



E³ series®

*Zuken's software solution
for electrical wiring,
control systems and
fluid engineering.*



ARM Automation achieves two-thirds electrical design time reduction using intelligent schematics



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Joe Geisinger
Chief Technology Officer,
ARM Automation

ARM Automation achieves two-thirds electrical design time reduction using intelligent schematics

ARM Automation designs, builds and supports custom automated manufacturing systems for a wide range of industries. The electrical design of these systems can be complex, running up to several hundred drawing sheets. Using E³.series intelligent schematics to drive the electrical design process, the company has reduced their development time by two-thirds.

No two solutions are the same

ARM Automation is frequently called upon by many different industries, from automotive component manufacturing to medical opto-electronics testing; to address difficult manufacturing, assembly, inspection and packaging challenges. ARM Automation begins each project by working closely with customers to understand both the nature of the application and the specific business objectives.

Just as no two needs are the same, no one solution or approach can best fit all performance demands, budgets and timelines.

ARM Automation applies its expertise in technical disciplines such as motion control, machine vision, robotics and control software to develop a unique solution that best meets the customer's business objectives. As an example, ARM Automation was asked to develop a high-speed, flexible, baked-goods layer-forming and case-packing system from scratch, that could outpace any system in the industry by 30%. Designed for washdown and compliant with EU requirements, this case-packing system is able to load 150 bags per minute into multi-orientation patterns



Complex automation system

without a hitch. ARM Automation delivered the system in six weeks to help the customer capitalize on a last-minute opportunity to almost double their business.

Previous electrical design methods

The electrical systems used in ARM Automation's systems are usually quite complex, often including robots, vision, welding, laser marking, chemical dispensing and other functions. ARM previously used a drawing-based electrical design software to design the electrical systems for its automation systems. In the past, ARM electrical engineers created schematic diagrams and designed the control panel and cable harnesses using an add-on to a popular 2D CAD system. They created custom symbols to represent equipment, created schematic diagrams and snaked cable through the diagrams

Results

- E³.series increased ARM Automation's efficiency and competitiveness allowing them to bid on more projects with delivery confidence
- Overall design time reduced by 66%
- E³.series intelligent design eliminated hours of manual error prone tasks increasing project ROI and design quality
- Debugging a complex design in the field was made significantly easier and more efficient.



Since 1993, ARM Automation has been developing custom automation solutions incorporating complex motion and/or vision systems to meet customer needs. From initial concept through years of field-supported operation, ARM is able and ready to provide solutions in the areas of machine design, systems integration and controls engineering.

E³.series is Zuken's software solution for electrical wiring, control systems and fluid engineering.





E³.series from Zuken is a Windows-based, scalable, easy-to-learn system for the design of wiring and control systems, hydraulics and pneumatics. The out-of-the-box solution includes schematic (for circuit and fluid diagrams), cable (for advanced electrical and fluid design), panel (for cabinet and panel layout), and formboard (for 1:1 wiring harness manufacturing drawings). Integrated with MCAD, E³.series is a complete design engineering solution from concept through physical realization and manufacturing output.

to connect the various equipment. They manually created terminal plans for use during the assembly process.

The primary problem with this approach is that the end result was a drawing without any intelligence that would allow it to, for example, track connections across different sheets and identify mismatches between terminals and cables. This meant that if an engineer moved a component from one location to another, he or she was responsible also for moving all of the affected cables and ensuring that they were properly connected in the new location. In some cases these cables might pass between numerous drawing sheets and each of the sheets had to be updated to properly implement the change. As ARM took on larger and larger projects, the number of sheets and the interconnections between the sheets increased and so did the potential for errors. Considerable time had to be spent checking and rechecking the drawings and the assembly process was hampered by the need to manually follow connections from sheet to sheet in order to understand the design intent.

Finding a new solution

When Joe Geisinger joined ARM Automation as Chief Technology Officer he recognized that electrical design had become a significant bottleneck for the company. *"The complexity of the systems we build has been increasing steadily over*

the years as we add new features to our machines and increase the sophistication of our control systems," Geisinger said. *"In the past, we sometimes had to shy away from bidding on some more complicated projects because the electrical design could not be completed in the time required by the customer."*



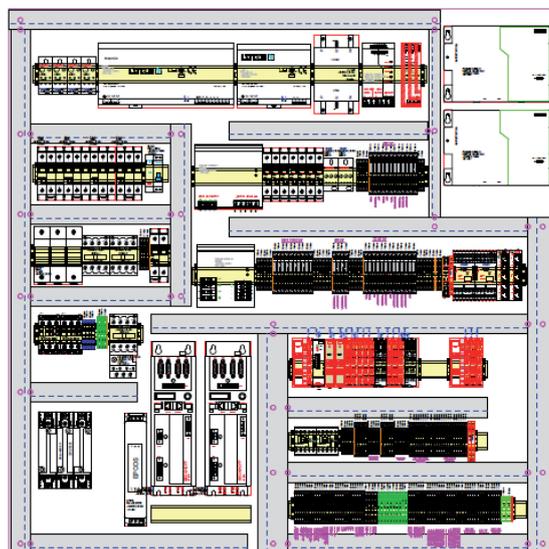
*Joe Geisinger,
Chief Technology
Officer,
ARM Automation*

"I had used Zuken products with a previous employer and had seen the improvements that could be achieved with database-driven design," Geisinger continued. *"I discussed the tool with the electrical engineering team and obtained consensus that E³.series could help substantially improve the design process."* E³.series is based on an object-oriented database with all modules feeding back to a single data structure. The database adds intelligence to graphics, including tracking connectivity, tracing connections, counting components and enabling new views of the data to be instantly created for downstream users.

