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Automotive Electronic Brake System Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented By Vehicle Type (Passenger Cars, Light Commercial Vehicles, Medium & Heavy Commercial Vehicles), By Components Type (Sensors, Actuators, Control Units, Others), By Technology Type (Brake Assistance, Autonomous Emergency Braking, Electronic Stability Control, Anti-Lock Braking System), By Region, Competition 2018-2028

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Abstracts

Global Automotive Electronic Brake System market was valued at USD 41 billion in 2022 and is anticipated to project robust growth in the forecast period with a CAGR of 6.51% through 2028. By using an electronic control unit, an automotive electronic brake system makes driving and total braking possible. An effective braking mechanism is provided by an automotive electronic brake system, which is made up of various parts including actuators, control units, sensors, and others. The car electronic brake system is becoming increasingly popular among owners of OEM and aftermarket brands due to its capacity to deliver effective brake management along with high-end automation. Given that demand for premium safety vehicles is at an all-time high on all continents, the market for automotive electronic brake systems appears to have an astounding growth outlook in the future.

Market Drivers

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Regulatory Mandates and Safety Concerns

One of the primary drivers of the global automotive electronic brake system market is the increasing stringency of safety regulations imposed by governments and international organizations. These regulations aim to enhance vehicle safety, reduce road accidents, and mitigate the severity of accidents. Electronic brake systems, including antilock braking systems (ABS), electronic stability control (ESC), and advanced driver assistance systems (ADAS), are crucial for meeting these requirements. ABS, for instance, is now mandatory in many regions. It prevents wheel lockup during hard braking, improving steering control and shortening braking distances. ESC systems help maintain vehicle stability during sudden maneuvers, reducing the risk of rollovers and skidding. Additionally, ADAS features like automatic emergency braking (AEB) further improve safety by detecting potential collisions and autonomously applying the brakes if the driver fails to react promptly. The demand for these systems is driven by the need to comply with safety regulations and improve vehicle safety. As regulations become more stringent and widespread, automakers are increasingly integrating electronic brake systems into their vehicles, driving market growth.

Increasing Vehicle Production and Sales

The automotive industry has been experiencing steady growth in vehicle production and sales worldwide. Rising disposable incomes, urbanization, and improved transportation infrastructure have contributed to increased demand for automobiles. As vehicle production and sales surge, the market for automotive electronic brake systems expands in tandem. Manufacturers are incorporating advanced electronic brake systems in a broader range of vehicles, from economy cars to luxury vehicles and commercial trucks. In addition to traditional automotive markets, emerging economies are becoming key drivers of growth as they witness a surge in vehicle ownership. With higher production volumes and increased adoption of electronic brake systems, economies of scale are achieved, leading to cost reductions and market expansion.

Technological Advancements:

The continuous evolution of electronic brake system technologies is a critical driver of market growth. Innovations and advancements in sensor technologies, control algorithms, and materials have enhanced the performance, reliability, and safety of these systems. This has led to increased consumer demand for vehicles equipped with the latest brake system technologies. One notable advancement is the integration of

electronic brake systems with other safety and driver-assist technologies, such as adaptive cruise control, lane-keeping assist, and collision avoidance systems. These integrations create holistic safety systems, offering enhanced protection for both drivers and pedestrians. Moreover, the development of electric and hybrid vehicles has spurred the demand for regenerative braking systems, which convert kinetic energy into electrical energy, further enhancing vehicle efficiency. The market is also witnessing improvements in brake-by-wire systems, which replace traditional hydraulic braking systems with electronic control. These systems offer precise control, faster response times, and the potential for additional features like predictive braking, which can further enhance safety and efficiency.

