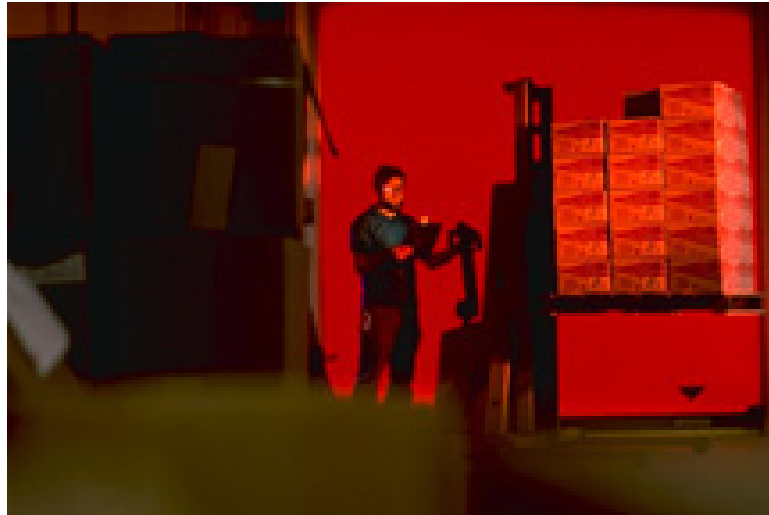


Opto 22 Systems Help Employees and Assemble Parts Correctly



Background

By converting from conventional PLCs to an Opto 22 solution, Toro Company's Riverside, CA, assembly plant not only saved money and improved efficiency, but they also sharply reduced workers' medical claims.

Toro Corp.'s Riverside, CA, plant is a fairly typical assembly operation. The factory makes sprinkler heads for lawn systems by assembling as many as 50 different plastic and metal parts to make a single product. The basic operations at each workstation (called a "fixture") are usually simple and partially manual. Workers insert parts into a fixture and the fixture performs the automated task required. The fixtures are grouped into cells and each cell typically has one Opto 22 controller. The controller polls the fixtures in succession to see when one is ready to activate.

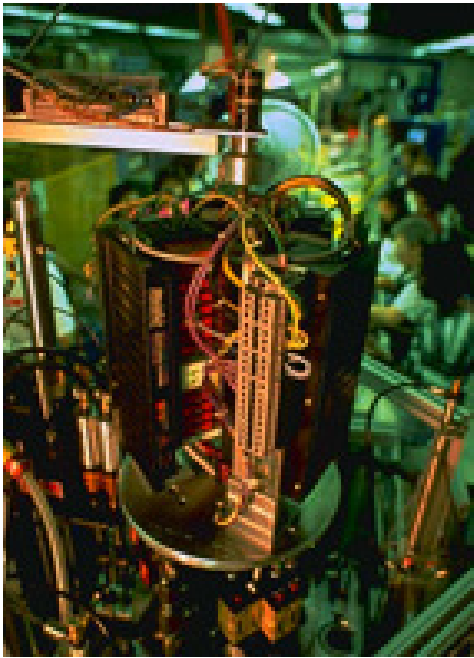
This is the kind of environment that is supposed to be where PLCs still shine: simple operations - fairly slow pace because human operators are involved at almost every step - long product runs and a product where cost is a major concern. Originally, the plant's pneumatically-operated fixtures were automated with PLCs, which was the conventional wisdom.

Toro first went with Opto 22 control systems to solve two particular problems: incorrectly assembled parts and workers with carpal tunnel syndrome from the pneumatic safety switches on some equipment.

The conventional wisdom has been superseded. Toro's experience substantiates this. By replacing PLCs with a modern control system from Opto 22, Toro not only increased productivity, improved quality and made trouble-shooting and programming the factory easier, but it also provided an additional benefit: significantly reducing medical claims by workers.

"What's really important to us as a manufacturer is increasing throughput while reducing defects," says Glenn Brauker. "The Opto 22 system is a major part of our plan to accomplish these goals." Originally, the factory was automated with PLCs. Now 70 percent of the plant automation uses Opto 22 systems, and Toro plans to convert the rest to Opto 22.

To site one example of Opto 22 benefits, says Brauker, "One product has an O-ring a little more than an eighth of an inch in diameter. The company paid extra to have them painted white and we still missed getting it on every once in a while." The factory had to test nearly



100 percent of the products to make sure they were assembled correctly.

To fix the quality problem, Toro wanted to go to a system which used electric eyes to sense whether all the parts were in place. That meant making the control systems on those stations more functional. To make it work effectively they needed more than PLCs.

Glenn cited another example. To make sure the workers' hands were cleared before a fixture cycled, the old system required the worker to press two buttons, one on each side of the fixture, simultaneously. The switches didn't take much pressure to activate, but a lot of the workers were pushing the buttons harder than they needed to, which translated into strain on their wrists. Toro's preferred solution was an electric eye system, one that simply required the worker's hands to break the beams. Again, the preferred system required changes to the control system and again Toro decided to use something other than PLCs.

