

A sustainable chip industry with CITC's revolutionary technology

Since March 2023, Mark Luke Farrugia has been the General Manager of Nijmegen's Chip Integration Technology Center (CITC). He has a clear mission; to make the chip industry more sustainable and to bring it to Europe and to Nijmegen in particular. "When I joined CITC two years ago, I saw that something was needed, a change, a new direction and a revolutionary product."

For many people, the Covid pandemic was a wake-up call about the world's dependence on chips. "Everyone realised that chips are in everything and that if there is a crisis anywhere in the world, it affects everyone." This has led to political initiatives to strengthen the chip industry in Europe. One example is the European Chips Act. The aim is to increase European production capacity and boost investment in technology and infrastructure, thereby reducing dependence on Asian markets.

New packaging: sustainable and efficient

CITC specialises in chip packaging. "This goes beyond simply putting a chip in a box; it is encapsulating the chip in a material that protects it from physical damage and environmental influences, while also providing the necessary electrical connections. This packaging is essential for the performance and reliability of the chip and is an important step in the production of advanced technologies", Farrugia explains.

At CITC, he and his team started developing a new technology that is both environmentally friendly and cost-effective. "We want to put Nijmegen on the map as a centre for sustainable chip production", he adds. CITC's innovative approach, which uses 'additive manufacturing', replaces traditional, polluting processes with a method that uses only the necessary materials. It minimises waste, drastically reducing both environmental impact and costs. Instead of traditional techniques, that etch away excess material and create waste, additive manufacturing technology builds the required layers directly. This ensures a much cleaner production process and makes it possible to produce the chip packaging here in Europe, rather than relying on cheaper but more polluting methods in Asia.

"The aim is not only to make environmentally friendly products, but also to keep them economically attractive", says Farrugia. "We want to reduce costs by up to 70%, which will make it attractive to produce these technologies in Europe. This could transform Nijmegen into a global centre for sustainable chip production, while making a significant contribution to the European chip industry."

Sustainable chip production in Europe

Farrugia, who is of Canadian-Maltese descent, began his career in the semiconductor industry straight out of college, gaining experience with major European players such as STMicroelectro-

tics and NXP. After his time in the industry, working with established research institutes and universities where he noticed that established players often stick to the confines of their established competencies, he decided to join CITC in March 2023. "After years of working with established institutes, I realised that if I really wanted to revolutionise sustainability and economic viability in Europe, I needed to be somewhere else", he explains.

Farrugia was won over by the potential he saw at CITC during a brainstorming session with experts from several Dutch institutions, including TNO and Holst Centre. "The idea of sustainable and economically viable chip production in Europe came from combining expertise from different fields", he says. "I realised that the establishment might not be willing to take the risks necessary for innovation. But newcomers like CITC are. They are determined to find their place in the industry and are willing to break new ground."

The 'iPhone idea'

Farrugia is a firm believer in bringing together expertise from different fields to generate revolutionary ideas. "The beauty of innovation lies in bringing together people with various skills", he says. "That's where the great ideas come from."

CITC works closely with partners such as TNO, TU Delft, Holst Centre and various industrial players such as NXP and Nexperia. These collaborations are crucial for turning innovative ideas into market-ready products. "Everything you do in a research institute like ours has to come to market eventually," Farrugia explains. "That's why we work with industrial partners from the very beginning."

Farrugia compares his approach to that of Nokia and Apple. "In my day, Nokia was the undisputed market leader. When Apple came along with its button-less phone, Nokia thought the new technology would not take off. And look where Apple is today. Incumbents often underestimate the impact of disruptive innovation," he explains. "This also applies to CITC's technology, which offers an alternative to established methods."



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