

## 4C4. Coal and Woody Biomass Co-firing Technology

**Research and development:** New Energy and Industrial Technology Development Organization; Chugoku Electric Power Co., Inc.; Hitachi, Ltd.; Babcock-Hitachi K.K.

**Project type:** High-efficiency biomass energy conversion technology development

**Period:** 2001-2003 (3 years)

### Technology overview

#### 1. Background

As part of their global warming countermeasures, industrially advanced countries are implementing policies to promote the adoption of power generation using renewable energy. One of these is the Renewable Portfolio Standard (RPS) system. The "Special Measures Law concerning the Use of New Energy by Electric Utilities" (RPS Law) was enacted in April 2003, and obligates electric utilities to obtain a specified amount of their energy from new energy power generation sources. The portion of energy derived from alternative sources is expected to increase from 3.3GkWh in 2003 to 12.2GkWh in 2010. Included in the definition of new energy is biomass fuel.

The co-firing of coal and woody biomass in the power generation sector, though already underway in the U.S. and European countries, is new to Japan and is facing a variety of technological problems. For pulverized coal-fired boilers, there are roughly two

co-firing options. One is to simply pulverize the woody biomass in existing mills and combust the pulverized coal-biomass mixture fuel in a boiler, using the existing burner. This method requires fewer equipment modifications and therefore costs less. However, mixtures of more than several percent of biomass cause the mill's power consumption to sharply increase due to the difficulty of grinding woody biomass with ordinary pulverizers. The other option is to establish a biomass-dedicated mill. Despite the higher equipment costs, this method is advantageous not only because a higher ratio of biomass can be utilized but also because the amount of NO<sub>x</sub> generated can be reduced.

Technology development of the latter option, commissioned by the New Energy and Industrial Technology Development Organization (NEDO), is underway.

