA

13.2.2.1 Strong demand for GDI and SUVs vehicles to drive market growth

13.2.3 INDIA

13.2.3.1 Rapid adoption of CNG vehicles to propel market

13.2.4 JAPAN

13.2.4.1 Growing HEVs industry with higher cylinder numbers to fuel market growth

13.2.5 SOUTH KOREA

13.2.5.1 Presence of local piston manufacturers to accelerate market growth

13.2.6 REST OF ASIA PACIFIC

13.2.6.1 Strong demand for alternate fuel to foster engines in emerging economies

13.3 EUROPE

13.3.1 MACROECONOMIC OUTLOOK

13.3.2 GERMANY

13.3.2.1 Presence of key players and automotive manufacturing hub to bolster market growth

13.3.3 UK

13.3.3.1 Growth of light commercial vehicles to fuel market growth

13.3.4 FRANCE

13.3.4.1 Strong government incentives for hybrid vehicles to support market growth

13.3.5 SPAIN

13.3.5.1 Strong automotive manufacturing industry to foster market growth

13.3.6 REST OF EUROPE

13.4 NORTH AMERICA

13.4.1 MACROECONOMIC OUTLOOK

13.4.2 US

13.4.2.1 Inclination toward full-size performance oriented SUVs and light trucks to support market growth

13.4.3 MEXICO

13.4.3.1 Competitive manufacturing costs, strategic location, and participation in trade agreements fleets to boost market growth

13.4.4 CANADA

13.4.4.1 Rise in larger vehicle models to enhance market growth

13.5 REST OF THE WORLD (ROW)

13.5.1 BRAZIL

13.5.1.1 Rising passenger cars with alternate to boost market growth

13.5.2 SOUTH AFRICA

13.5.2.1 Rising vehicle production to drive market

13.5.3 OTHERS

14 COMPETITIVE LANDSCAPE

14.1 INTRODUCTION

14.2 KEY PLAYER STRATEGIES/RIGHT TO WIN, 2020–2024

14.3 MARKET SHARE ANALYSIS, 2024

14.4 REVENUE ANALYSIS, 2019–2023

14.5 COMPANY EVALUATION MATRIX: KEY PLAYERS, 2024

- 14.5.1 STARS
- 14.5.2 EMERGING LEADERS
- 14.5.3 PERVASIVE PLAYERS
- 14.5.4 PARTICIPANTS
- 14.5.5 COMPANY FOOTPRINT: KEY PLAYERS, 2024
 - 14.5.5.1 Company footprint
 - 14.5.5.2 Region footprint
 - 14.5.5.3 Vehicle type footprint
 - 14.5.5.4 Shape footprint
- 14.6 COMPANY EVALUATION MATRIX: STARTUPS/SMES, 2024
 - 14.6.1 PROGRESSIVE COMPANIES
 - 14.6.2 RESPONSIVE COMPANIES
 - 14.6.3 DYNAMIC COMPANIES
 - 14.6.4 STARTING BLOCKS
 - 14.6.5 COMPETITIVE BENCHMARKING: STARTUPS/SMES, 2024
 - 14.6.5.1 Detailed list of key startups/SMEs
 - 14.6.5.2 Competitive benchmarking of key startups/SMEs
- 14.7 COMPANY VALUATION AND FINANCIAL METRICS
- 14.8 BRAND/PRODUCT COMPARISON
- 14.9 COMPETITIVE SCENARIO
 - 14.9.1 PRODUCT LAUNCHES
 - 14.9.2 DEALS
 - 14.9.3 EXPANSIONS
 - 14.9.4 OTHER DEVELOPMENTS

15 COMPANY PROFILE

- 15.1 KEY PLAYERS
 - 15.1.1 MAHLE GMBH
 - 15.1.1.1 Business overview
 - 15.1.1.2 Products/Solutions offered
 - 15.1.1.3 Recent developments
 - 15.1.1.3.1 Product launches/developments
 - 15.1.1.3.2 Other developments
 - 15.1.1.4 MnM view
 - 15.1.1.4.1 Key strengths
 - 15.1.1.4.2 Strategic choices
 - 15.1.1.4.3 Weaknesses and competitive threats
 - 15.1.2 TENNECO INC.

