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Automotive Engine Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented By Vehicle Type (Passenger Cars, Light Commercial Vehicles, Medium & Heavy Commercial Vehicles), By Placement Type (In-Line, V-Type, W-Type), By Fuel Type (Petrol, Diesel, Other Fuels), By Region, Competition 2018-2028

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Abstracts

Global Automotive Engine market was valued at USD 94 billion in 2022 and is anticipated to project robust growth in the forecast period with a CAGR of 5.48% through 2028. Vehicle engines are among the most crucial parts of a car. The automotive engine market is a cornerstone of the automotive industry, powering vehicles of various types and sizes. The automotive engine market is driven by several factors, including regulatory mandates, consumer preferences, and technological advancements in engine design and efficiency. Regulatory requirements related to emissions standards, fuel economy targets, and vehicle performance criteria drive automakers to invest in advanced engine technologies, such as turbocharging, direct injection, and variable valve timing, to meet compliance and market demand for cleaner, more efficient vehicles. Consumer preferences for performance, fuel efficiency, and environmental sustainability influence engine choices, prompting automakers to offer a diverse range of engine options to cater to different market segments and customer needs. Technological advancements in engine design, materials, and manufacturing processes enable automakers to improve engine performance, efficiency, and reliability, driving down emissions, fuel consumption, and operating costs throughout the automotive lifecycle.

Challenges facing the automotive engine market include emissions reduction,

electrification, and cost pressures. Stricter emissions regulations and consumer demand for cleaner vehicles drive automakers to invest in emissions control technologies, such as exhaust aftertreatment systems and hybrid powertrains, to meet compliance and market expectations for low-emission vehicles. The trend towards electrification, including battery electric vehicles (BEVs) and hybrid electric vehicles (HEVs), poses challenges for traditional internal combustion engines, necessitating investments in alternative powertrain technologies and infrastructure to remain competitive in the evolving automotive landscape

Opportunities for market growth lie in the development of advanced engine technologies, alternative fuels, and hybrid powertrain solutions that offer improved performance, efficiency, and environmental sustainability for automotive applications. Collaborative efforts between automakers, engine suppliers, research institutions, and government agencies facilitate technology innovation, standardization, and scale economies that drive down costs and accelerate the adoption of cleaner, more efficient engines. Moreover, the transition towards electrification presents opportunities for engine manufacturers to supply hybrid powertrains, range extenders, and other ancillary components for electrified vehicles, leveraging their expertise and capabilities to participate in the evolving automotive ecosystem. Overall, the automotive engine market plays a crucial role in shaping the performance, efficiency, and sustainability of vehicles across different automotive segments

Market Drivers

Stringent Emission Regulations and Environmental Concerns

The global automotive engine market is profoundly influenced by stringent emission regulations and growing environmental concerns. Governments worldwide have been implementing stricter emissions standards to combat air pollution and reduce the carbon footprint of vehicles. These regulations aim to limit harmful emissions like carbon dioxide (CO2), nitrogen oxides (NOx), and particulate matter (PM) from vehicles. To meet these stringent emission standards, automakers are forced to adopt cleaner and more efficient engine technologies. This has led to a shift from traditional internal combustion engines (ICE) to more environmentally friendly options, including electric and hybrid powertrains. However, internal combustion engines are still evolving to meet these regulations, driving innovation in areas such as fuel injection systems, exhaust after-treatment technologies, and lightweight materials. Additionally, automakers are investing in research and development to optimize the efficiency of internal combustion engines through technologies like turbocharging, direct fuel injection, and variable valve

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timing. These developments are crucial for reducing emissions and ensuring compliance with emissions regulations. As a result, the automotive engine market has witnessed a growing demand for hybrid and electric powertrains, while internal combustion engines continue to evolve to meet environmental requirements. This shift in focus is expected to continue shaping the market landscape in the coming years.

