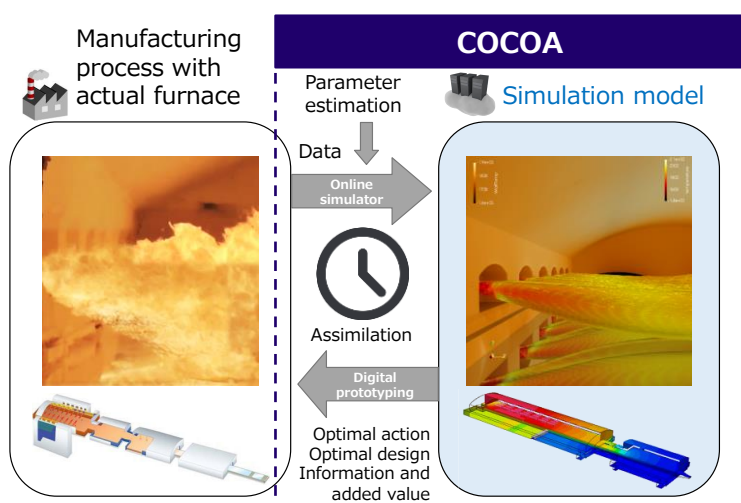


AGC Develops Digital Twin Technology for Glass Melting Process and Begins Operational Verification in Float Furnaces

Tokyo, January 23, 2023 – AGC Inc. (AGC; Headquarters: Tokyo; President: Yoshinori Hirai), a world-leading manufacturer of glass, chemicals and high-tech materials, has developed the CADTANK Online Computation and Optimization Assistant (COCOA) as a digital twin technology*¹ for the glass melting process that integrates an online simulator*² with a digital prototyping tool*³. Full-scale operational verification at AGC’s float furnaces is scheduled to begin in February 2023. This technology enables rapid and detailed understanding of the glass melting process and preliminary study of production conditions, which have been difficult to achieve in the past.



Operation flow of COCOA

- ① Obtain operation data (heat distribution from burners, electric boosters, etc.) and actual furnace condition data (temperature, quality, etc.).
- ② Automatically generate simulation models of the “current furnace status” using an online simulator.
- ③ Run a simulation of the case study freely changing the operating conditions with the simulation model shown in (2) as a reference.
- ④ Reflect the optimum operating conditions derived in (3) on the actual furnace and return to (1).

The temperature inside a float furnace and the flow of molten glass change daily depending on various factors such as the condition of the raw materials and refractories, which greatly impacts the quality of the glass produced. As these factors change, it becomes necessary to re-derive optimal operating conditions. Yet this adjustment requires time, and the production volume declines during this period.

The inside of a float furnace is searing at approximately 1,600°C, so it is difficult to obtain a detailed understanding of the internal conditions. Therefore AGC had been using CADTANK, a glass melting process simulation technology originally developed in the 1970s, but it was difficult to run simulations in a timely manner due to major effort required to collect the necessary data.

<Media inquiries>

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To solve these issues, AGC developed the simulation tool COCOA, which can check changes in temperature distribution inside a float furnace, the flow of molten glass, etc. from a simulation model automatically generated using float furnace operation data.

This enables process technicians to easily and directly conduct detailed condition assessments and preliminary studies of production conditions inside the glass melting process, which previously required simulation specialists taking time to implement. In the future, AGC will build an efficient production system based on simulation forecasts and utilize this system for sustainability to reduce GHG emissions*⁴.

As the next step in the development of digital twin technology, AGC is working on automatically estimate information that is difficult to measure and necessary to run simulations, using a technique called “data assimilation”. Once this is achieved, the real-time forecasting accuracy of digital twin technology will be further improved and its use will be expanded. By enabling anyone to use simulation technology through the digital twin, AGC will further expand its accumulated strengths in simulation technology and develop it into a differentiation technology.

*¹ Digital twin: Reproduction of the environment of a real space within a virtual space based on information from the real space.

