● R & D of Advanced Pressurized Fluidized Bed Combustion Technology （A-PFBC）

I. Purpose

From the viewpoint of reduction of Global Warming Gas and Saving of Energy with regard to the Worldwide Environmental issues, it is urgently necessary for us to develop a high efficiency technology, as well as, materialize its practical utilization. The captioned A-PFBC in a serial arrangement has been proved excellent in high efficiency, friendliness with environment, earlier practical operation and its economic advantages.

A-PFBC is a combined next-generation technology of coal utilization, which is composed of two pressurized FBC furnaces of an oxidizing furnace and a partial oxidizing furnace. We can raise its plant efficiency excellently by introducing the combined cycle operation of a gas turbine and a steam turbine. In addition, we can expect to enjoy merits of more compact design and module component fabrication. In running the R & D, miscellaneous features of the system and its practicability will be confirmed by means of the Process Development Unit (**P D U**) of the system

II. System of A-PFBC technology

A-PFBC can be positioned among the high efficiency power generation systems as shown in the following illustration, Figure 1.

A-PFBC is a high efficiency power generation technology combined with the currently existing technologies, of which a PFBC furnace is fabricated with a partial oxidizing furnace in combination, in addition, IGCC technique is practically introduced in the coal gasification gas turbine technology for the later stage energy extraction which comes after the cyclone treatment of the combustion gas.

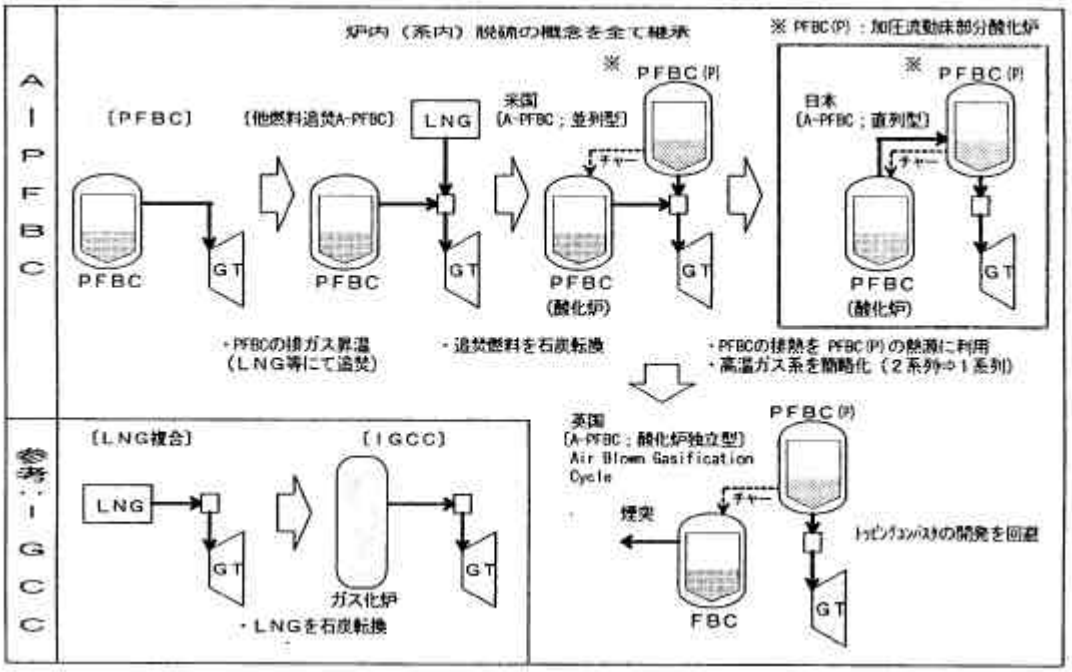


Figure 1. CONCEPTUAL FLOW SHEET of the A-PFBC SYSTEM

III. Target of Development

By running a PDU test (using a 15 ton/day class unit), the following verification and **acquisition of the technical data are planned. In parallel, assessment of both the technology and its feasibility will be also implemented for materializing a practical A-PFBC.**

- Verification of the System
- Capability confirmation of each Machinery Component (partial oxidization, deSOx, oxidizing performance of CaS, etc.)
- Proofing of Fundamental operation and System controlling method
- Confirmation of Coal Adaptability

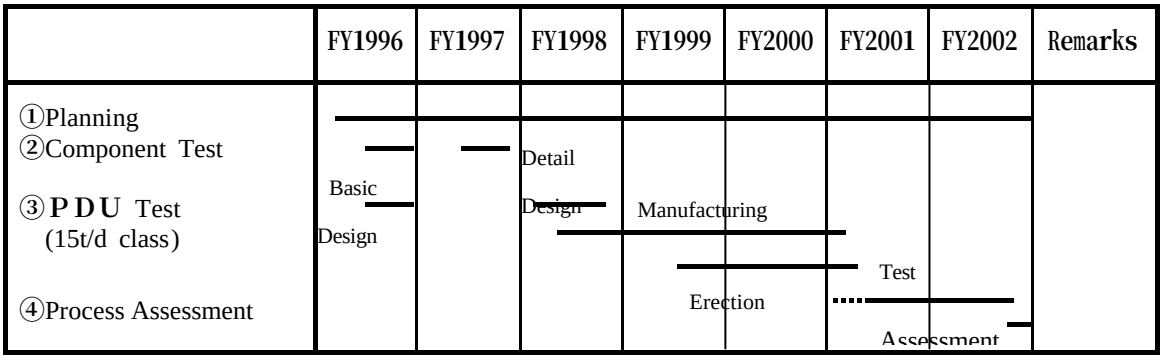
< Targeted introduction of a Commercial Unit >