Advancements in Engine Technology

Continuous advancements in engine technology play a pivotal role in shaping the global automotive engine market. Automakers and engine manufacturers are consistently striving to improve engine efficiency, performance, and reliability. Key technological advancements in this area include The downsizing of engines and their combination with turbocharging has become a prominent trend. Smaller, more efficient engines, often with fewer cylinders, are turbocharged to maintain or even improve performance while reducing fuel consumption and emissions. Direct fuel injection has become a common feature in modern engines. It allows for better control of fuel delivery, resulting in improved combustion efficiency and reduced emissions. These technologies optimize engine performance by adjusting valve timing and lift according to driving conditions, enhancing power output and fuel efficiency. The use of lightweight materials, such as aluminum and composite components, reduces the overall weight of engines and vehicles, contributing to improved fuel economy. Some engines are equipped with cylinder deactivation technology, which can shut down specific cylinders when they are not needed, further improving fuel efficiency. Many engines now feature start-stop systems that automatically shut off the engine when the vehicle is stationary, reducing idling time and fuel consumption. These technological advancements not only improve the performance and efficiency of internal combustion engines but also support the development of hybrid powertrains. As technology continues to evolve, it will be a key driver of innovation and competitiveness within the automotive engine market.

Increasing Demand for Fuel Efficiency

The automotive industry is witnessing a growing demand for fuel-efficient vehicles, driven by consumer preferences, fuel prices, and regulatory requirements. Fuel efficiency is a critical factor influencing consumer purchasing decisions and is directly linked to engine performance and design. In response to this demand, automakers are investing heavily in the development of engines that offer better fuel economy without compromising performance. This includes the optimization of transmission systems, aerodynamics, and engine efficiency. The development of lightweight materials and advanced engine technologies, as discussed earlier, is also aimed at improving fuel

efficiency. Additionally, hybrid and electric powertrains are gaining popularity as they offer improved fuel economy and reduced emissions. The transition to electric vehicles (EVs) represents a significant shift in the automotive engine market, with electric motors replacing traditional internal combustion engines entirely. While EVs are still a relatively small segment of the market, their growth is expected to accelerate as battery technology improves and charging infrastructure expands. As a result, the demand for fuel-efficient engines and powertrains will continue to drive innovation in the automotive engine market, encouraging manufacturers to develop cleaner and more efficient propulsion systems.

Global Economic Conditions and Consumer Preferences

The global automotive engine market is sensitive to economic conditions and consumer preferences. Economic factors, such as GDP growth, employment rates, and consumer spending, can significantly influence the demand for automobiles and, consequently, the engines that power them. During economic downturns, consumers may prioritize cost savings and opt for more fuel-efficient vehicles. Conversely, during periods of economic prosperity, consumers may show a greater inclination toward larger, more powerful vehicles that feature advanced engine technologies. Consumer preferences also play a crucial role in shaping the automotive engine market. As consumers become more environmentally conscious, the demand for eco-friendly vehicles with efficient engines increases. This shift in consumer sentiment has led to the rise of hybrid and electric vehicles, which have gained market share at the expense of traditional internal combustion engines. Additionally, regional variations in consumer preferences and economic conditions impact the types of vehicles and engines that are popular in different parts of the world. For example, in North America, there is a strong demand for pickup trucks and SUVs with powerful engines, while in Europe, smaller, more fuel-efficient vehicles are prevalent. These regional differences influence the product offerings of automakers and engine manufacturers in each market. Therefore, understanding and responding to changing economic conditions and consumer preferences are critical for companies operating in the automotive engine market. Adaptability and a proactive approach to market dynamics are key drivers in this regard.

Technological Convergence and Integration

The automotive engine market is experiencing a convergence of various technologies and integration of systems, leading to more advanced and sophisticated powertrains. This convergence is driven by the need for improved performance, fuel efficiency, and reduced emissions, and it encompasses several key trends: The integration of electric

components into traditional internal combustion engines has led to the development of mild hybrid and full hybrid powertrains. These systems can improve efficiency by using electric power during acceleration and regenerating energy during braking. Modern vehicles increasingly incorporate connectivity features and autonomous driving capabilities. These technologies require advanced engine management systems to optimize performance, manage power distribution, and ensure efficient operation in varying driving conditions. ADAS features such as adaptive cruise control, lane-keeping assist, and collision avoidance systems rely on engine and vehicle sensors, including radar and cameras. These systems are integrated with the engine control unit (ECU) to enhance safety and performance. The collection and analysis of data from vehicles can help improve engine performance, predictive maintenance, and fuel efficiency. As such, data analytics and telematics are becoming integral to engine development and vehicle management. Engine manufacturing is increasingly adopting smart and automated processes, including robotics and 3D printing, to enhance efficiency, reduce costs, and improve quality control.

