Study on the Highly Efficient Closed-Cycle Gas Turbine System for CO2 Collection

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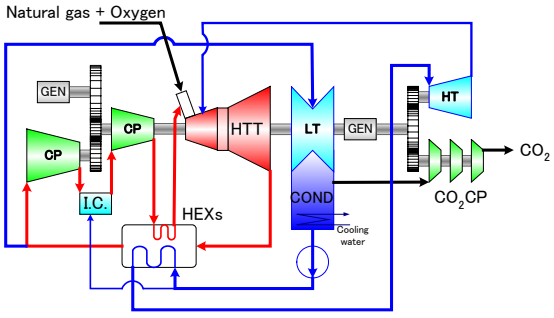
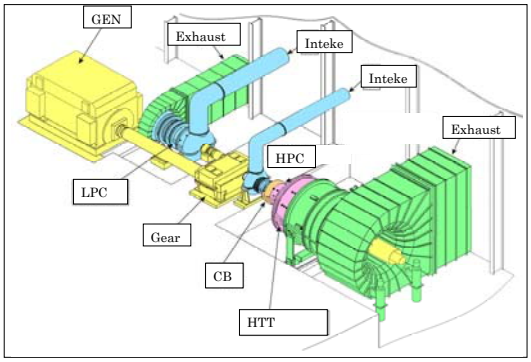
The power generating system in which gas turbine cycle and the steam turbine cycle were highly integrated was examined. This system can easily correspond to the carbon dioxide recovery, and can achieve generator-end efficiency of 60% (HHV). In this paper, the result of system optimization study and the conceptual design of the main equipment are described.

Figure 1 shows the schematic diagram of proposed system. This system can easily correspond to the carbon dioxide recovery by burning the natural gas with oxygen, and very highly efficiency can be achieved by the unique configuration in which the Brayton and Rankine cycle are highly integrated.

This study was carried out aiming at generator-end thermal efficiency of 60% (HHV) with the turbine inlet maximum temperature of 1973K.

We advanced the conceptual design of the equipment and optimization study of the system based on it. Figure 2 shows the bird view of the power train based on the conceptual design and Table 1 shows the plant performance summary that obtained as the final result of optimization study.





HTT	553.5 MW	CO_2CP	-17.5 MW
HT	35.5 MW	Other losses	-10.0 MW
LT	50.0 MW	Gross power	496.4 MW
CP	-114.9 MW	Gross effic.	59.5 %

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(1) E.Koda et al. “Study on the high efficiency closed cycle gas turbine system”, Proc. of ASME Turbo Expo2001, 2001-GT-0562

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