

"Woody biomass energy sources" such as wood chips, wood offcuts and timber from forest thinning are energy resources that are attracting attention as carbon-neutral fuels that will contribute greatly to reducing CO₂ emissions.

Chugai Ro Co., Ltd., a leading industrial furnace manufacturer, started research and development of woody biomass energy-based gasification power generation systems as a technology to alleviate global warming through utilization of Chugai Ro’s own technologies, in response to the adoption of the Kyoto Protocol in 1997. Japan has many biomass resources, but gathering biomass in large amounts is difficult, and it is necessary to establish systems that are suited to local characteristics such as the types and amounts of biomass generated.

Against this background, Chugai Ro Co., Ltd. has been pursuing the development of gasification power generation systems as a means for local production and consumption-type biomass energy utilization. Chugai Ro Co., Ltd. participated in the NEDO Project in FY2002 and achieved 500 hour-continuous operation and an energy conversion efficiency of 60% (electric energy = 20%, thermal energy = 40%) in February 2005 at the demonstration test facility (5 tons/day, 180kW) in Yamaguchi City of Yamaguchi Prefecture.

In February 2013, Chugai Ro Co., Ltd. constructed a "Biomass Gasification Tri-generation System" (7-9 tons/day, 180kW) in Yokote City of Akita Prefecture, which not only generates electricity and utilizes heat but also produces fuel at the same time. Chugai Ro Co., Ltd. has been conducting demonstration tests using this system ("Tri-generation System Demonstration Project Utilizing Un-utilized Biomass in Snowy Mountainous Areas," which is a project entrusted by the Ministry of the Environment as part of the "Model Project for Intensive Support for the Development of Low-carbon Areas").

Because this system utilizes the vast amount of timber from forest thinning in Yokote City, which is a city with active forestry industry, as a biomass fuel, it is attracting attention not only as a technology to alleviate global warming but also as a means of vitalizing the forestry industry of the city.

Biomass Gasification Power Generation System that Contributes to Reducing CO₂ Emissions and Enhancing the Local Vitality

Perspective of the Gasification Furnace Developed by Chugai Ro Co., Ltd. for Biomass Gasification Power Generation Systems (Source: Chugai Ro Co., Ltd.)
Q. Why did this project start?

Japan is poor in natural energy resources (fossil fuels) and relies on other countries for more than 80% of the total supply of energy. In 1997, the “Act on Special Measures for the Promotion of New Energy Use, etc.” was established to ensure energy security and alleviate global warming, and the promotion of active introduction of new energy sources that do not add to global warming (renewable energy sources) was set as a national task.

The word “carbon-neutral” began attracting attention in 2002, and promotion of research and development on and enhancement of the utilization of “biomass (biological resources),” such as plants, excrement of livestock and waste foods, as a new energy source was incorporated into the Act in conjunction with the amendment of the Act. In December 2002, a Cabinet Decision was made to adopt the “General Strategy for Biomass Japan” formulated by six government departments including the Ministry of Agriculture, Forestry and Fisheries, and it was decided that each of the six government departments would develop policies for promoting the introduction of biomass as an energy source.

NEDO initiated the “Development of Technologies for High-efficiency Conversion of Biomass and Other Energy Resources into Energy” Project in as early as FY2001, when the above-mentioned efforts had not started yet, and started technological development under the project.

Q. What was the aim of the project?

Utilizing un-utilized biomass resources requires the development of thermochemical gasification technologies that replace direct incineration technologies, which are present mainstream technologies for biomass utilization, or the development of liquefaction technologies to increase the energy conversion efficiency and use of ease, and various technological development projects have been conducted to achieve these.

Because the lower cost competitiveness of biomass conversion energy as compared to fossil fuel-based energy had been a hindrance to the promotion of introduction of biomass conversion energy, the “Conference for Promoting the General Strategy for Biomass Japan” (FY2007) presented a target unit production cost of 100 yen per liter, which was to be achieved in stages and on a material-by-material basis.

With regard to the target amount for the introduction, a target amount for the introduction of new energy of 19.10 million kl as a crude oil equivalent was established in the Outline established in 2002 by the Global Warming Prevention Headquarters. The Kyoto Protocol Target Achievement Plan established in 2005 set the target amount for the introduction of biomass energy at 43% of the target amount for the introduction of new energy and set the target amount for biomass heat utilization at 3.08 million kl.

Q. What is the role of NEDO?

The areas where biomass resources occur are distributed, and biomass resources vary widely in the shape and characteristics. For this reason, it is necessary to develop high-efficiency conversion technologies and put them into practical use in a way that is suited to the characteristics and local characteristics of the various biomass resources. This requires long research and development periods and large development costs, and it is difficult for a single company to take this development risk. NEDO considered that the involvement of NEDO to contribute to putting high-efficiency conversion technologies for biomass resources into practical use at an early stage was very important in light of the above-mentioned situation and the importance of putting such technologies into practical use in the national energy security policy as underlined by the setting of the biomass energy introduction targets in the “Outline of the Global Warming Prevention Countermeasures.” Therefore, NEDO has continuously conducted a wide range of research and development projects from ones relating to basic research to ones relating to the promotion of the popularization. With regard to woody biomass, whose utilisable amount is the largest among all biomass resources, NEDO considered that the installation of cost-effective large-scale equipment would be difficult because most of the timber mills with high biomass production and the abandoned timber from forest thinning were located in mountainous areas and it was essential to popularize small-scale equipment in order to pursue effective utilization of woody biomass. Therefore, NEDO has continuously supported the technological development for high-efficiency small-scale biomass gasification power generation systems and demonstration tests of such systems by Chugai Ro Co., Ltd.