# in one place

Issues ranging from
regulatory compliance to finance
influence the success of a product.
Although there is no single tool to guide
engineers through it all, people are
working on it. By Jean Thilmany

As software makers seek to derive further market value from their product life-cycle management offerings, they're looking to extend the PLM system beyond the engineering-manufacturing loop. They say PLM has a role to play across the entire company—and beyond.

In essence, they envision PLM as an end-to-end solution that ties the bill of materials, part lists, pertinent manufacturing information—such as inventory levels—to financial information and also to compliance, regulatory, and end-of-life concerns.

While that may not be a reality for quite a while, consultants who follow the

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industry say that new ways to link PLM to an enterprise resource management system can smooth the engineering-to-manufacturing handoff by streamlining the transfer of information. Smoother communication can cut engineering and manufacturing costs.

The components of PLM provide significant value, but there are no fully integrated offerings on the market that perfectly cover every aspect of product lifecycle, according to a report issued in April 2008 by the Aberdeen Group, a technology research firm in Boston. Companies have to integrate data and processes in order to develop a full solution, and that is no small task.

Mike Kirschner, president of Design Chain Associates, a San Francisco consultancy, said, "I'm not sure any software maker can offer a truly total solution."

Still, software makers continue to push the boundaries of what can be considered end-to-end PLM. And they're redefining it in the process.

## With Regulation in Mind

Last fall, for example, IBM introduced a consulting service that calls upon various pieces of its technology to ensure that products will meet regulatory compliance standards within their country of sale. The IBM Environmental Product Lifecycle Management service strings together a number of IBM software and hardware products that analyze every phase of an engineering company's design and production cycle.

Consultants will identify manufacturing and engineering practices that may be carried out in a more environmentally friendly manner, said Jeff Hittner, corporate social responsibility leader for IBM business services. They take into account the product's development and manufacturing processes as well as delivery methods and end-of-life reclamation and recycling considerations, he said.

Of course the consulting service isn't really a PLM system (although IBM does market a range of enterprise, product, and design software). Consultants will, however, look at information stored within a company's PLM system when they assess products for environmental compliance. The bill of materials, for example, houses much of the information of interest to the consultants.

Compliance issues are the driver behind the move

toward such end-to-end systems. Companies that need to comply with different rules in the European Union, China, and other markets are going to be particularly interested in the offering, said Marc Halpern, an analyst with Gartner Group of Stamford, Conn., who follows the PLM business.

Environmental mandates include the European Union's Restriction of Hazardous Substances Directive, or RoHS, which went into effect in 2006. It restricts six hazardous materials, including cadmium and lead, in the manufacture of various types of electronic and electrical equipment. To sell products in China, certain electronics manufacturers need to disclose the presence of chemicals such as lead, under the country's Administrative Measure on the Control of Pollution Caused by Electronic Information Products.

But don't look anytime soon for the actual PLM system to help engineers design to meet regulatory compliance standards, Kirschner said.

"Right now, PLM can't embody design intelligence like regulatory information—where you see chemical and energy restrictions for a given product—so you can't design for regulation," Kirschner said. "It'd be cool to have a system where you punch in parameters and the engineering tool spits out: here's what you've got to do. I'd like to see PLM get to that eventually, but it's still light years from that."

## System of Record

In the absence of an end-to-end tracking system, one trend coming to prominence is the use of PLM as the complete system of record for all product data, said Dick Bourke, president of Bourke Consulting Associates in Laguna Woods, Calif.

For many years, a company's ERP system served as this sort of system of record; that's where the bill of materials and part master lists were stored and manipulated. For many companies, ERP is still that system of record.

