The real and virtual worlds of production are merging into one. Long before they see the light of day, many of the parts, products, production facilities and entire supply chains that are the progenitors of everything from PDAs and airplanes to power plants and bottling processes are conceptualized, visualized, tested, operated and maintained in the virtual world.

Driven by advances in computing and simulation technology, virtual representations are drawing ever closer to accurately duplicating their real world counterparts. Meanwhile, in the real world, the chain of tools, robots, programmable controllers and communication systems used by production facilities are becoming increasingly digital, intelligent, and software-driven, making them easier to be accurately represented in the virtual world.

On May 4, 2007, these two worlds moved significantly closer to forming a single, seamless information and communications environment. That was the day that UGS of Plano, Texas — a leader in product lifecycle management (PLM) software — became A&D (Siemens PLM Software), a division of Siemens Automation and Drives (A&D), “the world market leader in the 121-billion-euro world automation market.” According to Group President Helmut Giese, “The good thing about all this is that although we were not the ones to invent the idea of how to close the loop, we are — given A&D’s leading position in automation technologies and our leading position in PLM — the only company that’s actually able to do so.”

Rapid Growth. According to a consensus of research organizations, including Frost and Sullivan and AMR Research, the world market for PLM products such as those produced by Siemens PLM Software and its competitors is expected to increase from $5.6 billion in 2005 to approximately $11 billion by 2012. Siemens holds 14 percent of the market. The second product category is cPDM. This market, which includes Teamcenter and where Siemens is the number one position, is expected to move from its current level of around $1.3 billion per year to over $1.3 billion in 2012. Demand in these three markets is strong across the board. For instance, between 2006 and 2012, says Shirk, European demand for PLM products is expected to average about 7 to 8 percent per year, moving from $5.6 billion to about $8.7 billion. Growing at about the same rate, the Americas are expected to head from $6.3 billion to $9.7 billion during the same period. And Asia, which is growing at 13 to 14 percent, is expected to move from $3 billion to about $5.6 billion per year.

For major companies such as GM — a Siemens PLM Software customer — multi-site collaboration capability means that they can work with 3D dynamic data in real time at their own sites while accessing supplier sites to get updates on evolving products. As a result, they can see what’s going on at all of their sites every single day. When changes are made to a level PLM to mid-size manufacturers in an easy-to-use, preconfigured portfolio with a low total cost of ownership. Considering the size and scope of the PLM market, there’s plenty of competition. But what’s different about Siemens PLM Software’s portfolio is that the company has taken its experience in 3D computer-aided product and factory design (NX and Tecnomatix software) and tied it to its Teamcenter collaboration data management system, thus plugging information from a multifaceted virtual world into a collaborative development environment. “Thanks to Teamcenter technology we tie these elements together better than any of our competitors can,” says Ludwig. “Its multi-site capability is something no one else offers, and it’s the core of our tremendous advantage.”

For instance, if a problem is discovered in a product, the original data — say from a supplier in Japan — can be called up immediately and revised collaboratively by designers, production people and the supplier. “This can cut downtime compared to conventionally run operations from weeks and months to days and in some cases hours,” says Ludwig.

But the real beauty of collaborative simulation technology is that it helps to keep costly mistakes of the past from happening in the future.
Flying High. Eclipse Aviation is another great example of why Siemens PLM Software is flying high. The Albuquerque, New Mexico-based company has introduced a revolutionary new category of products called “very light jets.” In an industry in which selling 100 planes per year is considered successful, Eclipse is aiming for 1,000 planes per year — a goal that is clearly within reach given the fact that it has more than 2,600 orders. To accomplish this without making its six-place, two-turboprop aircraft for one-half the cost of similar small jets, Eclipse designers modeled the entire aircraft, down to the last rivet, in NX software, managed all product information, from digital models to the last scrap of paper documentation, on Teamcenter, and designed and optimized its factory in Tecnomatix. Says Dr. Oliver Malsenford, senior vice president of engineering at Eclipse, “Our ability to meet our targets depends on digital mock-up and validation.”

What’s the technology secret to Eclipse’s success? “Using NX, Teamcenter and Tecnomatix, the user can bring in data from multiple suppliers to integrate them without ever having to create 3D visualizations, and ask questions in the virtual world about how a new product will perform and how it can be cost effectively manufactured,” explains Chuck Grindstaff, executive vice president of products, who heads research and development at Siemens PLM Software. “With Teamcenter, users can take 3D models, cross-section them, analyze distances between parts, and perform interference detections to see if all of the parts fit together properly.”

Siemens PLM Software simulation tools not only allow users to visualize the components that go into an assembly, but to dynamically interact with them. “For instance,” says Grindstaff, “we can run a vibration analysis on components, assemblies, entire power trains, the body of a car or the structure of an aircraft. So this technology is ideal for comparing models, analyzing where different parts can be optimized, heat and fluid dynamics, and integrating the results to make informed engineering decisions.”

Capturing Knowledge. What all such simulations have in common is that they represent virtually unquantifiable amounts of information. But to make that information useful it has to be distilled into knowledge. With this in mind, Siemens PLM Software researchers in the U.S., England, Israel, and China are expanding Teamcenter’s capabilities in the area of knowledge-based engineering. “By this we mean that Teamcenter will increasingly be focused on learning about and adapting to each customer’s requirements,” says Grindstaff. “Teamcenter will also improve in terms of capturing knowledge, searching databases, and reapplying knowledge to new designs. Over the next two decades, we will capture each industry’s best practices and inject the resulting knowledge into the design process.”

For the resulting designs to be meaningful, however, they will have to exactly duplicate their real-world counterparts — a challenge that will demand the simultaneous capture of data from hardware, software and electronics between the virtual and real worlds — a challenge, in short, that Siemens’ combined efforts in automation and PLM is uniquely suited to fulfill.

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