Key Market Challenges

Stringent Emission Regulations and Compliance

One of the most pressing challenges in the global automotive engine market is the continuous tightening of emission regulations imposed by governments and international organizations. Regulations are designed to reduce greenhouse gas emissions and air pollution, pushing automakers to develop cleaner and more fuel-efficient engines. Compliance with these regulations requires significant investments in research and development, testing, and the adoption of advanced technologies. This can increase the overall cost of engine development and production. Moreover, the rapid evolution of emission standards necessitates constant innovation, making it challenging for manufacturers to keep up with the latest requirements. A potential solution to this challenge is investing in research and development to create innovative engine technologies that not only meet current regulations but also anticipate future standards. This includes the development of hybrid and electric powertrains, which have the potential to reduce or eliminate emissions entirely. Automakers must also collaborate with governments and regulatory bodies to create realistic and achievable emission targets that balance environmental concerns with industry feasibility.

Rapid Advancements in Electric Vehicle (EV) Technology

The increasing popularity and rapid advancements in electric vehicle (EV) technology

pose a significant challenge to the traditional internal combustion engine (ICE) market. As EVs become more affordable and offer longer ranges, they are gaining market share, especially in regions with strong incentives for electric mobility. This shift to EVs challenges the automotive engine market on several fronts. First, it impacts the demand for traditional engines, leading to overcapacity in engine manufacturing facilities. Second, it necessitates a strategic shift in the industry, as automakers must invest in EV technology and infrastructure. Third, the supply chain for electric powertrains is different from that of traditional engines, requiring a reconfiguration of manufacturing processes and resources. To address this challenge, traditional engine manufacturers can consider diversifying their product offerings by developing their own electric powertrains or entering partnerships with EV component manufacturers. By embracing electric mobility, companies can adapt to the changing market landscape and continue to play a significant role in the automotive industry.

Rising Raw Material Costs and Supply Chain Disruptions

The automotive engine market is highly dependent on the availability and cost of raw materials, such as steel, aluminum, and rare earth elements. These materials are used in engine components, and fluctuations in their prices can significantly impact manufacturing costs. Moreover, supply chain disruptions, as witnessed during the COVID-19 pandemic, can disrupt the production of engines and related components. Fluctuations in raw material costs can strain the profit margins of engine manufacturers, especially when prices rise. Additionally, global supply chain disruptions, whether due to natural disasters, geopolitical issues, or pandemics, can lead to shortages of essential components, causing production delays and increased costs. To mitigate the effects of rising material costs and supply chain disruptions, engine manufacturers should consider strategies such as diversifying their supplier base, stockpiling critical components, and investing in advanced inventory management systems. These measures can help ensure a more resilient and flexible supply chain while also hedging against fluctuations in raw material prices.

Technological Obsolescence and Rapid Innovation

The automotive engine market is marked by rapid technological innovation, which can lead to the obsolescence of existing engine designs. As new technologies, such as advanced driver assistance systems (ADAS) and connectivity features, become more integrated with vehicles, engines must be equipped to handle the power and data demands of these systems. Engine manufacturers face the challenge of keeping pace with these technological advancements while ensuring that their products remain

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competitive and relevant. Failure to do so can lead to a loss of market share and decreased profitability. To address this challenge, engine manufacturers must invest in research and development to stay at the forefront of technology. This includes the development of engines that are optimized for hybrid and electric powertrains, as well as engines that are adaptable to future connectivity and autonomous driving features. Collaboration with technology companies and automotive suppliers can also help engine manufacturers access cutting-edge innovations.

