

Standard components replace specialized hardware

Advanced coating systems feature PC-based control

Semicore found that TwinCAT works well with Visual Basic (VB). They very easily created their own dynamic, event-based HMI software.



→ Semicore Equipment, Inc, based in Livermore, California, manufactures vacuum coating and etching systems for the electronics, optical, solar energy, medical, automotive, military and related high technology industries. Semicore vacuum sputtering and thin film evaporation systems provide coatings on a variety of materials including plastics, glass, ceramics, metals and hybrid substrates. Serving such a wide range of industries with a vast array of machine types requires flexible and highly scalable controls.

Semicore works with customers from the design concept stage through the machine assembly and installation stages. Semicore also remanufactures outdated machines to bring them up to speed with the latest in hardware and automation technology. Even though Semicore uses high-end technology, Matthew Hughes, President of Semicore, and Trey Haight, Operations Manager, always keep a "maintenance point-of-view" when designing systems. "We ensure that our machines perform well beyond the competition, but still have operational and trouble-shooting capabilities that are simple for users to work with," Hughes said. Semicore machines use special vacuum technology to apply gaseous or particle materials to surfaces on the outside and inside of various part shapes. These materials must be applied in chambers that are vacuumed to become free of atmospheric properties. When the chamber environments have been purified, coating materials are applied through sputtering or evaporation processes. Coating materials may include high purity gold, platinum, silicon, titanium, tungsten and many others.

Having abandoned PLCs in favor of PC-based control over seven years ago, Semicore has the experience to quickly recognize the quality industrial PC systems from the pretenders. The older PC-based Semicore systems used software coded in Flow Chart for control and in Visual Basic (VB) for Human Machine Interface (HMI). It was becoming apparent that the software platform Semicore once used was being treated as a legacy product by their vendor with little true advancement on the horizon. The software was also a substantial drain on CPU performance, causing maxed out PC processors with the inability to run other applications quickly or smoothly.

