Off-Highway Vehicle Engine Market Assessment, By Power Output [Under 50 Hp, between 50 and 100 Hp, more than 100 Hp], By Fuel Type [Gasoline, Diesel, Others], By End-use Industry [Agriculture, Oil and Gas, Construction, Marine, Mining, Others], By Region, Opportunities and Forecast, 2017-2031F

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Report description:

Global Off-Highway Vehicle Engine market is projected to witness a CAGR of 6.65% during the forecast period 2024-2031, growing from USD 36.64 billion in 2023 to USD 61.33 billion in 2031. The market has experienced a significant growth rate in recent years and is expected to maintain its expansion over the years to come. Off-highway vehicles are motorized vehicles designed for off-highway use, specifically on uneven terrains. The benefits of off-highway vehicle engines include high power output, durability, and fuel efficiency. The factors driving the growth of the off-highway vehicle engine market include increasing demand for construction and agricultural equipment, expanding manufacturing operations globally, and the development of alternative efficient and less-polluting engines. The increasing demand for construction and agricultural equipment is one of the main factors driving growth in the off-highway vehicle engine market, especially in developing nations where the agricultural industry substantially contributes to the economy. Moreover, rapid urbanization is also enhancing the market's growth rate extensively. For example, in January 2024, Italian American off-road construction and agriculture firm CNH planned to invest up to USD 50 million in the farm machinery segment in India and launch a 105HP tractor in May 2024. CNH, which produced and sold farm machinery and equipment under the New Holland brand, focused on the compact range of tractors of below 30-40 horsepower (HP), besides targeting to sell 1,000 baler machines (used for managing stubble) that year. At that time, CNH India had a four per cent market share in the tractor business in India and had a considerable presence in the 45-50 HP range of tractors.
Commercial Projects are Amplifying the Market Growth
Commercial projects are driving the growth of the off-highway vehicle engine market at an exponential rate. The need for automation and mass-scale production has led to the development of advanced machinery that works on off-highway engines, saving time and reducing labor costs. The electrification trend and the increasing focus on low-emission engines further contribute

to the market's growth.

For example, in November 2023, Caterpillar launched a three-year project to develop an advanced hydrogen-hybrid power solution for off-highway vehicles. The project, partially funded by the United States Department of Energy, aimed to create a hydrogen-fuel system for off-highway machinery, leveraging the versatile new Cat C13D engine platform. This initiative is part of Caterpillar's commitment to reducing greenhouse gas emissions and providing flexible power solutions to meet the unique demands of off-highway application.

Increasing Focus on Low-Emission Engines is Boosting the Market Significantly

The increasing focus on low-emission engines extensively drives the off-highway vehicle engine market. This focus has been fueled by government regulations for emissions reductions and the continued improvements in fuel efficiency. The use of fuel-saving technologies and the development of engines that provide better performance with lower emissions have gained traction in response to the relentless call to reduce carbon footprints. Additionally, the commercialization and development of technologies that control emissions from off-highway engines have led to a notable reduction in off-road emissions, further driving the demand for low-emission engines in the market.

For example, the California Air Resources Board (CARB) provided an update on the Tier 5 emission standards for off-road engines, proposing significant reductions of 90% and 75% in NOx and PM emissions, respectively, compared to the existing Tier 4 standards. The proposed Tier 5 standards aim to reduce oxides of nitrogen (NOx) and particulate matter (PM) emissions from new, off-road compression-ignition (CI) engines.

Government Initiatives

The government's involvement is crucial in accelerating the decarbonization of the off-highway vehicle sector. Efforts to reduce emissions from off-road vehicles have historically involved substituting biofuels into conventional diesel engines. Government initiatives, in collaboration with industry stakeholders and research institutions, are essential for conducting precompetitive research, developing innovative technologies, and convening diverse stakeholders to address the complexities of decarbonizing off-highway vehicle engines.