To solve these problems, Toro turned to Opto 22. The results were far beyond what they expected. Not only did quality go up and medical claims go down, but

manufacturing became easier and more accurate as well. According to Glenn Brauker, the choice of the control system was actually made by the technicians who would have to use and maintain it. "I was looking at PLCs and Opto 22," Brauker says. "When I presented them to the technicians, they liked the Opto 22 programming language better because it was easier to read and easier to understand." Today, the Toro factory uses more than 20 Opto 22 controllers, each handling between 40 and 100 I/O points. The system is controlled using the Opto 22 control language and the Opto 22 MMI. The result has been dramatically improved control.

The Opto 22 control system is so much more powerful than the PLC system it replaced that each cell only needs one controller. With the old system, each fixture in the cell required a dedicated PLC. "It [the Opto 22 system] is fast enough that each of the fixtures looks like it's running on its own controller. I might have four workers sitting there and each one starts when they're ready."

For example, the controller at each cell polls the fixtures in the cell in rotation every few milliseconds to see which ones are ready to operate. With conventional PLCs this can lead to delays because of the time it takes a PLC to scan the fixtures. But the Opto 22 system is so fast there is no perceptible time delay for the workers. "Each worker basically thinks their fixture is the only one being controlled," Brauker says. "Each fixture is being looked at every 10 to 15 milliseconds. I might have four workers sitting there and each one starts when they are ready." In the case of the tiny O-ring, Toro installed electric eyes to check for the presence of the part. If it isn't there, the fixture won't operate until the faulty assembly is taken off the fixture and a good one put on. "This has increased the reliability of our product," says Brauker.

Another powerful advantage of the Opto 22 solution is the Opto 22 software. The control language not only made it easy to design and program the processes, it also allowed Toro to employ sophisticated programming techniques.

By taking advantage of the Opto 22 control software's ability to run up to 32 different programs (called "flowcharts," or "charts") simultaneously, Toro has

assigned each fixture to a different chart. All the charts are controlling the same valves and cylinders, but with different timings as required by the individual fixtures. Brauker warns, "It doesn't work real well. At each point you'd have to say, 'this is in and this is out.' It wouldn't be too practical."

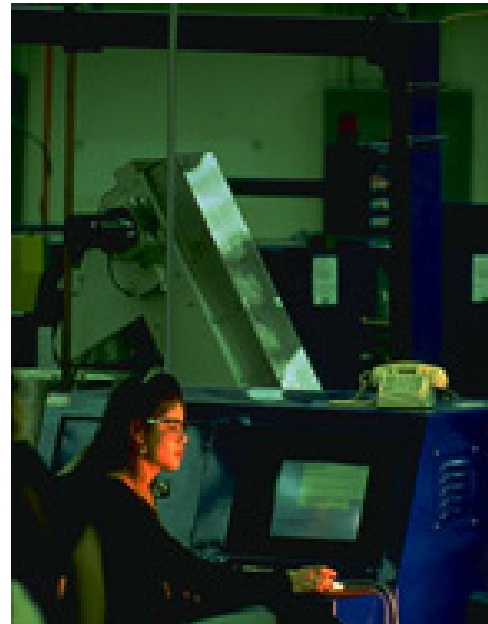
"Don't try that on a ladder logic system. It doesn't work real well," says Brauker.

The intuitive nature of the flowchart-based programming language means fewer programmer hours even for jobs like debugging. One application that takes special advantage of Opto 22's distributed intelligence involves mounting I/O Bricks directly on a turntable.

"In this case, we had to put the working station down on the table," Brauker explains. The fixture inserted a spring in a part and then held it down to compress the spring while the cover and two screws were put on. With the cover in place, the pressure is released and the part is brought around to where it is taken off the turntable. While the I/O Bricks were on the turntable, the controller wasn't. With some systems that would have meant running all the I/O wiring back to the controller - and a real mess. With Opto 22, there was only one set of wires coming from the Brain Board on the I/O Brick back to the processor carrying the data from all the I/O points.

Taking advantage of the small number of wires and the robustness of the Mystic protocol, Brauker installed slip rings to bring power to the turntable and to take the control signals off. Not only does the system work perfectly, but because the I/O Bricks are intelligent and their reaction times are short, the turntable can stop in about a sixteenth of an inch in case the system detects a problem.

Another advantage of the Opto 22 system is ease of data logging. When one process was producing faulty parts, Brauker used Opto 22's Windows connectivity to take data from I/O points in the factory and feed it to a Microsoft Excel spreadsheet on the LAN. By comparing the operators' reports on faulty parts with the logged information, he was able to trace down the problem.



"Now we can go into that fixture and start making it better," Brauker says.

About Opto 22

Opto 22 manufactures and develops hardware and software products for applications in industrial automation, remote monitoring, and enterprise data acquisition. Using standard, commercially available Internet, networking, and computer technologies, Opto 22's SNAP systems allow customers to monitor, control, and acquire data from all of the mechanical, electrical, or electronic assets that are key to their business operations. Opto 22's products and services support automation end users, OEMs, and information technology and operations personnel. Founded in 1974 and with over 85 million Opto 22-connected devices deployed worldwide, the company has an established reputation for quality and reliability. Opto 22 products are sold through a worldwide network of distributors, partners, and system integrators. For more information, contact Opto 22 headquarters at 800-321-OPTO or visit our Web site at www.opto22.com.