Consumer Demand for Enhanced Driving Experience

Consumers are increasingly demanding vehicles that offer not only safety but also a superior driving experience. Electronic brake systems contribute to this experience by improving vehicle handling, control, and comfort. Features like ABS, ESC, and ADAS not only enhance safety but also make driving more enjoyable. For instance, ABS prevents skidding and provides better steering control, allowing drivers to maintain control during emergency braking. ESC improves stability and reduces the risk of rollovers, making driving in adverse conditions more predictable and less stressful. ADAS features like AEB provide an additional layer of safety and convenience, as they can autonomously apply the brakes to avoid collisions. Furthermore, electronic brake systems play a role in improving ride comfort by reducing vibrations and noise associated with traditional braking systems. This enhanced driving experience is a significant market driver, as automakers aim to meet consumer preferences and remain competitive in a crowded marketplace.

Environmental Concerns and Fuel Efficiency

Growing concerns about the environment and the need for more fuel-efficient vehicles have become major drivers of innovation in the automotive industry. Electronic brake systems play a crucial role in improving fuel efficiency and reducing environmental impact. Regenerative braking, a feature commonly found in hybrid and electric vehicles, is a prime example. This technology converts kinetic energy into electrical energy, which can be stored and reused. By capturing and reusing energy during braking, regenerative braking reduces the energy lost as heat in traditional friction-based braking systems. This results in improved fuel efficiency and reduced emissions, making it a critical technology for automakers to meet stringent environmental regulations. Furthermore, electronic brake systems enable the integration of energy-saving

technologies such as predictive braking, which uses sensors and algorithms to anticipate braking needs and optimize braking force. This reduces unnecessary energy consumption and contributes to fuel efficiency.

Key Market Challenges

Increasing Regulatory Pressure and Safety Standards

One of the primary challenges facing the global automotive electronic brake system market is the increasing regulatory pressure and safety standards imposed by governments and international organizations. As a response to rising road traffic accidents and fatalities, regulatory bodies worldwide are continuously revising and tightening safety standards for automobiles. These regulations often mandate the incorporation of advanced safety technologies, including electronic brake systems, to reduce the risk of accidents and improve road safety. In regions like North America, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) have introduced stringent safety regulations and test protocols that push automakers to equip their vehicles with advanced EBS technologies. The European Union has also implemented a range of safety regulations, such as the Electronic Stability Control (ESC) mandate, which requires the inclusion of EBS in all new passenger vehicles to improve vehicle stability and reduce the risk of rollovers. These regulatory requirements, while beneficial for road safety, pose challenges for automotive EBS manufacturers. They must invest heavily in research and development to meet evolving safety standards and integrate advanced features into their systems, which often results in increased development costs. Compliance with various regional regulations can also be cumbersome, especially for manufacturers serving multiple markets worldwide. Therefore, staying up to date with changing regulations while maintaining a competitive edge in the market is a persistent challenge for EBS manufacturers.

Integration with Advanced Driver Assistance Systems (ADAS)

The integration of electronic brake systems with advanced driver assistance systems (ADAS) presents both opportunities and challenges in the automotive industry. ADAS technologies, such as adaptive cruise control, lane-keeping assist, and collision avoidance systems, have gained popularity due to their potential to enhance driver safety and comfort. These systems often rely on data from EBS to function effectively. However, integrating EBS with ADAS requires a high level of precision and coordination, which poses challenges for EBS manufacturers. One significant challenge

is the need for precise and real-time data exchange between EBS and ADAS components. For example, collision avoidance systems must rely on accurate information from the EBS to apply the appropriate level of braking force in emergency situations. Any delay or inconsistency in data transmission could compromise the effectiveness of these safety features. Therefore, EBS manufacturers must invest in robust communication protocols and ensure seamless integration with various ADAS components, which can be technically complex and require a high level of coordination among different technology providers. Another challenge is the development of redundant systems to ensure safety in case of EBS or ADAS component failures. Redundancy is essential to prevent catastrophic failures and maintain vehicle safety. EBS manufacturers must design and implement redundant systems effectively, which can significantly increase manufacturing and maintenance costs.

