

News Release

2019.12.26

OSAKI CoolGen Corporation

New Energy and Industrial Technology Development Organization

Starting demonstration tests for oxygen-blown integrated coal gasification combined cycle technology with CO₂ capture

- Aiming to achieve a 90% capture rate of CO₂ and a net thermal efficiency of 40% at commercial power plants -

NEDO and the OSAKI CoolGen Corporation are engaged in a demonstration project that consists of three steps to verify a revolutionary low carbon coal-fired power generation technology, through the combination of integrated coal gasification fuel cell combined cycle (IGFC) technology with CO₂ capture. The second step of this project, which is to verify oxygen-blown integrated coal gasification combined cycle technology with CO₂ capture (oxygen-blown IGCC with CO₂ capture), began on December 25.

Through these demonstration tests, we aim to obtain a prospect of achieving a net thermal efficiency of 40% (Higher Heating Value based)^{*HHV}, equivalent to the latest recent pulverized coal-fired power plant, while capturing 90% CO₂ at a commercial power plant (1,500°C-class IGCC), which will enable us to verify the basic performance, plant operability, reliability, economic feasibility, and other aspects of the oxygen-blown IGCC with CO₂ capture. By making the best use of the prospects which we obtain through the demonstration, we aim to establish an oxygen-blown IGCC with CO₂ capture and spread the technologies to worldwide. This will lead us to contributing to the global CO₂ emission reduction (global warming countermeasures).



Figure 1: CO₂ capture facility used in the second step
(Located inside the Osaki Power Station of The Chugoku Electric Power Co., Inc.)

1. Overview

The New Energy and Industrial Technology Development Organization (NEDO) and the OSAKI CoolGen Corporation are engaged in the "Integrated Coal Gasification Fuel Cell Combined Cycle (IGFC) Demonstration Project", which aims to achieve revolutionary low carbon coal-fired power generation through the combination of integrated coal gasification fuel cell combined cycle (IGFC), the ultimate high-efficiency generation, with CO₂ capture, in order to greatly reduce carbon dioxide (CO₂) emissions during coal-fired power generation.

This demonstration project consists of a demonstration of oxygen-blown integrated coal gasification combined cycle technology (oxygen-blown IGCC) in the first step, a demonstration of oxygen-blown IGCC with CO₂ capture in the second step, and a demonstration of IGFC with CO₂ capture in the third step. It puts into use a demonstration test facility constructed within the site of the Osaki Power Station of The Chugoku Electric Power Co., Inc. to verify the basic performance, plant operability, reliability, and economic feasibility of the system. Through the first step of the demonstration, which began in March of 2017, we achieved a net thermal efficiency of 40.8% (HHV), the highest level of efficiency in the world for a 170 MW class coal fired plant, and saw a prospect of achieving a net thermal efficiency of approximately 46% (HHV) by applying these results to a commercial power plant (1,500°C -class IGCC) with the new technology implemented.

We have recently completed the construction of the CO₂ capture facility and began the second step on December 25. In the second step, we are going to verify the basic performance, plant operability, reliability, and economic feasibility of the oxygen-blown IGCC with CO₂ capture,

through a combination of the oxygen-blown IGCC demonstration test facility with the CO₂ capture unit. Regarding the issue of reduced generating efficiency due to the energy loss that occurs during CO₂ capture, we aim to obtain a prospect of achieving a net thermal efficiency of 40% (HHV), equivalent to the recent pulverized coal-fired power plants, while capturing 90% CO₂ at the commercial IGCC gasification process.

