



ADC fills market niche with standardized and highly precise testing systems

PC-based control ensures high quality products in the sporting goods industry

Earning long-term customer loyalty in the sporting goods industry requires products that perform at the highest level, every time. On part of the manufacturers, this necessitates a significant amount of product testing prior to market introduction and quality control in manufacturing in order to ensure the highest level of quality. This is where Automated Design Corporation (ADC), based in Romeoville, Illinois, USA, comes into play. As a custom automation solutions provider, ADC leverages PC-based control technology in its offering of specialized machines for testing applications in this market.



ADC decided to standardize on Beckhoff control technology with a CP6706 Panel PC as all-in-one controller and HMI, here in a custom testing machine for a sporting goods manufacturer.



ADC team (left to right): Lisa Bitsky, President; Joe Bitsky, Vice President; Robert Sleazak, Technician; Drew Slack, Office Manager; Thomas Bitsky Jr., Lead Developer; Ryan Starbuck, Machinist; Thomas Bitsky, Founder and CEO.

Thomas Bitsky Jr., Lead Developer at ADC, talks about the decision to develop test systems for sports equipment, including balls, shoes, bats, and other equipment for golf and baseball: "In the early 1990s, we discovered a niche we could fill in the sporting goods market for standardized, automated testing systems. Until then, most of the solutions in the industry were homegrown assemblies. Often, these machines had little to no documentation, creating problems in operation and maintenance, and yielding results that were imprecise or couldn't be replicated. As automation specialists, we knew we could provide the precise and consistent solutions customers needed, and back up new systems with high-quality service and support."

For that purpose, ADC developed a standard line of load frames based on PC-based control technology from Beckhoff. A load frame, in simple terms, is a platform upon which a testing assembly can be built. ADC currently offers three standard options for their load frames: the GEN IV (Compression System), which is a tabletop-based solution for pressure testing of golf balls. Next, the Compression and Tension System (CTS) is a bench-top based system with higher load capacity, which is designed for testing balls, bats and materials used in athletic products. Finally, the Size, Weight and Compression (SWC) System accurately reports the physical characteristics of any golf ball or core, and adapts to test balls for other sports as well. The advanced, floor-mounted SWC system consists of a variety of individual testing stations, and utilizes a SCARA robot to move test products from station to station.

PC-based control replaces traditional control architecture

Thomas Bitsky Jr. explains that in the early days, ADC purchased a traditional PLC, an HMI, a servo system and sometimes additional control technology from a variety of different vendors: "The first few days when starting up a project back then were spent just connecting each of these very different systems and establishing acceptable communications. Therefore, these varied system architectures would not be a viable long-term solution. Given our extensive background in software development, we decided to use Microsoft Visual Basic (VB) for automation projects to move away from the traditional PLC. We found that Beckhoff as the specialist in PC-based control technology would be an

easy fit as a supplier in this regard, because they offer an integrated solution, complementing the proprietary ADC MechLab software for test applications in an ideal way. Since then we use Beckhoff Industrial PC hardware, TwinCAT 3 as the software for PC-based control, I/O components for data acquisition and EtherCAT for communication. Moreover, we benefit from the possibility to program C++ and .NET in one environment with the control application."

ADC implements TwinCAT 3 as the software programming environment and runtime for the load frame systems, leveraging the TwinCAT 3 PLC and PLC NC/PTP packages for motion control. "Since we decided to use TwinCAT 3 and EtherCAT, seamless communication is ensured among all components. Through the use of an ADS router, TwinCAT also easily connects to custom user interfaces and third-party devices," notes Bitsky.

Benefits through openness, modularity and compact design

In order to meet the requirements for compact motion control in the small testing systems, ADC uses AM8121 servomotors with One Cable Technology (OCT), connected to EL7211 servo terminals from Beckhoff. Thomas Bitsky Jr. explains: "The Beckhoff approach with the OCT technology not only removes up to 50 percent of the cabling requirements, it also greatly simplifies installation and commissioning."

This particular machine, called the Impactor, provides drop-test data for sporting goods materials.



The rapid acquisition, transmission and storage of data are vital to the success of any testing application. Lead Developer Bitsky explains: "With sub-millisecond communication times and optimal bandwidth utilization, EtherCAT allows us to collect data from sensors at very high speeds in an ecosystem that answers all communication needs for automation." To this end, ADC integrates a wide variety of Beckhoff EtherCAT I/O terminals as well as EtherCAT Box I/O modules. "Because it is widely accepted by thousands of technology providers, EtherCAT provides the basis to connect a vast range of automation hardware. Furthermore, the ability to quickly add new functionality as needed via EtherCAT Terminals has made developing and upgrading ADC systems much easier," adds Bitsky.

The company has moved into an all-in-one hardware solution by standardizing on a Beckhoff CP6706 Panel PC. This compact device offers an integrated 7-inch touchscreen display, 1.75 GHz Intel® Atom™ processor with 2 cores and Windows Embedded Standard 7 operating system. Bitsky discusses the benefits of the Panel PC: "The CP6706 Panel PC covers all our needs, including motion control, and provides us with ample power and flexibility in a very compact package."

Lead Developer Thomas Bitsky Jr., pictured here, programs on a test rig that integrates a full Beckhoff control system. The flexibility of the automation system makes it possible to easily transfer and reuse project code on current and future projects.



The TwinCAT automation platform is ideal to support the custom MechLab software solution developed by ADC, which is used for testing applications and the user interface.

Increased functionality with reduced cost and time requirements

As the implementation of Beckhoff products has become widespread across multiple product lines, ADC realized significant user benefits. Thomas Bitsky Jr. comments: "PC-based control has allowed us to expand the capabilities of our equipment without massive investments in building circuit boards and custom electronics. We've achieved sizeable cost reductions by integrating Beckhoff solutions. Via OCT and efficient I/O systems, our cabling costs were cut in half. Construction of electrical cabinets is also faster and less expensive, as we use fewer terminals and have less to wire."

The same applies to programming and commissioning time in his opinion: "Programming now takes days instead of weeks or even months as seen previously. This enables us to focus on the parts of the machine that the user cares about most – the user interface and data collection."

Bitsky sums up the business relationship ADC has with Beckhoff: "Overall, Beckhoff has helped us standardize our equipment, which is incredibly valuable. These days, Beckhoff hardware and TwinCAT software constitute the go-to platform in all our projects. We use an economical, compact Beckhoff Panel PC for PLC projects. We lean on TwinCAT and EtherCAT for the real-time control, and then leverage additional programming options in the same environment to open a world of possibilities beyond traditional automation. This is the vision that we continue to work toward: ADC can now scale systems to suit any application, offering our customers more tightly-integrated, standard solutions while reducing our own costs and commissioning time."

Further information:

www.automateddesign.com

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