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Digitally building the factory of the future

In order to develop the most productive machine tool possible, development teams have to design elaborate prototypes, build them and test them for months. Then it's always a matter of improving here, improving there. But virtual testing can be done much faster and in advance. Carina Mieth and Tim Gottschalk from TRUMPF rely on simulation and the help of AI here.

Building prototypes of new machines costs time and money. But what if the developer could test them down to the last detail before they were even built? At TRUMPF, engineers Tim Gottschalk and Carina Mieth are working on just that: virtual simulations of entire factories by computer. Using digital models of plants, the developers show how TRUMPF engineers will have to build the machines of tomorrow so that they can be highly productive at a reasonable cost.

Virtual simulations of entire factories by computer: this is what engineers Carina Mieth and Tim Gottschalk from TRUMPF are working on.
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Dozens of machine tests at the push of a button

"With our simulation, we can see how productive the machine and its automation will be. And that's even before it's built," says Carina Mieth, who is currently writing her doctoral thesis in simulation development. What used to take up to six months of design and construction for an ordinary prototype now happens in just a few days: Once the simulation has been created, all it takes is one click and dozens of tests will soon be running virtually. "If the customer wants to know, for example, how many sheets he can process with the machine in 72 hours, we can predict that number for him in the future. We can then compare an almost endless number of system variants, for example by using different automation possibilities of the machine," says Carina Mieth. But it is not enough if the plant can only produce quickly. It must also efficiently absorb the cut sheet metal parts with grippers. Tim Gottschalk has developed a solution for this: "With our new simulation program, we will be able to predict in the future with which arrangement the grippers can remove how many and which sheet metal parts," says the developer. In this way, it can be determined from the outset whether it is better to use one large gripper or many small ones.

"Simulation helps us better understand the smart factory," says Carina Mieth. For example, a large number of digital tests helped optimize the loading concept between the TRUMPF machine and the automated guided vehicle system.
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Data is the key to success

Simulation is indispensable for the construction of future factories. "We can see in advance on the computer how, for example, machine tools, storage systems and automated guided vehicle systems interact or fail to interact in a networked manner. This allows us to permanently improve processes in the smart factory," says Mieth. This helps especially in the development of new machines and software at TRUMPF.

An important prerequisite for making the various concepts compete digitally against each other in advance is data. "We draw on numerous production and machine data for the simulations and thus offer customers direct added value in the further development of their products. This way, customers always get the most suitable solution for their problem," says Gottschalk.

So will there be no more prototypes in the future? It's not quite that simple: "At the moment, we can't completely replace the real prototypes. We will always need at least a few - after all, there are external influences in reality that cannot be reproduced even in the best digital models. But in any case, we can test many more variants in a short time - and even before we build the first prototype."

One large gripper for sorting, or would you rather have many small ones? With the push of a button, Tim Gottschalk and Carina Mieth simulate many variants on the screen to find the best solution.
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