

best practices

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INTELLECTUAL CAPITAL

Robertson Ceco Automates Design Process, Leverages Designer Knowledge

By Daratech Research Staff

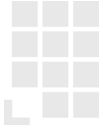
Robertson Ceco Corporation (San Ramon, CA), a manufacturer of pre-engineered metal buildings for the industrial and commercial industries, set out to improve the design and detailing stage of its engineering process, where most time is spent, typically measured in weeks. In the face of an increasingly competitive marketplace, Robertson Ceco sought out a single system that would automate its design process and leverage the knowledge of its most experienced designers. Since implementing knowledge-based modeling technology from Design Power, Inc. (Cupertino, CA), the company has seen a record rise in productivity. Man-hour per ton, its primary measure of productivity, is on a downward trend. Design time for what the company categorizes as a simple building has gone from two days to one day, while the time to design and detail a complex building has decreased from 45 days to 25.

Pre-Engineered Building
Manufacturer Boosts
Productivity, Shortens
Design Cycles

Process Transformation
Enabled by Design Power
Knowledge-Based
Modeling Software

As a result of the company's ability to better handle complex building design, orders for complex buildings rose 21% from 1999 to 2001. Before realizing these results, Robertson Ceco had to undergo a process transformation. Design represented not only one of the largest cost centers for Robertson Ceco, but also one of the longest

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learning curves. Further, design is more sensitive to building complexity and size than in any other area of the company – one size does not fit all. Robertson Ceco recognized that its greatest opportunity to improve time-to-money was in front-office efficiencies, in the area where orders are received and processed.

From the outset, the company established the criteria for what they needed to implement. For one, they wanted a single system to be capable of processing the most complex jobs as well as the least complex; to handle any design inputs and deliver design outputs. According to Roger Burlingame, vice president, Technical Services, Robertson Ceco, the company envisioned “a single system where all design inputs would be made and from which all outputs would be delivered. In our previous system, the outputs had become disconnected and required extensive effort to coordinate as changes to a project were made during the order development process.”

In addition, Burlingame said the company needed a system that answered the challenge of retaining the knowledge of design personnel, “encapsulating their knowledge in a form that could be perpetuated and easily maintained in the future as our product evolved to meet market demand.” For Robertson Ceco, design automation was not simply a matter of making drawing more efficient, but applying what their designers knew across all levels of building complexity.

Said Burlingame, “We were already experienced CAD users and we knew the advantages of creating everything in an electronic format, but we wanted more. We wanted to truly automate the process. Our goal was not simply to make drawing more efficient, we wanted to take what our designers knew about our products and about detailing and use it consistently across all building complexity.” He continued. “We wanted to achieve senior designer results regardless of the tenure of the person involved in the project.”

Robertson Ceco also recognized the need to shift from 2D to 3D, as the company increasingly targeted more complex building projects. Said Burlingame, “2D is appropriate for simple box buildings, but it runs into problems when the buildings are more complex or very large where the opportunity for undetected fouling and interference of members is greater. We believe that changing our culture of design to work in 3D represented a great opportunity for improving quality and the speed of design work.”

After reviewing several object-oriented knowledge-based modeling software products, Robertson Ceco selected Design++ (D++) from Design Power, which provides their designers with a method of defining unique and intelligent objects including selective dependencies. A rule captures and applies domain knowledge taken from designers and encapsulated in a model. Said Burlingame, “Design Power provided us with a unique dependency capability that limited the amount of time needed to insert changes into, and rerun the model.”

Another advantage of purchasing D++ was its ability to provide an easy transition from the company’s existing systems. “We had a significant investment in key legacy programs that we did not want to reprogram in the D++ environment,” said Burlingame. Design Power allowed the company to feed parameters to existing code and integrate the output of the code into the building model. Design Power developed a drawing production tool that interfaces with AutoCAD and other CAD programs to create a drawing model from a 3D model. “This makes drawing output a totally integrated and seamless deliverable of our system,” commented Burlingame.

Burlingame explained the process. “Our designs are system-wide designs. Each component interacts with some other component and the building system supports the loads that are required. Models are created for an entire project, including multiple buildings. The system determines the interdependencies of each component and object as the rules are fired. Structural designs are fed from our proprietary design system by way of a graphical user interface into the model.” He continues, “The graphical user



interface provides mechanisms for locating and changing the properties of objects in the model. The time to input this information is a function of the size and complexity of the project and can be measured in hours and days.”

The actual time to run the model to resolve all member connections and design objects not provided by the structural design system is typically completed in minutes and, at worse case, an hour or two. Said Burlingame; “The entire structure is modeled at once. Each object is detailed full scale down to the individual holes that make the component connections.”

Robertson Ceko believes that an object-oriented knowledge-based modeling tool was more suited to their purposes than a parametric CAD tool. According to Burlingame, many of the typical components of the company’s designs would require the designer to choose from thousands of templates and patterns. The object-oriented environment of D++ allowed Robertson Ceko to develop significantly less code and eliminate the need for highly structured code. While the old design system automated about 20 percent of the company’s business with a million lines of procedural code, the new system based on D++ supports about 85 percent of their business with half a million lines of code.