Igniting Your Manufacturing Business

An action plan for using proven CAM software technology to ignite the immediate and long term success of your manufacturing business

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The Future of Manufacturing Depends on Who You Talk to

Version one goes something like this:

"In America today, manufacturing is no longer a viable business. New contracts are difficult to obtain because low-cost offshore competition is too stiff. Customers who do remain are increasingly raising the bar in terms of quality, pricing, and delivery expectations. Modern equipment is expensive and technically difficult to implement. The average age of skilled workers is so high that more than half of the current workforce will retire in the next ten years. It is nearly impossible to find and hire sufficiently trained workers. If you train them yourself, they leave you and find work for a slightly higher salary with a competitor who didn't pay for the training."

BOTTOM LINE: Pessimism

Version two is very different:

"As more and more companies start to recognize and embrace technology, they will realize they are more capable and we will see America become more competitive. A recent article in the LA Times said, "U.S. manufacturing in the past decade has become much more competitive compared with low-cost manufacturing rivals. U.S. factories can make goods at the same cost or even cheaper than those made in Eastern Europe…"

Better still, a headline in Fortune Magazine (March 31, 2016) confidently predicted "The U.S. Will Surpass China as the No. 1 Country for Manufacturing by 2020." In spite of many of the impediments mentioned above, some manufacturers are learning that they can harness technology to obtain competitive advantages and grow their businesses."

BOTTOM LINE: Optimism

The Future of Manufacturing Depends on Who You Talk to

So which is it going to be for your manufacturing business?

If you subscribe to *Version One*, there is no need to read any further. Just keep doing what you have been doing and this vision will manifest itself without any additional effort.

On the other hand, if you favor *Version Two*, some hard work is required, as it is in any successful endeavor. A big part of that effort is learning how to best take advantage of proven CAM technology to dramatically improve productivity while reducing lead times and operating costs. This whitepaper outlines some of the CAM tools and processes many manufacturing businesses have already adopted to "out-machine" their competition and grow their businesses.

The following pages will outline simple steps manufacturing businesses can take to achieve productivity increases along with total cost and lead time reductions by using their computer aided manufacturing (CAM) capabilities more effectively.

These steps include:

1 Opening Moves

2 Implementing relentless "Post and Go" CNC machining on the shop floor

3 Ingraining a technology-based mindset throughout your business

4 Use training as a tool

5 Taking better advantage of the CAM capabilities you already have

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# 1. Opening Moves

Start from where you are.

If you have read this far, chances are your manufacturing business falls into one of three categories regarding your effective use of CAM software:

A Your machinists have been manually programming at the machine or using a very basic CAM software package, and this approach now limits both your shop's productivity and the type of work that is available to it.
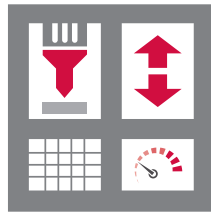
B You have installed or are about to install new equipment and are planning to implement more sophisticated manufacturing processes. You need software that offers broad capabilities, which will allow you to take full advantage of your new systems. It has to be powerful, but also easy to learn so you can get up to speed quickly.

C You have been a CAM user for a while now, but have not stayed current with all of the advanced capabilities that have been added to the package with each new product release. You suspect that you might be leaving serious money on the table, and you need a methodical approach for discovering which of these capabilities might be most beneficial to your business, and how to implement them effectively.

Come up with a plan.

You don't have to do this alone. Most CAM software is sold and supported by local resellers. These are independent businesses that know and understand the local market and its needs. They roll up their sleeves and delve into the intricacies of manufacturing businesses of all types and sizes from big auto and major aerospace manufacturers to job shops of all sizes. They partner with their customers (as well as CNC equipment cutting tool and equipment suppliers) to come up with sensible CNC manufacturing process solutions tailored to their customers' specific needs.

You don't have to do this alone. Your nearby CAM representative is ready and able to help.

Before they make a software recommendation, the reseller will spend some time with you to get a feel for your customers and their expectations, market opportunities, current equipment, your manpower and their capabilities, current bottlenecks and workflow frustrations, current and anticipated new equipment, business expansion opportunities, etc. Based on an analysis of this information, they will make software recommendations that will ameliorate existing problems and advance your business toward improved growth and profitability.

Have help ready and waiting.

