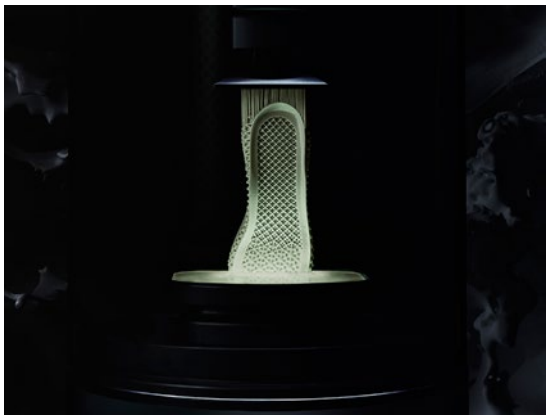
Future Tech

INNOVATIVE MATERIALS PAVE THE WAY TO THE FUTURE



© Adidas

Which materials will shape the future of our industry? Experts at Fraunhofer ISI and VDMA have developed scenarios together with scientists and company specialists.

By Holger Paul

Science fiction or reality? Sometimes it's hard to believe what has already been achieved. Take the hoverboard, a skateboard without wheels, first seen in the movie "Back To The Future", for example. Or the Star Trek replicator, capable of creating any type of object, even food. Or the see-through monitors and animated picture packages in "Minority Report". All science fiction once, all reality now, thanks to superconductivity, 3D printing and organic electronics.

"Product development often goes hand in hand with innovations in materials", explains Professor Dr. Ralf B. Wehrspohn, Deputy Chairman of the Fraunhofer Group for Materials and Components. "Materials are often underestimated when it comes to their potential for innovations", he explains. "But the fact is that about 70 percent of all German innovations relate to materials. Especially with the improved use of big data, the development of new materials, which takes at least 15 years at the moment, could be shortened dramatically. Furthermore, the production of materials and products would be greatly enhanced with Industrie 4.0-ready materials." After the "Industrial Data Space" for Industrie 4.0, Fraunhofer set up the "Materials Data Space" to accelerate big data in materials.

VDMA report "Future Materials 2030"

For the VDMA Competence Center Future Business, these obvious opportunities were reason enough to dig deeper into the matter - or rather - to look further ahead towards the future of materials and the corresponding process engineering. How will the world of mechanical engineering look in 2030 with respect to what are today still considered to be "future materials"? Which different scenarios can be foreseen and what would be their consequences for the industry? Answers are given in the new VDMA report "Future Materials 2030", published in collaboration with the Fraunhofer Institute for Systems and Innovation Research ISI.

"The biggest challenge for the machine makers is not materials technology itself - this is a major part of any mechanical engineering curriculum. Rather it's the sheer number of new materials and materials combinations that have to be assessed for their specific businesses", explains Dr. Eric Maiser, Head of the Competence Center. "Machines are affected in two ways, for they are essential for processing new materials and they can also directly profit from materials development, for example for a lightweight robot arm. We have extracted those materials with the biggest market potential and ability for change. The most important aim was to demonstrate strategies on how to adapt to these changes and thus spur growth and competitiveness within our industry." What's clear to him: No single company will be able to do this alone. Collaboration in value networks, especially with materials makers and researchers, is key.

Collective intelligence

Another aspect: Materials will play a decisive role in a digitized world hungry for individualized products. That calls for creative solutions: Next to open source software, the industrial world will also sooner or later embrace the concept of open source hardware - young companies experimenting with new materials

and processes, sharing their knowledge in makerspaces and fab labs. “It’s the opposite of optimized, straight planning, computer-aided engineering and volume production: Solutions found through collective intelligence, trial and error on small lots, with a fast time-to-market. There is already a community out there doing this. Thus, cooperating with those start-ups offers great new perspectives for established mechanical engineering companies. Think outside the box, be creative, welcome new talent this way”, Maiser says.

Four scenarios

The experts at Fraunhofer ISI and VDMA have developed four thought-provoking, specific scenarios together with scientists and company specialists. Three scenarios demonstrate many different opportunities for the industry, only one looks rather bleak. The latter claims that the world has gone back to national egoisms and protectionism with few efforts towards fighting global climate change. Here, the development of new materials would be very slow and would only be attractive for mass production. Asian mechanical engineering companies could stage price wars that would be hard to win for their European counterparts. The only way out for them would be enhanced offers for service, recycling and maintenance, or to address totally new markets for production technology and factories - Africa, for example.

The other three scenarios, in contrast, look promising, even if they are not without challenges. Number one is “sustainability counts”: a world in which the reduction and control of greenhouse gas emissions are general targets and the usage of materials based on renewable sources has been greatly improved. For example, natural-fiber-reinforced composites - fully recyclable. Biotech knowledge suddenly becomes interesting for machine makers. By 2030, the mechanical engineering companies in Germany and Europe have developed machines which can adapt to the various quality levels of these new materials and have thus gained a big competitive advantage in their respective markets.

Plastics or metals?

The second scenario is “plastic fantastic”: the usage of various new synthetic materials has spurred a wide range of new industrial applications. Materials with embedded, even changing functionality, are possible. Wherever the case may be, metal is replaced by lightweight composites. The complexity of these materials is much higher than today. Agile, temporary consortia produce customized components together. Business models emerge with more materials competence for machine makers. The mechanical engineering companies thus have to broaden their know-how especially in the field of chemistry. These new synthetic materials can only be processed by machines of the highest quality. Again, companies from Europe have a clear competitive edge here.

The third scenario is called “mighty metals”: this is a scenario based on technology evolution, rather than revolution, in contrast to “plastic fantastic”. Rules and regulations for recyclability have hindered the development of fancy new plastics. Here, additive manufacturing with metal powders plays a central role. Although the possibilities for diversification in a global market are less pronounced, the European mechanical engineering industry gains a competitive advantage with its know-how. “All these scenarios offer the opportunity for innovative solutions that mechanical engineering companies, together with partners from other industries, can develop”, says Maiser.

And unlike many other cases where regulations are an unnecessary burden, policy frameworks can actually be a driving force for new materials. A tight and strictly enforced CO2 emissions system, increased recycling standards or the promotion of ecologically-sound materials, for example, will increase the need for alternatives and substitutes. “It’s important though that each future material gets a chance to prove itself on the market, there shouldn’t be any discrimination by national rules or trade barriers. International harmonization would be the best solution,” claims VDMA expert Maiser. ■

Further Information

VDMAimpulse | VDMA Competence Center Future Business | Fraunhofer ISI |
VDMAimpulse 02-2017: “Machine Learning - A journey to the year 2030” |
VDMAimpulse 01-2017: Keeping a keen eye on the future” |
VDMAimpulse 01-2016: “Fit for the future”

Contact

Dr. Eric Maiser, Head of VDMA Competence Center Future Business, E-Mail: eric.maiser@vdma.org

About VDMAimpulse

Read the magazine online: www.vdmaimpulse.org

VDMAimpulse is an international online magazine addressing the mechanical engineering and machine manufacturing industry. VDMAimpulse will be published every other months on or around the last Wednesday in January, March, May, July, September and November. If you want to receive an e-mail every time the new issue of the magazine is published, please contact the editorial office: VDMAimpulse@vdma.org