

June 1, 2023

Okuma Corporation

Kimura Foundry Co., Ltd.

**Okuma and Kimura Foundry Develop Next-generation Casting Technology (not requiring wooden molds)  
Enabling 3D data linkage, robot usage, and fully automated manufacturing of medium and small castings**

To demonstrate at Gunma Factory, expected to accelerate manufacturing DX

Okuma Corporation (President: Atsushi Ieki) and Kimura Foundry Co., Ltd. (President: Kazutoshi Kimura) have developed a next-generation casting technology that enables fully automated manufacturing of small and medium-sized castings using robots, and will begin demonstration manufacturing at the Gunma Factory.

Okuma will continue to implement and improve the system at the demonstration plant, expand the system to Okuma's partner plants, and deploy the system to the Japanese foundry industry for continuing to contribute to resolving social issues faced by the industry.

#### **Background of Development of New Casting Technology**

The Japanese foundry industry plays an important role as a supplier of components to Japan's key industries such as automobiles and machine tools. In particular, castings used for machine tools require excellent properties such as high vibration damping capability and low thermal expansion coefficients. At the same time, these factories use ultra-high-mix low-volume production, which requires flexible production capabilities. The high international competitiveness of Japanese machine tools is supported by the Japanese foundry industry, which possesses both advanced technology and flexible production capabilities.

Even so, the Japanese foundry industry is also dealing with social issues such as labor shortages, calls to improve the work environment, and reduction of environmental impact, and is looking for ways to resolve these issues. And at the same time, their casting capacity has been in decline as the number of Japanese foundries has fallen from 2,791 in 1995 to 1,373 in 2019.

Against this backdrop, Okuma, a leader in manufacturing DX, and Kimura Foundry, a proven innovator in casting, will jointly create innovative next-generation casting technology to solve the problems faced by the Japanese casting industry and pave the way for the development of a new casting industry.

#### **Innovative Features of New Casting Technology**

##### **New casting method and fully automated manufacturing using robots**

- **Data linkage from sand molding to casting and parts machining, manufacturing DX Innovative manufacturing process with integrated production and full automation**
- **New casting method using robot direct machining on sand molds without requiring wooden molds**
- **Fully automated sand molding process using robots for enabling the ultimate in Process – intensive manufacturing.**

#### **Results of the New Casting Technology**

##### **Dramatic improvement in profitability and international competitiveness**

- **Labor - saving: Continuous nighttime and holiday operation using only 1/4 the labor - saving conventional systems**
- **Shorter lead times (2 weeks → 3 days minimum)**

- **Manufacturing costs: Same or lower than before (significant improvement in profitability)**

## **Overview of New Casting Technology**

The specific methods for realizing this new casting technology are described below.

- **Data linkage from sand molding to casting and parts machining, manufacturing DX Innovative manufacturing process with integrated production and full automation**

(First in the industry)

In conventional casting by general hand molding\*1, a foundry creates a material drawing together with drafting a casting plan based on a product drawing, and a wooden mold builder designs and manufactures a model (wooden mold).

In the production process using the new casting technology, cast part shapes are molded directly into sand molds without requiring the use of wooden molds, thus eliminating the need to design and manufacture wooden molds, set and remove wooden molds from sand molds, and perform related tasks such as storage, management, and repair of wooden molds.

Furthermore, combining the cutting processes after casting enables the production of parts in a single, integrated process, eliminating intermediate inventories for making full automation a step closer to reality.

## **Manufacturing DX of small castings for machine tools**

This newly-developed casting process generates sand mold models (sand mold layout, sand mold machining path, and core shape data) from 3D models of materials and products, and further enables manufacturing DX of small castings for machine tools by combining processes through digital data linkage up to parts machining after casting.

- **New casting method using robot direct machining to sand molds without requiring wooden molds**

With this new casting technology, a robot directly machines the required casting part shape into a sand mold that is 500 x 200 mm square without using a wooden mold.

A sand mold model is generated on the sand mold by 3D-CAD/CAM with a layout containing the required type and quantity and is converted into a machining path for the robot.

This method, which enables layout of multiple part types on a single sand mold according to the required quantity, can be said to be the most appropriate method for the ultimate high-mix low-volume and variable-mix variable-volume production.

- **Fully automated sand molding process using robots for the ultimate in process-intensive manufacturing** (First in the industry)