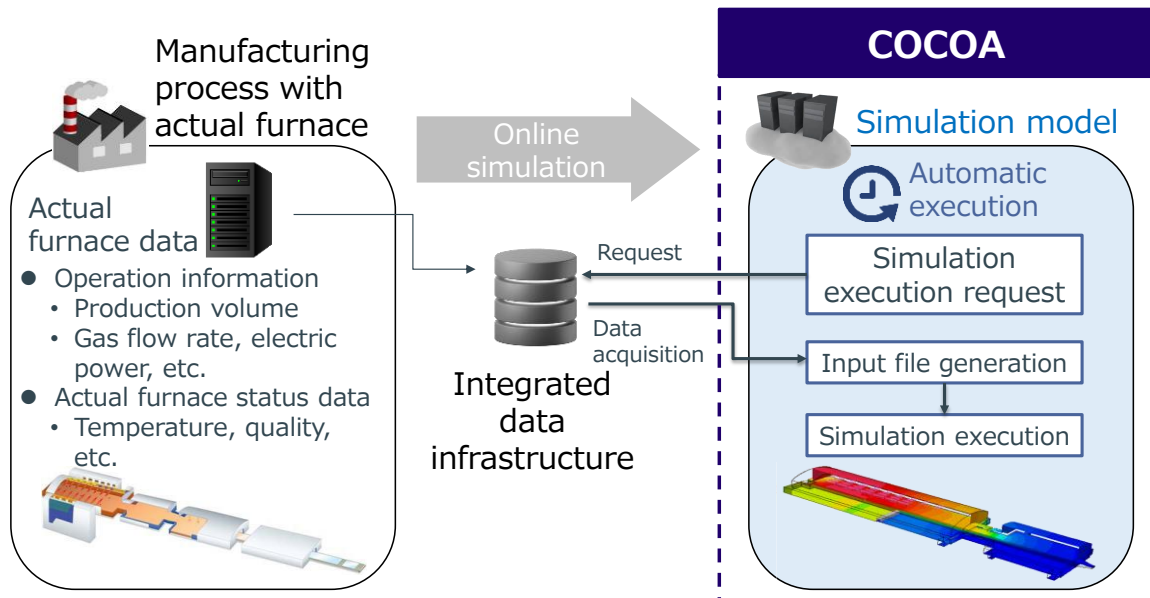
*² Online simulator: A system that automatically updates simulation models in real time

*³ Digital prototyping tool: Simulation execution tool for sensitivity analysis and preliminary study

*⁴ An abbreviation of greenhouse gas

< Reference >

■ Image of online simulation



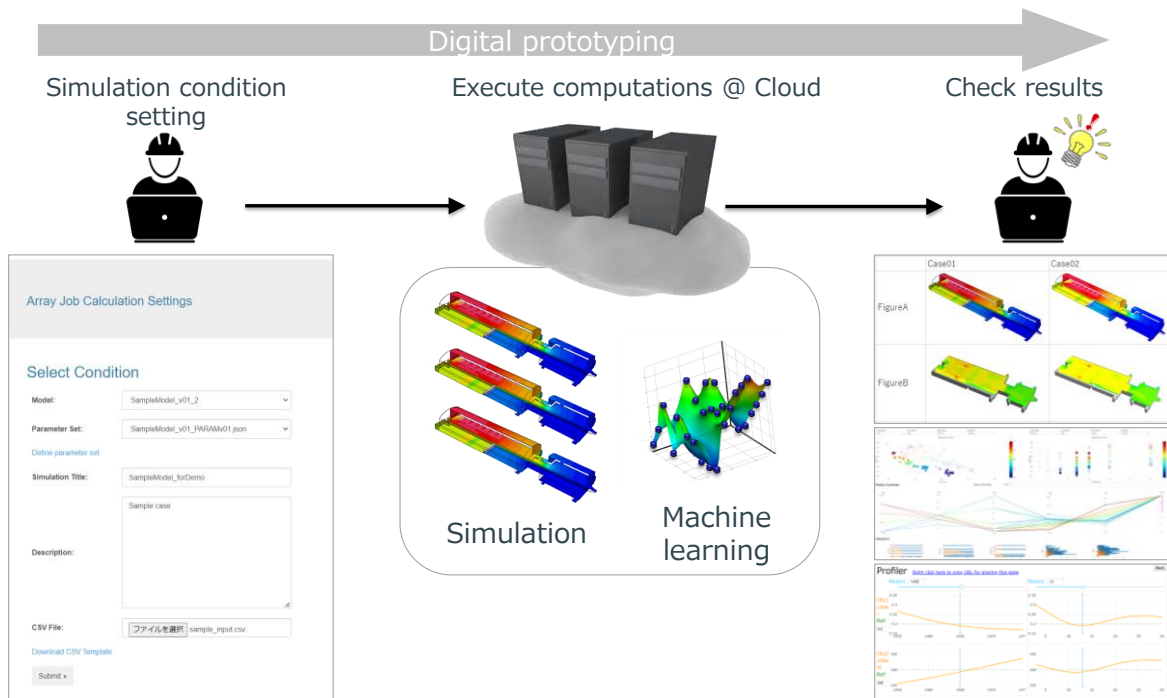
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■ Image of digital prototyping



■ Data assimilation

This is a method to improve the accuracy of simulations by merging simulation and measured data. This technology has developed especially in the field of meteorology. In recent years, it is expected to be used in industrial applications. The application of data assimilation to the simulation of glass melting processes is expected to improve the forecast accuracy of simulations by accurately estimating conditions inside float furnaces, which are difficult to measure.

In developing this technology, AGC is utilizing open innovation and collaborating with Dr. Takemasa Miyoshi of the Data Assimilation Research Team at the RIKEN Center for Computational Science. Dr. Miyoshi is a leader in data assimilation research and made numerous achievements through cutting-edge initiatives, such as real-time forecasting of guerrilla rainstorms using big data from the “Fugaku” supercomputer and weather radar observations. AGC will promote the advancement of digital twin technology by fusing AGC’s simulation technology with Dr. Miyoshi’s deep knowledge of data assimilation.

URL: <https://data-assimilation.riken.jp/~miyoshi/>

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