

## Siemens and Toyota Industries Corporation

Nuremberg and Aichi  
April 12, 2021

# Toyota Industries Corporation and Siemens cooperate on digital transformation for die casting

To support their goal of manufacturing quality parts, Toyota Industries Corporation and Siemens have cooperated to develop artificial intelligence (AI) that can predict product abnormalities in aluminum die casting, a key process in automotive air conditioning compressor production.

The development is one of the world's first to use defect prediction AI for die casting. It improves quality and productivity by utilizing the AI application in Industrial Edge, the Siemens edge computing platform for industry. The initiative is an innovative example of digital transformation in manufacturing, and Toyota Industries Corporation aims to use it to further evolve their technology and incorporate it into their production plants in Japan and overseas. Siemens hopes that more businesses in the manufacturing industry will adopt their digitalization and automation solutions such as Industrial Edge.

The die casting process is challenging to manage due to a range of constantly changing production conditions such as variations in the molten aluminum temperature or the injection rate. Success relies on the judgement of experienced workers, and sometimes the parts require secondary processing to handle abnormalities and maintain high quality standards.

## SIEMENS

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During development, the two companies used a Siemens Simatic S7-1500 controller to gather big data totaling approximately 40,000 data points per die casting shot at the model line and then analyzed the data using AI technology. They succeeded in preventing defects and improving quality by monitoring the production status in real time and automatically predicting equipment abnormalities that lead to quality issues. The production data is processed by the defect prediction AI on Industrial Edge, enabling instant analysis of the data on production conditions at the time of a shot and assessment of the part quality immediately after the casting. This series of AI technologies boosts productivity, improves quality, and transforms how operators work.

Aluminum die casting is a high-speed molding process in which molten aluminum is shot into a die at high pressure. It is ideal for the accurate manufacture of metal cast parts that demand high dimensional precision, and therefore is often used for automotive parts that require high quality and reliability. The aluminum die cast parts made at the Toyota Industries Corporation production plant in Obu, Japan, have excellent airtightness and high pressure resistance. They are essential for the high-quality Toyota Industries Corporation compressors used in automotive air conditioning, a field in which they proudly hold the largest share of the global market\*.

Siemens aimed to contribute to operational improvements with Siemens Industrial Edge, while Toyota Industries Corporation aimed to increase quality and productivity. The alignment of these goals with the die casting process led to this development, during which they demonstrated proof of concept across two years and achieved a successful outcome. Based on this result, they will continue pursuing technological advancements in order to provide better products for their customers throughout the world.

“Digital transformation is a game changer. I am delighted to have the opportunity to partner with Toyota Industries Corporation in this revolutionary endeavor and to work together to forge the future,” says Rainer Brehm, CEO of Factory Automation, Siemens AG. “We will continue to develop and provide solutions for industries incorporating the latest technologies and to contribute to optimized and sustainable manufacturing.”

“It is significant that Toyota Industries Corporation has successfully implemented AI technology and achieved outcomes in the die casting process, which is where important compressor parts are produced. I am also proud that we have contributed to the practical use of Industrial Edge, the Siemens edge computing platform for industry,” says Yuji Ishizaki, Senior Executive Officer, Member of the Board and General Manager of Compressor Division, Toyota Industries Corporation. “We will continue to offer new value for customers and to pursue even better working methods by embracing the use of advanced digital technologies in the production field.”

This press release is available at <https://sie.ag/3dQ9I9w>

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**Siemens AG (Berlin and Munich)** is a global technology powerhouse that has stood for engineering excellence, innovation, quality, reliability and internationality for more than 170 years. Active around the world, the company focuses on intelligent infrastructure for buildings and distributed energy systems and on automation and digitalization in the process and manufacturing industries. Siemens brings together the digital and physical worlds to benefit customers and society. Through Mobility, a leading supplier of intelligent mobility solutions for rail and road transport, Siemens is helping to shape the world market for passenger and freight services. Via its majority stake in the publicly listed company Siemens Healthineers, Siemens is also a world-leading supplier of medical technology and digital health services. In addition, Siemens holds a minority stake in Siemens Energy, a global leader in the transmission and generation of electrical power that has been listed on the stock exchange since September 28, 2020. In fiscal 2020, which ended on September 30, 2020, the Siemens Group generated revenue of €57.1 billion and net income of €4.2 billion. As of September 30, 2020, the company had around 293,000 employees worldwide. Further information is available on the Internet at [www.siemens.com](http://www.siemens.com).

#### **About Toyota Industries Corporation**

Toyota Industries Corporation was established in Kariya, Aichi Prefecture in 1926 for the manufacture and sale of the Type G Automatic Loom invented by Toyota Industries Corporation founder Sakichi Toyoda. Afterwards, the company's field of business was expanded to automotive related fields such as vehicles, engines, and car air conditioning compressors, as well as industrial vehicles, such as lift trucks, and other materials handling equipment and systems related to transportation, storage, and sorting of goods. They continued to devote themselves to research and development to create new value as well as to providing products and services that would satisfy their customers. Currently, they have 256 consolidated subsidiary companies, their employee count has risen to 66,478 (as of March 31, 2020), and they are proud to hold the largest world market share for three products: air-jet looms, car air conditioning compressors, and lift trucks.. In promoting their diverse businesses, Toyota Industries Corporation contributes to making the earth a better place to live, enrich lifestyles and promote a compassionate society. For more information, please visit <https://www.toyota-industries.com/>

\*Based on Toyota Industries Corporation's assessment

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