- 15.1.2.1 Business overview
- 15.1.2.2 Products/Solutions offered
- 15.1.2.3 Recent developments
 - 15.1.2.3.1 Developments
- 15.1.2.4 MnM view
 - 15.1.2.4.1 Key strengths
 - 15.1.2.4.2 Strategic choices
 - 15.1.2.4.3 Weaknesses and competitive threats
- 15.1.3 AISIN CORPORATION
 - 15.1.3.1 Business overview
 - 15.1.3.2 Products/Solutions offered
 - 15.1.3.3 MnM view
 - 15.1.3.3.1 Key strengths
 - 15.1.3.3.2 Strategic choices
 - 15.1.3.3.3 Weaknesses and competitive threats
- 15.1.4 KOLBENSCHMIDT PISTONS
 - 15.1.4.1 Business overview
 - 15.1.4.2 Products/Solutions offered
 - 15.1.4.3 Recent developments
 - 15.1.4.3.1 Expansions
 - 15.1.4.3.2 Other developments
 - 15.1.4.4 MnM view
 - 15.1.4.4.1 Key strengths
 - 15.1.4.4.2 Strategic choices
 - 15.1.4.4.3 Weaknesses and competitive threats
- 15.1.5 SHRIRAM PISTONS
 - 15.1.5.1 Business overview
 - 15.1.5.2 Products/Solutions offered
 - 15.1.5.3 MnM view
 - 15.1.5.3.1 Key strengths
 - 15.1.5.3.2 Strategic choices
 - 15.1.5.3.3 Weaknesses and competitive threats
- 15.1.6 DONGSUHFEDERAL-MOGUL CO., LTD.
 - 15.1.6.1 Business overview
 - 15.1.6.2 Products/Solutions offered
 - 15.1.6.3 Recent developments
 - 15.1.6.3.1 Developments
- 15.1.7 NPR-RIKEN CORPORATION
 - 15.1.7.1 Business overview

- 15.1.7.2 Products/Solutions offered
- 15.1.8 INDIA PISTONS LTD.
 - 15.1.8.1 Business overview
 - 15.1.8.2 Products/Solutions offered
- 15.1.9 HITACHI ASTEMO, LTD.
 - 15.1.9.1 Business overview
 - 15.1.9.2 Products/Solutions offered
- 15.1.10 HIRSCHVOGEL GROUP
 - 15.1.10.1 Business overview
 - 15.1.10.2 Products/Solutions offered
- 15.1.11 C.S. PISTON (THAILAND) CO., LTD.
 - 15.1.11.1 Business overview
 - 15.1.11.2 Products/Solutions offered
- 15.2 OTHER PLAYERS
 - 15.2.1 PT ASTRA OTOPARTS TBK.
 - 15.2.2 HONDA FOUNDRY CO., LTD.
 - 15.2.3 MENON GROUP
 - 15.2.4 ROSS RACING PISTONS
 - 15.2.5 CP CARRILLO
 - 15.2.6 CAPRICORN GROUP
 - 15.2.7 COSWORTH
 - 15.2.8 BOHAI AUTOMOTIVE SYSTEMS CO., LTD.
 - 15.2.9 TOMEI POWERED INCORPORATED
 - 15.2.10 LALLSONS PISTON & RINGS PVT. LTD.
 - 15.2.11 ATRAC ENGINEERING CO.
 - 15.2.12 WISECO
 - 15.2.13 JEPISTONS
 - 15.2.14 GIBTEC PISTONS
 - 15.2.15 DONG YANG PISTON