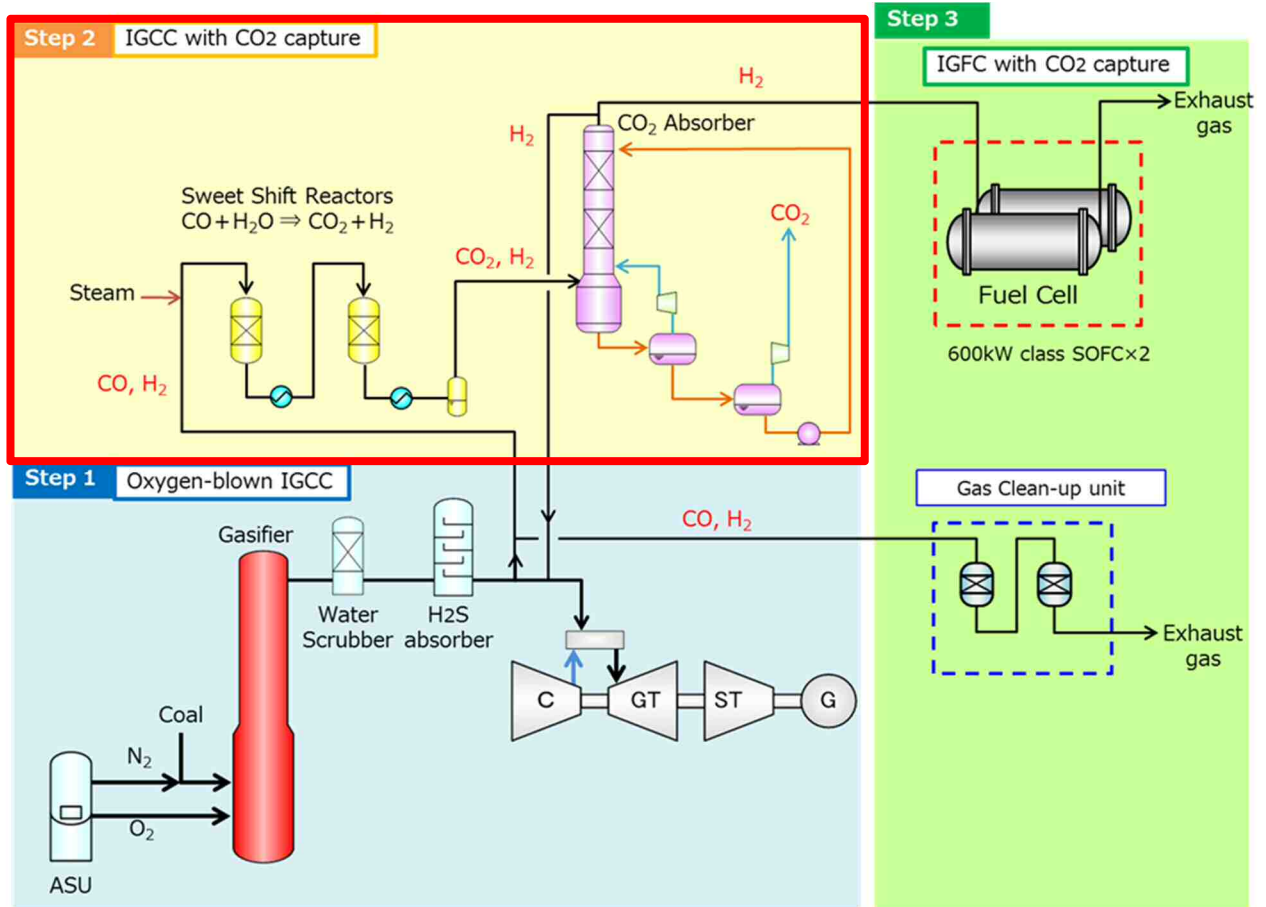


Figure 2: Outline of demonstration test system

2. Demonstration Test Details

- (1) Goals : To verify the feasibility of technologies that are able to maintain high-efficiency power generation while also ensuring stable CO₂ capture processes at oxygen-blown IGCC plants equipped with demonstration facilities for CO₂ capture.
- (2) Implementation period : From December 25, 2019 to February 28, 2021
- (3) Implementation location : Within the site of the Osaki Power Station of The Chugoku Electric Power Co., Inc. (6208-1 Nakano, Osakikamijima-cho, Toyota-gun, Hiroshima Prefecture)
- (4) Demonstration test targets : See the table below.

Table: Demonstration test targets for oxygen-blown IGCC with CO₂ capture

Item	Target/Indicator
Basic Performance (Power generation efficiency)	To obtain a forecast of a power generation efficiency of approximately 40%(net HHV) while capturing 90% of the CO ₂ in the newly-built commercial IGCC plant(1,500°C class IGCC)
Basic performance (CO ₂ recovery rate and purity)	CO ₂ recovery rate : 90% or more / Captured CO ₂ purity : 99% or more
Plant Operability and reliability	To establish the operational method of IGCC with CO ₂ capture and to verify the reliability
Economy	To evaluate the cost per amount of recovered CO ₂ in the commercial IGCC plant using cost target data shown in the Technology Roadmap as a benchmark.

By achieving the targets set for these demonstration tests, we can create a coal-fired power generation system with virtually no CO₂ emissions by incorporating new CO₂ utilization and storage technologies that are currently being developed as part of other projects.

3. Future Plans

During the third step (FY 2018 to 2022), we plan to implement a demonstration test for IGFC with CO₂ capture by integrating fuel cells with the demonstration facilities used in the current tests. We aim to obtain a prospect of achieving a net thermal efficiency of approximately 47% (HHV) while capturing 90% CO₂ at the 500MW class commercial IGFC.

4. Inquiries

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