DON'T PASS NOTES

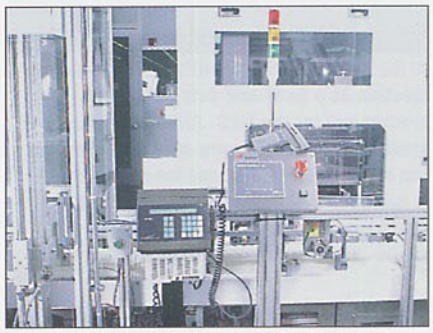
Paperless Auto ID supports high-volume production, improves productivity

The ability to automatically collect accurate, real-time data concerning high-volume production can be a powerful tool. This capability allows **HMT Technology Corp**. to meet its customers' rapid time-to-market demands. The Fremont, Calif.-based company designs, develops, manufacturers, and markets high-performance thin-film disks used in high-capacity hard-disk drives for high-end applications such as PCs, network servers, and work-stations. The company's customers are leading OEM disk drive manufacturers.

"We compete in a high-technology commodity market. Production relies on advanced technology, but the end products are commodity items," says Jeff McKay, director of information services. "Our competitiveness relies on the ability to provide rapid data flow and rapid data crunching."

This year, to improve its competitiveness, the company opened a highly automated fab facility in Fremont, Calif. Plans to further automate the new facility, which runs concurrently with an older, less-automated fab facility also located in Fremont, called for a paperless data collection system.

At the older facility, a paper-based traveler—each order's job packet—is routed through production with the order. Operators hand-write historical documentation, such as which toolsets were used and the results of various activities, on the travelers. Eventually, that information is manually entered into the company's manufacturing execution system (MES). HMT's goal for the new fab facility was to implement a system that would automatically record this information and send it to the MES, thus eliminating the manual documenting and keyboarding procedures and providing up-to-date production information.



In automated production, terminals at each work cell allow operators to read bar codes on transport cassettes to change tool settings, identify lots to the manufacturing execution system for routing, and query the system about lot information.
(Photo courtesy Foto F/X, Les Baldwin)

To achieve that goal, the company began work with **Redline Solutions**, Santa Clara, Calif., a systems integrator specializing in Auto ID applications. "We help our clients analyze problems and guide them to solutions. Sometimes we do the implementation; other times we put tools in the users' hands and help them out as needed," says Todd Baggett, Redline's president. "HMT knew what it wanted to do, which was to eliminate the use of paper-based travelers. But they didn't know what all the necessary components were, so our role was that of consultant and supplier."

Put the pieces together

After analyzing its requirements, production processes, and available technology, HMT implemented an Auto ID system to track manufacturing lots through production. It includes Linx III Model 2 industrial terminals from **Linx Data Terminals**, Plano, Texas; fixed-mount scanners and guns from **Symbol Technologies**, Holtsville, N.Y.; and bar-code printers from **Zebra Technologies**, Vernon Hills, Ill. The data collection system interfaces with MESA, an MES from **Camstar Systems**, Campbell, Calif., that runs on an IBM AS/400 midrange computer.

Integration between the data collection system and the MES allows operators to verify production routes for manufacturing lots and record the results of various quality tests. For example, Linx terminals at each work cell either read the bar code or a radio-frequency (RF) ID tag for each lot and determine if there is work to be done at that cell. If so, it routes the cassette—the material holder—to the appropriate workstation. If no work is needed, it routes the cassette to the next workcell.

The system's main benefits, HMT's McKay says, include: 1) the use of paperless travelers; 2) highly accurate data collection; 3) real-time data entry; 4) data collection speed that supports high-volume production; and 5) support for physical automation—conveyors and robotics—by precisely identifying each lot, allowing the system to follow customized lot procedures.

"This application is about as sophisticated as it gets," Baggett says. "In the past, all documentation was handwritten on the paper traveler and then keyed in later, which created delays. Today, operators have control over what's going on, and can track material and lots in real-time. They get a true picture of what's happening right now. If product fails a quality test, an operator has the capability to immediately determine what the process was for previous lots and determine what has since changed," he says.

