

BUSINESS



A researcher works at a biotech company in Tianjin on Dec 1. CHEN SIHAN / XINHUA

Nation to ramp up efforts for edge in biomanufacturing

Innovative, green production pattern seen as key growth engine in future

By MA SI masi@chinadaily.com.cn

In a significant push to cultivate new growth engines, China is prioritizing biomanufacturing as a cornerstone future industry, aiming to harness its potential to upgrade traditional sectors and forge entirely new tracks in the green economy.

Biomufacturing, an innovative production paradigm that converges biology, chemistry and engineering, is transforming waste into wealth. Industrial exhaust is being converted into fish feed, used cooking oil into jet fuel and crop straw into biodegradable film. This technology, characterized by its low carbon emissions, efficiency and renewability, is now at the forefront of the nation's industrial strategy.

The sector has been explicitly outlined as one of the six future industries and a new economic growth point, according to the recommendations for formulating the 15th Five-Year Plan (2026-30) adopted by the fourth plenary session of the 20th Communist Party of China (CPC) Central Committee in October.

Zhang Linshan, a researcher at the National Development and Reform Commission's Chinese Academy of Macroeconomic Research, said, "As a typical representative of new quality productive

forces, biomanufacturing is at a critical stage of transitioning from the laboratory to industrialization, which holds strategic significance for China to seize the opportunities of the new technological revolution and build long-term competitive advantages."

Li Boyang, head of the consumer goods industry research institute at the China Center for Information Industry Development, said: "Biomufacturing can be a crucial direction in our efforts to build a manufacturing powerhouse. On the one hand, it can cultivate numerous new sectors such as biomaterials, bioenergy, biopharmaceuticals, bio-environmental protection, biochemicals and bio-agriculture. On the other, this advanced technology can help many traditional industries upgrade and transform."

This direction is seen as a vital development following smart and green manufacturing. China's innovation capacity in the field is growing, accounting for over 20 percent of global academic publications and patent applications, supported by a network of national key laboratories and industrial innovation platforms, said the China Center for Information Industry Development.

Globally, investment and financing in synthetic biomanufacturing have maintained a compound annual

growth rate of about 30 percent since 2015, and are projected to reach around \$25 billion in 2025. In China, annual investment in biomanufacturing has grown to nearly 30 billion yuan (\$4.3 billion), Li estimates.

Chen Guoqiang, director of Tsinghua University's Center for Synthetic and Systems Biology, highlighted the inherent advantages of biomanufacturing. "It offers fundamental benefits of being low-carbon, environmentally friendly and safe."

While acknowledging higher initial costs, Chen expressed optimism about its broad prospects, suggesting that policy support to expand application scenarios, especially in bulk materials, could steadily grow the market.

The strategic importance of the sector was a central theme at the recent 2025 Biomufacturing Conference held in Chongqing last week. The conference said that biomanufacturing represents a crucial future form of materials production, and is widely regarded internationally as a potential core driver of the fourth industrial revolution. Vigorously developing biomanufacturing is deemed to have great significance for fostering new quality productive forces and advancing new industrialization.

The conference called for enhanced scientific research and innovation, targeting fundamental scientific problems and major engineering bottlenecks. It emphasized strengthening original

innovation and breakthroughs in core technologies to deepen the integration of scientific and industrial innovation.

Furthermore, it advocated for synergistic development across industry, academia, research, application and finance. The goal is to link various industry segments into robust chains, transforming individual corporate strengths into ecosystem advantages.

Expanding application scenarios was also highlighted. Participants urged active promotion of biomanufactured products in diverse fields such as medical health, common chemicals, cosmetics, new materials and green energy to enhance scenario, diversified and high-end product supply capabilities.

The 14th Five-Year Plan period (2021-25) has already yielded notable highlights for China's biomanufacturing development. Li said the industry's scale has steadily expanded with accelerated layout in emerging areas.

Subsectors like bio-based materials, bio-based chemicals and food additives have seen sustained growth, with bio-fermentation output value increasing by approximately 20 percent compared to 2020. China leads the world in output for several bulk products, while it has achieved parallel or leading development with developed nations in emerging areas like hyaluronic acid, polylactic acid and artificially synthesized starch, Li added.

Demand for AI talent drives new employment opportunities, sectors

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Artificial intelligence is emerging as a major driver of new employment opportunities, as growing demand for relevant talent boosts hiring activity and lifts pay levels across multiple sectors, a recent report showed.

From January to October, the number of AI-related job openings surged 543 percent year-on-year, with AI roles dominating the list of the most in-demand positions, according to a 2025 talent mobility report released by major recruitment platform Maimai.

Among the top 10 most in-demand technical jobs, algorithm engineers and large-model algorithm engineers ranked first and second, and were also the most sought-after roles for fresh graduates. In the top 10 non-technical roles, AI product managers came in third, the report showed.

High-paying positions are also increasingly concentrated in the AI sector. Among the top 20 jobs with monthly salaries exceeding 60,000 yuan (\$8,526), AI-related technical roles made up the majority. The report also highlighted a clear "AI premium", with average pay for algorithm engineers for AI-generated content nearly 18 percent higher than that of general algorithm engineers, and AI product managers earning more than 20 percent above their traditional counterparts.

AI-related skills are also becoming a key requirement in recruitment. During the January-October period, 19.18 percent of newly posted jobs explicitly included keywords such as "AI" and "large models", up about 7 percentage points from the same period in 2024, the report showed.

"Talent standards in the AI era are shifting from selecting people with the highest potential ceilings to those with the strongest capability baselines," said Lin Fan, founder and CEO of Maimai. Lin added that AI-native talent should possess three core abilities: fast learning across new tools and domains, sound judgment to assess AI outputs, and the ability to ask precise and meaningful questions.