Global Economic Uncertainty and Market Volatility

The automotive engine market is susceptible to global economic conditions and market volatility. Economic factors, such as recessions, trade disputes, and currency fluctuations, can affect consumer purchasing power and, subsequently, the demand for vehicles and engines. Market volatility, which can be driven by geopolitical events, regulatory changes, or industry disruptions, adds another layer of uncertainty. For instance, the imposition of tariffs on certain components or vehicles can disrupt global supply chains and create market instability. To navigate economic uncertainty and market volatility, engine manufacturers should adopt a flexible approach to production and market expansion. Diversifying into emerging markets, where economic conditions may be more stable, can help mitigate the impact of economic downturns in mature markets. Additionally, robust risk management strategies, including financial hedging and scenario planning, can assist in safeguarding against market fluctuations.

Key Market Trends

Electrification and Hybridization of Automotive Engines

One of the most profound trends in the automotive engine market is the shift towards electrification and hybridization. This transformation is driven by a global push to reduce greenhouse gas emissions and mitigate the environmental impact of transportation. As a result, automotive manufacturers are investing heavily in electric and hybrid powertrains, which offer enhanced efficiency and reduced carbon footprint compared to traditional internal combustion engines (ICEs). Electric Vehicles (EVs): EVs are becoming increasingly popular as advancements in battery technology allow for longer driving ranges and faster charging times. Pure electric vehicles rely solely on electric motors, eliminating the need for internal combustion engines. Leading automakers are introducing a wide range of EV models, from compact city cars to luxury SUVs, and electric sports cars. Battery electric vehicles (BEVs) have gained significant traction, with companies like Tesla, Nissan, and Ford leading the way. Hybrid Vehicles: Hybrid

vehicles combine internal combustion engines with electric propulsion systems. There are two primary types of hybrids: mild hybrids and full hybrids. Mild hybrids use electric power to assist the internal combustion engine, while full hybrids can operate on electric power alone for short distances. Popular hybrid models include the Toyota Prius, Honda Insight, and Ford Escape Hybrid. Plug-in Hybrid Vehicles (PHEVs): PHEVs are a hybrid subcategory that allows drivers to charge the vehicle's battery from an external power source, such as a wall outlet. This provides extended electric-only driving ranges and reduces overall fuel consumption. Notable PHEVs include the Chevrolet Volt and Mitsubishi Outlander PHEV. Fuel Cell Vehicles (FCVs): Fuel cell vehicles use hydrogen fuel cells to generate electricity, which powers an electric motor. They emit only water vapor as a byproduct and offer quick refueling times. Companies like Toyota and Hyundai have introduced FCV models, albeit in limited markets. The transition to electrified powertrains is not limited to passenger vehicles; it extends to commercial vehicles as well. Manufacturers are developing electric trucks, buses, and delivery vehicles to address emissions concerns in the transportation sector. The increasing adoption of electrified powertrains represents a significant trend in the automotive engine market, with profound implications for the traditional ICE segment.

Downsizing and Turbocharging

In response to stricter emissions standards and the pursuit of improved fuel efficiency, downsizing and turbocharging have become key strategies in the automotive engine market. Downsizing involves reducing the engine's displacement while maintaining or even improving power output. Turbocharging complements this approach by using exhaust gases to drive a turbine that compresses incoming air, resulting in more power from a smaller engine. Smaller engines consume less fuel, and the addition of a turbocharger can provide extra power when needed, reducing the engine's fuel consumption. Smaller engines generate fewer emissions, which is essential for compliance with stringent emissions regulations. Turbocharged engines offer increased power and torque compared to naturally aspirated engines of similar displacement. Downsized engines can be employed in a variety of applications, from compact city cars to high-performance sports cars. Major automakers have embraced this trend, with many offering downsized and turbocharged engines in their lineup. Examples include Ford's EcoBoost engines, which are available in a range of vehicles, and Volkswagen's TSI engines, renowned for their balance of power and efficiency.

