Virtual Twins in the Automotive Industry: Innovation Boost for Fuel Cell Production

Three companies, one goal: OMRON, Dassault Systèmes and VAF GmbH use virtual twins to make manufacturing more flexible and sustainable.

"One for all, all for one." This motto of the "Three Musketeers" from Alexandre Dumas' novel dates back to 1844, and yet it has not lost its relevance over the years. Three companies that count themselves among the innovation leaders in their industries have now joined forces to drive the future of mobility, or more precisely the fuel cell. As a strong team of three, the automation experts from OMRON, the virtual twin specialists from Dassault Systèmes, and the production and digitization professionals from VAF GmbH are pooling their expertise in their respective fields.

"In the future, production will increasingly be about seamless IT-OT integration, i.e. the connection of information technology and operational control hardware. To connect these two levels, OMRON is working with partners such as Dassault and VAF who score high on IT and integration expertise", reports Henry Claussnitzer, Business Engagement Manager Automotive EMEA at OMRON. Together, the companies want to take the production of hydrogen fuel cells to a new level.

Planning production workflows virtually

Science and technology company Dassault Systemès creates collaborative virtual environments as "virtual twin experiences" of the real world. Using Dassault's 3DEXPERIENCE platform and working with VAF, OMRON has developed a robotic stacker cell for fuel cell stack assembly. The solution can achieve a 0.5-second cycle of individual layers of bipolar (BPP) and membrane electrode (MEA) plates. The idea for the project came from e.Volution company, which wanted to implement a new mobility-as-a-service (MaaS) concept based on a fuel cell. With 3DXP, the digital twins of design and manufacturing merge into a common digital twin as a virtual base model.

Digital technologies for autonomous production

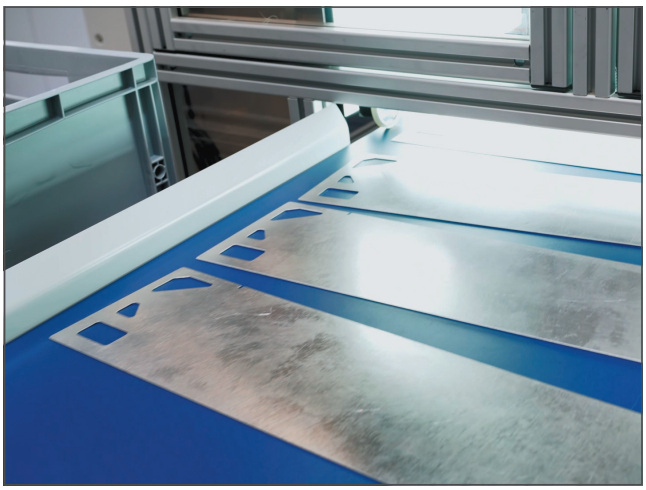
The digital twin ensures that production workflows can be virtually run through to improve planning and development and to push new developments. Information and operation technology (IT and OT) thus become flexible and scalable production solutions. Virtual twins can support prototyping, simulate material and resource savings in new cycle concepts and help shorten time-to-market. In addition, such an approach benefits sustainability and efficiency gains. Dassault, OMRON and VAF aim to help manufacturers and suppliers in the field of sustainable mobility to identify and use digital technologies to further develop autonomous production.

