



Daniel Newman: Hey, everyone. Welcome back to the Six Five Summit. I'm Daniel Newman, one of the hosts here at the Six Five. It's day two. We are in the semiconductor track spotlight session. I've got Adeline Tay joining me from Micron.

Adeline, welcome to the Six Five Summit, first timer.

Adeline Tay: Hey, Dan. Thank you for having me here in the Summit.

Daniel Newman: So good to have you here. Today we're going to talk about how Micron is harnessing the power of AI in its fabs. As we know, AI is one of the hottest topics in the market. It doesn't matter if you're in SaaS or you're in CHIPS, or you're anywhere in between. Right now, pretty much every business is focusing on how to implement, build, invest around a future that's going to be powered by AI. So no surprise that Micron is on that same path, and I look forward to talking to you about that.

Now, the events theme is all about navigating rough waters. The focus was that we knew that there was a bit of a downturn. The semiconductor businesses definitely felt it. PCs, infrastructure, we've seen rifts and layoffs, high interest rates. We're seeing lots of economic indicators that there are challenges, but we believe you can innovate through these things. So, start with that. Talk about how Micron is navigating rough waters with practical innovation.

Adeline Tay: Right. You know, Dan, my team, actually works a lot with data. We draw insight from them and turning this insight into better business outcome. My role is to enable our manufacturing plan to use data to improve our yield, quality and productivity. As you already mentioned, semicon has been integrated part of our life, from smartphones and computers to autonomous vehicle. It serves as a building blocks that enable all this innovation that shape our daily life.

In recent times our industry has faced unique challenges, and it's the most severe demand supply imbalance in the last 13 years. We do face a lot of challenges, however, in such situation, we definitely need to adapt and find innovative way to remain competitive and sustain our operation. And I think this is where the air power innovation has helped us to navigate the downturn. Specifically, our team works a lot on implementing our Industry 4.0 technologies, which leveraging the big data to improve our own manufacturing processes.

Our journey actually started in 2014 with our fab leveraging machine learning to improve manufacturing operation and to reduce our tool idle time. We use AI in our fabrication, assembly and test facilities that help us achieve better business outcome. In Micron we actually collect petabytes of in-house manufacturing data. Our data scientist uses this information for insight to develop models for AI and machine learning that improve and enhance the manufacturing processes. We use a lot of the robotic process automation, mobile technology, as well as the AR/VR tools that have become essential to maintain productivity in our manufacturing operations.

Daniel Newman: Yeah. So let me ask you, it sounds to me, Adeline, like you're using a lot of automation, you're using a lot of artificial intelligence. You're taking the data to continually optimize the manufacturing process in fab around the world. But we've also seen the company's been very innovative in its own process. In the last few years you've seen big process node enhancements. You've announced the 1-beta DRAM 232-layer NAND. Can you make that connection? The



abilities for you to make these innovations and launch these innovations into market. Is AI and the smart manufacturing providing you guys the pathway to launch these new technologies and bring them to market?

Adeline Tay: Right. We actually build our own integrated new analytical platform that leverages AI and machine learning auto diagnostic capabilities across more than a thousand of the production and metrology steps. We conducted automated root cause analysis and corrective actions enabling quick resolve, equipment downtime and process deviation. On top of that, we actually employ a lot of Velo analytics to process millions of images per day to monitor real time manufacturing process anomaly. This includes detecting anomaly in the manufacturing processes, as all this technology can help us to sense things that even the most highly trained human personnel cannot see, hear or feel. I think AI can perform this task with laser sharp precision in a fraction of the time.

Also, in part of our processes we actually enable early drift detection that might impact our two IOT products. We have integrated facilities and two sensors into our IOT platforms and our control centers. We set up remote operation centers that operates 24/7, which also functions as essential hub for manufacturing and engineering to achieve [inaudible 00:05:46]. The center also has a web-based deviation management platform which enable our staff to analyze and correct aberration processes in real time. This allows them to react to problem and have assessed the solution quickly. We actually reduce the time to resolve some of this quality issue by half.

Daniel Newman: And Adeline, didn't Micron see some really impressive outputs after making these improvements when they ramped up the 1-beta DRAM and 232?

Adeline Tay: Yes, you're right. In fact, this solution has hit historical high yield because of the dedicated Micron team members and the creative use of our AI in our manufacturing processes. The yield target faster than any of the note in the history of Micron, and I believe now part of it is the harnessing of the power of this AI technology that we're using in the fact that help us to hit this targets.

Daniel Newman: So Adeline, clearly you've been implementing inside the Micron facilities, and it sounds like you're using a lot of sensors to basically help you (a) create highest levels of productivity, the most significant yields from all of your fabrication. You're got a ton of data being generated as well across the fabs. So basically you're getting all this visual data, the camera data. Have you guys been able to note meaningful productivity gains by taking all this data and applying it and using AI and ML? Can you say that since you've applied it you are getting more productivity out of your fabs than you did prior?

Adeline Tay: Yeah. In fact, I'll answer this question in two aspects. One of the AI use cases we have implemented is our planning digital twin. Our digital twin models enable us to be more agile in running our production line with three key features. First, it optimizes the short term output with AI powered advanced tactical scheduling. Two, it manages midterm capacity with full plan digital model, actively adjusting our asset configuration based on our best simulated outcomes. Three, it does the network level simulation globally of capacity and wafer loading that optimize



our production and CapEx strategy. And this has enabled us to react and adjust quickly to demand changes.

