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Case Study

Maker of prefab pharmaceutical cleanrooms standardizes on Siemens technologies with huge cost, time and space savings

By standardizing on Siemens automation, controls, and building management system components, G-CON Manufacturing cut its prefab cleanrooms' component costs by as much as 75 percent, programming time by 80 percent, and mechanical space requirements by 30 percent — all while ensuring greater reliability, functionality and efficiency for its customers.



- **Customer:** G-CON Manufacturing, Inc. College Station, TX (www.gconfio.com)
- **Challenges:** Outdated controls and automation components, plus time-consuming fabrication cycles
- **Solution:** Bring automation and controls in-house, then standardize on Siemens SIMATIC TIA portfolio components and the TIA Portal
- **Results:** Dramatic savings in costs, time, and space while improving reliability, functionality and efficiency for customers

Few industries face the high risks that the biotechnology, pharmaceutical and life sciences industries do. Research and development of new personalized medicines, stem-cell protocols and gene therapies can take years, cost many hundreds of millions of dollars and yet still fail in the clinical trial process.

Even more serious are the human lives at stake, with innumerable people the world over counting on breakthroughs to save themselves or loved ones from serious illnesses and genetic defects that afflict them.

These industries are also heavily regulated, necessarily so because the life-safety of their products must be ascertained against a wide range of use-case variables.

In the U.S., they must comply with Title 21 CFR Part 11 of the U.S. Food and Drug Administration (FDA) regulations. International counterpart regulations

apply elsewhere. These regulations define the criteria by which electronic documents and signatures are considered trustworthy and reliable.

So, for these industries, efficacy, life-safety and regulatory compliance are paramount concerns, followed by cost and speed. The latter involves both time-to-innovation with new products and approaches as well as time-to-market via product commercialization in order to serve patients in need as well as recoup R&D investments and generate returns during limited patent lives.

All of these issues are drivers of Texas-based G-CON Manufacturing, the world leader in the design, construction and installation of prefabricated cleanrooms called PODs. Compared to build-in-place facility approaches, PODs can save months, if not years, in building cleanroom facilities for this industry.

Challenges:

Outdated controls and automation components, plus time-consuming fabrication cycles

Sid Backstrom, G-CON's Vice President for Business Management, explains that the traditional build-in-place approach can take from 18–24 months whereas building standard PODs – typically 12 feet wide by 50 feet long – can take a small fraction of that time, depending on a customer's specifications. Several PODs can be configured to provide thousands of square feet in total contiguous cleanroom space.



G-CON saved extraordinary amounts of cost, time, and space by using Siemens components in its prefabricated cleanrooms called PODs that it builds for the pharmaceutical, biotechnology, and life sciences industries.

"Build-in-place involves many different parties with separate purchase orders to each and require coordination of trades, permits to be pulled, materials ordered and delivered, safety requirements met, getting people onto and off of the building site, possible disruptions to current operations, and so on," Backstrom says.

"In contrast, G-CON's PODs, whether standard or custom, are fully designed and manufactured at our facility where they undergo factory acceptance testing before shipping, site-testing after shipping, and each customer gets a comprehensive engineering turnover package that provides full traceability of components, finishes, and structural details."

When Patrick Dorman, G-CON's automation and electrical engineering manager, joined the company in 2018, he saw lots of opportunities to improve the PODs, especially the automation and controls for each one's building management system (BMS) and environmental monitoring system (EMS). These are the most important systems in a POD and contained in each POD's mechanical space.

"We used to subcontract our automation and controls of these systems to a third party, which used an alternative brand of PLCs, I/O, HMIs and SCADA software, all of which I've worked with in the past, so I knew their strengths and shortcomings,

especially the latter because many were nearing end-of-life and becoming obsolete," Dorman recalls.

"Outsourcing automation and controls meant that every project required customization, along with massive coordination with the third party," he adds. "In addition, they designed, engineered and programmed the BMS and EMS as separate systems. This added complexity, space and testing requirements, as well as support and service demands. If a customer needed changes, we'd have to go back to them for those, which was expensive and time-consuming."

Solution:

Bring automation and controls in house, then standardize on Siemens SIMATIC TIA portfolio components and the TIA Portal

With G-CON management's support, Dorman made the strategic decision to bring the design and engineering of the BMS/EMS automation and controls in-house and combine them to manage both systems. In addition, he chose to standardize on the Siemens SIMATIC Totally Integrated Automation (TIA) portfolio of highly integrated components, programming them all using the SIMATIC TIA Portal, a common software engineering and programming framework with point-and-click ease-of-use.