Cost and Pricing Pressure

Cost considerations are a critical challenge in the global automotive electronic brake system market. While EBS technology has become more advanced and widespread, manufacturers face the ongoing pressure to reduce production costs and offer competitive pricing to automakers. As vehicle production volumes increase, there is a need to scale up production efficiently and optimize the supply chain, which often requires significant investment in automation and process improvement. Moreover, as EBS systems become more sophisticated and integrated with other vehicle systems, the cost of components such as sensors, actuators, and control units increase. To stay competitive, EBS manufacturers must continually find ways to reduce the cost of these components while maintaining or improving performance and safety standards. Additionally, pricing pressure comes from the automakers themselves, who seek to optimize their costs while maintaining high-quality standards. Negotiating contracts and ensuring competitive pricing for EBS systems is a complex process that EBS manufacturers must navigate effectively. Balancing the need for advanced features and safety with cost-efficient production is a constant challenge. EBS manufacturers must innovate in areas such as material selection, manufacturing processes, and supply chain management to meet these demands.

Technological Advancements and Innovation

The rapid pace of technological advancements in the automotive industry poses both opportunities and challenges for the global EBS market. While innovation in EBS technology can lead to improved safety, performance, and user experience, it also requires substantial investment in research and development to stay competitive. One

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of the challenges is the integration of emerging technologies, such as electric and autonomous vehicles. Electric vehicles (EVs) have unique braking characteristics due to regenerative braking systems, which can be complex to integrate with traditional hydraulic EBS. EBS manufacturers must adapt their systems to work seamlessly with regenerative braking while maintaining traditional hydraulic capabilities. In the case of autonomous vehicles, EBS technology becomes even more critical, as these vehicles rely heavily on precise control of braking systems to ensure safety. Ensuring the readiness of EBS for autonomous driving involves incorporating advanced sensor technologies, complex algorithms for decision-making, and robust cybersecurity measures. Furthermore, EBS manufacturers need to keep pace with advancements in artificial intelligence (AI) and machine learning to enable predictive and adaptive braking systems that can anticipate driving conditions and respond accordingly. The continuous evolution of materials and manufacturing processes also poses challenges. New materials, such as carbon-ceramic composites, promise improved performance and durability but may require significant investments in manufacturing techniques. Additionally, innovations in sensor technologies and the adoption of 5G and beyond for vehicle communication bring opportunities to enhance EBS capabilities, but they require EBS manufacturers to stay up to date with rapidly changing technologies.

Global Supply Chain Disruptions and Component Shortages

The global automotive industry, including the electronic brake system market, faces supply chain disruptions and component shortages as a result of various factors, including geopolitical tensions, natural disasters, and global economic shifts. These disruptions can significantly impact production capacity, lead times, and costs for EBS manufacturers. One notable example of a supply chain disruption was the COVID-19 pandemic, which resulted in factory closures, reduced production capacity, and component shortages. Manufacturers were forced to halt or slow down production, leading to delays in EBS system deliveries and increased costs due to inventory management. Geopolitical tensions and trade disputes can also disrupt the supply chain, as tariffs and import restrictions affect the movement of components and finished products across borders. EBS manufacturers with global operations may need to reevaluate their supply chain strategies and consider diversifying suppliers to mitigate risks associated with geopolitical instability. Furthermore, the automotive industry has been affected by semiconductor shortages, which have had a ripple effect on EBS manufacturing. Modern EBS systems rely on a variety of electronic components, including microcontrollers, sensors, and integrated circuits. A shortage of semiconductors can lead to production delays and increased costs for EBS manufacturers, as they compete for limited resources with other industries.

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Key Market Trends

Advancements in Autonomous and Electric Vehicles

One of the most prominent trends in the global automotive electronic brake system market is the rapid advancement of autonomous and electric vehicles. The shift toward autonomous driving and electrification is changing the requirements for braking systems and driving demand for more sophisticated EBS technologies. Autonomous vehicles, commonly known as self-driving cars, rely heavily on advanced EBS to ensure safety and precise control. These vehicles require braking systems that can make split-second decisions based on data from various sensors and artificial intelligence algorithms. EBS manufacturers are investing in research and development to create braking systems that can anticipate and respond to complex driving scenarios. This includes not only traditional hydraulic brake systems but also brake-by-wire systems that provide enhanced control and modulation.