Advanced Materials and Lightweighting

The pursuit of greater fuel efficiency and reduced emissions has led to a trend in the

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automotive engine market centered around advanced materials and lightweighting. Engine components are being designed and constructed with materials that offer improved strength-to-weight ratios, durability, and thermal efficiency. Lightweight materials such as aluminum and composite alloys are replacing heavier steel components in engine construction. Aluminum is significantly lighter than traditional cast iron, resulting in weight savings and improved thermal management. Many modern engines feature aluminum components. Carbon fiber-reinforced composites and other advanced materials are increasingly used in engine components, including intake manifolds and valve covers, to reduce weight and improve efficiency. Advanced cooling systems, such as electric water pumps and lightweight radiators, are deployed to manage engine temperatures effectively while reducing weight. Engine components themselves, such as pistons and connecting rods, are being downsized and optimized for weight reduction without sacrificing strength and durability. The integration of advanced materials and lightweighting techniques enhances the overall efficiency of automotive engines, contributing to improved fuel economy and reduced emissions. It also allows for better weight distribution, positively impacting vehicle handling and performance.

Variable Valve Timing and Cylinder Deactivation

Variable valve timing (VVT) and cylinder deactivation are technologies that enhance the efficiency of internal combustion engines. These innovations are central to the trend of optimizing engine performance while reducing fuel consumption and emissions. VVT systems allow for precise control of when the engine's intake and exhaust valves open and close. By adjusting valve timing based on driving conditions, the engine can optimize power output and fuel efficiency. VVT systems are commonly used in both gasoline and diesel engines. Cylinder deactivation technology allows certain cylinders in an engine to shut down during low-load or cruising conditions, effectively converting a multi-cylinder engine into a smaller one. This reduces fuel consumption while maintaining sufficient power when needed. Cylinder deactivation is particularly prevalent in V8 and V6 engines used in larger vehicles. These technologies, driven by the need for improved fuel economy and emissions reductions, have a significant impact on the automotive engine market. They are widely adopted by automakers, with many offering engines equipped with VVT and cylinder deactivation across their model range.

Segmental Insights

Vehicle Type Analysis

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With the largest market share was the in-line segment. For passenger cars, in-line engines are the most prevalent engine type. These engines are found in everything from luxury sedans like BMW and Mercedes to family-friendly hatchbacks. This is because they are simple to manufacture and install at a low cost. Consequently, OEM finds it to be a preferred option. Three or four sets of cylinders can be connected to one or two crankshafts in a W-engine. W-engines are used in luxury cars and heavy-duty trucks because they are more powerful and take up less room. The most common engine type in all high-performance cars is the V-type.

Regional Insights

The largest revenue share was accounted for by North America. Developed economies like those of the United States and Canada are found in North America. The presence of long-standing original equipment manufacturers, which provide a solid basis for the region's robust development and market expansion, is a major factor driving market growth. The demand for commercial vehicles in North America is expected to be driven by growing infrastructure investment, technological innovation in drive systems, and the continuous growth of local to international supply chain networks. Over the course of the forecast period, The dynamic automotive sector in developing nations like China and India will propel market expansion.

Key Market Players

Cummins Inc.

Fiat S.PA

Volkswagen Group

Ford Motor Company

Mitsubishi Heavy Industries

AB Volvo

General Motors

Honda

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Hyundai Motor Company

Scania AB

Report Scope:

In this report, the Global Automotive Engine Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Automotive Engine Market, By Vehicle Type:

Passenger Cars

Light Commercial Vehicles

Medium & Heavy Commercial Vehicles

Automotive Engine Market, By Placement Type:

In-Line

V-Type

W-Type

Automotive Engine Market, By Fuel Type:

Petrol

Diesel

Other Fuels

Automotive Engine Market, By Region:

Asia-Pacific

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China

India

Japan

Indonesia

Thailand

South Korea

Australia

Europe & CIS

Germany

Spain

France

Russia

Italy

United Kingdom

Belgium

North America

United States

Canada

Mexico

South America

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- Brazil
- Argentina
- Colombia
- Middle East & Africa
- South Africa
- Turkey
- Saudi Arabia
- UAE

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Automotive Engine Market.

Available Customizations:

Global Automotive Engine market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

- Detailed analysis and profiling of additional market players (up to five).

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