

# Choosing the Fastest CMC

By Jim Parrie, CPF, Ph.D.

*There's much more to the true cutting speed of a CMC than the number of inches it can cut per second*

Throughout the West Coast Art & Frame Show in January attendees were asking, "Who has the fastest mat cutter?" This question of speed is understandable, but it is one that doesn't have a simple or obvious answer. Cutting speed is often regarded as the



The Plus-is from Valiani is an electronic automated CMC designed for round-the-clock high-speed cutting, with rapid blade change and a mat stylus for French lines.

most important feature when determining cut time by many production framers. They think of cutting speed strictly as a function of the traveling speed of the cutting head and gantry. However, there is more to the true cutting speed of a mat cutter than the number of inches per second a head can cut. Based on visits and work with hundreds of production facilities over the past few years, here are a few important points to consider.

When analyzing the cutting speed of a CMC, what is most important is the number of mats that can be cut within a given time period, which is sometimes referred to as production speed or cycle time. Looking at the entire cutting process, the head speed is only a small part

of the total production speed equation. Factors to consider when looking at production speed are:

1. *Production type* - Are you cutting high volume customs, low volume customs, or high volume duplicates?
2. *Head zero homing time* - The amount of time it takes for the head to get back to the starting position after completion of the previous cut cycle.
3. *Gantry travel speed* - The travel speed of the gantry along the X-axis measured in inches per second.
4. *Head speed* - The travel speed of the cutting head along the Y-axis measured in inches per second.
5. *Cut initiation time* - The amount of time from the moment the operator decides to begin cutting a particular order until actual cutting begins.
6. *Data entry time* - The amount of time it takes an operator to enter the appropriate manufacturing data.
7. *Changeover time* - The amount of time necessary to change materials between cutting operations.
8. *Blade change time* - The amount of time it takes to change a blade; this includes all blade changes in a production shift.
9. *Downtime* - The amount of time a machine is down due to systemic issues, such as software bugs, mandatory maintenance, etc.

## *Production Type*

The type of production you are running, custom versus volume, affects production time. When producing large quantities of custom items, there can be more time devoted to material changes and machine set-up. High volume custom mat cutting generally comes into play for chain operations, e-commerce sites, and OEMs building units

for trade show orders, such as High Point. Therefore, before evaluating CMCs, determine the number of times you must change job specifications between cut cycles. That will give you an idea of how many times materials will be changed out, data inputs will need to be made, and potential physical machine setup alterations like a head change will need to be made. Also before evaluating CMCs, measure the time interval required to place materials on the CMC, complete the cutting cycle, remove the cut materials, and be ready to begin the next job. This “changeover” time will be affected by not only the head speed but also by how long it takes to:

- Change out materials
- Change job specifications (data input)
- Change head
- Replace blades
- Remove debris

Changeover time and employee idle time (the amount of time an employee may sit idle while waiting for a machine to complete a cycle) can be reduced by using a double-bay machine (which allows two separate jobs to be setup simultaneously on one machine). An alternative is to use two or more CMCs per operator. An operator can reduce changeover time by loading one machine or bay while the CMC is cutting another job. In choosing, consider the cost of purchasing two less expensive machines versus a single double-bay machine. Also, if you are operating a single double-bay machine and that machine goes down, you will lose all of your

cutting the same size multi-opening mats. If you cut a large volume of single opening mats, a double bay machine may be too fast because a single operator cannot keep up with the machine. Some double bay machines have such a fast gantry and head speed that it takes two employees to run the machine. That's why it's important to determine if there is a true cost effective-



*The Wizard 9000 is a heavy-duty CMC that features multiple blade cartridges as well as the new pen cartridge to provide speed and versatility.*

ness of buying a double-bay machine. Just as a CMC has a maximum production speed, so does an operator. In some cases a high-speed CMC can out-produce an operator, requiring either an additional operator or not using the machine at its true performance specifications.



*The Zund 1600 is a high-end machine featuring a vacuum table that can make bevels, straight cuts, and French lines with one cutting head.*

production capacity. If you use two or more less-expensive machines and one machine goes down, you will only lose a percentage of your mat production capacity.