In addition to improved hardware, EBS for autonomous vehicles must integrate seamlessly with the vehicle's autonomous driving software and communicate effectively with other vehicle components, such as lidar, radar, and cameras. This level of integration demands complex data processing and communication capabilities to deliver safe and reliable autonomous driving experiences. The growing popularity of electric vehicles is another significant trend in the automotive industry. EVs use regenerative braking systems to recover and store energy during deceleration, which requires unique braking solutions. EBS manufacturers are developing regenerative braking systems that seamlessly blend regenerative and friction braking to provide smooth and efficient deceleration. Furthermore, electric vehicles often require advanced thermal management solutions to prevent brake overheating during regenerative braking events. Advanced materials and cooling techniques are being explored to ensure the longevity and performance of EBS components in EVs. As the adoption of autonomous and electric vehicles continues to increase, EBS manufacturers must adapt and innovate to meet the specific needs of these rapidly evolving segments of the automotive market.

Integration with Advanced Driver Assistance Systems (ADAS):

The integration of electronic brake systems with advanced driver assistance systems (ADAS) is another key trend in the global automotive EBS market. ADAS technologies, such as adaptive cruise control, lane-keeping assist, and collision avoidance systems,

rely on data from EBS to function effectively. This integration enhances overall vehicle safety and driver comfort. The integration of EBS with ADAS requires precise and real-time data exchange between these systems. Data fusion, where information from various sensors and systems is combined to make informed decisions, is a crucial aspect of this trend. EBS must provide accurate vehicle speed, wheel slip, and brake pressure data to ADAS systems to enable features like adaptive cruise control and collision avoidance. In response to this trend, EBS manufacturers are developing sensor technologies and data fusion algorithms to ensure that critical information is seamlessly shared with ADAS components.

Ensuring redundancy and fail-safe systems is vital when EBS is integrated with ADAS. Redundancy is essential to prevent catastrophic failures in case of a component malfunction. EBS manufacturers are developing advanced fail-safe mechanisms, such as redundant brake-by-wire systems, to maintain safety and control even in the event of system failures. The growing demand for ADAS features is driving innovation in sensor technology. EBS manufacturers are developing advanced sensors that can accurately measure wheel speed, vehicle speed, and wheel slip, even in challenging road conditions. These sensors are crucial for the precise operation of ADAS features like adaptive cruise control and lane-keeping assist. Overall, the integration of EBS with ADAS technologies represents a significant market trend, and EBS manufacturers are continuously working to enhance the coordination and cooperation of these systems to improve overall vehicle safety and driver assistance.

Enhanced Safety Features

Safety is a paramount concern in the automotive industry, and this trend is pushing EBS manufacturers to develop increasingly advanced safety features. These features go beyond the basic function of braking and aim to prevent accidents and mitigate their consequences. Electronic Stability Control (ESC) systems have become a standard feature in many vehicles, and they are closely tied to the EBS. ESC helps maintain vehicle stability and prevent skidding or rollovers by selectively applying the brakes to individual wheels. EBS manufacturers are continuously refining ESC algorithms to make them more effective in various driving conditions, contributing to overall road safety. Autonomous Emergency Braking (AEB) systems have gained prominence as a crucial safety feature. These systems use sensors to detect impending collisions and automatically apply the brakes to prevent or reduce the severity of accidents. EBS manufacturers are working on improving the speed and accuracy of AEB systems, enabling them to recognize a wider range of obstacles and respond more effectively. Another significant trend in safety features is pedestrian detection systems. These

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systems utilize EBS sensors and cameras to identify pedestrians and cyclists on or near the road and automatically apply the brakes to avoid collisions. EBS manufacturers are investing in improving the accuracy and reliability of pedestrian detection, particularly in low-light and adverse weather conditions.

