

Industrial machinery

Komatsu NTC Ltd.

Virtual commissioning at the hardware-in-the-loop stage significantly improves process efficiency

Product

NX

Business challenges

Improve machine tool design process efficiency

Reduce development time

Enhance information integration between departments

Ensure the safety while commissioning

Keys to success

Introduce Mechatronics Concept Designer to accelerate information sharing between the mechanical design and control design teams

Perform simulations in a virtual space on a level that mirrors the actual machine

Results

Parallel mechanical design and control design led to a significant reduction in development time

Running the control programs in a virtual space improved debugging efficiency and ensures the safety of staff members during testing

Early detection of mechanical design problems resulted in reduced manufacturing costs and shorter construction times

Komatsu uses Mechatronics Concept Designer to test control programs that virtually recreate actual machinery to reduce time-to-market and costs

Concurrent mechanical design and control design avoids rework at later stages

Komatsu NTC is a machine tool manufacturer that designs, manufactures, and sells equipment such as transfer machines, special-purpose machines, grinding machines, machining centers, crankshaft millers, and wire saws. As a member of the Komatsu group, the company provides world-class products under the directives of "Quality is #1" and "Improving customer

satisfaction." In addition, members adhere to environmentally-friendly manufacturing guidelines.

"As the importance of mechanical configuration software increases and the development process becomes more complex, the customers' demands for delivery times and costs are getting tougher," notes Yoshiharu Oyabe, director of the Development Division's System Development Center. "However, in the field of electrical and software control design, we had no choice but to start work upon receiving the required information from the blueprints provided after the completion of the mechanical design, which interfered with short delivery times and cost reductions."



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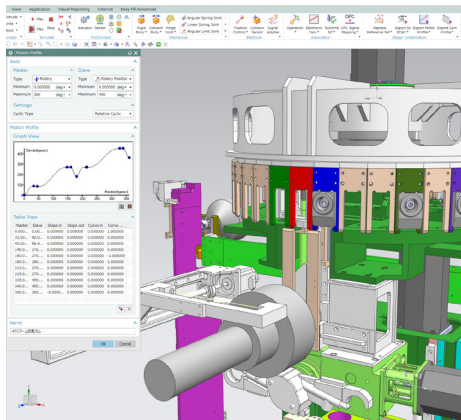
Yoshiharu Oyabe
 Director
 Development Division’s
 System Development Center
 Komatsu NTC Ltd.



Previously, information was exchanged between the mechanical design and the control design teams during meetings held at each step of the development process. When the work gets extremely busy, it becomes difficult to establish opportunities to share ideas between the teams. As a result, the detailed design work moves forward without specification changes being reported. This results in project errors. For example, in some cases, it was discovered during the final stage of the design process that the mechanical and electrical components were interfering with each other; in other cases, it was noted that the machines did not function as requested.

In addition, sometimes the mechanical design team would create a prototype halfway through the control design process, and the control design team would have to modify the control programs to match those technical requirements. In order to avoid this kind of rework, the engineers needed a tool that would allow them to model the control areas in 3D at an early stage of the design process and verify the validity of the electrical design and the control programs at each development step.

“The fusion of the real and virtual worlds is a key component and a significant theme in aiming for next-generation manufacturing based on Industrie 4.0,” explains Takafumi Asatani, who works in the Control Development Department within the System Development Center. “We wanted to achieve virtual commissioning to carry out efficient control software development in an environment that virtually recreates the actual machinery.”



Mechatronics Concept Designer delivers completely virtual commissioning

Komatsu NTC began the process to select a tool to achieve virtual commissioning in 2015. The company compared and considered several tools using multiple evaluation criteria. As a result,

Siemens Digital Industries Software's NX™ software and the optional Mechatronics Concept Designer module were installed in the control design area. The mechanical design area uses a 3D computer-aided design (CAD) software solution from another vendor, so being able to seamlessly exchange and re-use design assets from the existing CAD software was an important requirement.

