Rethinking Manufacturing

What are the major trends driving production automation?
Martin: The most important long-term trend is our evolving ability to holistically model and simulate the complete product value chain — everything from the product to be produced to the processes and resources that will be used in producing it, whether it’s a car or a couple of tons of iron ore. We are not yet able to model value chains as broadly as we would like, or in a holistically integrated manner; but we’re getting there. The ability to model and simulate product value chains opens the door to improved collaboration between R&D and manufacturing, which is another very important capability. Once you can simulate products and processes in a holistic value chain, you can optimize manufacturing processes so that they can be modified in response to actual external demand. And once you’re that far, the next capability is the integration of manufacturing operations into the supply chain to provide the visibility that enables agility.

Can we simulate products and processes in their full complexity today?
Martin: Not together as a holistic system or in the same language. What’s missing is an architecture for modeling and simulation that can be implemented across heterogeneous application architectures. What we have today is silos of different technologies and applications.

What’s the economic value of simulation?
Martin: In most environments we could cut the cost of design in half if design and portions of execution were done in the virtual world.

Do you need to see an operation as a whole to see the value of simulation?
Martin: Yes. If you measure the value of simulation at a project level, you won’t necessarily see the total scope of savings. But if you’re modeling at an overall cost-to-performance level it is definitely cheaper to simulate.

Are many companies doing this?
Martin: No. Companies can be divided into those that have an internal or “inside-out” focus on manufacturing — one that pushes rather than pulls — and those that are moving to an “outside-in” focus. Here, customer requirements are translated back from need and use into manufacturing and operations. As you can imagine, this is a huge cultural change for manufacturing operations. In inside-out-driven operations I produce as much as I can and rely on sales and marketing to sell the product. This is where most companies are today. But the most advanced organizations are starting to implement outside-in-driven manufacturing. These companies are driving for value from the customer’s side. This amounts to a strategic joint value creation relationship between the manufacturer, suppliers, and the customer.

Is Siemens heading for an outside-in manufacturing architecture?
Martin: Following its recent acquisition of UGS, Siemens Automation & Drives announced a project called Archimedes that is designed to provide an integrated systems engineering architecture for products and production processes. The goal is to create an environment in which Siemens, non-Siemens and UGS components plug into a process-based architecture to achieve overarching automation and process integration. So in my opinion, the fact that Siemens has identified such a systems-integration architecture bodes well for Siemens’ Strategy and the future.

Where will we be in 15 years?
Martin: We will move toward much more sophisticated and holistic modeling in the virtual world. Modeling will include not only mechanical components, but human and network components, and even the behavioral aspects associated with operations. We will be in a position to simulate opportunities to a very late stage, right up to the point that virtually all of the questions have been answered. To accomplish this, we will conduct at least 80 percent of development in the virtual world. Today it’s just the opposite. Why will we move in that direction? Because in the physical world we make mistakes and generate waste that costs time and money. In the virtual world, simulation allows us to structure experiments, test, detect errors, and try innovations that ultimately optimize products and processes. That’s my vision of the future, and it’s only ten to fifteen years away.

Interview conducted by Arthur F. Pease