The report showed that AI tools have already become standard workplace equipment, with over 90 percent of professionals using them at work, up sharply from 69.99 percent in 2024. To be specific, DeepSeek and Doubao ranked first and second in usage rates, at 67.62 percent and 66.68 percent, respectively, while ChatGPT ranked third at 32.31 percent.

"AI will drive organizations through three stages of evolution: from 'everyone as a programmer', to 'everyone as a manager', and ultimately to 'everyone as a CEO'," he noted.

The senior executive added that in the first stage, at least 20

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percent of workloads can be consistently handled by AI, with employees focusing on task decomposition and result optimization. In the second stage, AI will complete 60 to 70 percent of the work, and collaboration will increasingly take place between humans and intelligent agents. And in the final stage, more than 95 percent of work will be completed by AI, and professional services will become more platform- and cloud-based.

"More one-person companies are expected to emerge in this stage as firms purchase services on demand rather than maintaining full in-house teams," the executive said.

At the corporate level, sustained investment in AI has become a broad consensus, particularly among major industry players. The report found that 91 percent of companies with more than 10,000 employees have already applied AI, and 21.15 percent have achieved large-scale implementation in core businesses. ByteDance, Xiaohongshu (RedNote) and Ant Group topped the list for the number of newly created AI positions.

In terms of AI penetration rate in newly created positions, the top 20 companies were mainly concentrated in new energy vehicles, the internet and smart hardware. Xpeng ranked first with an AI penetration rate of 19.32 percent, followed by Ant Group at 17.87 percent and Huawei at 16.62 percent.

The AI-powered job market momentum is backed by a gradually recovering hiring market since June 2025, according to the report, with the overall number of newly posted jobs in the new-economy sectors from June to October exceeding the level of the same period last year.

New-economy industries refer to sectors that leverage technologies such as the internet, big data, cloud computing and AI to create new products, new business forms and new business models.

Salaries for newly created positions have also shown an upward trend. The average monthly pay in new-economy industries rose to 45,553 yuan during January-October this year, up from 42,874 yuan in the same period of 2024.

Major CO2 power generator starts operations

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The world's first commercial supercritical carbon dioxide power generator started operations in Southwest China's Guizhou province recently, a significant milestone in the global transition toward high-efficiency waste heat recovery, said its operator China National Nuclear Corp (CNNC).

Known as Chaotan One, the new generator, located at a plant in Guizhou's Liupanshui city, uses carbon dioxide instead of steam to transfer heat. Each unit of the project boasts a power generation capacity of 15 megawatts, it said.

It has been connected to the grid from a steel production plant in Guizhou to produce electricity from waste heat, addressing a long-standing technical bottleneck in the efficient utilization of small-to-medium scale thermal energy sources.

Huang Yanping, CNNC chief scientist and chief designer of Chaotan One, said the commercial operation

of this project represents the first transition of this innovative technology from laboratory to commercial implementation worldwide.

The system, with simplified structural design and fewer components, makes it possible to operate and maintain more easily compared to conventional steam-cycle plants. It can generate over 70 million kilowatt-hours of electricity annually, adding about 30 million yuan (\$4.26 million) in revenue.

By utilizing supercritical CO2 power generation, the project implements an innovative power cycle that is more efficient, takes up less space, requires fewer auxiliary components and reacts faster than traditional systems, he said.

According to Huang, when the working pressure of CO2 exceeds 73 atmospheres and the temperature exceeds 31 C, it enters a supercritical state, leading to increased density that approaches a liquid state, which enables it to store more energy.

Meanwhile, its viscosity remains

very low, close to that of a gas, resulting in smaller flow resistance.

According to CNNC, the system offers a drastic performance leap over traditional sintering waste heat steam power technologies currently in use, with overall power generation efficiency up by more than 85 percent, net electricity generation improved by over 50 percent and required floor space reduced by 50 percent.

Beyond being an innovative technology, supercritical CO2 power generation is poised to significantly contribute to the country's dual-carbon goals by efficiently converting industrial waste heat into power, it said.

Industry experts believe the innovative thermoelectric conversion technology comes at a critical juncture for China's energy landscape, as the country's electricity consumption is expected to reach a record high in 2025, with total power use projected to surpass 10 trillion kWh nationwide.

Rising demand is driven in large

part by high-tech and advanced manufacturing industries, according to the national energy work conference held recently in Beijing.

Power use in sectors such as new energy vehicle manufacturing and wind power equipment manufacturing has jumped more than 20 percent and 30 percent year-on-year, respectively, from January to November. Electricity consumption in the internet and related services sector surged more than 30 percent, it said.

Wang Hongzhi, head of the National Energy Administration, said at the conference that China is set to overfulfill its target of having nonfossil energy account for 20 percent of its total energy consumption in 2025.

Thanks to robust green investment, the leapfrog development of the new energy sector, and the accelerated construction of major hydropower and nuclear power projects, the country's green and low-carbon energy transition has accelerated this year, Wang said.



Employees of China National Nuclear Corp work at a supportive facility for Chaotan One, the world's first commercial supercritical carbon dioxide power generator, in Liupanshui, Guizhou province, on Saturday. XIAO YAN / XINHUA

The Nuclear Power Institute of China started research into the world's cutting-edge supercritical CO2 power conversion technology as early as 2009. In 2023, construction commenced on its demonstration project in Liupanshui.

In 2024, CNNC launched a demonstration project integrating molten-salt energy storage and supercritical CO2 power generation

technologies, with scheduled demonstration operations set for 2028.

Looking ahead, the supercritical CO2 power generation technology will be integrated with multiple heat sources to form power generation systems, said Huang.

This will help expand its applications to solar thermal power, waste heat recovery, energy storage and other fields, he said.