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The digital twin: the link between the virtual and real worlds

The trend is unmistakable: Digital twins continue to make inroads in industry. What's lacking, however, is a consistent strategy.

The digitalisation of production processes is moving ahead steadily. Simulation tools such as the digital twin are playing a crucial role. As a key element of the smart factory and the Internet of Things (IoT), they are being used more and more in industrial environments.

Digital twins provide an accurate, detailed 3D representation of a real-life object, such as a robot or a machine. With the aid of realistic simulations, manufacturers can test, inspect, and optimise technologies and entire processes much faster and more economically than in the physical world. The simulation models make development and planning phases more efficient and speed up commissioning. The models can also be used to ensure smooth plant operation. Industrial enterprises that already rely on these technologies have thus gained significant competitive advantages.

The revolution has already begun

Market research firms see tremendous potential for projects with networked devices, machines and plants in the coming years. In a 2018 survey by Gartner, the IT analysis and market research institute, 48 percent of the companies that already use IoT applications indicated that they currently use digital twins or plan to do so in the future.

TechSci Research also predicts strong growth in the market for digital twins. By 2020, this category is expected to be worth 13.9 billion dollars. Leading players in this segment include companies such as General Electric, IBM, Microsoft, Oracle, PTC, Ansys, Dassault Systèmes, Siemens, Bosch Software Innovation, and SAP, whose solutions will also play a significant role among many exhibitors at the FachPack trade fair.

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Digital twins in use throughout the entire service life

In machine and plant manufacturing, digital twins will be used throughout the entire service life in the future, starting in the development phase and extending to operation, as well as in adapting machines to new requirements. The product's features and functions can be simulated and optimised as early as the design and development phase. Indeed, all relevant components are consolidated into a software program when digital twins are programmed in machine and plant manufacturing. The digital twin can simulate not only individual machines but also entire production processes, including controllers, machinery, and plants. It can also map entire smart factories and place them into operation virtually. The fully functional simulation on a software platform saves companies time and money, since they can identify design errors before building a prototype or a machine in the real world.

Optimised maintenance and repair

The digital twin also presents new possibilities for maintenance and repair, thus making an important contribution when it comes to continuously maintaining an optimum level of machine and plant efficiency. Down times and the associated loss of production cost money. That means that repairs must be carried out quickly. With the digital twin, the data can be encrypted and linked in the cloud, so that service technicians, for example, can easily access machine information and identify and solve problems by remote maintenance. The digital map can then display all processes on the computer, a tablet, or even on virtual reality goggles.

Based on the displayed machine information, technicians immediately know which part caused the defect. They can then solve the problem immediately or send out the right spare part. In the best case scenario, there is no need to dispatch a maintenance team. Upgrades and retrofits can also be simulated without disrupting operation.

Interdisciplinary collaboration is required

However, standardised interfaces, data formats, and infrastructures are the prerequisites for smooth networking and optimum use of digital twins. According to Deloitte, data containers and a higher-level data management system that acts as a supra-platform, along with end-to-end data exchange, are key factors in this regard. Market researchers believe that all stakeholders involved need to subordinate their data silos to this higher

level as a basic requirement for implementing digital twins. At the same time, they see this as the biggest obstacle to success, one that can only be overcome if a neutral partner handles and coordinates the data management function. This requires compromises among the providers and broad acceptance on the part of all stakeholders.

These efforts will pay off for all industrial enterprises. Continuous machine monitoring makes it possible to adhere to optimum operating parameters and thus ensures higher efficiency. Comprehensive and continuous quality assurance also results in higher product quality. Another benefit is that risk can be reduced with preventive maintenance. High data availability, combined with analysis functions, helps companies identify and make use of growth potential. Users can respond more flexibly and ensure greater transparency in their production processes.

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