Brake-by-wire systems and predictive braking are emerging technologies aimed at enhancing safety. Brake-by-wire systems offer precise control of braking force and can adapt to different driving conditions, while predictive braking uses AI and machine learning to anticipate potential hazards and adjust brake force accordingly. EBS manufacturers are developing these technologies to provide more proactive and precise safety features. The trend towards enhanced safety features is driven by the growing awareness of road safety and the desire to reduce accidents and fatalities. EBS manufacturers play a pivotal role in this trend by developing advanced systems that contribute to overall vehicle safety.

Sustainable and Lightweight Materials

The automotive industry is increasingly focused on sustainability and reducing the environmental impact of vehicles. EBS manufacturers are responding to this trend by exploring sustainable and lightweight materials for their braking components.

One notable development in this area is the adoption of carbon-ceramic composite materials for high-performance braking systems. These materials are not only lighter than traditional cast iron but also offer superior performance and durability. Carbon-ceramic brakes reduce unsprung weight, improving handling and fuel efficiency. While initially limited to high-end sports cars, EBS manufacturers are working to make these advanced braking systems more accessible across a wider range of vehicles.

Reducing the environmental impact of friction materials used in brake pads is another aspect of this trend. EBS manufacturers are exploring eco-friendly friction materials that produce fewer harmful emissions and reduce wear on brake components. This not only aligns with sustainability goals but also extends the lifespan of EBS components.

EBS manufacturers are continuously seeking ways to reduce the weight of their components to improve overall vehicle efficiency. This trend involves the use of lightweight materials for components such as calipers, rotors, and brake lines. Lightweight materials not only contribute to fuel efficiency but also improve handling and reduce brake wear. The adoption of sustainable and lightweight materials aligns with global efforts to reduce the carbon footprint of vehicles and enhance fuel efficiency.

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EBS manufacturers are playing a vital role in promoting these advancements.

Segmental Insights

Vehicle Type Analysis

The Global Automotive Electronic Brake System Market is divided into three segments according to the type of vehicle: passenger cars, light commercial vehicles, and heavy commercial vehicles. Over the course of the forecast period, the passenger car segment is anticipated to have the highest CAGR and to hold a dominant market share. Vehicles with at least four wheels that are used to transport people and no more than eight seats—including the driver's seat—are referred to as passenger cars. Global automakers have increased their production capacities as a result of the ongoing rise in demand for passenger cars.

Regional Insights

The largest market for electronic braking systems is predicted to continue to be Asia-Pacific. The expansion of the Asia-Pacific region is being supported by rising car production and EBS penetration in China and India. Within the Asia-Pacific region, the automotive electronic brake system market is driven by the ongoing demand for advanced braking systems and increasing vehicle production. The Asia-Pacific automotive electronic brake system market has also been significantly impacted by the growing government regulations aimed at enhancing vehicle safety. Because manufacturers in Asia-Pacific can offer significant cost reductions due to the region's abundance of cheap labor and raw materials, the region is predicted to experience the fastest growth.

Key Market Players

Advices

Kuster

Continental AG

Haldex

Knorr Bremse AG

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Robert Bosch GmbH

ZF Friedrichshafen AG

Halla Mando

Akebono Brake Industry Co., Ltd

Brembo

Report Scope:

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

Automotive Electronic Brake System Market, By Vehicle Type:

Passenger Cars

Light Commercial Vehicles

Medium & Heavy Commercial Vehicles

Automotive Electronic Brake System Market, By Component Type:

Sensors

Actuators

Control Units

Others

Automotive Electronic Brake System Market, By Technology Type:

Brake Assistance

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Autonomous Emergency Braking

Electronic Stability Control

Anti-Lock Braking System

Automotive Electronic Brake System Market, By Region:

Asia-Pacific

China

India

Japan

Indonesia

Thailand

South Korea

Australia

Europe & CIS

Germany

Spain

France

Russia

Italy

United Kingdom

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Belgium

North America

United States

Canada

Mexico

South America

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 Electronic Brake System Market.

Available Customizations:

Global Automotive Electronic Brake System 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:

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Company Information

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

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