The second part of this is really on our labor productivity. I think I mentioned about the various automation application we have developed to provide the insights and human needs to manually extract data for troubleshooting and analysis. So apart from what we have built in term of decision making, we also deploy mobile application that actually assists our technician, notifying them of maintenance job and helping them to prioritize them for maximum efficiency. Material scheduling is automated to improve the utilization of these tools and our specs. Documentation is done electronically and it provides an easy way to track performance and compliance. In the near future we're actually looking at augmented reality that we'll use to assist them in task execution and remote support for expert resources.

Daniel Newman:

So let's pivot, Adeline. I'd like to talk a little bit about something else that's been really important on the world stage, and that's sustainability. So as AI continues to proliferate, as we see more GPUs deployed, and therefore more memory, we will see power increase. And so it's really important that the industry takes a leadership role in terms of being more sustainable, of putting climate first, and doing so in a meaningful way. Micron was recently named by the WEF, the World Economic Forum, for its new Singapore fab. And they named it a sustainability lighthouse and it's now, as far as I understand, it is the first frontend semiconductor fab in the world to receive this recognition.

First of all, tell me a little bit about this recognition, what it is, and talk a little bit more about what you're doing with smart manufacturing is really driving eco efficient operations and more sustainability from the manufacturing process.

Adeline Tay:

Well, I mean, the World Economic Forum is actually recognizing factory that has meet certain standards of achieving sustainability goal it has been set up for. In Micron, we already first achieved the World Economic Forum for Industry 4.0. We went on to take up the challenges to get ourself on the stage, in terms of the sustainability ground. And how did we do that? We can only improve when we monitor some things. So where there's needed we actually deploy sensors, such as flow meters, that help us to capture missing data that drive the granularity optimizations. Our team partners closely with the fab to create the actionable insights with all these AI ML model of our processes based on this environmental footprint, such as energy efficiency, waste reduction and greenhouse gas emission. Giving you a very practical example, we do perform a lot of process conversion in the line and part of the current processes will require a carbon footprint buy-off on top of the traditional qualifications.

Daniel Newman:

So I want to go outside the fabs a little bit, because obviously AI and ML is going to be a big part of Microns future. I mean, right now I've been listening to the earnings reports of pretty much every major tech company in the last quarter, and every one of them has come out now with a declarative this is our AI strategy. Whether it's being embedded into products, whether it's picks, and we say picks and shovels, the things that are going to be used to enable the industry. Micron has a little bit of both, because you can't do compute without memory, so there's a very important relationship there. But talk about how AI and ML is being used across Micron outside of just the fabs.



Adeline Tay: Okay. Our team also has implementation in both procurement and supply chain data processing through the ML models that provide the strategic recommendation on cost saving, supplier selection and risk mitigation, based on the changing market dynamics. By integrating all these insights from the various category specific cost and market intelligence, the solution actually helps eliminate most of the manual and ad hoc analysis as it trigger real-time alert to our category managers on negotiation and sourcing strategy opportunities.

Another tool that we have actually helped develop is to allow our sales team to reach better pricing for our product, based on product complexity, differentiating factors, markets and customer dynamics.

Daniel Newman: So as we wrap up our conversation, let's think about industry-wide. So you work in a number of industries, you supply to a number of industries, your technology, whether it's in automotive or in devices, or of course, your technology supports healthcare and financial services. How do you see all the Industry 4.0 methods and smart manufacturing practices that you are implementing as valuable? And how can they be applied to the other industries that you work with, and maybe even beyond that?

Adeline Tay: Right. I'll suggest looking into three areas, partnerships, technologies, and even how the organization has been set up to make sure that they are successful in their journey. I think the key enablers that has contributed to our success including working with our industry partners at academy to build a smart ecosystem. We have our joint data science program with our key equipment supplier that greatly benefit both parties in knowing the equipment and process better. We also look at Channel G players and startup not traditionally serving semicon. Micron actually has USD 300 million AUM AI venture funds where we invested in all this startup on AI technology.

Invest and choose the right technology backbones for all use cases, as many of these smart manufacturing initiative involve big data and massive compute power for data manipulation and analysis. This actually will help you to scale better when you have a successful pilot. It is also important to tune and define your smart manufacturing organization, the role and responsibility of the different teams, and how smart manufacturing can be adopted in your factories, or in your industry better.

Daniel Newman: So I think that to summarize the conversation, Adeline, and first of all, thanks so much for spending some time with me. Micron is taking a very inside-out approach to how it leverages and utilizes the power of AI. It sounds like really at the core of your manufacturing, smart manufacturing strategy, you're using it to do everything, from create greater efficiencies to being more sustainable in how you're developing and producing semiconductors. And then, of course, it sounds like you also, and hopefully you are as you're working closely with industry and customers to help them take some of the best practices that you've learned in terms of developing your own manufacturing strategy and helping other companies take advantage of some of these technologies. And of course, lots of memory to be sold for all these companies that want to use all the compute in all of the applications that they're going to want to run. It's all that data, it's going to need all that memory. That's good for Micron.

So I want to just say thank you, Adeline, so much for taking the time to join us here at the Six Five Summit. Really interesting stuff that you're doing in Micron. Smart manufacturing, greater



sustainability, and of course, the utilization of AI across every part of the business is going to be critical long-term for any company that wants to be competitive in really any industry. So, I hope we'll have you back sometime soon. Thanks for joining us at this year's Six Five Summit.

Adeline Tay:

Thank you, Dan.

Daniel Newman:

All right, everybody, there you have it. We are here in the semiconductor track. It's day two. Really interesting conversation there about smart manufacturing. A lot to learn from a company and from someone that's spent a lot of time, a lot of effort to build out a world leading, and of course, recognized world leading manufacturing process, even focusing in on important things like sustainability. Stay tuned. More Six Five Summit coming your way.