

Biomass Gasification Market Assessment, By Source [Agriculture Waste, Forest Waste, Municipal Waste, Animal Waste, Others], By Gasifier Technology [Fixed Bed, Fluidized Bed, Others], By Application [Power Generation, Chemicals, Transportation Fuels, Ethanol, Hydrogen Generation, Others], By Region, Opportunities and Forecast, 2017-2031F

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Abstracts

The global biomass gasification market is projected to witness a CAGR of 7.66% during the forecast period 2024-2031, growing from USD 52.60 billion in 2023 to USD 96.91 billion in 2031. Biomass gasification is a thermochemical process that converts biomass feedstocks into a gaseous mixture called syngas. This process typically involves subjecting biomass, such as wood, agricultural waste, or energy crops, to high temperatures in a controlled environment with limited oxygen or steam. Syngas produced from biomass gasification has a wide range of applications such as power generation, chemical manufacturing, and waste management. Biomass gasification systems offer high flexibility, cleanliness, and cost-efficiency, making them an economically viable option for power generation among renewable energy technologies.

The market for biomass gasification is expanding significantly because of various factors such as reduction in greenhouse gas (GHG) emissions, waste management, and the possibility of decentralized energy production. The growth of the global biomass gasification market is driven by several factors, including increasing demand for renewable energy sources to lower dependence on fossil fuels. Additionally, the implementation of stringent government regulations on greenhouse gas emissions is acting as another growth-inducing factor. Biomass gasification significantly reduces greenhouse gas emissions, thereby gaining prominence as a sustainable alternative.

Furthermore, rising waste disposal costs have accelerated market growth as biomass gasification is a cost-effective way to dispose of waste materials, such as wood waste and agricultural residues.

As a viable way to achieve net-zero carbon emissions, biomass gasification is gaining traction. For instance, in August 2023, the United Kingdom's government unveiled the Biomass Strategy 2023. The role of sustainable biomass in helping the government's efforts to enable net zero and the areas that require additional action are all outlined in the Biomass Strategy 2023. To meet the target, the strategy also seeks to increase biomass sustainability and encourage the use of sustainable biomass across a variety of economic sectors.

Increasing Demand for Biomass Gasification from Agricultural Waste

Biomass gasification is used for agricultural waste to improve the usage of biomass energy, which helps in lowering carbon dioxide emissions and increasing fuel safety. Agricultural waste can be converted into useful gas and biochar via a gasification system. The biochar produced from biomass gasification can be added to soil to improve its structure, ability to hold onto water, and availability of micronutrients. In the long term, this can help farmers financially by increasing crop yields and reducing their demand for fertilizers. Additionally, by converting carbon-rich agricultural waste into biochar, which can be used as a soil supplement, the long-term use of biomass gasification for agricultural waste may help in the storage of carbon. This can lower greenhouse gas emissions and lessen the effects of climate change.

For instance, in February 2023, Southeast Asia Development Solutions (SEADS) adopted green technology as the engine of Vietnam's agricultural sector. According to the organization, agricultural residues are currently being burned and thrown in Vietnam, which wastes resources and pollutes the environment. Agri-micro and small businesses need to switch to a more affordable and sustainable energy source. The need for cleaner energy can be met by utilizing appropriate biomass-based energy technologies, such as volumetric continuous biomass gasification (VCBG), which can assist in turning agricultural residues into fuel for processing and heating.

Growing Usage of Biomass Gasification for Power Generation

Biomass gasification for power generation involves converting biomass feedstocks, such as wood chips, agricultural residues, and energy crops, into a combustible gas mixture called syngas through a thermochemical process. This can then be used as fuel

in various power generation systems to produce electricity. Biomass gasification provides high power production efficiency, which is used in a variety of power-generating systems, including internal combustion engines, gas turbines, heat recovery boilers, and steam boilers. It has emerged as the most cost-effective technology for producing electricity, with a total cost that is now comparable to that of producing electricity using conventional energy sources. Additionally, small-scale production yields economic benefits due to the adaptability of gasification power generation. In comparison to other power generation methods using renewable sources, the process of power generation through biomass gasification is easy, and the equipment is cheap.

For instance, in August 2022, the Indian government declared that Haryana is the only state in the nation to have installed a 6,463 kW_{eq} (kilowatt equivalent) biomass gasifier plant to produce electricity from biomass and stubble. To stimulate investment in this industry and build up the infrastructure of the biomass supply chain, the ministry in March 2022 released a long-term contract for biomass supply that had a minimum seven-year duration.