Both decisions would greatly simplify procurement, fabrication, support, and service, saving G-CON weeks, if not months, rework by a third-party, and associated costs. Specifically, those Siemens components include the following, which use PROFINET industrial Ethernet to communicate:

- **SIMATIC S7-1500 programmable logic controllers (PLCs)**, the most advanced and arguably the world's fastest PLCs, compact to save space, with both standard and fail-safe models, plus integrated remote diagnostics.
- **SIMATIC ET 200SP I/O system units** for compact control cabinets, with easy interoperability with other components, plus flexibility, integrated trace function, integrated system diagnostics, integrated security, web server and full symbolic programming.
- **SIMATIC HMI Comfort Panels**, for implementation of high-performance human-machine interface (HMI) visualization applications at the machine-level, featuring high-resolution touchscreens with 16 million colors and wide viewing angles. Programmable in the TIA Portal via SIMATIC WinCC.
- **SIMATIC WinCC**, a highly scalable, secure, and open supervisory control and data acquisition (SCADA) and HMI system programming and operating capabilities. Supports international standards as well as native script and programming interfaces.
- **SINAMICS G120 variable frequency drives (VFDs)**, for precise control of fan motors to ensure ideal air circulation and temperature control throughout G-CON PODs for both technicians' comfort and biological processes.
- **SCALANCE switches**, for networking all the components together and enabling their PROFINET communications.

For assistance with bringing the design and engineering of the BMS/EMS automation and controls in-house and standardizing on the Siemens SIMATIC TIA portfolio and using the TIA Portal, Dorman engaged AWC, a certified Siemens Channel Partner, specializing in factory and process automation as well as other engineering services.

"I've worked with a lot of companies that provide solutions around Automation and Controls across Texas and the Gulf Coast over my 30 years in this line of work, including time with one of the biggest oil majors, and AWC tops them all," Dorman says. "Their reps are knowledgeable and consultative, responsive no matter what time of day or night, even weekends and holidays. They get me quotes on time for even the smallest projects, and always give me the best price."

Results:

Dramatic savings in costs, time, and space while improving cleanroom reliability, functionality and efficiency for customers

Lowering cost was a primary objective for G-CON and Siemens delivered. For example, Dorman estimates the company pays 75 percent less for its SIMATIC S7-1500 PLCs than what it was paying previously for a competitor's PLC. "The price savings we achieved was significant and functionality of the Siemens S7-1500 was better and in a more compact form factor, which saves us critical space in the mechanical rooms. Plus, if we need support, we can get it quickly by calling Siemens or AWC and not have to pay for it."

According to Dorman, G-CON has been able to reduce the space of its mechanical room by 30 percent, from 12 feet to 8.5 feet in length, thanks in part to the compactness of Siemens SIMATIC components and creative engineering by his team with help from AWC. "This gives our customers more cleanroom space in their PODs, which is really what they're paying for," he says. "So, Siemens and AWC have really enabled us to provide more value to them and improve the competitiveness of our offerings that much more."

The SIMATIC TIA Portal also cut programming time by as much as 80 percent compared to Dorman's experience programming other vendors' automation and controls, including competitors' SCADA and HMI systems. "First, with its graphical interface, the TIA Portal is extremely easy to use and learn, which is important to me as I tend to hire newly-minted engineers, so they don't have to unlearn old and often bad habits," he says.

"What could have taken three weeks to engineer and code in other vendors' environments takes us just three days with the TIA Portal, which also facilitates code reuse."

Patrick Dorman

Standardization's benefits. The combination of Siemens TIA components and the TIA Portal enhances interoperability and scalability, both big benefits of standardization. Dorman cites one huge project with multiple PODs that required 90 control panels, 29 VFDs, four different networks, a historian server and two SCADA servers. "In all, we had 643 I/O points, but with the TIA Portal, it was very, very easy to get all of those components talking to each other."

G-CON's PODs provide easy traceability and audit trails of their BMS/EMS systems for Title 21 CFR Part 11 compliance and similar regulations in the EU and other world regions. This saves customers time and labor by not having to log system data manually. "This lets them focus more resources on producing product breakthroughs, instead of on data entry," Dorman says.

For G-CON customers, the company's standardization on Siemens components means greater reliability and availability as well as asset utilization. "Siemens components are rugged designed, extremely well-engineered and made, and their built-in diagnostics and web server means we can get alerts if performance degrades. We can also troubleshoot issues remotely and much faster, preventing or minimizing production disruptions."

Reliability and availability of G-CON PODs to a customer's process is critical both in terms of cost and life-or-death outcomes, according to Backstrom. "For example, if a disruption occurs in a production batch, the cost can be in the millions. Even worse, if the drug is treating a life threatening illness, loss of life is possible as well because the product isn't ready in time. That's a big part of our thinking and mission at G-CON and why we consider Siemens and AWC as our strategic partners in fulfilling that mission."

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