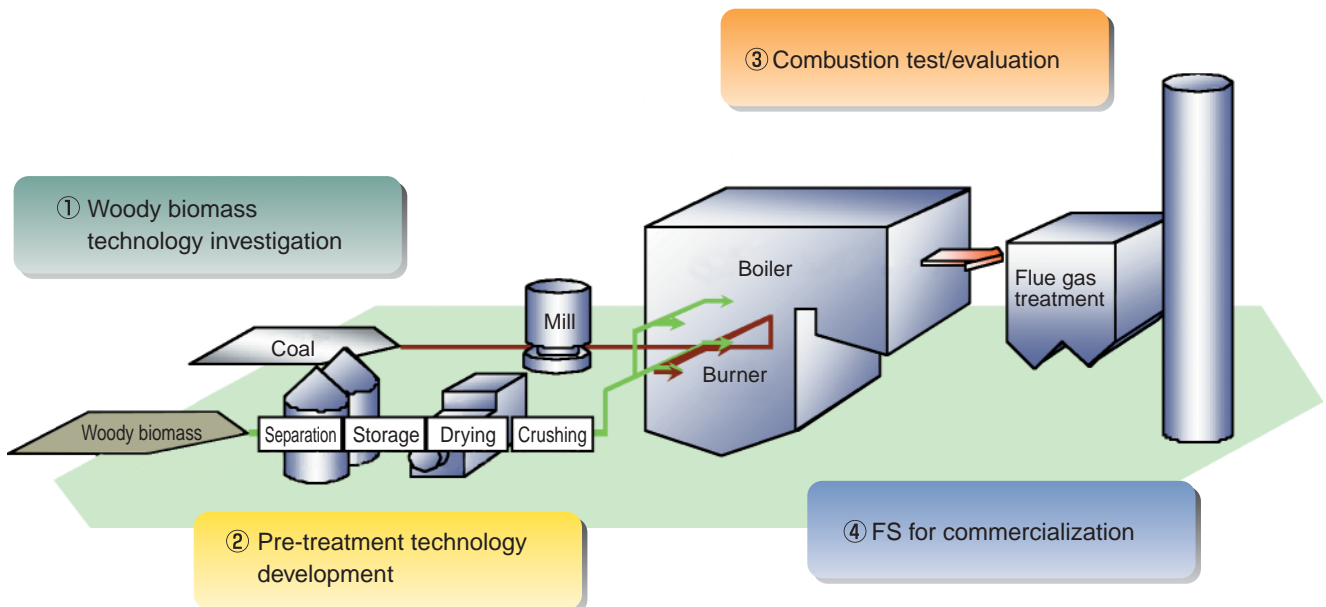


Fig. 1 Process flow of coal/woody biomass co-firing system

2. Development target

- (1) Co-firing ratio of woody biomass: 5-10%
- (2) Clearance of current regulatory environmental restrictions
- (3) Power generation efficiency comparable to that of existing coal thermal power plants: A decrease in net thermal efficiency of less than 0.5% with a woody biomass co-firing ratio of 5% (on a calorific base).

3. Technologies to be developed

- (1) Woody biomass pre-treatment technology (mainly grinding)
- (2) Woody biomass combustion technology (co-firing burner/biomass-dedicated burner)

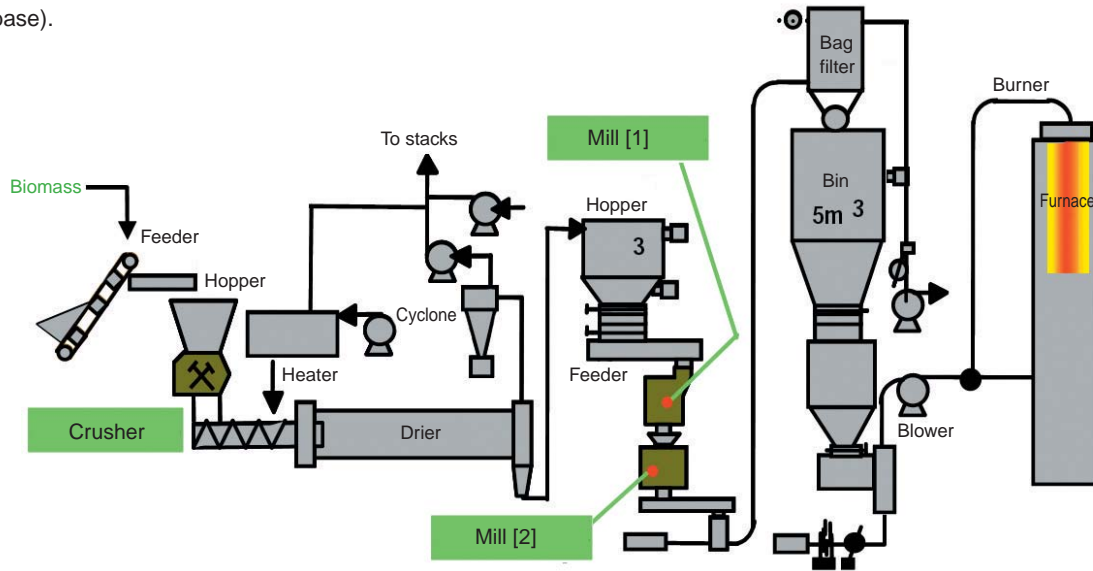


Fig. 2 Process flow of pilot-scale test facility

4. Development progress and results

This project, was conducted at Chugoku Electric Power Co., Inc., Hitachi, Ltd., and Babcock Hitachi K.K., and commissioned by

NEDO, for the evaluation of the pilot plant's combustion results, with an eye toward commercialization.

R&D timetable

2001	2002	2003	2004	2005
Coal/woody biomass co-firing technology R&D (commissioned by NEDO)			Demonstration test	
Development of component technologies for processes from receiving to storage, crushing, dry-boiler combustion, and flue gas/ash disposal			Component technology development results-based deployment toward demonstration tests	
1. Woody-biomass technology investigation				
2. Pre-treatment technology development				
3. Combustion test and evaluation			Planning	
4. FS for commercialization			Installation work	
Review of forest biomass utilization by local governments			Demonstration test	
Utilization planning and system design/verification			Supply system and other improvements/developments	

References

- 1) Kazuhiro Mae: Coal Utilization Technology Information Journal No. 253, pp. 3-5, Feb. 2002.
- 2) Hiroshi Yuasa: A collection of lectures from Thermal/Nuclear Power Generation Convention, Fukuoka, pp. 102-103, Oct. 2003.