But that's just the beginning. Many CAM users have arrangements with their resellers that give them as-needed access to technical support delivered via phone, the internet, and in person. So they are never left in the dark regarding how to use the software or take advantage of advanced features. CAM software licenses may also be packaged with training and consulting service options to help put users on a fast track to becoming more competitive. Many also sponsor special events where customers can learn about aspects of Mastercam that they could better utilize to improve manufacturing cycles and reduce operating costs.

As one businessman to another, your CAM reseller will be the first one to tell you that implementing the plan he helps you develop will involve some initial costs and extra effort. He will also be able to refer you to many of his customers who have recouped this investment many times over within months of implementing the plan.
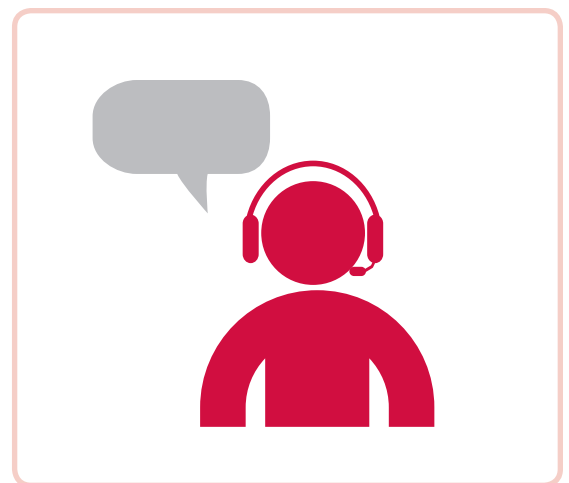
2. Post and Go

Competitive manufacturing businesses understand that standardization of manufacturing processes is necessary if everyone in the shop is working as a team to find ways to improve productivity and reduce manufacturing costs. One of the most important of these standardizations is with post processors that enable the machine tool to run the manufacturing program generated in Mastercam exactly as it was written, without any additional modifications of the G-code at the machine.

Dial in your posts.

About 40-60% of the problems related to machines not doing exactly what the programmer has intended, can be traced to post-processor issues. For most CNC equipment, posts shipped with your CAM software work very well out of the box. For more sophisticated applications, however, refinements may be necessary.

Some shops feel that they are just too busy to take the time needed for optimizing their post processors. They rely on workarounds that involve manually rewriting the posted G-code at the machine. This means at least one person has to understand the idiosyncratic behaviors of a particular machine. But what happens when that person goes on vacation, or a takes a different job? And how many machinists or operators in a shop will know what adjustments should be made on every machine so that the shop has the flexibility to move people around to suit the work load on a given day?

Revising G-Code at the machine also opens the door for individuals to innocently make program modifications based on their personal preferences. For example, they might dial back feeds and speeds under the mistaken belief that they are creating safer operating conditions, when they may only be reducing manufacturing efficiency and, ironically, increasing the risk of scrap. (Incidentally, if you think this may be happening in your shop there is software that can check to ensure that programs were run exactly as they were posted from the CAM system.)

Optimizing your posts reduces or eliminates all of these issues.
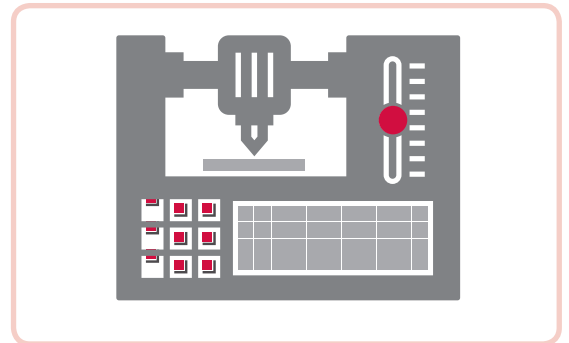
Just do it.

What we need to do is synchronize features in our posts so that, as much as possible, they behave identically, across the board. That way if you program something for one machine and want to run it on a similarly equipped machine, the programs are as compatible as possible. You don't have to keep going in to reprogram parts every time you switch the machines they will be made on. Just do it for all your equipment, and you will save an enormous amount of time and scrap.

The good news is that for most 3-axis CNC machines, generic (no charge) posts should be available that usually work fine on most equipment as delivered. CAM resellers are often willing to do some editing on these basic posts at little or no additional charge. However, when you expand into 5-axis mills or advanced mill-turn equipment, then some customization may be needed to make sure what happens on multiple axes is well coordinated. In these cases, the reseller stands ready to coordinate data gathered and settings made at the machine with the efforts of a professional post-processor developer.

