H2-ICE Market by Vehicle Type (Trucks and Buses, Construction Equipment, Mining Equipment, Farm Tractors, Industrial Forklifts), Combustion Approach (PFI-SI, ECDI-SI, and HPDI), Power Output (<300HP, >300 HP) and Region - Global Forecast to 2035

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Report description:

The benefits of H2-ICE over other near-zero emission technologies are expected to drive the market. Hydrogen internal combustion engines have certain benefits over other near-zero or zero-emission technologies like battery electric vehicles and fuel cell electric vehicles. The battery weight and size are major points of concern that sharply impact the payload capacity of the vehicles. Due to this Hydrogen IC engines can turn out to be a better option for heavy commercial vehicles with their ability to manage heavy load conditions. The range for H2-ICE vehicles will also be comparatively similar to BEV and FCEV but will have the advantage of faster refuelling and also can make use of the available refuelling stations by making a few modifications for hydrogen gas. The initial costs for H2-ICEs are expected to be lower than BEVs and FCEVs by a considerable margin, making it a better choice for heavy commercial vehicles.
"The On-Highway vehicles are estimated to have the largest share in the H2-ICE market."
On-highway vehicles are expected to represent the largest market in the H2-ICE powertrain technology by 2030 & later years. This growth is mainly attributed to the increased demand for sustainable transportation solutions in the freight and logistics sectors. Countries such as India, China, and the US have extensive highway route networks that require long-haul trucks to travel long distances continuously with adequate performance. H2-ICE technology with engine capacity in the range of 8-10 liters will offer relatively longer driving ranges and reduced refueling capabilities. These countries have limited charging infrastructure over highways, due to which pure electric and fuel-cell trucks are not considered for long-distance running applications. As H2-ICE is based on traditional diesel engines, and hence, it is better aligned with the operational needs of fleet operators with limited additional substantial cost. Several OEMs & other stakeholders like AB Volvo (Sweden), Ashok Leyland (India), PACCAR Inc. (US),

MAN (Germany), and Tata Motors Limited (India) are actively involved in the testing of these vehicles and expected to launch few commercial models from 2025 onwards. The widespread growth in the logistics & e-commerce sector surged the need for last-mile delivery and initiatives by these OEMs supported by other stakeholders to improve operational performance and hydrogen infrastructure, the market of H2-ICE in the truck segment is likely to become a reality with a promising adoption in next 3-4 years.

"Mining equipment are expected to be the promising off-highway segment for H2-ICE technology"

Mining equipment will possibly have noteworthy adoption of H2-ICE technology in some of the equipment categories such as wheel loaders and dump trucks. The transition to sustainable mining equipment from traditional diesel-powered equipment is crucial for reducing emissions and enhancing operational efficiency in hydrogen engines can play an important role in supporting this transition. Liebherr (Switzerland) is developing hydrogen engines (H966 and H964) which can be installed in heavy construction and mining equipment in later years. There is also a possibility that Off-highway equipment manufacturers design articulated dump trucks powered by hydrogen engines. At present, AB Volvo (Sweden) offers articulated dump trucks powered by fuel cells, but with the advancements in hydrogen technology, it is expected that H2-ICE engines will also be equipped with these vehicles deployed at the mining locations of Europe, and LATAM countries.

"North America is one of the prominent markets for H2-ICE technology."

North America is likely to have substantial market adoption for H2-ICE vehicles mainly for the heavy trucking application. The region is known for its developments and research in H2-ICE technology with Cummins as a front runner followed by PACCAR and Allison Transmission among other stakeholders. In the US, a Class 8 long haul truck is the primary evaluation candidate for an H2-ICE powertrain with a range of 500 miles. The region also has the presence of a few component and technology developers for the H2-ICE. These include PHINIA Inc. (US), and BorgWarner Inc. (US), these companies are developing fuel injection technologies focused on hydrogen engines. The widespread landscape of the US and Canada has generated opportunities in the transportation and logistics sector. As the transportation sector is one of the major contributors of greenhouse gases, the region is essentially working to find sustainable solutions to withstand the performance of traditional IC engines without impacting environmental factors, which will subsequently boost the futuristic demand for H2-ICE engines in the region.

The breakup of primary respondents

-□By Company: Tier 1 - 40%, OEMs -60%
-□By Designation: Manager - 60%, Director Level - 30%, Others - 10%
-□By Region: Europe - 30%, Asia Pacific - 50%, North America - 20%

The H2-ICE market will be dominated by global players, including Cummins Inc. (US), Deutz AG (US), Ashok Leyland (India), Paccar Inc. (US), AB Volvo (Sweden) HD Hyundai Infracore (South Korea), MAN (Germany), J C Bamford Excavators Ltd. (UK), Liebherr (Switzerland), KEYOU GmbH (Germany). The study includes an in-depth competitive analysis of these key players in the H2-ICE market with their company profiles, recent developments, and key market strategies.

Research Coverage

The study's primary objective is to define, describe, and forecast the H2-ICE market by volume. The study segments the H2-ICE Market By Vehicle Type (On-Highway vehicles (Trucks and Buses), Off-Highway vehicles (Construction Equipment, Mining Equipment, Farm Tractors, and Industrial Forklifts)), By Combustion Approach (PFI SI, ECDI SI, and HPDI), By Power Output (Below 300 HP, and Above 300 HP) & Region (North America, Europe, and Asia Pacific). It analyzes the opportunities offered by various market segments to the stakeholders. It tracks and analyzes competitive developments such as market ranking analysis, total cost of ownership, technology comparison, and future potential of H2-ICE Vs. BEV Vs. Diesel and other activities carried out by key industry participants.

The report provides insights on the following pointers:

-□Analysis of key drivers (Stringent GHG emission norms, Government and OEMs push to develop H2-ICE and Benefits of hydrogen over other near-zero emission technologies), restraints (storage and transpiration of H2), opportunities (H2-ICE components

demand would create potential market for Tier 1 Suppliers), and challenges (High initial costs for H2 engines and infrastructure and Challenges associated with H2 ICE engines) are fueling the demand of the H2-ICE market.
-Product Development/Innovation: Detailed insights on upcoming technologies, research & development activities, and new product & service launches in the H2-ICE market.
-Market Diversification: Exhaustive information about new products & services, untapped geographies, recent developments, and investments in the H2-ICE market
-Competitive Assessment: In-depth assessment of market ranking, growth strategies, and product offerings of leading players in the H2-ICE market, such as Cummins Inc. (US), Deutz AG (US), Ashok Leyland (India), Paccar Inc. (US), AB Volvo (Sweden) HD Hyundai Infracore (South Korea), MAN (Germany), J C Bamford Excavators Ltd. (UK), Liebherr (Switzerland), KEYOU GmbH (Germany).
-The report showcases an in-depth analysis of the total cost of ownership between Diesel Vs. H2-ICE Vs. FCEV. It studies factors like initial costs, fuel costs, maintenance costs, and a few additional costs.
-The report showcases a comparison between H2-ICE Vs. FCEV Vs. Diesel Vs. Biofuel based on load capacity, technologies associated for combustion, infrastructural requirements, emissions and fuel relations.

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