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Oji Holdings Corporation
Bacchus Bio innovation Co., Ltd.
JGC Holdings Corporation
ENEOS Materials Corporation
Osaka Gas Co., Ltd.
Toray Industries, Inc.

Biomanufacturing Ecosystem Construction Project Using Wood and Other Under-Utilized Resources Selected as NEDO Research and Development of Technologies to Promote Biomanufacturing

A consortium of six companies, namely, Oji Holdings Corporation (President: Hiroyuki Isono; Headquarters: Chuo Ward, Tokyo; hereinafter, Oji HD), Bacchus Bio innovation Co., Ltd. (President: Akihiko Kondo; Headquarters: Kobe City, Hyogo Prefecture; hereinafter, Bacchus), JGC Holdings Corporation (Chairman: Masayuki Sato; Headquarters: Yokohama City, Kanagawa Prefecture; hereinafter, JGC HD), ENEOS Materials Corporation (President: Hayato Hirano; Headquarters: Minato Ward, Tokyo; hereinafter, ENEOS Materials), Osaka Gas Co., Ltd. (President: Masataka Fujiwara; Headquarters: Osaka City, Osaka Prefecture; hereinafter, Osaka gas) and Toray Industries, Inc. (President: Mitsuo Oya; Headquarters: Chuo Ward, Tokyo; hereinafter, Toray) hereby announce that we jointly proposed the Biomanufacturing Ecosystem Construction Project Using Wood and Other Under-Utilized Resources (hereinafter, the Project) for the Research and Development of Technologies to Promote Biomanufacturing publicly solicited by the NEDO (New Energy and Industrial Technology Development Organization) as well as that we were selected for implementing the same.

Based on the Research and Development of Technologies to Promote Biomanufacturing R&D Plan announced by the Ministry of Economy, Trade and Industry, the Project aims to shift the existing manufacturing processes from fossil resources-based to biomass-based. Working toward the goal of the integrated implementation of sustainable raw materials development, microbial breeding, development of culturing, separation, purification, and conversion processes, and conducting production demonstrations, the consortium will pool the knowledge and technologies we have cultivated so far for the advancement of the society as a whole.

We will ensure stable supplies of wood and other under-utilized resources by effectively utilizing the infrastructure of paper mills and other facilities. Additionally, we aim to be the first in the world to build an ecosystem for biomanufacturing using these resources through collaboration and running demonstrations as a consortium of Integrated Biofoundry*¹⁾ businesses and manufacturing companies.

The Project is scheduled to run from FY2024 to FY2031 and will address the following themes:

- Development and demonstration of the use of under-utilized resources as raw materials (Oji HD, Toray)
- Microbial breeding for efficient production of target substances (Oji HD, Osaka Gas, Toray)
- Functional demonstration of development platform for a wide variety of raw materials, microorganisms, and products through the sophistication of Integrated Biofoundry (Bacchus, JGC HD)
- Development of commercialization technology for various products using wood-derived material (Oji HD, ENEOS Materials, Osaka Gas, Toray)
- Development of evaluation methods for social implementation of biomanufacturing products (jointly)

