

# Is sustainability driving printed electronics?

The OE-A Working Group Sustainability has been advancing environmental and sustainable considerations within the printed electronics industry for quite some time now. In order to gain current insights into the activities of the working group, OPE journal sat down for an interview with Dr Michael Korell, Spokesperson of the WG Sustainability and OE-A Managing Director Dr Klaus Hecker

**OPE journal:** Dr Korell, Dr Hecker, let's start by shortly introducing the OE-A Working Group Sustainability to our readers. What is your structure, and what are your goals and activities?

**Dr Klaus Hecker:** Sustainability is a crucial topic for the OE-A. Our activities in this area already started a decade ago with the aim of educating our members, but also to receive input from them on topics such as green electronics, sustainability, and circular economy. Our dedicated Working Group Sustainability has been around for a couple of years now – with Dr Korell as the spokesperson of the group.

**Dr Michael Korell:** Our target is to identify the sustainability benefits of printed electronics, which is actually a lot more complex

than it may sound. In a dialogue with all stakeholders we identify and communicate benefits and challenges, – starting with our customers, the market regulators, and society in general.

A very common misunderstanding is that printed electronics wants to substitute conventional electronics. This is not the case: we consider ourselves as a complementary approach for electronics. We provide our customers and the end users with new possibilities and capabilities. Especially when it comes to sustainability, printed electronics products do offer a number of advantages. We differentiate between the direct aspects such as the nature of the materials and the way those materials are being processed, and the indirect aspects such as the applications: benefits arising from smart packaging, medical sensors, etc.



Dr Klaus Hecker



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**Dr Michael Korell, Vice President,  
Head of New Growth Area Energy Storage,  
Evonik Industries AG**

In the industry, the perception of sustainability has changed from a “nice-to-have” to a “must-have” in recent years. This also affects our interactions with the customers, as they specifically demand products that provide sustainability benefits, as well as with investors – both in start-up companies and large corporations. Sustainability definitely has a direct link to the economic future of a commercial entity.

**OPE journal:** You just said that sustainability changed from a “nice-to-have” to a “must-have” – and one might add that this counts for all industries, not just printed electronics. To provide our readers with more details: what is the role of sustainability in the PE industry – and what are its advantages compared to conventional solutions?

**M. Korell:** Let me start with the direct effects and contributions: Generally speaking, printed electronics is an additive manufacturing process. You only use as much material as you basically find within your product! In comparison, many processes in conventional electronics are based on subtractive production processes. For instance, if you look at semiconductor production, you will find hundreds, if not thousands, of process steps that involve chemicals, high energy consumption for cleaning and drying, etc. In general, printed electronics requires fewer production steps.

**K. Hecker:** Let me add lower-temperature processes to this list, as they are more energy-saving. If we go one step further, into the applications, we can also identify other benefits: the products are more lightweight, which is especially beneficial in automotive applications; OPV is also a huge topic when it comes to green energy generation and harvesting on buildings with a low energy payback time and a small CO<sub>2</sub> footprint.

Furthermore, products such as smart labels can be used to enhance digital recycling and therefore enable a circular economy. Products can be tagged in order to provide information about their composition, base materials, etc.

**OPE journal:** LOPEC has added Sustainability as another featured topic next to Mobility and Smart Living. What are your plans for the tradeshow in order to highlight the sustainable properties of printed electronics?

**M. Korell:** As chair of the business conference, I pay high attention to sustainability criteria in the selection process of the contributions. Already in the call for papers, we put an emphasis on sustainability. We want our presenters to talk about what their technologies can contribute! These aspects will also become highly visible at the exhibition booths at LOPEC. Moreover, the products and prototypes of the OE-A Competition at the OE-A booth will reflect these considerations.

**K. Hecker:** Yes, indeed! Even our existing focus topic of Smart Living comprises aspects such as smart buildings. Sustainability will also be reflected in the plenary session and the other conference parts. Finally, the OE-A Competition and LOPEC Innovation Showcase will be further stages for sustainable innovations and products.

**OPE journal:** How does the OPE industry react to the increasing importance and demand for sustainable products (and sustainable production)?

**M. Korell:** Many companies have introduced sustainability criteria to their management processes and innovation pipe-

lines. Our objective is to push projects that have a green impact. We also see this along the supply chain: our customers demand that we address sustainability questions such as the lifecycle analysis, information about the ecological footprint, etc. And we do the same with our own suppliers! If you are not able to answer those questions, you have a certain risk of losing business opportunities.

Furthermore, in the academic world and in research institutes, sustainability has become an integral topic that is being considered very intensively. There are even research institutes with a main focus on this topic: in our working group, we have VITO, a Belgian R&D institute that specifically centres on sustainability.

**K. Hecker:** We also initiated a Research and Integration Action within the EU HorizonEurope funding programme on “Functional electronics for a green and circular economy” Together with other networks, we proposed this to the European Commission. In a nutshell, there was a call for projects that specifically aimed at demonstrating how printed and other new forms of electronics can contribute to a green and circular economy.

**OPE journal:** When we talk to members of the packaging supply chain, “Design for Recycling” is a key term that we hear more and more frequently. Is it also a concern of the OE-A and the wider printed electronics community to involve recycling service providers directly when new products are coming out?

**M. Korell:** Absolutely! Each individual member who develops a new product is looking into this. Moreover, the Working Group Sustainability has hosted a number of discussions with recycling companies in order to understand how recycling processes work business-wise. The electronics industry, and also the printed electronics industry, needs to offer products that are compatible with existing recycling processes! The overall goal is not to endanger or harm existing processes.

**K. Hecker:** While the question may be simple, the answer isn’t. These recycling processes and chains can differ quite a

lot! Whether you have plastic recycling, or paper, glass, metal – they are all quite different. We invited companies and associations from these fields to learn from each other.

**M. Korell:** If you look at the circular economy, you have the different 'R's: Re-use is the preferred option, for obvious reasons. Recycling of a printed electronics device under sustainability aspects is a rather challenging topic, as the recycling processes themselves would leave a much larger footprint than actually using the energy content of this product and produce a new one. From an ecological point-of-view, this would not make sense.

**K. Hecker:** While collecting and recycling of final consumer products is difficult, there are already many closed loops within the companies, where the material waste produced during production – such as silver inks and substrates – is being recycled successfully.

**M. Korell:** Thanks to the contributions of our machine manufacturing members, more and more additive manufacturing processes are moving into large-scale commercial production. So far, these were mainly used for prototyping. This is also an important and very positive contribution!

**OPE journal:** What is the role of the EU and its regulations?

**M. Korell:** The regulatory environment that the EU provides is our most important guidance. There are many people that consider the Green Deal as a threat, but it is also a great opportunity, especially for the printed electronics industry! It offers us the chance to really demonstrate our benefits practically by putting our products into the market and convincing the regulatory bodies as well as the societies from its benefits. The devil lies in the details within these regulations, as they are highly complex and interconnected. After all, there are some major contradictions between certain funding programmes of the European Union on

the one hand, and the regulations on the other hand. For instance, if you look at the Battery Directive, we are still confronted with a situation where batteries have to be separated and disposed of separately. While this regulation has been introduced for good reasons in the past, as every battery contained toxic components, now some new technologies do not expose those risks anymore. Industry would like to see a bit more dialogue within the European Commission. Nonetheless, the opportunities of the Green Deal are enormous.

**K. Hecker:** We are in contact with the Commission on this topic. Fortunately, they do see flexible and printed electronics as a beneficial technology that can support the realisation of the Green Deal's goals.

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