Getting this work done right, at the outset, can eliminate subsequent headaches and get advanced multi-axis manufacturing systems operating efficiently months ahead of schedule vs. users trying to develop their own home-made post solutions. Doing it the right way, up front, generally results in a fast, many-times-over payback to the manufacturer.

3. Ingraining Technology

Celebrate the your new workforce arrivals.

We are starting to see a lot more Millennials in positions of responsibility on the shop floor. These are young men and women who grew up ingrained in technology. If you put advanced manufacturing technology in their hands, they will quickly figure out how to use it, and find even better things to do with it.

To take best advantage of this burgeoning workforce, we need to ingrain our manufacturing businesses in the best available technologies. This won't happen by itself. You need to establish plans, set goals, and review results. You can also enlist your CAM reseller (and other trusted advisors) who have wide ranging experiences that you can tap into to help you formulate your plans and review your results. There is one other important step to take.

Put process improvement in your budget cycle.

If you are really serious about it, then you need to budget for it, or it's not going to happen. We'll use our software, Mastercam, as an example. A Mastercam customer challenged his reseller to show him the value of his annual maintenance fee. After spending some time at the plant and reviewing how the machinists were using the software, the reseller reported back to the owner that there were some training issues that needed to be resolved. The owner gave the reseller one week to fix them. The owner was so impressed with the immediate productivity improvements in the shop that he budgeted to have an Application Engineer from the reseller come in for five days every quarter to target further improvements.

The AE returns to this company once a quarter to assess progress that has been made, recommends refinements that can be implemented to the current objectives, outlines the latest software tools, and works with the team to select additional process improvement goals for the coming quarter. After doing this for many successive quarters, the AE's involvement was reduced from five days a quarter to three. The process itself, which has made important contributions to the company's bottom line, has been ongoing for more than 36 months at the time of this writing.

Ingraining Technology *(continued)*

Make a leap with turnkey technology.

Sometimes the process improvement team will determine that major leaps in manufacturing productivity can be achieved by implementing specialized cells for manufacturing selected families of parts. These systems tend to be tightly integrated to streamline programming, setup, in-process inspection, and allow for multi-axis operation for long sequences of unattended single set-up manufacturing.

Some manufacturers will assign the task of getting these systems up and running to one of their best engineers. There are two potential problems with this approach to consider. Much of that engineer's valuable expertise will be lost to the company while he is immersed in this project. There may also be tremendous lost opportunity costs as the system lags behind its full potential for many months, sometimes years, before it is fully optimized.

Another approach is to have the primary suppliers organize a multi-discipline team comprised of the representatives from the machine builder, cutting tool supplier, and CAM software developer to install a work cell that will operate at near peak productivity soon after it is installed. The result is a process that is highly efficient in every espect, resulting in immediate step increases in manufacturing efficiency and profitability.

Increased Tool Life   **Save Time & Money**

Break outdated habits that are holding you back.

Many people, once they learn how to do something, tend to do it the same way over and over again (year after year) because time is limited, but the things waiting to be done are not. For example, taking time today to learn how to use a roughing toolpath incorporating Mastercam's Dynamic Motion technology (or other CAM vendors solutions for constant chip load machining) might cost the learner a couple hours today. However, Mastercam users who invest that time learn a couple things:

1. Using these toolpaths is easy and

2. The time it takes to learn them is returned over and over again in terms of faster programming, high material removal rates, and longer tool life.

CAM software can be incredibly powerful, but all those tools may not be on the surface. People who invest just a little time to find out about underused CAM tools are having those wonderful "a-ha" experiences when they realize how much better they could be doing.

For most CAM users, there are a great many "a-ha" (or at least mini "a-ha") experiences waiting for them when they begin to systematically explore some of the enhanced capabilities that have been added to the product over the last several versions. If every programmer or programmer/machinist learns to use just one of these capabilities a month, these personal initiatives can amount to a substantial manufacturing process improvement program all by themselves.

4. Use Training as A Tool

Most CAM users are under-utilizing their software. That means that profits are being left on the table due to lost opportunities for efficiency improvements and cost reductions. Training can correct this problem, but it has to be the right kind of training, tailored to your manufacturing problems, opportunities, and work force.

Training should not be an afterthought — off in a little corner to be engaged in when you get around to it. Instead, it should a primary Big Picture tool for obtaining sustainable, manufacturing competitiveness. Here are some thoughts on how training can be revolutionized to meet your manufacturing companies' long-term objectives.