16 MNM INSIGHTS ON BIO-FUEL AND E-FUEL USAGE

- 16.1 US
 - 16.1.1 MNM INSIGHTS ON BIO-FUEL AND E-FUEL USAGE IN US LIGHT & HEAVY-DUTY VEHICLE CATEGORY
 - 16.1.1.1 Light-duty vehicles
 - 16.1.1.2 Heavy-duty vehicles
 - 16.1.2 INSIGHTS ON POLICIES & REGULATIONS
 - 16.1.3 FUEL PRODUCTION: FUTURE TECHNOLOGY ROADMAP

16.2 BRAZIL

16.2.1 MNM INSIGHTS ON BIO-FUEL AND E-FUEL USAGE IN BRAZILIAN LIGHT & HEAVY-DUTY VEHICLE CATEGORY

16.2.1.1 Light-duty vehicles

16.2.1.2 Heavy-duty vehicles

16.2.2 INSIGHTS ON POLICIES & REGULATIONS

16.2.3 FUEL PRODUCTION: BRAZIL'S FUTURE TECHNOLOGY ROADMAP

16.3 INDIA

16.3.1 MNM INSIGHTS ON BIO-FUEL AND E-FUEL USAGE IN INDIAN LIGHT & HEAVY-DUTY VEHICLE CATEGORY

16.3.1.1 Light-duty vehicles

16.3.1.2 Heavy-duty vehicles

16.3.2 FUEL PRODUCTION: INDIA'S FUTURE TECHNOLOGY ROADMAP

16.4 EUROPE

16.4.1 MNM INSIGHTS ON BIO-FUEL AND E-FUEL USAGE IN EUROPEAN LIGHT & HEAVY-DUTY VEHICLE CATEGORY

16.4.1.1 Light-duty vehicles

16.4.1.2 Heavy-duty vehicles

16.4.2 FUEL PRODUCTION: EUROPE'S FUTURE TECHNOLOGY ROADMAP

16.5 INDONESIA

16.5.1 MNM INSIGHTS ON BIO-FUEL AND E-FUEL USAGE IN INDONESIA LIGHT & HEAVY-DUTY VEHICLE CATEGORY

16.5.1.1 Light-duty vehicles

16.5.1.2 Heavy-duty vehicles

16.5.2 FUEL PRODUCTION: INDONESIA'S FUTURE TECHNOLOGY ROADMAP

17 RECOMMENDATIONS

17.1 JAPAN, INDIA, AND SOUTH KOREA: PROMISING ALTERNATIVES TO CHINA AS THEY DEMONSTRATE STABLE DEMAND FOR AUTOMOTIVE PISTONS

17.2 FLAT-TOP TO BE KEY SHAPE IN PISTON MANUFACTURING

17.3 ALTERNATE FUEL SEGMENT TO GROW AT FASTEST RATE

17.4 CONCLUSION

18 APPENDIX

18.1 INSIGHTS FROM INDUSTRY EXPERTS

18.2 DISCUSSION GUIDE

18.3 KNOWLEDGESTORE: MARKETSANDMARKETS' SUBSCRIPTION PORTAL

18.4 CUSTOMIZATION OPTIONS

18.4.1 AUTOMOTIVE PISTON MARKET, BY COUNTRY, BY VEHICLE TYPE

18.4.1.1 Passenger cars

18.4.1.2 LCVs

18.4.1.3 HCVs

18.4.2 AUTOMOTIVE PISTON MARKET, BY COUNTRY, BY COMPONENT

18.4.2.1 Piston heads

18.4.2.2 Piston rings

18.4.2.3 Piston pins

18.4.3 AUTOMOTIVE PISTON AFTERMARKET, BY COUNTRY, BY COMPONENT

18.4.3.1 Piston heads

18.4.3.2 Piston rings

18.4.3.3 Piston pins

18.5 RELATED REPORTS

18.6 AUTHOR DETAILS 262 _

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