For instance, in June 2023, Norwegian government planned to open an area of ocean almost the size of Germany to deep-sea mining for mining engines, despite facing global opposition. The government has proposed opening over 280,000 square kilometers of the country's territorial waters to deep-sea mining, which could make Norway the first country to start commercial deep-sea mining. The move is driven by the increasing demand for minerals such as cobalt and nickel, which are used in electric car batteries and solar panels.

The Marine Industry is Amplifying the Market Growth Extensively

The marine industry is amplifying the growth of the off-highway vehicle engine market through its increasing demand for construction and mining equipment, which relies on off-highway engines. Additionally, the electrification trend and the increasing focus on low-emission engines further contribute to the market's growth.

For instance, in 2023, the California Air Resources Board issued Executive Orders for MY2023 Spark-Ignited Marine Engines, granting certifications to manufacturers of spark-ignited marine engine families. These orders pertained to newly certified spark-ignited marine engines and evaporative families. Moreover, the issuance of these executive orders aligned perfectly with the regulatory efforts to address emissions from new gasoline spark-ignition marine engines, thereby reflecting ongoing oversight and compliance measures in the marine industry.

Asia-Pacific Comprehensively led the Off-Highway Vehicle Engine Market

Asia Pacific led the off-highway vehicle engine market due to several factors. Firstly, the region's dominance is attributed to the increasing demand for construction and mining equipment in countries such as China and India, which are among the largest tractor markets in the world. Furthermore, the growth in infrastructure activities, such as road construction and housing, has fueled the demand for off-highway vehicles in the region. The rising agriculture market and mechanization trend in developing countries have also contributed to the region's leadership.

For example, in January 2023, Cummins introduced a new generation of off-highway engines, the CS IV range, specifically designed for the Chinese market. These upgraded engines, with displacements ranging from 2.8 to 15 liters, offer a power output of 48-674 hp (36-503 kW), catering to various applications, including construction and mining equipment. The engines are engineered to deliver higher power output and torque, addressing the increasing demand for high-performance and efficient

engines in China's growing construction and infrastructure sectors.
Future Market Scenario (2024 - 2031F)
-The increasing demand for fuel-efficient and low-emission engines is expected to drive the growth of the off-highway vehicle engine market, which in turn is expected to cater to ample opportunities for growth over the upcoming years.
-The growing electrification trend in off-highway vehicles is expected to create new opportunities for the off-highway vehicle engine market.
-Moreover, the increasing demand for agricultural machinery and equipment is expected to drive the growth of the off-highway vehicle engine market and create substantial opportunities for market expedition over the years to come.
-The increasing adoption of advanced technologies such as telematics and IoT in off-highway vehicles is anticipated to lead to ample possibilities for market prosperity in future.
-The continuously rising demand for compact and lightweight engines is significantly augmenting the market and is anticipated to result in myriad opportunities for growth over the years to come.
-Furthermore, key players are focusing on strategic collaborations to increase the efficacy of their respective engines, which in turn, is expected to lead to extensive opportunities for market prosperity in future.
Key Players Landscape and Outlook
The off-highway vehicle engine market participants include Deutz AG, Cummins Inc., Mahindra & Mahindra Ltd., Kubota Corporation, Caterpillar Inc., and Deere & Company. These market players in the off-highway vehicle engine market prioritized technological advancements and strategic partnerships to bolster market revenue and establish a strong position in the highly competitive market. This focus on innovation and collaboration is driven by the market's steady growth and increasing competition, with significant expansion expected in the future.
In April 2023, Caterpillar unveiled the Cat C13D, a new 13-liter off-diesel engine platform, designed to achieve best-in-class power density, torque, and fuel efficiency for heavy duty off-highway applications with power requirements from 456 to 690 hp. The engine was designed adequately to meet the emissions standards of higher regulated markets.
In March 2023, Kubota showcased its newly developed 3.8-liter hydrogen engine at CONEXPO- 2023. The engine, designed for industrial off-highway applications, is a four-cylinder unit with a power output of 85 kW. It operates solely on hydrogen, eliminating carbon dioxide emissions. Moreover, the engine's design is like that of gasoline engines, and it represents a significant step towards carbon neutrality and the use of alternative, environmentally friendly power sources in off-highway equipment.

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