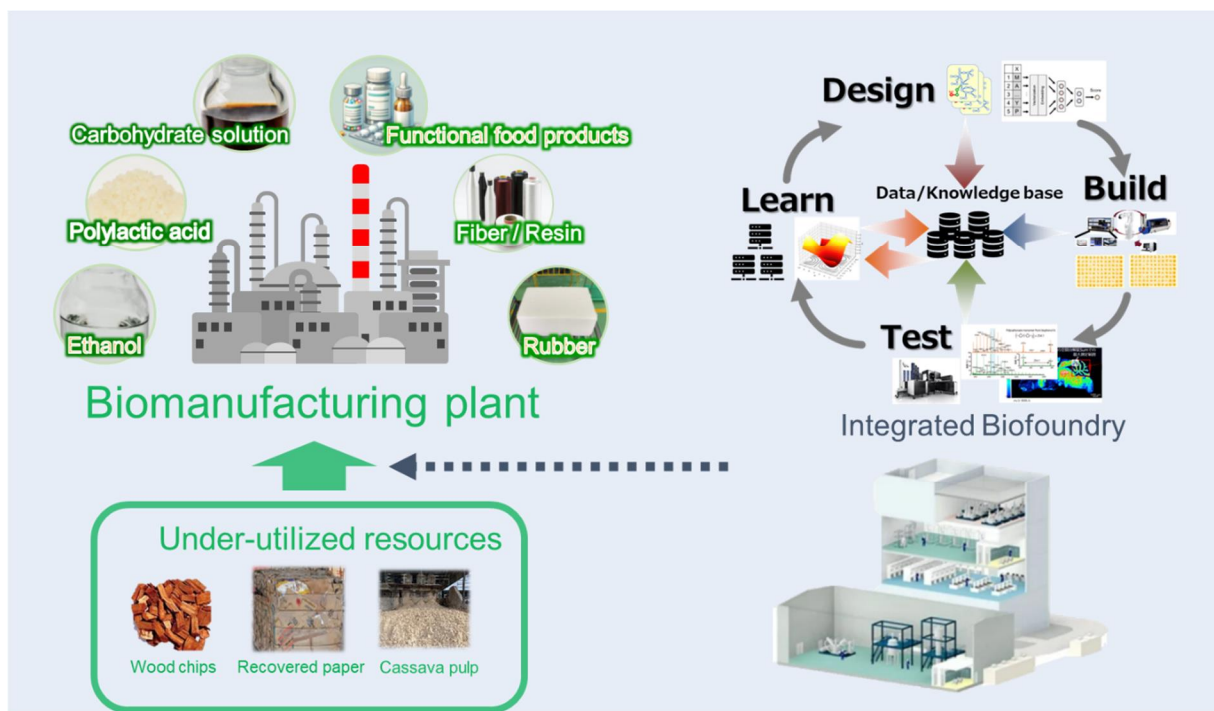


Figure 1. The six-company consortium’s “**biomanufacturing ecosystem**” using under-utilized resources

The development details of the six companies in the Project are as follows.

<Oji HD>

As part of its efforts to build core businesses for the next generation, Oji HD has been promoting the development of new wood-derived materials, taking the lead in the development of ethanol and polylactic acid in addition to wood-derived liquid sugar, which are key materials for biomanufacturing.

As part of the project, Oji HD will develop wood-derived materials to help solve social issues, carry out production demonstrations, and conduct commercialization studies for industrial applications. Additionally, it will lead the project as the managing company.

<Bacchus>

Bacchus has been developing biofoundry services as a platformer combining biotechnology-related knowledge with digital technologies such as data science to create smart cells that efficiently produce useful substances.

In this Project, Bacchus aims to create a “microbial development platform” that can generate smart cells*²⁾ using wood and other under-utilized resources. Then, through demonstrations accelerating the development of the other members, will proceed with social implementation.

<JGC HD>

JGC HD is currently working with Bacchus to build an “Integrated Biofoundry” that will provide a one-stop service for everything from microbial development and improvement to culture tank scale-up and production process development, combining life science knowledge and engineering technologies.

In this Project, JGC HD will develop a data-driven production process platform for wood and other raw materials, microorganisms, and products. Furthermore, supporting the development of biomanufacturing processes by other team members and working towards expanding the biomanufacturing industry as a “biomanufacturing platform.”

<ENEOS Materials>

ENEOS Materials manufactures and sells synthetic rubber and other high-performance materials as the core operating company of the ENEOS Group’s functional materials business. To reduce greenhouse gas emissions in society and achieve carbon neutrality by developing, manufacturing, and selling products using bio-based and recycled raw materials and environment-friendly advanced materials.

As part of the Project, ENEOS Materials will develop a technology for manufacturing butadiene*³⁾ using

bioethanol derived from under-utilized resources and carry out social demonstrations for industrial applications.

<Osaka Gas>

Osaka Gas and its group companies use *Halomonas* bacteria to produce and sell ketone bodies (BHBs^{*4}) naturally derived from sugars using proprietary fermentation technologies accumulated through the development of biogas production processes.

As part of the Project, Osaka Gas will demonstrate the production of BHB in Japan using *Halomonas* bacteria to develop and demonstrate the production of heme iron and butanol.

<Toray>

Aiming to produce polymers from sustainable resources, Toray has been working on technologies to make sugar from cassava pulp^{*5}, a by-product of starch, generated at Thai starch plants as well as the development of a unique microorganism that produces an intermediate of adipic acid, a raw material for nylon 66, from sugar.^{*6,7}

As part of the Project, Toray will promote the integration of these technologies and conduct a scale-up demonstration to realize a supply chain from cassava pulp to fiber and resin products.

*1) "Integrated Biofoundry," a biomanufacturing platform that provides a one-stop service from microbial breeding to process development.

(Reference) JCG HD press release [20230601 \(jgc.com\)](https://www.jgc.com/20230601)

*2) Smart cells are sophisticatedly designed cells with enhanced capacities for efficiently producing target substances.

*3) A basic chemical produced along with ethylene and other substances by pyrolysis of petroleum naphtha. It is the main raw material for synthetic rubber, a main constituent of tires.

*4) BHB is an abbreviation for D-β-hydroxybutyric acid.

*5) NEDO demonstration project "International Demonstration Project on Japan's Technologies for Decarbonization and Energy Transition / Demonstration Project for an Energy-Saving Cellulosic Sugar Production System Using Bagasse"

*6) NEDO-subsidized project "Project for Development of Production Techniques for Highly Functional Biomaterials Using Smart Cells of Plants and Other Organisms"

*7) NEDO-subsidized project "Development of Production Technology for Bio-based Products to Accelerate the Realization of Carbon Recycling"