The system at work

"In some ways, this is more of a continuous process than a discrete process," McKay says. "We produce several types of products as a percentage operation. Of, say, 100,000

Jim Fulcher
Associate Editor

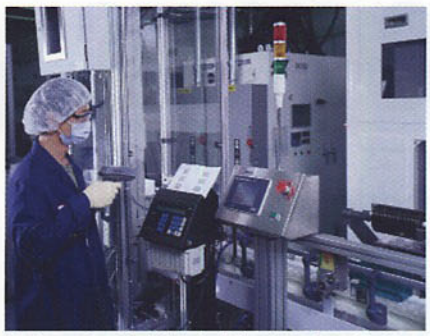
disks to be produced today, X percent will be one type, Y percent will be another type, and so on. Those percentages change depending on what products we need."

Substrates to be used for the disks either are acquired from other suppliers or produced at the company's facility in Eugene, Oregon. They are loaded into bar-coded cassettes for transport to either of the Fremont fab facilities. Once at the automated facility, the cassettes are automatically scanned as they pass down a conveyor before they are transferred to a transport cassette embedded with a read-write RF ID tag from **Omron Electronics**, Schaumburg, Ill. This transport cassette withstands the wet environments of various process steps.

In the automated process, a local area automation controller at each step knows what product types it is producing and testing. It also verifies that each tool is configured correctly for scheduled production. RF readers placed at strategic gateways monitor the progress of each lot as it moves through the processes.

Once the wet processes are completed, the disks are transferred from the transport cassette to a bar-coded shipping cassette. The bar-code information includes lot ID information that the MES associates with historical data.

The Linx terminals function as a front-end data gathering mechanism for the MES. As such, they allow operators to query the system about a given cassette, select processes to perform, and update lot status. The use of bar- code menus allow operators to quickly move through program options.



At the automated fab facility, data terminals function as a front-end data gathering mechanism for the MES. Although automated production doesn't require operators, they can use hand-held scanners and the data terminals to query the system about a given cassette, select processes to perform, and update lot status. *(Photo courtesy Foto F/X, Les Baldwin)*

Tracking lots through production allows the MES to maintain records for each disk's entire life cycle. The records begin with whether or not the raw materials came from HMT or outside suppliers, the lot the disk came from, the product type it was produced as, date and time indications for various production processes, and information about quality tests and results.

"The new fab facility is much more automated than the older facility. That level of automation requires fewer operators, and they largely are responsible for watching SPC charts," McKay says. "They make adjustments when there are problems and they do some maintenance work to the tools, but all the shop-floor data entry they used to do is now automated."

Recognize the benefits

The use of an automatic data collection system provides HMT with accurate and timely shop-floor information, and also allows shop-floor personnel to focus on quality and productivity.

"We run 24 hours a day, seven days a week. When the line is running, money is coming into the business," McKay says. "This new facility is now much more productive than a less-automated facility because it keeps running and operators don't need to stop and enter information about production."

With continuous operation, it is critical for the data collection system to be running at all times to record production results, McKay says. This system provides a real-time interface between data collection in the fab and the MES system. And yet, data also continues to be collected even if the link between the AS/400 and the automation systems is down. If that happens, the collected data then passes on to the MES once the link has been re-established.

"Even though the MES is down for a few hours each month for routine maintenance, the data collection system keeps running," McKay says. "To the operators and equipment, it looks like the MES is running because data is still being collected."

And because the AS/400 connects all the facilities, "we also need to be sure that if a backhoe severs the network line somewhere, it doesn't stop production at the fab facilities. This architecture offers that insurance," McKay says. "We're proud of the data collection and execution systems' robustness. Machines and robots go down, but these systems keep running.

"If you walk through the two facilities, it's clear that automation is the way of the future. We need to be better and faster than our competition," McKay says. "It's also important to stay ahead of them without spending a lot of money doing it. These systems give us that opportunity."