Asatani notes, "Using Mechatronics Concept Designer, we can execute development steps that maintain consistency between mechanical design and control design right from the concept design stage. Mechatronics Concept Designer was the only tool equipped with the features needed for Hardware-in-the-Loop (HIL), enabling completely virtual commissioning. Being able to change the values for gravity and friction and perform the computation to simulate movements such as falls, collisions and rebounds as well as the compatibility with the Siemens CNC controllers we have adopted were also key points."

The company set up an environment for implementing and using NX and Mechatronics Concept Designer over a six-month development period. After starting operations, the control design team carried out basic and applied training while receiving support from Siemens Digital Industries Software. The installation went smoothly thanks to the intuitive operation of NX and Mechatronics Concept Designer.

Achieving HIL virtual commissioning to improve the efficiency of the development process

Komatsu NTC is applying NX and Mechatronics Concept Designer to accelerate the sharing of information between the mechanical design and the control design teams to improve the efficiency of the development process. For example, the control design team uses Mechatronics Concept Designer to change the shape and dimensions of machine parts in accordance with requirements. Because those changes can be immediately shared with the mechanical design team, both teams are able to execute integrated development steps while referencing the latest design information.

With an information technology (IT) environment that enables team members to model the control areas in 3D at an early stage of the design process, the engineers can readily verify the validity of the electrical design and control programs at each step of the development. They have also been able to achieve virtual commissioning by applying HIL with Mechatronics Concept Designer. Currently, the company virtually tests the control programs – simulating the actual machinery -- to understand the conditions in which defects and errors occur so that any required debugging can be easily performed.

Asatani explains, "In previous testing before Mechatronics Concept Designer, sometimes the prototype would be destroyed because of interference between components or malfunctions caused by design errors. With Mechatronics Concept Designer, we can check the movement of areas that cannot be physically seen by using a cross-section

"With Mechatronics Concept Designer, we can check the movement of areas that cannot be physically seen by using a cross-section simulation. As a result, we have been able to improve the efficiency of the testing and debugging work as well as ensure the safety of the testing staff."

Takafumi Asatani
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Solutions/Services

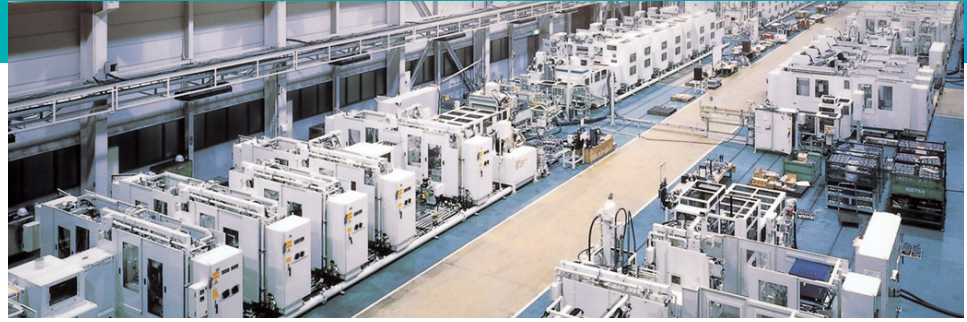
Mechatronics Concept Designer
siemens.com/mcd

Customer's primary business

Komatsu provides design, manufacturing and sales of transfer machines, special-purpose machines and other machine tools.
www.komatsu-ntc.co.jp/

Customer location

Nanto City, Toyama Prefecture
Japan



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Going forward, Komatsu NTC plans to integrate Mechatronics Concept Designer with computer-aided manufacturing (CAE) software to measure component deterioration and friction from the movement of the machinery. The company plans to set up a system to evaluate the machinery's product lifecycle in order to utilize Mechatronics Concept Designer for remote support, such as when a machine malfunctions after delivery. Specifically, Komatsu NTC plans to create a framework for early resolution by using the NC-PLC data from

before and after the malfunction. By replicating the problem using Mechatronics Concept Designer, the technicians will be able to identify the root cause of the problem before visiting the customer site.

Oyabe explains, “Siemens is one of the few industry players that can provide a total solution across all layers, from applications to infrastructure. We wish to promote next-generation manufacturing while utilizing Siemens' comprehensive solutions. We plan to operate not only in Asia but actively expand into Europe as well.”

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