

# Gas Turbine Combined Cycle Performance Analysis Technology

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- ⇒ Performance analysis technology of gas turbine combined cycle system composed of various components such as gas turbine (GT), heat recovery system generator (HRSG), and steam turbine (ST) using a physics-based model
- ⇒ Application fields of the performance analysis technology using a physics-based model : 1) performance design, performance acceptance test, and performance diagnosis of conventional power generation system, 2) Development of advanced power generation system such as integrated gasification combined cycle, gas turbine-fuel cell hybrid system

## Client / Market

- Gas turbine manufacturers
- Engineering companies for energy systems
- Electric power companies with gas turbine combined cycle

## Necessity of this Technology

- Combined cycle gas turbine performance design aspect: In the performance design of gas turbine for combined cycle, gas turbine performance design considered the performance characteristics of the bottoming cycle is required to maximize the efficiency of the combined cycle.
- Gas turbine combined cycle power plant performance acceptance test aspect: In the performance acceptance test of gas turbine combined cycle power plant, correction curves of the combined cycle power plant derived by combining the design specifications of components is required, and the curves are utilized to examines whether the completed gas turbine combined cycle power plant is able to fulfill the performance in the contract.
- Gas turbine combined cycle power plant performance diagnosis aspect: In the performance diagnosis of gas turbine combined cycle power plant, the analysis for the degree of degradation and the cause of deterioration were required to predict the appropriate maintenance schedule because the performance of gas turbine degrade with increase in operation time.

## Technical Differentiation

- Performance design of gas turbine for combined cycle
  - Estimation of realistic gas turbine performance specifications by utilizing the regression analysis model obtained through analyzing data from existing gas turbine, and physics-based model

## DESIRED PARTNERSHIP

Technology Transfer

Licensing

Joint Research

Other



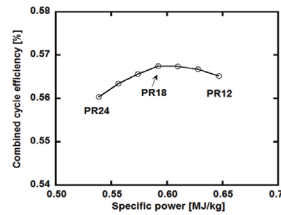
## TECHNOLOGY READINESS LEVEL [TRL]

- Research, basic explanation
- Project concept or idea development
- Technology idea verification
- Prototype development
- Trial product production/ evaluation in similar environment
- Pilot field demonstration
- Development and optimization of commercial model
- Commercial product demonstration
- Mass production and initial market launch

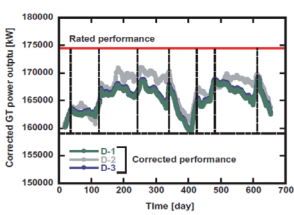
- Prediction of design performance specifications of gas turbine for combined cycle by simulation of gas turbine system with bottoming cycle using the physics-based model
- Performance acceptance test of correction curve for gas turbine combined cycle power plant
  - Accuracy improvement of correction curves of combined cycle by utilizing the model-based simulation of overall combined cycle power plant as well as combination correction curves of each component provide by manufacturer's
  - Prediction of the correction curves of combined cycle power plant with inlet chiller and duct firing
- Diagnosis of gas turbine combined cycle power plant performance
  - More accurate quantitative analysis of performance degradation using physics-based model than that of using data analysis

## Excellence of Technology

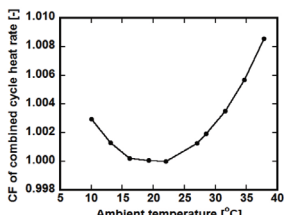
Example of Optimal Pressure Ratio Estimation for Combined Cycle Gas Turbine



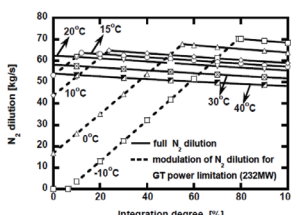
Example of Performance Degradation analysis of Gas Turbine



Example of Correction Curve of Predicted Combined Cycle



Example of Performance Analysis of Integrated Gasification Combined Cycle



## Current Intellectual Property Right Status

### KNOW-HOW

- Performance design of gas turbine for combined cycle power plant
- The prediction of correction curves of combined cycle power plant
- The performance diagnosis of gas turbine
- Analysis of advance gas turbine-based energy system