

PRESS RELEASE

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Let there be a light: Lifecycle assessments for greener and more sustainable lamp designs

Using fewer resources, avoiding electronic waste, and saving energy: This is possible if the entire production chain for more sustainable lamps is investigated and levelled up. For the SUMATRA project, researchers at Fraunhofer IZM and their industry partners are working together on exactly this mission. The precise eco lifecycle assessments and resulting design recommendations produced by Fraunhofer IZM and the environmental services provider Interseroh will assist lighting brands like TRILUX or OSRAM in making their production processes better for our environment and selecting more sustainable materials for their products.

It is the ambitious goal of the European Green Deal to bring carbon emissions to a net zero and decouple economic growth from its dependence on resources – more than enough reason for companies to think again about sustainability. The eco lifecycle assessments of the SUMATRA project will contribute to this endeavour by putting in place the framework that is needed to produce lamps that are not only built to last, but easy on our natural resources and energy-efficient. For this purpose, the project team has set its sights on two key aspects of sustainability – the consumption of energy and materials – in the production of LEDs as well as entire lamps.

For the SUMATRA project, Fraunhofer IZM is taking a step back from lamp manufacturing on the ground for a bird's eye view of the entire production chain. The eco-design experts of the Berlin-based institute are scrutinizing established lamp designs with targeted lifecycle assessments to find opportunities to improve the lamps' environmental footprint in terms of resource efficiency and carbon emissions. What is unique about these assessments is their modular format that allows different types of LEDs, drivers or even lamp body designs and materials to be cross-compared with each other. The researchers at Fraunhofer IZM are sent designs and finished products from TRILUX, the lighting company and leader of the project, to conduct their assessments and come up with ideas about how to make the lamps more durable and more efficient. One aspect that is of particular interest for TRILUX is the question of reparability, with lamps designed from the outset with later repairs and maintenance in mind. OSRAM, another leading lighting brand involved in the project, works on optimizing the system architecture to make sure that LED drivers can be more easily replaced, repaired, or reused in new configurations. At the other end of the chain, Interseroh is bringing its perspective to the table: The recycling experts care about the end-of-life stage and want to know what needs to change in lamp designs to facilitate recycling and help circular economy concepts along.

Editorial desk**Susann Thoma** | Phone +49 30 46403-745 | susann.thoma@izm.fraunhofer.de |Fraunhofer Institute for Reliability and Microintegration IZM | Gustav-Meyer-Allee 25 | 13355 Berlin | www.izm.fraunhofer.de |

The project researchers have come to focus on three specific steps in the process. The first is a solid and comprehensive dataset to help ecological lifecycle assessments for LED lights, as the available data is frequently outdated. The second key factor addresses the question of resource efficiency writ large, going beyond the usual emphasis on a lamp's energy efficiency. This can mean scaling the circuit board just right to make the best use of the available space with the best possible light yield. A balance needs to be found between the efficient use of the materials and the performance of the lamp in real-life working conditions. As modern LED lights are already far more efficient than their conventional forebears, saving resources in this respect is an important step towards more sustainable production processes. The third and final focus of the project addresses the ability to tear down a lamp at the end of its life: Easy disassembly is a precondition for correct recycling. On these and other factors like the choice of materials, the SUMATRA assessments will offer important pointers towards effective improvements.

Product developers in the industry can use these insights to feed into their new designs and receive regular feedback about their environmental footprint from the specialists at Fraunhofer IZM. Good communication between research and industry plays a major role for the success of the project. This also includes the careful balance between economic realities and eco-design potential: Lamp designs must be economical in their use of materials, but also energy-efficient, and price-sensitive. In industrial and office lighting in particular, there is little room to accommodate even smaller price increases for a more sustainable design. The immense leap in efficiency that came with the switch from conventional lightbulbs to LED lighting will not be replicated when updating an older LED lamp with newer units, even though the ecological benefits are still evident. Lamps should be both: Good for our environment, but also easy on the price tag.

TRILUX intends to take forward the findings from SUMATRA into several new lamp designs after the conclusion of the project, and it hopes to benefit from the work with Fraunhofer IZM in the form of insights with lasting relevance for later projects. The job for Fraunhofer IZM is to find the general eco-design principles that will continue to benefit future lamp designs. And in the long run, all of this will feed through to the end user with lamps to enjoy for longer and with a cleaner environmental conscience.

The SUMATRA project is supported by the Federal Ministry of Education and Research as part of the research campaign "Resource efficiency for the energy transition". The €1.1 million project is scheduled to run from 1 June 2021 to 30 September 2023.

Text: Theda Dieken

Technical contact

Marina Proske | Phone +49 30 46403-688 | Marina.Proske@izm.fraunhofer.de | Fraunhofer Institute for Reliability and Microintegration IZM
| Gustav-Meyer-Allee 25 | 13355 Berlin | www.izm.fraunhofer.de |



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The way to a brighter future? New design recommendations for LED lights will help reduce e-waste. © Fraunhofer IZM
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The Fraunhofer-Gesellschaft, headquartered in Germany, is the world's leading applied research organization. With its focus on developing key technologies that are vital for the future and enabling the commercial exploitation of this work by business and industry, Fraunhofer plays a central role in the innovation process. As a pioneer and catalyst for groundbreaking developments and scientific excellence, Fraunhofer helps shape society now and in the future. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 76 institutes and research institutions throughout Germany. The majority of the organization's 30,000 employees are qualified scientists and engineers, who work with an annual research budget of 2.9 billion euros. Of this sum, 2.5 billion euros are generated through contract research.

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Technical contact

Marina Proske | Phone +49 30 46403-688 | Marina.Proske@izm.fraunhofer.de | Fraunhofer Institute for Reliability and Microintegration IZM
| Gustav-Meyer-Allee 25 | 13355 Berlin | www.izm.fraunhofer.de |