

BRIGHT IDEAS

INNOVATIONS IN SEMICONDUCTOR MANUFACTURING IMPACT MULTIPLE INDUSTRIES

The name may seem obscure, but the technology—used in everything from cell phones to light bulbs and satellites—is critical to modern life. And one company, backed by Department of Defense (DoD) Small Business Innovation Research (SBIR) funding, is at the technology's cutting edge.

That company, New York-based tech firm Veeco, with R&D and production facilities in Somerset, New Jersey, has long been one of the driving forces behind metal-organic chemical vapour deposition systems, or MOCVD for short.

The technology itself, first popularized in the 1980s, is a lot like baking a complicated cake. A machine deposits thin layers of atoms onto a semiconductor wafer, stacking each layer in a specific and calculated way in order to create a material that has certain optical or electrical properties.

The resulting wafers are utilized in a variety of technologies, from cell phones, base stations, light bulbs, televisions, automobile sensors, security cameras and satellites.

Following the growth of light-based technologies in the 1990s, MOCVD systems took off. One company, Emcore, was on the forefront of this boom, building an MOCVD division that in 2003 was acquired by Veeco.

Back then, said Mark McKee, director of product marketing at Veeco, companies were trying to figure out how to scale the systems to profitable production. The company was awarded several DoD SBIR contracts that were crucial in establishing the commercialization of MOCVD systems, McKee said.

“The SBIRs gave us the first insight into if



it was even feasible,” he said. “They definitely helped us in terms of the modifications of the reactors and enabled us to do some initial exploration into the different material systems that we thought would have commercial opportunities.”

Now, while there are several other companies sharing the MOCVD space, the ubiquitous application of the systems means that there are plenty of opportunities to go around.

“All the lightbulbs you buy are either made on our or our competitor’s equipment,” McKee said.

But the beauty of the Veeco systems is that they are flexible and can build according to a company’s needs, McKee added, whether that be a global car brand or a cell phone manufacturer. “Every customer might have their own recipe, so they need a flexible tool that they’re able to adjust,” he said.

The latest and largest of these production systems can produce as many as 12,000 wafers per month, which, using LED chips as a metric, equates to as many as 70 million chips per system per month.

While LED technologies continue to evolve, Veeco is also looking to expand in several other industries, including server processing, electric power, and 5G cellular systems. Moreover, there’s plenty of room for the wafer systems in the military, McKee said. Eventually the company hopes to improve their MOCVD systems to the point where they compete with popular silicon-based wafers.

“It’s been a fun ride and it’s exciting to see where this market is going,” McKee said. “Right now, we’re looking at markets, what opportunities there are, how to win and make our product even better.”



Emcore Corp. (Veeco Instruments, Inc.)

Modernization Priority: General Warfighting Requirements (GWR)

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