"The concept seems to be the BOM will have been
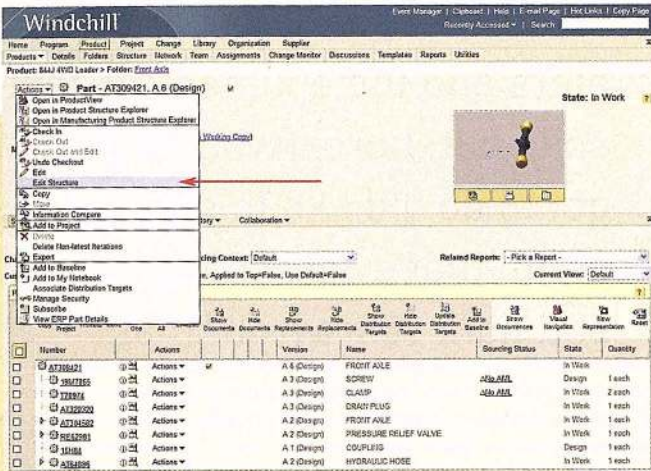
PLM software ties the engineering and manufacturing BOM, above, with the CAD design, below. Some consultants and researchers argue PLM is the logical place to house the master BOM. PTC now offers a PLM module that automatically updates the manufacturing BOM.
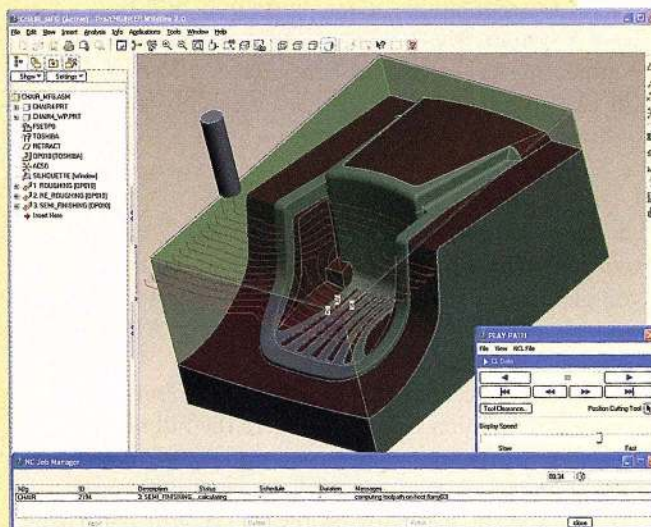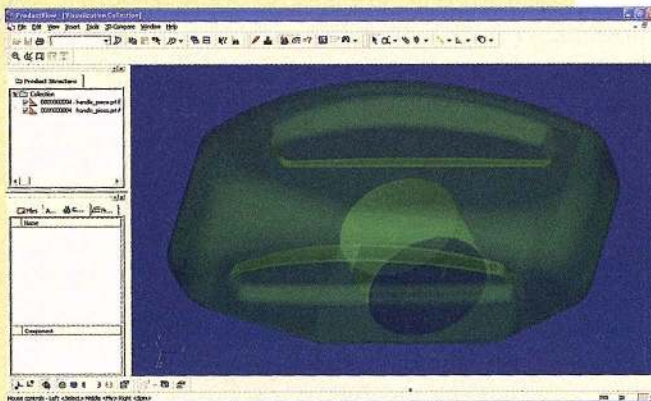
made up front by a manufacturing engineer working with a design engineer and that when it gets into the ERP it won't change any more," Bourke said.

But anyone with on-the-ground engineering or manufacturing experience knows changes to the BOM never end and certainly the BOM never reaches an end point.

"Now people realize the more logical place to house the master BOM is in the PLM system," Bourke said.

Storing the bill of materials and all related product data in the product lifecycle management system makes sense because of the functions and differences between ERP and PLM. The enterprise resource planning system acts as a repository for all company information, including manufacturing, engineering, financial, and accounting. So it initially seemed logical that the BOM reside in the enterprise system, Bourke said.

The manufacturing engineer's job is typically disconnected from the mechanical engineer's job. Mechanical engineers have their PLM systems. Manufacturing engineers pull information from their desktop applications or from tools like Microsoft Excel to lay out plans for the manufacturing process. They then pool that information to enter it into the ERP system, the system of record.

"What ERP is supposed to be there for is to take the product definition and information and use it to plan and control manufacturing," Bourke said. "It's a place to explode the BOM into individual parts and use it for routine shop scheduling."

