

Owens Design Makes Picture Perfect DVDs with CTC 2700 Controller

Owens Design develops and manufactures custom capital equipment and sub-assemblies for the semiconductor, data storage, and biomedical industries. They provide a complete development service including design, prototyping, volume production and sustaining services. Because the company's entire focus is capital equipment, and capital equipment is frequently a critical path item, developing projects quickly and efficiently is a top priority. But in addition to speed, the other two major project parameters — quality and cost — must also meet standards that will not only satisfy Owens Design's customers, but encourage them to return for repeat business.



The Challenge

One such customer is Optical Disc, a southern California OEM, which sells DVD and CD-ROM duplication systems to motion picture studios. To sell the DVD duplication systems, Optical Disc was providing its customers with additional equipment to create the high quality coated glass disks used for DVD masters. Three machines were needed to respectively coat, clean and bake the DVD disks, and these machines were sourced from three different vendors. Each of these machines needed to be run manually, and the manual transfers between the systems had all the inherent downtime, risk of contamination, and labor. But one of the biggest drawbacks of the three-system design was the footprint: Optical Disc's customers simply did not want to allocate the space required for three big machines that were not directly involved in generating salable product. Optical Disc decided it was time to develop their own system that combined the coating, cleaning, and baking operations into a single, condensed footprint with a single point of support, one operator, and no manual transfers between machines. They approached Owens Design with their ideas and asked for their help.

The Choices

As for most projects, Owens Design needed to devise a solution that was inexpensive, worked well, and met a tight schedule. Optical Disc had a major trade show in a few months and they very much wanted to have a prototype of the new machine ready for that event. Owens Design considered several different control schemes for the new machine, including personal computers and PLCs. The big drawback of the PC was that it was not an intrinsically industrial platform, and it needed a lot of expensive hardware add-ons, complex software development and customized integration. Multitasking and

performance were also of concern with a PC design. Traditional PLCs met many of the application's hardware and performance requirements, but they were expensive and required cumbersome ladder logic programming to address many complex, multitasking operations — a big drawback for a project on a tight schedule.

The Solution

Owens Design had used CTC controllers for several projects in the past, and they looked at them again for this job. They selected the CTC Model 2700 controller. Stephen Chu, Owens Design, senior electrical engineer, explains why: “The CTC 2700 series controller was an elegant solution to this problem, with easy to follow state programming language and fast built-in multitasking to deal with the robot, scrub/rinse, coating and heating modules individually.” The 2700 also addressed the project's needs for coordinating I/O, motion control, and serial/Ethernet connections in a single, cost-effective solution. All in all, the 2700 coordinates and controls seven axes, four of which are dedicated to a stepper-powered glass robot that moves the cassette around to the main processing stations. A low-cost monochrome CTC touch screen provides a user interface that was easy to design, integrate and operate. Randy Curtis, Vice President of Sales at Owens Design, sums it up more simply: “[CTC] was our first choice because they make it work.”

The machine, known as the LaserPrep P-4000, has a loading station, where the operator loads a SMIF pod cassette (a mini clean environment) filled with optical glass disks into the system. The operator sets the correct parameters for the job from the touch screen, either via a recipe download over Ethernet connections or manual entry at the touch screen. Once the LaserPrep P-4000 starts running, the robot sequentially moves the cassette around to the main processing stations:

- a scrub and rinse module, which eliminates any trace contaminants on the disks prior to coating
- a glass coating and thickness measurement module, which spin coats the glass with a polymer coating and then confirms that the coating's thickness meets the established quality criteria
- four separate precise temperature control chambers, which cure the coating onto the disks

Because the disks are in a closed, controlled environment, the risk of outside contamination is negligible, run-to-run consistency is maintained, and operator exposure to toxic chemicals is minimized. The complete cycle is finished in an hour with little or no operator intervention, at which time the disks are ready to unload for use as masters. Best of all, the LaserPrep P-4000 takes only 10% of the floor space required for the three previous machines.

The CTC controller was a central unit not just for control, but also for communications between several different devices and systems. A serially connected bar code scanner reads the cassette ID, while an optical measurement unit over a second serial connection reads data on the coating's thickness. These devices must be tied in with the stepper

motors in the robot, the touch screen and various I/O to enable the system to run smoothly. Batch data for the cassette can then be uploaded over Ethernet connections to other systems in the enterprise. The 2700's communications abilities enabled Owens Design to do this with an off-the-shelf package that controlled every aspect of the machine from a single, easy to build Quickstep™ program.

Because the CTC Model 2700 was so easy to program and integrate, the prototype was designed in just 2-1/2 months. After another three weeks of testing, the product was ready to ship to the customer, in plenty of time to meet their requirements to display the product at the trade show, where it was very well received by attendees.