The type of mats you are cutting can affect measured time. If you are cutting 16”x20” single-opening mats, you will have a faster cycle time than if you are

### ***Homing Speed***

With some CMCs, production time can be decreased because the cutting head must re-zero or return to home. Head Zeroing or Homing Time refers to the amount of time it takes a cutting head to return to 0,0 on the X- and Y-axis (often referred to as “Home”). While some cutters begin cutting without the head returning to 0,0; other CMCs require the CMC to return to home at start-up—often referred to as initialization. Homing time can add up to 5 to 10 seconds of production time on some machines. CMCs that require the head to initialize for each cutting cycle consume valuable time. If it requires an extra 10 seconds and you do this process 200 times per day, five days per week, that is a total of 10,000 seconds or 2.77 hours per week. If this machine is operated by a single operator, then that operator has 2.77 potential idle hours per week. At \$12 an hour, that equates to \$33.33 per week or \$1,666 a year in idle time. This must be compared for all CMCs under consideration. You need to add the cost of homing time to the cost of a machine over its lifespan when determining if a machine is cost effective.

The zeroing of the head on every cut is just one factor among many when analyzing a machine. Do not eliminate a machine on that factor alone, but use it to calculate the true cost of a machine. If the idle time is \$1,666 per year, for example, but the cost difference between the two machines is \$30,000, then the breakeven point is 18 years. In such a case it would be cheaper to operate a less expensive machine for 18 years even with its slower production speed. Making a CMC purchase decision requires combining metrics studies with cost analysis and carefully examining a machine's features.



The Gunnar 4001 is made for high-volume framing operations, with dual cutting heads, fast linear speed, and dual clamping system.

## Data Entry

One of the most time-consuming and error-prone aspects of mat production is data entry. There are two basic methods of transferring manufacturing specifications into a CMC—manually and electronically. For manual entry, production personnel read a work ticket or cut list and then enter the specification into the CMC software by hand. Manual data entry time is a function of the number of data entry steps in the CMC software and the complexity of program initiation.

Prior to purchasing a CMC, it is advisable to get a copy of the operating system to determine its ease of use, the number of steps needed to enter the cutting specifications, and the probability of error. Count the number of steps required to initiate the cutting action and the required time until the material is cut and the changeover is complete. In a perfect world, orders come into a CMC electronically from a server, an employee will scan a bar code, and the order will appear on the CMC. An employee should be able to visually verify the order and then click cut.

Here is the minimum number of steps to produce a mat using current technology; anything beyond this increases cycle time and the opportunity for error:

1. Scan bar code to access order
2. Order appears and employee visually verifies specifica-

- tions and mat color
3. Employee places material in cutter
4. Employee initiates cutting process with the click of one button
5. Machine cycles
6. Employee removes materials
7. Machine is ready for next order

Cycle time is increased in each of these seven areas when there are machine or software limitations. You need to determine the cost of those limitations over the life of the machine and then determine which machine provides the greatest value for the price. For example, ask the following for Point 1 (scan bar code for order):

- Does this CMC integrate with production software?
- Can I electronically transfer cutting and material specifications?

If the answer is “No” to either question, then there will be a higher labor cost associated with that process. You need to calculate that cost and see what investment would be needed to offset that cost. If you are not using manufacturing (production) software, then you are not operating as profitably as you can.

Software is an important but overlooked part of running a CMC. Company owners spend hours conducting due diligence when purchasing a CMC to make sure they get the fastest and most efficient machine, but they rarely do the same for production software. (I personally cannot conceive of running an efficient and profit-maximizing production facility from Excel spreadsheets or a manual system.)

Point 4 (employee initiates cutting process with the click of one button) is where many CMCs tend to increase in cycle time. Some CMCs do not truly integrate with production software but merely invoke another file. For a CMC to be truly integrated, manufacturing data should pass from the manufacturing software database to the CMC software, with the CMC software ready to cut with one mouse click.

Check with the CMC manufacturer and the production software developer to see how the manufacturing data is passed between the systems. Most CMC manufacturers do not write (develop) their own manufacturing software; therefore an interface is required. An interface is a small program that translates the information from one program into terms that another program will understand. Interfaces can provide an effective transmittal of data; however, not all CMC programs interface effectively with certain manufacturing programs. The point is that you cannot assume that you are truly integrated unless you examine the data transfer.

## Blade Change

All CMCs require blade changes, but blade costs are far from being the only consideration. You also want to con-

sider blade life, blade change frequency, and blade change time. Blade life is important not only because it directly affects annual blade costs, but also because it affects the frequency of blade changes. Suppose one blade lasts 50 mats and costs 10 cents while another one lasts for 100 mats but costs 25 cents. At first look, the cheaper blade costs less. When you consider the added time an operator spends in changing blades twice as often, however, then the more expensive blade actually costs less.

