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Automotive Thermal System Market Report by Component (Compressor, HVAC, Powertrain Cooling, Fluid Transport), Vehicle Type (Passenger Cars, Light Commercial Vehicles, Heavy Commercial Vehicles, and Others), and Region 2023-2028

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Abstracts

The global automotive thermal system market size reached US$ 35.5 Billion in 2022. Looking forward, IMARC Group expects the market to reach US$ 45.5 Billion by 2028, exhibiting a growth rate (CAGR) of 4.2% during 2022-2028. The rising demand for fuel efficiency, the escalating trend towards lightweight vehicles for improved fuel efficiency, the overall growth of the automotive industry and advancements in materials, sensors, and electronics are some of the major factors propelling the market.

The automotive thermal system is a crucial component of modern vehicles designed to regulate and manage the temperature of various systems and components within the automobile. It encompasses a range of mechanisms and technologies aimed at maintaining optimal operating conditions for the engine, transmission, cabin, and other vital parts. The thermal system primarily consists of the engine cooling system, which uses a combination of coolants, radiators, fans, and pumps to dissipate excess heat generated during combustion. This prevents the engine from overheating and ensures its efficiency and longevity. Additionally, the cabin heating and cooling subsystems provide comfort to passengers by controlling the interior temperature through air conditioning and heating units.

The global market is primarily driven by the rising demand for fuel efficiency. Automotive manufacturers are continuously focussing on improving fuel efficiency in traditional internal combustion engine (ICE) vehicles. Effective thermal management helps engines reach their optimal operating temperatures more quickly, reducing fuel consumption. Moroever, advancements in materials, sensors, and electronics have enabled the development of more efficient and precise thermal management systems.

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This includes innovations in active grille shutters, variable refrigerant flow systems, and more. The overall growth of the automotive industry, including the production of both passenger and commercial vehicles, contributes to the demand for automotive thermal systems. Continuous research and development efforts by automotive manufacturers and suppliers lead to the creation of more efficient and innovative thermal management solutions. The trend toward lightweighting vehicles for improved fuel efficiency and performance requires innovative thermal solutions that balance weight reduction with effective heat dissipation.

Automotive Thermal System Market Trends/Drivers:

Stricter Emission Regulations and Efficiency Demands

Governments and environmental bodies are imposing stricter norms to curb vehicle emissions and promote cleaner air quality. As a result, automakers are under immense pressure to develop vehicles that are more fuel-efficient and emit fewer pollutants. Automotive thermal systems play a pivotal role in achieving these goals. Efficient thermal management enhances engine combustion efficiency, reducing emissions and improving overall fuel economy. This has led to the integration of advanced cooling and heating technologies, such as variable cooling systems, active grille shutters, and waste heat recovery systems. Manufacturers are also incorporating thermal management solutions for electric and hybrid vehicles to optimize battery performance and extend their lifespan. As emission standards continue to tighten, the demand for innovative automotive thermal systems is expected to rise as automakers focus to meet these stringent requirements while delivering high-performance vehicles.

Rising Electric Vehicle Adoption

EVs generate heat not only from the powertrain but also from high-capacity batteries during charging and discharging cycles. Efficient thermal management is crucial to maintaining optimal operating temperatures for these components, which directly impacts battery life, safety, and performance. Automotive thermal systems in EVs involve advanced cooling solutions, such as liquid cooling systems and thermal interface materials, to ensure consistent and safe operation of the battery pack and electric drivetrain. Additionally, cabin heating and cooling become even more critical in EVs, as efficient temperature control directly affects the driving range by reducing the load on the battery for climate conditioning. As the electric vehicle market continues to expand, the demand for sophisticated thermal management solutions tailored to the unique needs of EVs is set to escalate, augmenting innovation and growth in the sector.

Consumer Demand for Comfort and Connectivity

Modern vehicle buyers not only demand efficient and eco-friendly solutions but also prioritize comfort and connectivity. Automotive thermal systems directly influence cabin climate control, enhancing passenger comfort during both extreme weather conditions and daily commutes. Advanced heating, ventilation, and air conditioning (HVAC)

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systems with zone-wise temperature control, air purification, and smart connectivity features are becoming standard in many vehicles. These systems not only ensure personalized comfort but also contribute to driver alertness and overall road safety. Furthermore, as vehicles become more connected and technologically advanced, thermal management is also essential for maintaining optimal operating conditions of onboard electronics, infotainment systems, and sensors. The integration of thermal solutions to manage heat generated by these components ensures reliable performance and prolongs their lifespan.

Automotive Thermal System Industry Segmentation:

IMARC Group provides an analysis of the key trends in each segment of the global automotive thermal system market report, along with forecasts at the global, regional and country levels from 2023-2028. Our report has categorized the market based on component and vehicle type.

Breakup by Component:

Compressor
HVAC
Powertrain Cooling
Fluid Transport

Compressor dominates the market

The report has provided a detailed breakup and analysis of the market based on the component. This includes compressor, HVAC, powertrain cooling and fluid transport. According to the report, compressor represented the largest segment.

The compressor plays a pivotal role in managing the temperature and comfort of a vehicle's interior environment. Essentially acting as the heart of the air conditioning system, the compressor is responsible for circulating and pressurizing the refrigerant, which facilitates the transfer of heat from the cabin to the outside environment. This transfer of heat enables the cooling of the cabin air, ensuring a comfortable temperature even in the scorching heat of summer. The compressor's operation is a delicate interplay of mechanical and thermodynamic principles. As the refrigerant flows through the system, the compressor compresses it into a high-pressure, high-temperature gas. This gas is then condensed, releasing heat, and transformed back into a liquid. The liquid refrigerant then expands, absorbing heat and causing the air around it to cool down. This cooled air is then directed into the cabin, providing occupants with a pleasant driving experience, regardless of external weather conditions.

