

Design automation brings automatic ROI

by Emily Atkins

Imagine an investment in business-enabling software that within one year would allow a manufacturer with around \$4 to \$6 million in sales to reallocate half of its engineering staff and free-up two of its salespeople, as well as reducing order lead times, and increasing its sales success rate by 100 percent. Too good to be true?

Not so. This is exactly what 3L Filters, an engineer-to-order manufacturer of pressure vessels in Cambridge, Ontario, has achieved through the introduction of NeXtreme Automation software created by Tryllium Industries, also located in Cambridge. 3L estimates that the system has accounted for the equivalent of two new sales positions and four new engineering positions, without adding a cent to the company's payroll.

For Kevin Cassells, 3L's engineering manager, it's a no-brainer. "Responsiveness is the key to survival in tougher economic times," he says. "Since we introduced the software, our sales success rates have doubled from eight to 16 percent."

Inefficient supply chains

In the world of engineer-to-order manufacturing, the order process requires time-consuming, exacting work because each product is different. A customer cannot simply place an order and expect to have it delivered within a specified time period. Once an order is placed, the design engineers have to create drawings for the item to be manufactured and generate a bill of materials, which is sent to the purchasing department so a quote can be assembled. According to research conducted by Dr Paul Doherty of Wilfrid Laurier University, in Waterloo, ON, this iterative process can take weeks, and sometimes a month or more to complete.

This long order processing time leads to lengthy cycle times and inefficiencies in the supply chain. This is where Tryllium Industries decided to focus its expertise. For Gordon Hobbs, Tryllium's CEO, creating an automated design to order process was a logical progression for his company. Started in 1986 as a custom software design house, then shifting to the computer-aided design (CAD) resale business, Tryllium's staff had intimate knowledge of the way engineer-to-order manufacturers were handling their orders.

"We noticed that the manufacturers were only using 10 percent of their CAD systems' capabilities, nor did they understand that the processes to which they were applying the systems could be made radically more efficient," Hobbs says.

Because different departments were operating in independent environments, no single person or department had an overview of the whole organization. "The glaring oversight that many companies make is to have unique functions for each department. Then you end up with different formats for documentation and data for each department. What we saw was a huge opportunity to save companies money by helping them to eliminate the transcription activities."

Previous attempts to streamline the process involved prohibitively expensive, one-off custom attempts to integrate the software and hardware systems. In 1998, Hobbs and his team decided that the industry needed a generic design automation platform that could be

easily customized for specific applications. Their first attempt was an Internet-based database of common electromechanical components used by engineers in 3D CAD modelling called PartsLibrary. This project was mothballed in favour of a system that could be used by non-technical personnel to configure, design, document and cost complex products that otherwise required significant engineering input. Tryllium called the second product NeXtreme Automation.

Engineer in a box

NeXtreme Automation is a Web-based design and costing (DCA) system. The software works by calling upon a vast database of commonly used parts, components and the relationships among them to create three-dimensional prototypes of products. "Nobody is completely unique," Hobbs says. "Everybody is using the same basic components; structural steel, for example."

According to Professor Doherty, the program operates exactly like an engineer in a box—within 10 minutes of the specifications being entered, the system can produce detailed 3-D drawings that might take a human engineer with a CAD system more than a week to complete.

And there's more. NeXtreme Automation offers its users functions from the sales process right through to manufacturing. A sales module allows users to manage customer contacts and collect the specifications needed to design and price a customer's desired product. Application engineering will take the sales input and create a solution that fits within the bounds of the manufacturer's capabilities. The design engineering function creates a detailed, three-dimensional design of the product, along with a Bill of Materials (BoM), which identifies all the raw materials and components required to build it. The purchasing function cross-references the BoM with a list of cost standards maintained in the company's ERP system to give an accurate costing for producing the product.

Manufacturing engineering prepares a detailed process routing, which shows all the tooling, setup, fabrication, machining, welding assembly and testing required to build the product. Cost estimating takes the process routing and compares it to the ERP system's database of capacity standards, and calculates the cost of machine and labour time that will be needed. Finally, the technical documentation is produced, including sales visuals, quotation drawings, production drawings and process instructions. The final documentation also functions as technical service documentation.

Because it is Internet-enabled, NeXtreme Automation can be used worldwide to allow users' sales personnel based overseas to create detailed designs and obtain pricing anywhere, at any time of day. Previously, engineer-to-order manufacturers trying to sell into international markets were constrained by time zones and the availability of their engineering staff. Now those functions are online any time, anywhere.

Implementing NeXtreme Automation

Starting from the basic database, each user of the software can speci-

fy its own components and the multiple relationships between them. This is the most time-consuming and complex part of the implementation process. For 3L, the full implementation of Tryllium's software took more than a year, although the return on investment was realized even before implementation was complete. The initial setup was for only one of the company's 13 product families. The majority of the time required was programming the system with the full details of the parts and components that go into its standard product lines.