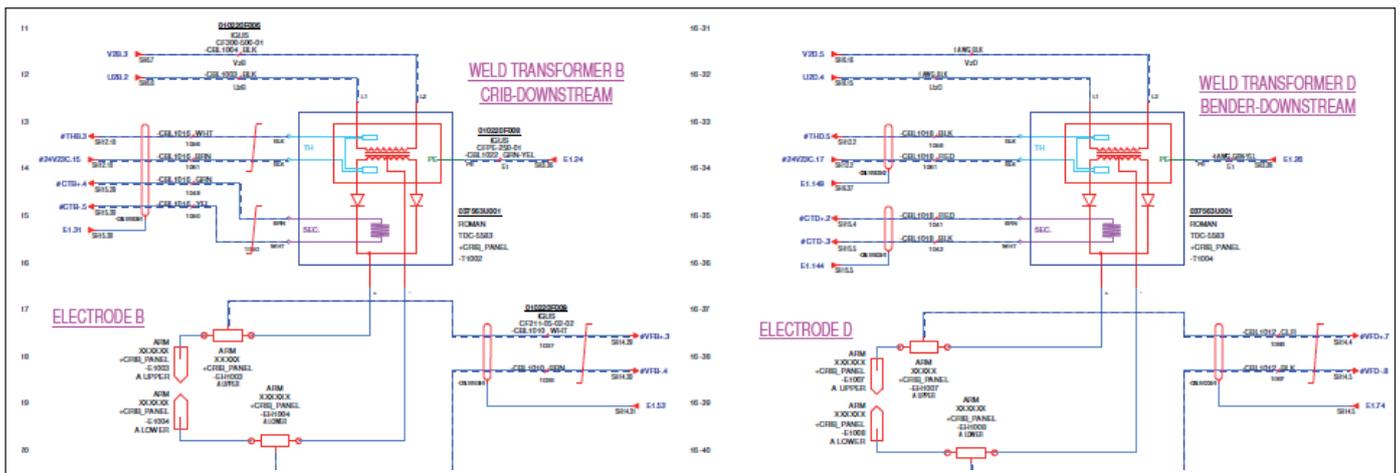
New database-driven design process

ARM Automation began the implementation process by creating a library of components that are commonly used in the company's systems. These library entries are not simply drawings but also have the intelligence to know,

for example, how many and what type of connectors are contained on each component. When one of these components is inserted into a schematic and connected to the other components with wire harnesses, E³.series keeps track of the electrical connections and space in the control panel. The software checks the consistency of connectors, ensuring that there are enough pins to handle each wire in an assembly. This intelligence automates many of the downstream activities that had to be performed manually in the past, such as selecting the right mating



E³.panel drawing



E³.schematic screen

connector and calculating the available space in control panels. The E³.series database automatically tracks each of the components used in the project so this information can be reported and used by the assembly team. ARM Automation tracks both the internal part number and the manufacturer's part number so users can search for components either in the library or in a project. Engineers use this capability to call up all equivalent components from multiple manufacturers so they can obtain competitive bids. E³.series reduces checking time by enabling the engineer to simply click on a signal to trace its route through the design.

The intelligence embedded in the schematics dramatically reduces the time required to make changes. For example, an engineer can drag a component from one location to another, even from one page to another, and the software will automatically update the traces and cross-references across each of the sheets they traverse. Likewise, if the engineer inserts a new page, the software will automatically update the page numbering and cross-references across the entire project. A simple change like this would have required hours of tedious work with the old software but with E³.series it is completely automated.

"E³.series has the intelligence to know what signals are moving through wires," Geisinger said. "The software even tracks whether a signal passes through a component unchanged or undergoes a transformation. We set up certain pins with equivalent signals and then we can easily determine, for example, where all of our power pins are. An engineer can simply right-click on a wire to determine its destination and highlight the wire across each of the sheets it traverses. You can easily trace a signal from device to device and pin to pin back to its source in the cabinet. Since the software is signal-driven, it's easy to isolate AC signals from DC signals and keep them as far apart as possible to reduce noise."

Improvements in assembly process

The ability to follow a signal through the entire system with the click of a mouse makes it easier to debug a complex system in the field. An example of this is an end effector for a robot that is powered by a trace running from the master cabinet, to the robot controller, to a cable at the base of the robot, through an energy chain to the end effector. In the past, the person doing the build would work with paper schematics and would have to exhaustingly follow each wire from sheet to sheet from the end effector to the cabinet.

Now the assemblers use the E³.series viewer to trace the wire throughout its path while highlighting the wire colors as they go through each connector. The entire project is contained in a single file so users can jump from sheet to sheet throughout the drawing. On the panel drawing, they can click on any component to open up the schematic sheet where the part is located with the part highlighted. As the electrician is wiring the cabinets, he or she has E³.series viewer open and can jump back and forth between the panel drawing and schematic.

Overall design time reduced by 66%

"The intelligence contained in the database of E³.series has helped reduce design time to about one-third of the time required in the past," Geisinger concluded. "These time savings have made it possible for us to bid on more complex systems without concern that the electrical design could not be completed within the project deadline. With the database keeping track of the components and signals, it's also more difficult to make a mistake which makes it easier to assemble and troubleshoot the system."