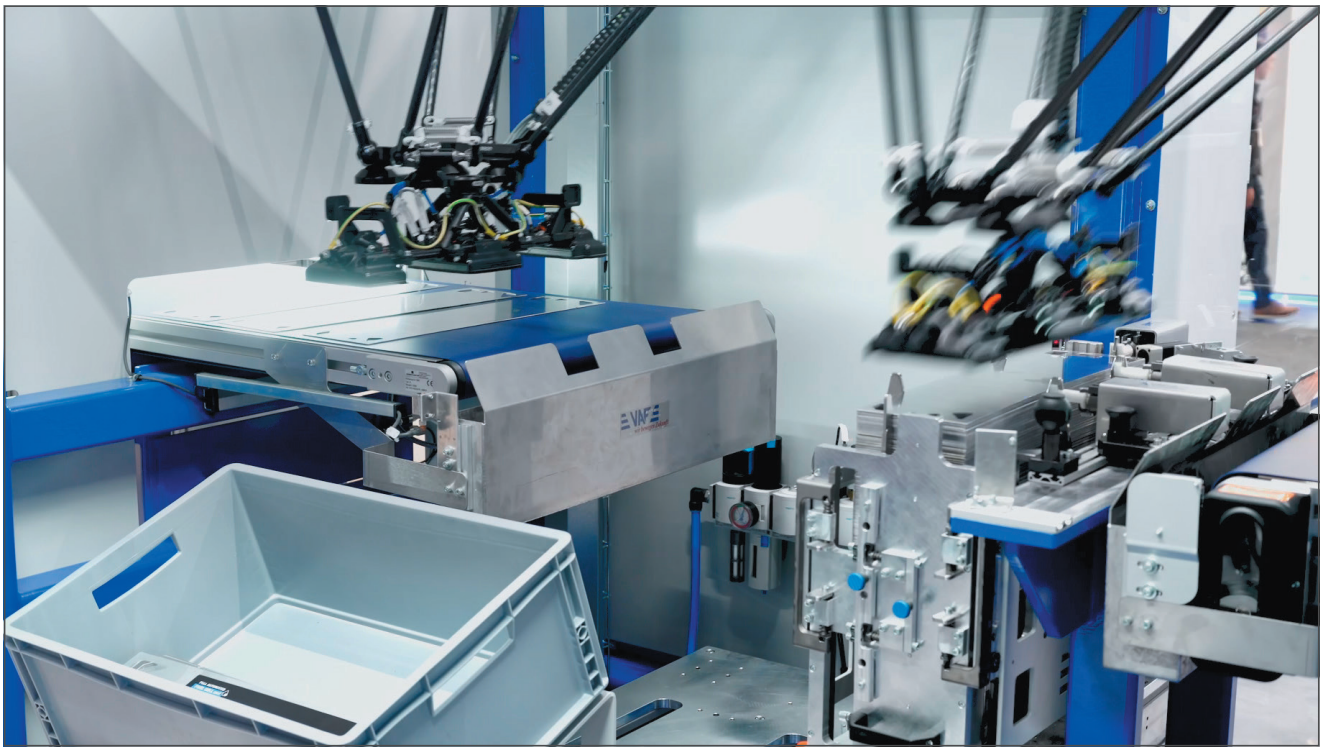
First joint appearance at Hannover Messe 2022

The 3DEXPERIENCE platform helps to highly automate processes in fuel cell production. Furthermore, quality can be increased, and cycle times reduced. The cooperation between OMRON, Dassault and VAF was presented for the first time at Hannover Messe 2022 as "virtually the fastest plug-in system in the world" (Claussnitzer). The cross-network collaboration for the product creation process could be experienced live at twelve stations. The complete journey of the various virtual twins from the initial idea to after-sales service during machine operation was shown. Graebener Bipolar Plate Technologies supplies fuel cell bipolar plates that form the core of the fuel cell stack. The final step of the scenario shows how feedback from the individual process steps can flow back into the pool of ideas for new variants and developments or even completely new business models – a virtual life cycle across the entire value network.

Fuel cell production requires maximum precision

Hermann Stark, Managing Director of VAF GmbH, explains the special challenges that the construction of fuel cells poses for manufacturing companies: "In the case of the fuel cell, a key point is to fit the components over one another with precision. Precise and absolutely reliable accuracy is required in order to comply with the seals and not to damage the bipolar plate and the MEA. With Dassault Systèmes and OMRON, we found partners who supported us in all systems, so we were able to realize a successful machine." Philippe Bartissol, Vice President Dassault Systèmes, adds: "Over the past three months, the chemistry between VAF, OMRON and Dassault Systèmes has been nothing short of incredible, and I look forward to our next steps together."





Jointly supporting hydrogen technologies

In addition to their innovative spirit, the three companies also share a vision of sustainable mobility. Claussnitzer summarizes: "We want to do something for the future and invest in renewable energies. That was the main driver that brought us together." Bartissol adds: "We all recognized that we need hydrogen in the mobility industry now. But we need to build the new champions of hydrogen value networks together."

At present, no one knows exactly what the fuel cell will look like in the future, how big it will be or what shape it will take. "But building flexibility into the machine is the biggest challenge. At the same time, speed and accuracy must not be neglected," says Claussnitzer. "This is precisely the area in which we have set out with our partners, and as a team we will develop many exciting approaches for more flexible and efficient production."

About Dassault Systèmes

Dassault Systèmes, the 3DEXPERIENCE Company, is a catalyst for human progress. Through collaborative and virtual 3D environments, Dassault Systèmes enables companies and people to truly experience sustainable innovation. By creating virtual twin images of the real world with the 3DEXPERIENCE platform and applications, Dassault customers are redefining the boundaries of innovation, learning and production to develop a more sustainable world for patients, citizens, and consumers. Dassault Systèmes creates value for over 300,000 customers of all sizes across all industries in more than 140 countries. For more information, please visit: www.3ds.com.

About VAF GmbH

VAF GmbH develops intelligent high-end assembly and production lines and provides complete integration of automation systems for fully automated production lines, including intelligent storage and logistics as well as IT solutions for digital production facilities. Further information at: http://www.vaf-bopfingen.de

About OMRON Corporation

OMRON Corporation is a leading automation company with its core competencies in Sensing & Control + Think technology, and is engaged in a wide range of businesses including industrial automation, healthcare, social systems, and electronic components. Established in 1933, OMRON has about 30,000 employees worldwide, working to provide products and services in around 120 countries and regions. For more information, please visit https://www.omron.com/global/en/