



## Battery manufacturing

# Multi-layer battery electrode coating advances battery manufacturing

## Advanced electrode designs and their impact on battery electrode performance and efficiency

**Pam Poulin**, Market Development Manager at Thermo Fisher Scientific, and **Dr. Julian Renpenning** conducted this interview with Dr. Paul Baade, CEO and Co-founder of 8Inks.

### 8Inks introduction

Founded in 2022 by Paul Baade and three colleagues, 8Inks is reinventing lithium-ion battery manufacturing with its innovative multi-layer curtain coating process. This technology enables advanced electrode architectures and faster production speeds, with the goal of improving battery performance while reducing costs. Paul's journey began at ETH Zurich, where he designed battery packs for electric racing cars. His passion led him to research battery materials at Lawrence Berkeley Lab and to pursue a Ph.D. at ETH Zurich, where he developed the innovative technology behind 8Inks. The company's approach to electrode manufacturing addresses key challenges in modern battery production and has the potential to transform the efficiency, performance and economics of the industry. In this interview, Dr. Paul Baade discusses 8Inks' unique approach to multi-layer curtain coating and its implications for high-performance, scalable battery solutions.

### Tell us about how 8Inks got started? What sparked the idea, and what is really driving you and the company's mission?

Well, 8Inks was founded to address a critical bottleneck in the battery manufacturing industry—the availability of high-quality electrodes. Our inspiration came from observing that innovative electrode designs were struggling to scale due to incompatibility with existing manufacturing processes. This led us to identify an opportunity to revolutionize the way batteries are produced, with a focus on improving scalability, energy density and sustainability.

Our primary mission is to enable the mass production of Next Gen batteries. We are leveraging our patented multi-layer curtain coating technology to improve performance while ensuring recyclability and lower production costs. This strategy allows us to address today's battery manufacturing challenges and pave the way for more efficient and sustainable energy storage.

**Could you explain what multi-layer curtain coating technology is and how it differs from traditional electrode coating and battery manufacturing methods?**

Multi-layer curtain coating is a revolutionary process that enables the simultaneous deposition of multiple layers in battery electrodes, significantly increasing production speed and design flexibility. Unlike traditional types of welding electrode coatings methods such as slot-die coating, which is limited to one layer at a time and lower speeds, our technology can coat up to 10 times faster. It can achieve a greater range of coating thickness from very thin to thick.

This not only reduces costs, but also allows us to tailor specific battery performance. The ability to deposit multiple layers simultaneously and at higher speeds offers significant advantages in both electrode production efficiency and design capabilities compared to conventional manufacturing techniques.

**And could you elaborate on the key benefits of this battery electrode coating process, particularly in terms of energy density and power density?**

We use our multi-layer curtain coating technology in several ways to improve battery performance. One way to increase energy density for state-of-the-art batteries is to work with higher duty cycles and thicknesses. By enabling the production of thicker and more precisely controlled electrode layers, we can increase the energy density of batteries. We do this by managing structure and composition to overcome transport properties across the stack.

The ability to design and structure internal layers more efficiently results in batteries that can deliver more power for a given load required for a given application.

Looking further into the future, solid-state batteries in combination with Li metal can be the game changer, enabling 400Wh/kg or more. Here, our technology allows us to really manage and tune the tricky solid-solid and Li-metal interfaces. We enable cell manufacturers to place the electrode materials and their respective properties exactly where they are needed.

**With these benefits in mind, which industries or applications do you think would benefit most from your electrode coating technology?**

In general, our technology will benefit industries that require high-performance and scalable battery solutions, such as electric vehicles (EVs) and grid energy storage. In particular, the automotive industry, which is a major driver of battery demand, will benefit from our ability to produce batteries that are not only higher in energy and power density, but also more cost-effective and sustainable.

Our solutions can have a significant impact on these sectors by enabling the production of batteries that meet increasing demands for performance, efficiency and environmental responsibility.

**How exactly is your technology changing the competitive landscape in battery production, particularly in ramping up output?**

Our multi-layer curtain coating technology drastically increases production output by enabling faster coating speeds and simultaneous deposition of multiple layers. We are able to do this by taking advantage of the free-falling curtain to operate within the stable region of the coating window. This reduces the time and cost associated with traditional battery production methods, enabling manufacturers to more efficiently meet the growing demand for high-performance batteries.

**What have been the biggest challenges you have faced in developing and scaling up this technology?**

The most significant challenges have been scaling our technology from the lab to industrial production levels while maintaining the precision and performance of the coating process. This is a challenge faced by many cell manufacturers. By focusing on electrode coating, the most critical step in the battery value chain, we are able to make faster progress. We aim to have our customer demonstration pilot line operational by Q2 2025.

### How does 8inks' technology compare to other battery manufacturing methods currently on the market?

The 8inks technology is unique in its ability to combine high-speed production with multi-layer capabilities. It is a technology that has been proven at extremely large scales, such as in the paper industry for cellulosic material or photographic film industries. We adapt it to battery materials and designs. What sets us apart is the great flexibility in terms of coating materials and slurries that can be used on existing coating lines. The barrier to adoption is quite low with our technology.

### From a business standpoint, what makes 8inks stand out to potential customers and partners?

Our unique advantages include extremely fast development times for new solutions. We also offer a clear path to scalability, making it easier for partners to integrate our technology into their existing operations. When developing new solutions, we understand the trade-off between cell performance and production requirements. This must go hand in hand when scaling new products.

### Could you outline the different ways companies can work with 8inks, from initial pilot projects to full-scale customized battery production systems?

Companies can work with 8inks in a variety of ways, depending on their needs and stage of development. We offer pilot projects where we help companies develop specific battery designs using our innovative coating technology. This allows partners to explore and validate the benefits of our approach for their unique applications.

We don't stop there though. Following up on projects we offer production systems to implement the solutions at scale. It's essentially a hardware upgrade that includes our knowhow and IP. This option is ideal for those who wish to fully integrate our technology into their own facilities, significantly reducing ramp-up times.

This range of option allows us to support companies at different stages, from initial concept testing to production integration.

### What kind of feedback are you hearing from customers who have used your technology?

Customer feedback has been overwhelmingly positive. They have noted significant improvements in battery design flexibility. In particular, the ability to integrate thin layers into an electrode lay-up has stood out. This opens up new possibilities in the solution space and allows our customers to solve different types of challenges for multiple use cases.

### Looking ahead, what's next for 8inks in terms of developing the technology and expanding in the market?

The next steps for 8inks include scaling our pilot production facility to meet the needs of our first customers. This demo center allows us to showcase scalability and industrialization. It allows us to quantify the performance and production benefits. Our goal is to demonstrate the power and flexibility of our technology across a wide range of applications.



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