Government Initiatives and Policies in Europe Driving the Biomass Gasification Market

Based on the regional segmentation, Europe holds a prominent share of the global biomass gasification market. Biomass gasification plays a significant role in Europe's energy transition and sustainability efforts. European Union (EU) policies such as the Renewable Energy Directive (RED) and the Biomass Action Plan, promote the use of biomass for energy production, including gasification technologies. The United Kingdom is one of the global leaders in biomass policy and technologies, with biomass accounting for 8.6% of the global energy supply in 2022. This progress is driven by the effective biomass policies that have been in place for over 20 years. These policies have helped reduce the reliance on coal in electricity systems and stimulated substantial investment in low-carbon technologies and fuels. Furthermore, Germany plans to construct a biomass gasification facility as a part of its strategy for renewable energy. This plant will help the country reach its 2030 carbon neutrality target by producing syngas for electricity generation from wood chips and agricultural waste.

Furthermore, in May 2022, Swedish biomass gasification technology developer Cortus Energy AB (Cortus) announced that it had received two orders for biomass gasifiers, along with burners and gas coolers/boilers, from German companies blueFLUX Energy AG and Holzner Druckbehälter GmbH. Furthermore, according to Cortus, the combined value of these two projects could reach USD 7.74 million, contingent upon the final extent of delivery.

Mitsubishi Heavy Industries (MHI) Group is the Leading Player in the Biomass Gasification Market

Mitsubishi Heavy Industries, Ltd. (MHI) is at the forefront of sustainable solutions, particularly in biomass gasification technology. MHI utilizes its expertise to transform organic waste materials into renewable energy sources by showing the organization's commitment to environmental progress. MHI facilitates the production of clean fuels such as hydrogen, ammonia, and synthetic natural gas from biomass feedstocks through innovative processes. MHI leads the way in advancing biomass gasification, aiding in the reduction of greenhouse gas emissions, and fostering a transition to a greener energy landscape through strategic collaborations and continuous research. MHI remains steadfast in its mission to tackle energy challenges while promoting economic development and environmental stewardship with a diverse range of products and technologies.

In August 2021, Mitsubishi Power, a subsidiary of Mitsubishi Heavy Industries Group, in partnership with JERA Co., Toyo Engineering Corporation, and ITOCHU Corporation, started working on a project to create a commercial-scale supply chain for sustainable aviation fuel (SAF) made using wood biomass gasification and FT synthesis technology. NEDO selected the project, which intends to build a prototype supply chain model over four years, from FY2021 to FY2024. This effort will focus on the early supply of wood biomass-derived aviation fuel to support future domestic SAF supplies, contributing considerably to the government's 2030 Greenhouse Gas Removal goal.

Future Market Outlook (2024–2031F)

Emery Gasification company has subsequently developed its proprietary gasification technology according to the available feedstock in the operating region. Entrained Bed Gasification technology developed by Mitsubishi Group has successive potential to produce bio-jet fuel from woody biomass (feedstock). Likewise, there are more operational plants working on specific gasification technology. Furthermore, fixed-bed updraft gasification and circulating fluidized bed (CFB) are patented technologies developed by Nexterra and Valmet respectively. Therefore, advanced gasification technology has impeccable market potential and hence can be accounted as an important parameter for deciding market opportunities, along with deriving numbers.

Key Players Landscape and Outlook

The development of biomass power plants is the primary focus of major firms, leading to swift progress in the biomass gasification industry. In addition, these companies are working together frequently to develop various advanced technologies to boost their profits.

In April 2023, Valmet Corporation and Greenalia Biomass Power Curtis-Teixeiro S.L.U entered a three-year service agreement to enhance the performance of Greenalia's Curtis-Teixeiro biomass plant in Spain. The agreement, part of Valmet's Q1 2023 orders, aims to optimize the availability and capacity of the 50 MWe biomass-fired bubbling fluidized bed (BFB) power boiler plant, delivered by Valmet in 2020. Greenalia seeks to bolster environmental performance through emission control, aligning with its commitment to green energy generation in the fight against climate change. Valmet provides continuous support to Greenalia's pursuit of improved performance and clean energy initiatives.

In August 2022, Aries Clean Technologies, the maker of Aries GREEN bio-carbon reached a milestone of 1 million pounds sold across North America, while simultaneously expanding their offerings of renewable carbon products. Furthermore, it has secured re-certification from the International Biochar Initiative for the fourth year running.

In January 2024, Enkern announced that it will retire its Enkern Alberta Biofuels (EAB) plant in Edmonton. The EAB facility achieved its main objective of completing the commercial scale-up of Enkern's industry-leading technology. With more than 15,000 hours of operation producing ethanol and methanol (ISCC EU and ISCC PLUS certified), the plant facilitated the validation by strategic industry players and other third parties of Enkern's innovative waste-to-biofuels platform. It also allowed Enkern to attract global partners and investors while developing a world-class team with expertise in the design and deployment of advanced gasification technology. With those objectives achieved and factoring in the current market and domestic regulatory conditions, Enkern has decided to retire the EAB plant. Enkern, with the support of its strategic investors, will continue to focus on the global deployment and commercialization of its technology.

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*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work.

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