



# CNC Can Mean a JOB

GEORGE KLEIN

**Many correctional facilities have workshops that produce furniture, signs, cabinets, and other items that are typically sold to government agencies or nonprofits. The primary goal of these operations is usually to provide training and rehabilitation to inmates. However, these workshops normally operate without any funding from government so they must be efficient to be commercially viable. A number of facilities are addressing this challenge by utilizing computer numerical control (CNC) equipment to increase inmate productivity while also giving inmates marketable skills by teaching them to use equipment commonly used in private industry.**

Vermont Correctional Industries (VCI), Newport, Vermont, and the Wisconsin Department of Corrections Fox Lake Correctional Institution and Stanley Correctional Institution are State enterprises that accomplished both goals by equipping their workshops with the latest CNC equipment.

## Vermont Case History

VCI Newport has been producing furniture for Vermont State agencies, municipalities, and nonprofits since 1994. Its CNC machining is a partnership between Community High School of Vermont (CHSVT) and VCI. CHSVT is the country's only accredited high school within the Department of Corrections, and inmates earn vocational course credits toward their diplomas by taking the CNC courses offered by VCI.

VCI operates independently, much as a business does, outside of the department's General Fund appropriation. All of the State staff, inmate workers, and costs of production are paid from the sale of goods and services. By law, VCI's customer base is limited to Federal and State agencies, municipalities, and nonprofit organizations. These restrictions represent a compromise between the important goals of protecting private companies from unfair competition and providing meaningful work and job training to help offenders succeed when they return to their communities.

The furniture shop originally used only table saws and bandsaws to produce work zones, base cabinets, wall cabinets, storage cabinets, etc. Traditional methods require considerable amounts of time to perform more complicated jobs. For example, a corner work zone has a corner top with a 45-degree angle cut into

it. Inmates cut a 48-inch square piece on the table saw, then move to a bandsaw and rough cut the 45-degree angle. Finally, they attach a straight edge to the piece and run a router along it to generate a clean surface on the edge. The entire process takes about 45 minutes.

Another job that is difficult using conventional methods is producing an L-shaped top for a smaller work zone. Inmates cut two rectangular pieces and use "dogbones," to fasten them together. This process takes 30 minutes and produces a work surface with a seam. One more example is producing the sides of cabinets. Inmates cut a piece to dimension on the table saw, move it to another machine to drill 32 millimeter (mm) holes for adjustable shelving, and then finally move it again to a dado saw that cuts dados for fixed shelves, backs, and bottoms. The entire process takes approximately 90 minutes to produce the two sides of a cabinet.

Michael Lacoss, Jr., the Vocational Coordinator for CHSVT, says his organization found it difficult to stay competitive using traditional manual woodworking methods. He says he was also concerned that with industry rapidly moving to CNC machines, inmates were learning skills that would be obsolete in the outside world. Lacoss used the Internet to research CNC machines designed for woodworking. He selected a CNC router that offered a 48-by-96-inch table suitable for furniture making, high accuracy, and rugged construction at an economical price. The router has ball screws on all three axes, offering smooth motion, a high level of accuracy and repeatability, and minimal maintenance. A closed-loop servo control system provides constant position feedback, higher power, and smooth continuous motion, which eliminate the possibility of losing position in the middle of a part.

Lacoss says the CNC router substantially reduces the time required to complete the difficult jobs mentioned previously by cutting com-



Figure 2. Corner top produced by VCI Newport.

plex shapes in a single motion and changing tools when needed to cut the complete part in a single setup. The router cuts the angled desktops for work zones in only two minutes and also cuts L-shaped hutches and desktops in only two minutes. The router produces cabinet sides in 10 minutes, using a five-station tool changer to switch from a 32mm drill to various size cutters. The router cuts L-shaped desktops from a single piece of wood so the seams are eliminated. Accuracy is also much better with the CNC router. "These time savings have made Vermont Correctional Industries more competitive, helped win new business, and quickly paid for the [CNC] machine," Lacoss says.

Just as important as the economics is the fact that inmates are learning skills that are in high demand in private industry. A recent article in *Forbes* magazine (Maynard, 2012) stated that:

While the easy jobs are gone, there's one skill applicants can learn that will get them an offer from any manufacturer across the country—and most likely, around the world. People who can run CNC machines can write their own ticket, as Dustin Dwyer of our Changing Gears public media project found out... Graduates of places like Grand Rapids, Mich., Community College can earn double the minimum wage, and as much as \$80,000 a year—without a four-year degree.



Figure 1. Techno machine cuts an octagonal tabletop and rectangular tops at Vermont Correctional Industries.

Lacoss adds, "The guys who show interest in learning how to run the CNC are really excited by it. By learning CNC they are gaining the potential to earn a substantial income on the outside."

### Wisconsin Case History

The Wisconsin Department of Corrections purchased a CNC router for its Fox Lake Correctional Institution in 2005 and another one for Stanley Correctional Institution in 2011. These woodworking shops produce furniture and signage for State agencies, universities, the Department of Natural Resources, and the correctional system itself.



Figure 3. 3D sign produced for Wisconsin state agency at Stanley Correctional Facility on Techno CNC router.



Figure 4. Another 3D sign produced at Stanley Correctional Facility.



Figure 5. Layered sign produced at Stanley Correctional Facility.

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"I thought it would be beneficial to the inmates to learn how to program and operate machines that are used in private industry to produce a wide range of metal, plastic, and wood products," Pepinski says.

Stanley Correctional Institution brings in trainers from First Technology, Mukwonago, Wisconsin, to teach inmates how to program and operate the CNC router. The training is based on the introduction to CNC curriculum provided with

the machine. The curriculum offers a number of project-oriented lessons that walk the student (or teacher) step-by-step through the use of the CNC machine, how to fixture parts to the machine, and even how to use the accompanying software.

Inmates begin operating the machines after their training is complete. Those at the GED level take about six months to become proficient at operating the machine and another six months to become

skilled programmers. After the inmates become experienced, a new inmate is rotated into the group and trained by the others. Civilian shop specialists also work with the inmates to help them overcome difficulties. Many inmates are so interested in learning to operate and program the machines that they take manuals back to their cells to study in their spare time.

"The CNC equipment has given us the opportunity to create new product lines by creating 3D [three-dimensional] signs that are much more complex than what we could do in the past," Pepinski says, adding that the sign shops at the two Wisconsin correctional facilities produce a wide range of signs with 3D lettering, logos, and images. For example, signs for the Department of Corrections incorporate a 3D version of the Department's logo. Inmates made a 3D plaque to honor a small child with a serious illness and the child wrote a letter thanking the inmates involved. The CNC router has also substantially reduced the time required to produce simpler 2D geometries such as furniture components.

"CNC machinery has helped take our prison workshop to the next level by increasing productivity, enabling us to build more complex products, and providing inmates with skills that are in demand on the outside," Pepinski says. ■


#### Reference

Maynard, M. (2012, March 14). The one skill that will land you a job in any factory, anywhere. *Forbes*. Retrieved from [www.forbes.com/sites/michelinemaynard/2012/03/14/the-one-skill-that-will-land-you-a-job-in-any-factory-anywhere/](http://www.forbes.com/sites/michelinemaynard/2012/03/14/the-one-skill-that-will-land-you-a-job-in-any-factory-anywhere/)

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(Porter, ten Brinke, Wilson, 2009)

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