Breakup by Vehicle Type:

Passenger Cars
Light Commercial Vehicles
Heavy Commercial Vehicles
Others

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Passenger cars dominates the market

The report has provided a detailed breakup and analysis of the market based on the vehicle type. This includes passenger cars, light commercial vehicles, heavy commercial vehicles, and others. According to the report, passenger cars represented the largest segment.

Passenger cars encompass a wide spectrum of vehicles designed primarily for the transportation of individuals and small groups. This category includes sedans, hatchbacks, coupes, and even certain types of crossover vehicles. The sheer volume of passenger cars on the roads is immense, reflecting the widespread use of these vehicles for personal transportation. This high demand necessitates sophisticated thermal management systems to ensure not only optimal engine performance but also cabin comfort, especially as passengers spend considerable time inside the vehicle. As consumers increasingly prioritize comfort, convenience, and advanced features, the role of efficient automotive thermal systems becomes more crucial. Moreover, the technological advancements in passenger car design have propelled the integration of cutting-edge thermal technologies. Advanced air conditioning systems, climate control mechanisms, and innovative thermal insulation techniques are all tailored to enhance the driving experience for passengers.

Breakup by Region:

North America
United States
Canada
Asia Pacific
China
Japan
India
South Korea
Australia
Indonesia
Others
Europe
Germany
France
United Kingdom
Italy
Spain
Russia
Others
Latin America

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Brazil
Mexico
Others
Middle East and Africa
Asia Pacific exhibits a clear dominance, accounting for the largest automotive thermal system market share
The report has also provided a comprehensive analysis of all the major regional markets, which include North America (the United States and Canada), Asia Pacific (China, Japan, India, South Korea, Australia, Indonesia, and others), Europe (Germany, France, the United Kingdom, Italy, Spain, Russia, and others), Latin America (Brazil, Mexico, and others), and the Middle East and Africa. According to the report, Asia Pacific accounted for the largest market share.
Asia Pacific's escalating manufacturing ecosystem fosters a high demand for advanced thermal management solutions that cater to the diverse needs of vehicles produced in these markets. Moreover, the expanding middle class in many Asia Pacific countries has fueled an increase in automobile ownership. As disposable incomes rise and urbanization continues, there is a growing appetite for vehicles equipped with advanced features and technologies, including efficient thermal systems that enhance driving comfort and efficiency. Moreover, the region's climatic diversity, ranging from tropical to temperate, accentuates the need for reliable thermal management solutions. Efficient air conditioning and climate control systems are essential for maintaining passenger comfort across a wide spectrum of environmental conditions. Furthermore, the Asia Pacific region has become a hotbed for electric vehicle (EV) adoption and innovation. Battery cooling systems and climate control mechanisms for EVs are crucial for ensuring optimal battery performance and maintaining driving range in various weather conditions.
Competitive Landscape:
Automotive thermal system companies are investing significantly in research and development to create innovative solutions. This includes developing advanced cooling technologies, more efficient heat exchangers, and smart climate control systems. Companies are working on materials with better thermal conductivity and exploring novel designs to optimize heat dissipation and management. With the rise of electric and hybrid vehicles, companies are tailoring their thermal systems to suit the specific needs of these platforms. This involves designing thermal solutions for battery cooling and temperature management, as well as optimizing thermal efficiency in electric drivetrains to enhance overall performance and longevity. Moroever, leading players are placing a strong emphasis on improving energy efficiency and reducing the environmental impact of their solutions. This includes developing systems that consume less power while delivering optimal performance, as well as integrating waste heat

recovery systems to utilize excess heat for improved efficiency.
The report has provided a comprehensive analysis of the competitive landscape in the market. Detailed profiles of all major companies have also been provided. Some of the key players in the market include:
Borgwarner Inc.
Continental Aktiengesellschaft
DENSO Corporation
General Motors Company
Gentherm Incorporated
Grayson Automotive Services Limited
Lennox International Inc.
MAHLE GmbH
Modine Manufacturing Company Inc.
Visteon Corporation
Recent Developments:
In May 2023, Gentherm Incorporated collaborated with Carrar for the delivery of robust two-phase immersion thermal management for electric vehicle (EV) battery modules. The two-phase immersion thermal management solution offers fully controlled liquid level, vapor, and pressure at all times.
In October 2022, Grayson automotive services limited launched a vehicle thermal management system (VTMS). It saves weight and optimises driving range for electric buses, commercial vehicles, and off highway applications.
In May 2022, Modine Manufacturing Company Inc launched new EVantage Line of Thermal Management Systems for Commercial Electric Vehicles. It regulates battery, traction motor, and power electronics temperatures within optimal ranges under all operating conditions and is customizable for any size chassis.
Key Questions Answered in This Report
1. How big is the global automotive thermal system market?
2. What is the expected growth rate of the global automotive thermal system market during 2023-2028?
3. What are the key factors driving the global automotive thermal system market?
4. What has been the impact of COVID-19 on the global automotive thermal system market?
5. What is the breakup of the global automotive thermal system market based on the component?
6. What is the breakup of the global automotive thermal system market based on the vehicle type?
7. What are the key regions in the global automotive thermal system market?
8. Who are the key players/companies in the global automotive thermal system market?

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