Targeted performances of the unit are shown as follows;

Loss of Ignition (LOI):	**below 0.3%**
H_2S concentration:	**below 110 ppm (at deSOx furnace outlet)**
Calorific value of Produced Gas:	**900 – 1,200 kcal/Nm^3**
Allowable emission limits:	**SOx 50ppm, NOx 45ppm, Dust 10mg/Nm^3 (at the stack outlet)**

IV. Development Schedule

Implementation of the R & D of the A-PFBC is scheduled during the period from FY1996 to FY2002, as shown in the following chart.



V. Feature of This System

(1) High-Efficiency System (net 46% at the generated power outlet)

- Rising of the gas turbine (GT) inlet gas temperature has been materialized by combusting the produced gas in an improved combustor. It has made the gas turbine efficiency higher.

- Because of the introduced three portions of the PFBC system to recover high temperature heat flow of the steam such as Oxidizing furnace, SGC and HRSG, higher temperature steam recovery has become available to improve the overall GT efficiency, particularly, by upgrading the Steam Turbine (ST) efficiency. (593 degree C. at 170 ata)

(2) Mitigation of Gasification Condition enables Wider Selection of Coals

- Chasing of a complete gasification has become unnecessary, for the new system can work quite efficiently by its partial gasification (Carbon conversion ratio is more or less around 85%)

- Generated char is guided to the oxidizing furnace, and then it is burned completely under an oxidizing atmosphere.

(3) Adoption of High temperature Dry type DeSOx System by Lime use

The contained sulfur is captured in a form of CaS, and then oxidized to make gypsum in the oxidizing furnace. It makes higher efficiency because the deSOX is fundamentally an exothermal reaction and lacks in heat loss to bring a higher thermal efficiency.

(4) Mitigation Possibility of Working Condition of Micro-Dedusting Device

- Chasing of a complete gasification has become unnecessary, for the new system can work quite

efficiently by its partial gasification (Carbon conversion ratio is more or less around 85%)

- Dedusting can be done in the medium temperature range of the deSOx furnace, which helps upgrading of reliability of the component machinery, etc., by reducing the thermal stress and strain, as well as, fly-ash adhesions.

- In comparison with A-PFBC which is composed of parallel arranged oxidizing furnaces, the new one can dedust well with its single lined furnace to make the system simplified.

(5) High efficiency Possibility by Systematization

- Without any additional devebpment of some new devices to be installed to the machinery component, a high efficiency upgrading can be materialized by introducing a newly designed systematization. (development of a new topping-cycle combustor is not necessary in the systematization.)

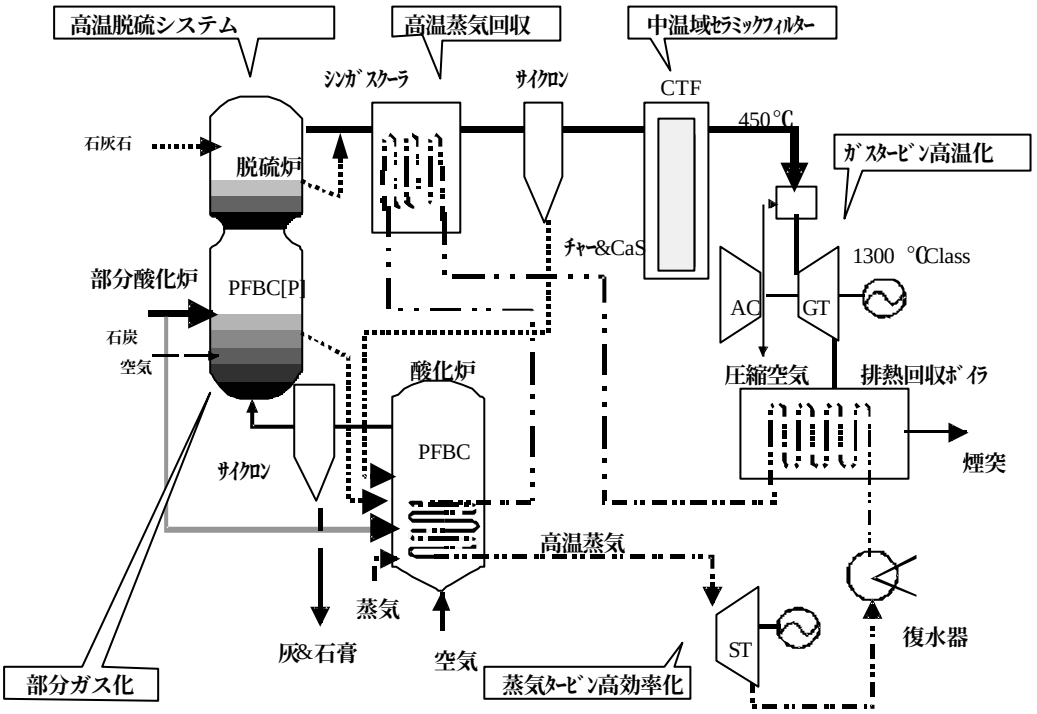


Figure 2. Outlined System Flow of the A-PFBC Arrangement