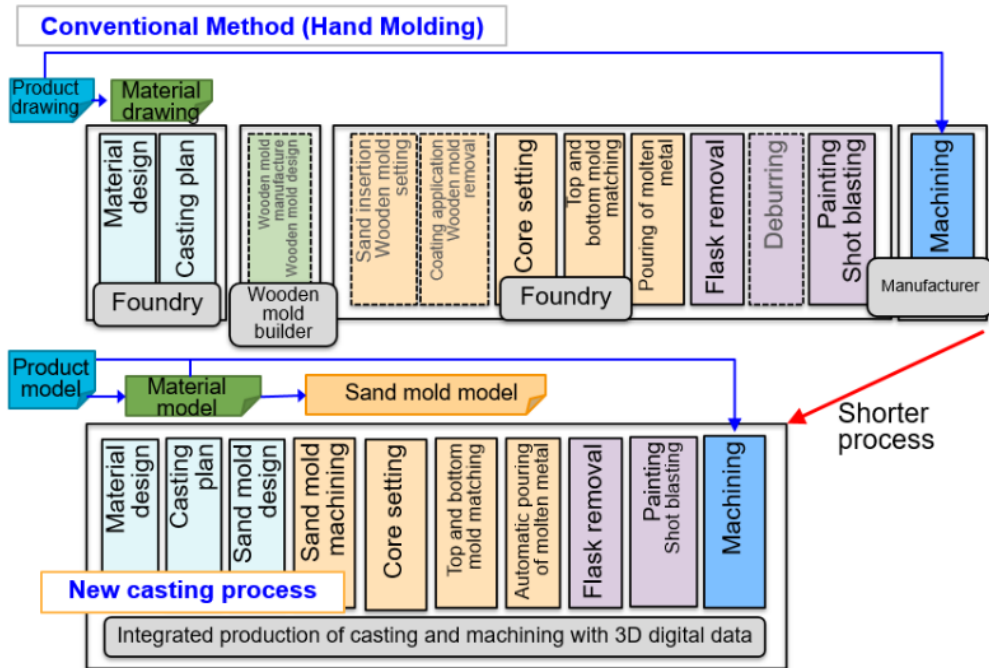
In addition to sand mold machining, the core insertion process into sand molds and the mold matching process for upper and lower molds are fully automated by robots for the first time in the world, and unmanned operation during nighttime and holidays is possible by connecting the pre- and post-processes with an automatic guided vehicle.

Robotic machining of sand molds and automation of core insertion and upper/lower mold matching eliminates human variation and improves the shape accuracy of parts and also does not require the removal of burrs\*2 that occur on the parting line after casting.

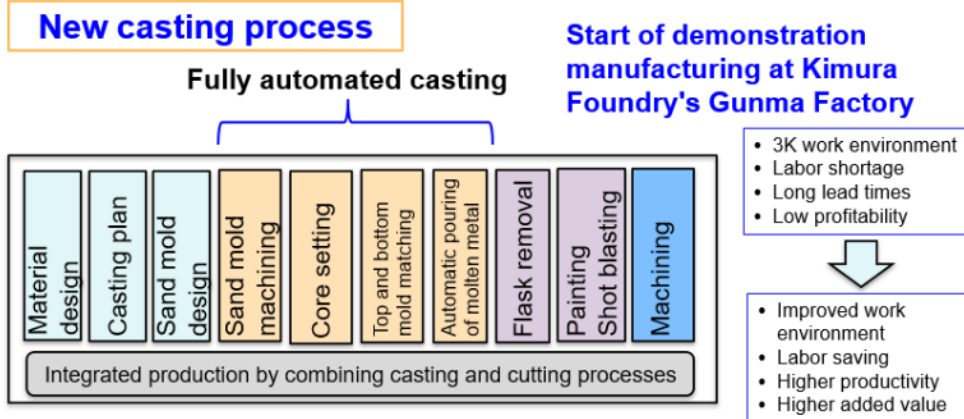
\*1 Hand molding: A common method in the production of small castings in which sand molds are used as casting molds into which molten metal is poured for forming sand molds by hand.

\*2 Parting line: A protruding portion of a casting caused by a gap or misalignment between the upper and lower mold matching surfaces of a sand mold.

## New casting and molding technology for integrated production

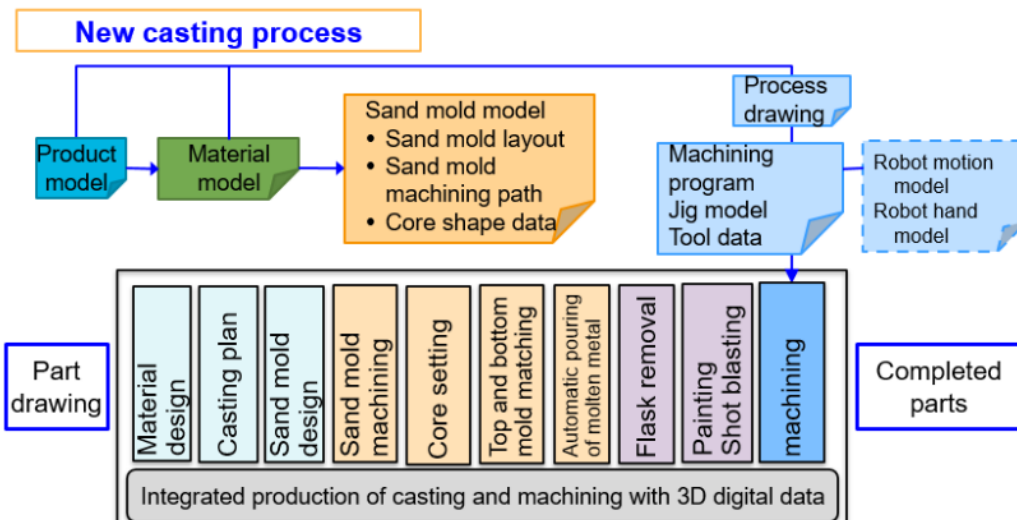


## Fully automated manufacturing using robots



- Direct machining by sand mold robot without requiring wooden molds
- Fully automated sand molding process using robots (core setting, top and bottom mold matching)
- Automatic transfer of sand mold between processes

## Manufacturing DX from part drawing to machining



End