But the method, still widely relied upon, doesn't always work smoothly, he added. It's the pulling from many different systems and the continued updates that can cause problems.

"Right away there's a disconnect between what engineering puts in the system and what manufacturing puts in the system," said Bourke, who calls himself a former ERP-focused consultant.

That's one reason—the continued updates from two different sources and many different applications—the information stored in the ERP system doesn't always match what's actually going on in the plant. The parts list is never perfectly updated or reliable. This, of course, causes problems when it comes to planning inventory or production.

Now that much stronger production-definition capabilities are available within PLM than in the past, it makes sense to house all forms of BOM and product definition in PLM, Bourke said.

"As PLM has grown up, it's now recognized that that's where product definition data is created and that's where it should be maintained," he added.

Indeed the Aberdeen Report finds that the best-in-class

companies that it follows are more likely than others to centralize product data and more likely to use PLM as the primary system of record in the enterprise.

## Software to the Fore

PLM vendors are now stepping up with offerings to ensure that the engineering and manufacturing views of the BOM are in agreement right out of the gate and all the way to the factory floor.

A good example is the Manufacturing Process Management tool, a module of the Windchill PLM package from PTC of Needham, Mass. The tool ties the creation and maintenance of the manufacturing bill and the engineering bill within one software package, Bourke said.

"The concept is, if there are necessary changes to the manufacturing bill—like differences in the plant where manufacturing will take place, which is an important concept in a globally dispersed environment—the changes are tied back to the engineer bill," he said.

"There's also a high degree of referential integrity," he added. "You can see where it changed and how."

With the PTC module, numerically controlled tool paths and coordinate measuring machine inspection programs are also automatically generated from the design model, housed within PLM. In that way, the system automatically creates updated manufacturing work orders and instructions.

## Tracking Costs

According to Aberdeen, using PLM as the system of record has good results for other business processes as well, such as determining the cost of parts and products, tracking company costs, and setting prices.

With this method, developing costs based on design data can be done earlier in the product lifecycle where it has a greater role to play in business decisions, according to the report.

Because the enterprise resource planning system is a rich repository of information useful to both manufacturing and engineering sides of the operation, that information can and should be flowing from the ERP to the PLM system, according to the Aberdeen Group. It found that best-in-class companies are more likely to bring costs—including sourcing data, and supplier data—from ERP to PLM, according to the report.

It's this type of information that helps closely track costs. After all, these two systems working in tandem best know the true value of a product—based on its part costs and supplier costs.

The report found that the best-in-class companies actually develop what the costs should be for a part or product and move that information from PLM to ERP.

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"This supports a different use of PLM with regards to costing, where costs are identified and developed in the product innovation and engineering environment as opposed to—or in addition to—the ERP environment," the report states.

Though Aberdeen's study concluded that PLM still has a way to go in terms of tracking product design from early inception right through sales to reclamation, it is becoming the main go-to source for a large amount of product data.

Nobody has it all, the consultants say. Although he believes no software developer has a complete solution, Kirschner of Design Chain Associates said he's found one vendor that does come close.

"Right now, SAP has the closest thing to an end-to-end technology, but really there's no real solution out there," Kirschner said.

SAP, of Walldorf, Germany, is best known for its enterprise resource planning systems, but its business suite includes product lifecycle management software. SAP has primarily focused on Fortune 500 companies, but is now moving its focus to small and midsize companies, including engineering operations, according to a spokesperson.

That movement toward smaller companies will make SAP's end-to-end application more accessible to engineering organizations, Kirschner said.

The lifecycle of a product, like that of anything else, exists in a world of increasingly complex financial and regulatory issues that touch on everything from creation to reclamation.

According to the experts and analysts, engineering companies won't find for some time a total lifecycle system that ties all elements of a business together to guide development and marketing of products. Systems are developing, however, that bridge many gaps in the current state of the art.

Software developers are working to create tools that can incorporate ever more of the big picture and make it accessible to engineers. As Kirschner, put it: "The idea is feasible. We just have to get to it." ∎