

PURE SOLUTIONS

ENTEGRIS' MICROCONTAMINATION CONTROL CREATES CUSTOM PROCESSES FOR ELIMINATING IMPURITIES IN SEMICONDUCTOR MANUFACTURING. BY TIM O'CONNOR

When fabricating chips and devices that operate on the microscopic scale, even the smallest imaginable contamination can compromise a component. A single spec of molecular-sized dirt can shorten the lifespan of a semiconductor or cause it to operate in unexpected ways. That can have wide-ranging consequences. It's an inconvenience when a smartphone shorts out, but if it happens in a vehicle traveling 70 mph on the interstate it can be disastrous.

"It's not the end of the world if your cell phone has a glitch or you get a blue screen on your laptop, but in the car, a glitch – if it's a fully autonomous vehicle – can result in the loss of a life," says Clint Haris, senior vice president and general manager for Entegris.

With the number of IoT connected devices forecasted to reach 75 billion by 2025, according to the analysts at IHS Markit, the need for reliable, long-lasting components will only increase. Already, everything from cars to refrigerators and even water bottles are equipped with processing power and memory chips. It's difficult to know what other kinds of IoT devices and product will emerge in the coming years, but Entegris' microcontamination control division is helping manufacturers prepare.

COMPLETE SOLUTIONS

Entegris' growth into a global company since its founding in 1966 has been driven largely by a series of acquisitions. Today, Entegris is a global company with about 40 manufacturing facilities in the United States, Japan, Taiwan, South Korea and Malaysia.

For five decades, the company has built a reputation for creating custom purification solutions for its clients. Haris actually began his career as an Entegris customer before joining the company four years ago. In his previous life in the semiconductor industry, he witnessed first-hand how Entegris collaborated with its customers to find the right process and chemicals for their manufacturing processes. "Entegris has always been a thought leader with the technology they offer to semiconductor fabs," he says.

The microcontamination control division is one of three segments at Entegris that provides purity solutions. The others are the advanced material handling division, which is involved in transporting materials during semiconductor fabrication, and the specialty chemical division, responsible for providing a suite of chemicals used in the manufacturing process. Conversely, the microcontamination control division specializes in purification and filtra-



ENTEGRIS CREATES MICROCONTAMINATION-REMOVAL PROCESSES FOR SEMICONDUCTORS, FLAT-PANEL TELEVISIONS, LIFE SCIENCES AND OTHER INDUSTRIES.

tion systems of chemicals and gases used in the semiconductor industry.

Taken together, those three divisions offer a total solution for Entegris' customers. "While we do have competitors that focus in specific areas, no one really has that breadth of solutions," Senior Manager of Solutions Marketing Scott Moroney says. "That enables us to understand our customers' challenges better than our competitors."

Being able to provide a wide range of solutions enables Entegris to more easily move between different kinds of customers. About 70 percent of the company's business is in semiconductors, but it also creates microcontamination-removal processes for flat-panel televisions, life sciences and any other industry where there is value placed on purity.

Exclusive feature

Entegris / www.entegris.com / HQ: Billerica, Mass. / Employees: 3,500 / Specialty: Purification and filtration systems / Clint Haris, senior VP and GM: "We're constantly looking at how do you take out smaller and smaller contaminants and how do you get things to a purer level."

“You need very custom solutions to purify them and you need to also make sure each of those custom solutions – if they are going to alter the chemistry – do not alter them in a way that impacts the performance for that customer,” Haris says.

Further, Entegris clients can be found at every level of the supply chain in those industries. The company develops solutions not only for semiconductor manufacturers, but also for the chemical and gas suppliers that support those OEMs.

“Because we supply products that address multiple steps in the entire semiconductor manufacturing process, Entegris not only understands the technical challenges but can also engage in partnerships between companies to solve problems,” Haris says.

He recalls a recent situation where a semiconductor maker was having trouble getting its manufacturing process to work due to metallic contamination in its processing. Entegris provided purification systems to several of the clients’ suppliers to ensure metal contamination would not originate from their facilities and it worked with the client

to purify all points of contact in the fabrication process. “We were able to not only address the problem at the point of the issue but to work upstream to improve the quality throughout the manufacturing process,” Haris notes.

STAYING AHEAD

As IoT devices become more prevalent and smaller, the need for micro-contamination solutions will only increase. The recent introduction of 3D NAND represents another breakthrough in miniaturization and memory storage that will impact how companies think about contamination. 3D NAND allows memory to be stacked vertically, as opposed to being limited to a 2-D plane.

Haris likens the change to going from building ranch homes to skyscrapers – the increase in capacity and density is monumental. “We’ve started to get to the point where it’s getting harder to shrink down sizes, so now what we’re doing is we’re starting to build up to get more storage,” he explains.

With components becoming even smaller and denser, the amount of acceptable contamination also



shrinks. It’s gotten to the point where Entegris is extracting metal ions because even contamination on the atomic scale can affect chip performance. “We’re constantly looking at how do you take out smaller and smaller contaminants and how do you get things at a purer level,” Haris says.

Entegris must continuously upgrade its capabilities to stay ahead of its customers’ requirements. For the past several years, the company has invested more than \$100 million annual in capital equipment and facilities to prepare for the future. “We’ve built up an infrastructure that allows us to keep up with demand,” Haris says. **mt**



ENTEGRIS CONTINUOUSLY UPDATES ITS CAPABILITIES TO ENSURE IT CAN MEET THE PRECISE NEEDS OF ITS CUSTOMERS.