To know how much you save by reducing changing time, calculate the time it takes an operator to change blades and then multiply that by operator labor costs. Then factor that into your overall blade costs. The next time you're watching a CMC demonstration by a manufacturer, ask to see a blade change and time it. Do not consider just the blade change time all by itself, but also ask these questions:

1. Does the head have to return to home for changing? (That increases the time.)
2. Can you change the blade in the middle of a cut cycle or does a CMC have to complete a cut cycle first? (If the answer is "No," then you may damage added material if the blade goes bad during a cut.)
3. Does the machine prompt you prior to the beginning of a cut cycle to tell you that a blade is nearing the end of its useful life? (If the answer is "Yes," then you minimize the possibility of ruining mats with dull

blades.)

4. Are any tools required? (There is always a possibility a tool will be lost.)

5. Can cartridges be preloaded to reduce blade change time? (An operator can reload cartridges during a cut cycle.)

Blade change is important in the overall production speed of a CMC because it affects production time. The more times a blade must be changed, the more there's a corresponding increase in production time.

### *Downtime*

Machine downtime is an often-used term, but what exactly is it? Is it when machine maintenance is being done? When a machine is broken? When a machine is sitting idle awaiting an operator to initiate a procedure? The answers are Yes, Yes, and No. Downtime generally refers to the period when a machine is not processing raw materials due to machine failure, breakdown, or maintenance. Because a CMC contains a computer and software, downtime for a CMC also includes software and computer hardware failure, upgrades, and maintenance. On the other hand, delays caused by a machine awaiting operator action are considered part of regular production cycle time.

The first step in managing downtime is to investigate the frequency of maintenance, how long maintenance takes per occurrence, and who performs the main-



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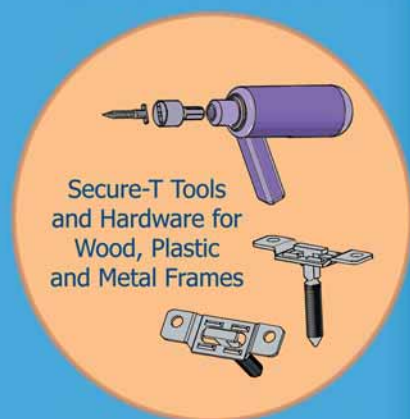
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tenance. First, calculate the cost per maintenance not only in the terms of actual labor and parts but also in the amount of production time lost. How many units could you have produced in the time it took to do the maintenance? Some machines require more maintenance than others, and there is a cost associated with that. You then need to determine if the price difference of a comparable machine is offset by maintenance costs. If maintenance and repairs can be done by your staff, the costs are much lower than if they must be done by a factory technician.

Since CMCs use computers and software, you should determine:

- The frequency of software upgrades. (All software gets bugs; the more frequent your upgrades, the quicker those bugs can be fixed.)
- The size of your technical support and service department.
- If the software is written in-house or outsourced to a third party. (Remember, third party vendors may start finger pointing if there is an issue.)

In an ideal world, you should be able to make repairs using in-house labor and have any needed replacement parts shipped to you next day. Equipment and software used in a production environment will require maintenance, and it will fail at some point. Consider what that will cost you in hard costs as well as in

production loss and general grief.

Also consider maintenance and repair costs over the useful life of the machine. Some CMCs require component replacements like cutting heads several times over a machine's useful life. Component replacement increases the lifetime costs of a machine while it also adds to the length of service; both factors influence your long-term return on investment.

### *The Big Picture*

When looking at production speed, keep in mind that there are far more factors to consider than just the speed of the cutting and the gantry. Look at what you produce and how many of those items you need to make in a year. Whether it is homing time, cut initiation time, blade changing time, or equipment downtime, consider all of the pertinent factors when determining the true speed of a CMC. The head may move fast, but remember to take all the factors into account when making a decision about which CMC to buy. ■

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Jim Parrie, Ph.D., CPF, a 30-year veteran of the framing industry, has owned and operated small frame shops, galleries, and wholesale operations to high volume OEM facilities. Currently, he owns Millennial Technologies & Consulting International, a consulting firm to high volume framers, retail chains, and manufacturers throughout the world.



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