Not every manufacturer will experience the quick ROI that 3L did. Mature industries where there are standard product lines with minimal variation are the best candidates for a faster ROI. Tryllium has identified various factors that affect the startup costs and ROI. First is the complexity of the product lines to be engineered. The more complex the product, the more involved the programming of the database. Since this is a highly technical process, it is usually performed by Tryllium staff who are experienced with the application. Second, implementation costs will increase if the manufacturer does not already have detailed documentation of designs and specifications of the products it makes.

Costs for the application vary, depending on whether Tryllium is contracted to complete the programming. The base cost is \$50,000, plus \$5,000 per user. The company estimates that if it is contracted for the programming, an installation will run between \$30,000 and \$80,000 per complex product family. Tryllium is also making the software available for rent at a monthly rate equal to a fraction of the engineering work it replaces. The company promises an ROI of between nine and 12 months.

Measurable results

For 3L Filters, implementation of the NeXtreme Automation automation product has meant dramatic results. "Originally we implemented it as a sales tool," Cassells says. "The resources weren't there on a regular basis on the upfront quotation engineering. If the sales department was ready to submit a quote and they need a page-size drawing to show the general details, engineering would say 'OK, you can have it in two weeks.' So if you take that out, then you get better reaction times from a sales perspective, because engineering was always the bottleneck."

Taking out that bottleneck has meant dramatic reductions in lead times for the 80 percent of 3L's sales that are minor variations on a standard product. Pre-sales engineering time has been reduced by 90 percent. The turnaround time for quotations was reduced from an average of seven days to only four hours. As a result, the company can respond to more RFQs, and has increased its rate of converting quotes to orders to 16 percent, up from eight percent.

With the software in place, the sales department can verify and optimize the designs that the system creates. Errors have also been reduced, resulting in fewer costly production mistakes. With scheduling conflicts between standard and custom jobs reduced by 40 percent, the engineering staff can now focus on the custom jobs. As a result, production design lead-time has been reduced by 75 percent.

Cassells points out that the software was brought in as a tool to handle sales of general, standard products with slight variations that engineering really didn't need to be involved in. That improved the turnaround time—some customers have been so impressed with the fast response that they have even offered the work before getting competitive bids. "So your success rate goes up and you're quoting more, so your dollars go up."

A bonus for Cassells, and 3L Filters, is that he can handle more

work in the engineering department using this tool as a basis for designs. "If there's something outside of the scope of the standard design, I can take the basic model then manipulate it into the form the client wants. And you're saving a significant amount of time, and you can allocate resources elsewhere. It reduces quote lead-time, and I still have the benefit of the resources."

Following the 80/20 rule, Cassells says that now his engineering staff can focus their attention on the 15 to 20 percent of clients that will deliver the 80 percent of revenue, while the software looks after the 80 percent of quotes that bring in 20 percent of the company's revenue.

"It's made it easier to sell 3L's products," Cassells says.

Issues to resolve

In spite of its overall satisfaction with the Tryllium software, one significant issue remains for 3L to resolve: integration of NeXtreme Automation with 3L's existing ERP application. The interface between the two systems is less than satisfactory because it relies on a batch upload of the Bill of Materials and manufacturing routing from NeXtreme Automation to the ERP system. The objective is to implement a real-time communication process, but both Cassells and Hobbs point to a reluctance on the part of 3L's ERP vendor to play a meaningful part in customizing the application. As a result, 3L Filters is examining its options, and may have to shift to a new ERP provider to ensure that it can get the most out of its NeXtreme Automation application. According to Hobbs, Tryllium is working in co-operation with an ERP vendor so that future buyers will have the option of buying another suite of applications that are fully compatible.

Innovate to survive

Although the software eliminates the need for as much engineering work, far from turning engineers into a dying breed by taking their jobs, the engineer-in-a box software is giving them the freedom to do the kind of work they enjoy. Instead of performing the repetitive design tasks involved in recreating standard products with minor variations—the "grunt work," as Hobbs calls it—engineers will be called on to actually use their skills and creativity to solve new problems. "Having the grunt work taken out of the engineering department's responsibilities means that engineers can do what engineers want to do: engineering," Cassells says.

Hobbs points out that Western countries are having trouble competing in the global market because our labour costs are too high. "The whole problem with manufacturing leaving North America is that we're not innovating to stay ahead of the underdeveloped countries, all we're doing is competing on commodity products. The only edge we have is to make new things ahead of the rest of the world."

Innovation is the answer, he believes, with our highly educated and skilled workforce of engineers and other skilled technical professionals, Canada should be leading the way. He points to 3L Filters as a prime example. The time and resources that 3L

has extracted by using NeXtreme Automation have permitted Cassells to focus the company on developing a niche expertise in a high-profit business area that has the potential to double 3L Filters' sales. And Tryllium itself seems to be setting an example for other innovators by bringing automation to the design and costing of engineered products; not a small accomplishment for an engineering software system.

www.tryllium.ca

www.3lfilters.com

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Tryllium's Gordon Hobbs



Kevin Cassells of 3L Filters