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A Virtuous Data Circle

By **Heidi Hoffman**

This article is the fifth and final in a series highlighting the vital importance of SEMI Standards to commemorate the publication of the 1000th SEMI Standard in July 2019. Find the entire series here.

As we define industry standards for managing data in the fab and beyond, we are creating a virtuous circle. More data create better processes. Better processes generate more good data, and more good data lead to better processes. It becomes a cycle of continuous improvement, and we are only just beginning to realize its potential. To dive deeper we interviewed Alan Weber, vice president, New

Product Innovations at Cimetrix, and an active member of SEMI Standards Information and Control Committee (IC&C).

"Industry standards are critical in allowing us to collect information across the fab and use it in increasingly sophisticated control algorithms for the equipment," said Weber. "The last few years have been about analysis applications that leverage big data in the fab. What started at the lot level is now applied at the wafer level, and for a process like lithography, it's down to the shot or die level. We're now collecting enough data variables at individual process and recipe steps to model for predictive maintenance and virtual metrology."

The migration from using data as rearview mirror for identifying and addressing fab issues to using data to head off issues preemptively represents a paradigm shift offering immense advantages. This is the starting point for realizing a virtuous data circle.

The benefits of a virtuous data circle are simple and compelling: higher yields, faster time to market, more revenue and greater profitability. Our optimism, however, is tempered by major obstacles to this promising future.

Multilingual Manufacturing

Weber points out that the electronics industry is becoming a multilingual standards world with more than 1,000 fab equipment vendors and several layers of protocols that present the challenge of seamlessly handling multiple protocols. His IC&C Committee is out to tackle this challenge.

"While SEMI Standards efforts first began in the front end, our standards program now encompasses the back end with test and packaging as well as other device areas including MEMS, sensors and displays," said James Amano, senior director, International Standards and EHS, SEMI.

 "We're going to see data connectivity from the front end to the back end to the final assembly of multi-chip products and that needs standards," Weber explained. "We'll need more connected equipment throughout the global, multi-site manufacturing process if we are to support the full traceability requirements of the most demanding markets such as automotive."

The industry will benefit from greater collaboration. Weber predicts that companies will team to create integrated supply chains within broader industry supply chains.

Getting the Right People at the Right Time

"As we lead the development cycle of a standard from concept to realization, one of the most important jobs of our standards task forces and committees is to coordinate competing companies

and build an industry consensus," Amano said. "This is the case for data in particular, where we rely on industry professionals like Weber and his colleagues, who are working to bring people together to collaborate on developing standards for connectivity and data sharing. It is that critical human element that allows SEMI to sustain our commitment to introducing standards that move the industry forward."

Will Companies Share Data If It Is Secure?

Weber contends that when it comes to securing and sharing the data, the biggest challenge is to change the industry's information-sharing culture.

"Finance and defense are already finding ways to deal with data security," said Weber. "While we will always have problems that require technology fixes, like dealing with new types of computer viruses, I am confident that we will be able to create standards that enable the free, secure flow of information. The key to making progress and better leveraging data is to get companies to see the potential of sharing data while investing in the standards."

SEMI recently launched a project to optimize data sharing across two critical process steps – lithography and plasma etch – to accelerate the adoption of data-driven AI methodologies. The results will help to establish data transfer and management standards crucial to the trusted exchange of trade secrets, IP and other sensitive information. Tools and materials from several SEMI members will be used for the project at Cornell University's NanoScale Science & Technology Facility (CNF). SEMI members are invited to join the project review team. Contact Pushkar Apte at SEMI (papte@semi.org) for more information on the initiative.

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Advantages Are Too Great to Ignore

Traditional cultural obstacles aside, the advantages of creating virtuous data circles are simply too great to ignore. Now that it's accepted wisdom for fabs, factories and supply chains to continuously leverage interconnected data to get smarter, the time has come to extend those advantages throughout the full manufacturing process. Without these data circles, we'll slow the development of new technologies and applications.

We can only speculate where the lines of sharing data are drawn and will be redrawn in the future. But, without doubt, technology innovations such as AI will spawn new information business models that

vertically and horizontally integrate companies in ways previously unimaginable. Data standards will underpin this structural transformation.

Use your voice to affect standardization in and around the microelectronics industry. Learn about SEMI International Standards **– and become part of the solution.**

Heidi Hoffman is senior director of technology communities marketing at SEMI. Hoffman and her team shine a spotlight on the work of the more than 20 technology communities under the SEMI electronics manufacturing supply chain collaboration platform. Actively engaging community members in marketing programs that showcase their unique value, Hoffman's team helps companies to grow and prosper through the power of connection, collaboration and innovation.

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