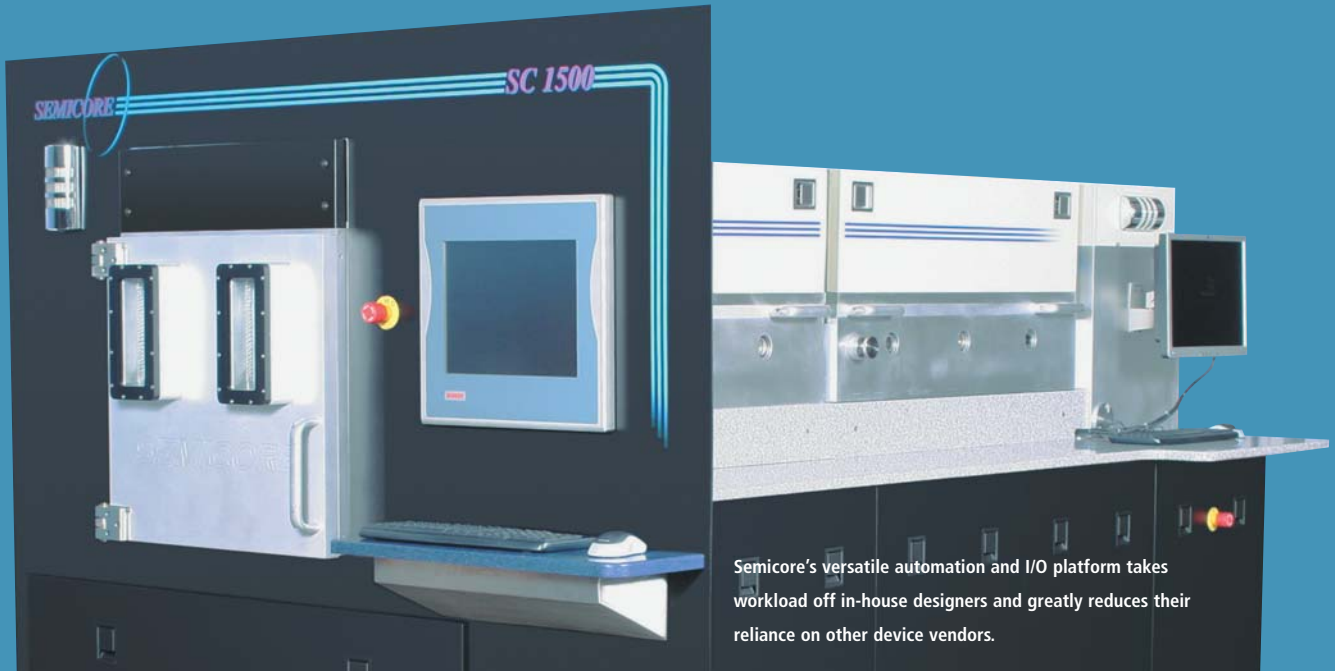


Beckhoff C6330 PCs as hardware platform for TwinCAT automation software.

New software is light on CPU load, heavy on power and features

The result of Semicore's ambitious Controls Automation Initiative and under a year of development was their advanced HMI and control package based on Beckhoff technology:

- | C6330 Industrial PCs
- | CP7802 Control Panels
- | TwinCAT PLC and Motion Control software



Semicore's versatile automation and I/O platform takes workload off in-house designers and greatly reduces their reliance on other device vendors.

- | Local Bus Terminals with BK9000 Ethernet TCP/IP Bus Coupler
- | CU20xx Ethernet Switches
- | AX2006 Servo Drives
- | AM3044 Synchronous Servomotors

The first application of the new Semicore control system was implemented on one of the most complex machines the company had ever built. "It was really a trial by fire for the Beckhoff controls because the first application was as demanding as it gets in our industry," Hughes said. "The project was to develop a brand new coating system that applied diamond-like carbon, chromium carbide and titanium nitride coating on internal surfaces." This coating method is used to increase the life of pipes used in gas, chemical and petroleum applications. "It's not difficult to apply wear and corrosion resistive coatings to the outside surfaces of pipes," Hughes said. "Coating the inside of pipes is where it gets tricky." This plasma and vacuum-based machine had high frequency control, arbitrary wave form generation with multi-channel scope feedback, and highly complex gas management functionality.

The coordinated motion axes on Semicore machines are highly dynamic and require very accurate positioning systems. TwinCAT software handles the motion of the Semicore transport and positioning systems for moving parts through the coating process. It also helped Semicore develop their HMI. "TwinCAT works well with VB – we can very easily create our own event-based HMI software," Haight said.

"Also, we went from well over 90 percent CPU usage on our old polling-based system to less than 10 percent usage with the new event-based, TwinCAT system. We're free to use a variety of other software applications without hitting CPU performance limits," Haight said. "TwinCAT has also given Semicore the ability to bring a machine from zero manual control to full manual control in hours. In our previous systems, this process could take weeks." In addition, the flexibility to code with a multi-language IEC 61131-3 programming en-

vironment saved Semicore numerous hours of programming time. "I enjoy the option to code in Structured Text over Flow Chart, since it fits my programming background," he said. "TwinCAT allows programmers to choose code languages to fit their skill sets and specific application requirements."

Standard Bus Terminals replace specialized hardware

Semicore achieved further streamlining because of the Beckhoff I/O system's flexibility. With over 200 terminal types, Semicore had access to a full range of analog and digital I/O as well as numerous special function cards that helped eliminate third-party devices and greatly reduced the required cabinet space. "There are several other examples where the flexible Bus Terminal I/O helped us fill small gaps that we normally would have to develop our own solutions for in the past," Haight said.

"Semicore continues to have a very high success rate with repeat customers," Hughes said. "The new machines equipped with Beckhoff controls have been well received and helped increase reorder rates. In addition, several companies using Semicore machines have referred us to their own customers located around the world so we've seen a great boost in our 'word of mouth' generated sales by our customers."

The PC-based controls with TwinCAT software and the streamlined wiring advantages of Bus Terminal helped Semicore greatly reduce programming and wiring time. "We saw reductions on the order of 20 percent in both programming and electrical wiring on our machines," Haight said. "This flexibility helps us reduce machine cost, but also make custom changes per last-minute customer requests. We can even create new features easily after machines have been delivered and installed on site if needed."

→ Semicore Equipment, Inc. www.semicore.com

→ Beckhoff USA www.beckhoffautomation.com