

Philip Ashley (2002) **CNC Manufacturing, it all comes down to knowledge.**

There is no trick or secret formula to successful CNC manufacturing. It all comes down to knowledge and how this is applied in the high-tech workplace. Knowledge of your materials; your cutting tools; your processes and your products are important factors in a successful CNC manufacturing environment.

The materials you use have properties that affect the way you process them. Solid wood is used much less today than even a few years ago but those manufacturers who still use reasonable amounts of solids certainly know their materials well. These properties affect the speed at which cutters can be set to remove material, what type of cutters you need and the way the wood is held onto the machine table. Other materials include manufactured board, plastics and non-ferrous metals and there are tools and methods best suited to these "alternative" materials.

The cutting tools you use are a major factor in the success of your CNC operation. Tools designed for CNC manufacture may be more expensive, but over a period of time pay for themselves many times over. Speed of cutting, efficient chip removal and long life under programmable conditions are all factors. The knowledge to apply these expensive and efficient tools to the materials is vital in extracting the very last dollar of value from your investment. Your supplier can help you get the most from this commitment that should equate to between ten and twenty percent of your CNC machine cost.

The way you process your materials is another factor in how well your CNC installation is performing. Processing includes your machinery and the way this is used. It includes your use of jigs or fixtures, how these are made and how effectively the product is held while it is being machined. Processing also includes how well the CNC machine fits into your existing production line. Many new CNC installations are simply squeezed into the most convenient space and this never allows for its efficient use.

The components you make and the design of your product, or the way they fit or are joined together will also have an effect on your success as a CNC manufacturer. Design can be an effective way of luring the consumer back to Australian-made product, but if the design cannot be made effectively with modern machinery, then the high cost will undo all your good intentions. Furniture designers do need some knowledge of CNC machinery and someone in your company will be skilled in the most efficient way of taking a new design through to the (CNC) production stage.

The bottom line in any CNC manufacturing installation is the operator and/or programmer of your equipment. These people can make or break any business. It is a fact that the furniture industry in Australia fails to attract the right young people! The fault begins in the secondary colleges where the career councilor

takes a group of students to a factory and says, "This is where you will end up if you don't do well." The Government's policy to keep students in school longer has not helped. Any young person leaving school at year twelve usually has "higher expectations" than a trade, and often cannot live on the apprentice wage offered now that a vehicle and other life expenses are involved.

Mature workers seem to be a good option for today's modern manufacturing solutions. This will be someone with a good employment record, reasonable computer skills, problem-solving and organisation skills and looking for a future with career-options. TAFE colleges must look at the way CNC training is offered to industry and develop a way of delivering work skills at a time when the employees and employers can best afford it, at a price that is acceptable to a struggling industry.

Four steps to successful CNC production.

Step one is to determine how the part will be made on your CNC machine. You will need to think about the geometry of the part, how it will be held on your machine table and how it will be processed. This means that the order of processing must be worked out to effectively machine the part in the shortest possible time while maintaining a consistent acceptable quality. Acceptable quality means what the customer will accept and may not be the best you can achieve. This is referred to as "fit for purpose" manufacturing. The tools you will use and the cutting parameters (feed speeds, depth of cut, tool data etc) need to be known at this stage. The limitations of your machine will determine what you will be able to achieve and how long this will take. A clever programmer will be able to get the best out of any CNC machine.

Step two is to create the program to control the machine movements. This often only extends to the use of the program supplied with the machine and it is here that problems and delays can occur. The use of a CAD design program can double the effectiveness of any CNC machine. The CAD program output can be converted to the file format used by your machine and then processed in the usual manner. Alternatively the CAD design can be processed using CAM software and run directly from the hard drive of your CNC machine. This requires that a post-processor be written to add the codes your machine needs during the CAM processing of the CAD design. CAD-CAM and a post-processor may cost ten thousand dollars but this is a sound investment in the performance of your CNC machine and in reality is only a small percentage of your initial machine cost.

Step three is to conduct a trial run. This includes making any jigs you may need, installing and testing effective cutting tools and determining the quality of finish produced. At this stage your programmer needs to think about the sequence of machining and how efficient this really is. Safety will come into their thinking at this point. In addition to the actual program, the loading and unloading of the

machine including the optimum location of the pallets or trolleys will shorten your production time.

Step four is to document everything you do. Documentation includes production drawings, the tools and tooling information used and any notes you may need so that the next time you set up the same job all the information is available and you are not doing everything again. Documentation is also important in advising the person feeding the machine of the machine cycle, the materials to be used and what to do with the finished product. Errors or problems encountered in the initial setup should be recorded so that future setups can be completed efficiently. If the same problem occurs again it can be easily identified and fixed.

Once your machine is running there is still some work to do to keep it up to speed (so to speak). Your operator should observe the movements of the machine and check for any irregularities. They should listen to the sound the cutters make, as this is usually the first indication that there is a potential problem. They should look closely at the loading and unloading operation, seeking a more efficient solution. A most important function of the operator will be to look at machine stoppages and downtime. Every time your CNC machine stops it is costing your company. Good forward planning should ensure this does not happen, but the last person to affect this is the operator so he/she is more important than is usually realised.

Philip Ashley is Manager of the Furnishing Industry Training Centre at Holmesglen Institute, Melbourne.