Unlimited training program.

Many CAM resellers provide training services that are customized for the needs of their market areas as well as for specific customer. For example, one Mastercam reseller decided to add value to its training services by making training available to any, every, and all employees of companies enrolled in their unlimited training program. They thought everyone who is willing should get training and this will make their customers more competitive. That is good thinking.

Many variations.

There are many other variations on this theme. Training can be provided in cost-effective classes at the reseller that are attended by multiple customers; customized training off-site or in house; training packaged with advanced system installations; in-house mentoring programs where experienced users help learners improve their skills; and self-study at the learners own pace via Mastercam University.

Most CAM users are under-utilizing their software.

Anyone who wants training should get it and there are many ways to achieve this objective. Explore them.

Use Training as A Tool *(continued)*

Get the right people in the right seats.

Training is not the only way to impart necessary skills. It is also a way to evaluate what the wide ranging inherent abilities of a set of workers is, so that they can be used most effectively.

If a company has one seat of CAM, it is likely that one or two workers will have been selected as primary users. They should be trained. But why not make training available to a dozen others in the shop who would like to know more about the CAM system?

Cycle everyone through if they want to come. Some of these may become back-ups to the primary programmers and ones who will jump into the next programming positions when the need arises. Some may show an aptitude and love for even more complex types of programming, multi-axis or mill-turn, for example. It's good to know that this kind of talent is available on your staff, as your company grows into more complex CNC manufacturing applications.

Proficiency testing at the end of a training session gives the trainer a window into how well they are doing their jobs. It also provides insights into the types of CNC work for which individual is best suited.

Not everyone who attends training will have the desire or aptitude necessary to become CNC programmers. But the entire staff will benefit from a shared understanding of how CAM processes work, and what needs to happen to support them. Finally, giving everyone the opportunity to attend training is a real morale booster, something everyone can appreciate.

Focus on need to know.

The most valuable training for both the manufacturer and the individual CAM user is tailored to provide information that will be of the most immediate use —as opposed to providing a blanket curriculum that is set in stone for everyone. This concept applies to classroom training sessions designed for specific customers, as well as one-on-one training designed to help specific users to adapt proficiently to manufacturing challenges they are likely to encounter every day.

Companies who have elected to use CAM generally fall into two categories: startups and companies who are replacing their existing process/system because they couldn't accomplish what they needed to do. These companies often have a sense of urgency. They feel like they are behind the 8-ball and need rapid fire success.

If regularly scheduled classes don't line up, the reseller can come up with a more customized alternative — for example, combining training with implementation of the postprocessor — focusing on hands-on training with the customer's specific application.

Many CAM resellers have application engineers who are industry experts. They can pretty much throw them into a variety of situations and turn new CAM users into application-specific power users capable of getting parts off the machine efficiently and safely.

5. Take Better Advantage of What You Already Have

Learn more about improvements in the latest release of your CAM software that can have a significant impact on your manufacturing business results. Although these concepts can apply to almost any CAM system, for this example, we'll use one Mastercam reseller who is encouraging their customers to get involved with the incremental approach to continuous manufacturing improvement outlined in this plan.

CNC=Code 'N' Coffee.

QTE Manufacturing Solutions (a Mastercam reseller headquartered in St. Louis, MO) introduced a monthly before work learning session called "Code 'N' Coffee." AEs from QTE serve coffee and doughnuts and talk about important technical issues before attendees head off for their jobs. Attendees learn a lot about Mastercam capabilities that they may not have discovered on their own, and get to ask the experts' technical questions that may make the project they are working on go easier — sometimes a lot easier.

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N5262 X4.299 Y88.702
N5264 X3.522 Y113.202
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N5270 X...
N5272 X...
N5274 X...85.202
N5276 X138.909 Y180.702
N5278 X138.805 Y97.452

Topics on the Code and Coffee agenda are selected to add significant value to the Mastercam user's experience. Here are a few:

Productivity deep dive: Underused productivity tools can have a big impact on the bottom line. Understanding the value of what's already in your software — from Dynamic Motion techniques to stock-awareness — is key to running at peak efficiency.

Lathe with live tooling: The popularity of lathes with live tooling is evidenced by the fact that post-processors for these machines are in great demand. Mastercam Lathe greatly enhances the value of these machines because the program incorporates all of Mastercam 3-axis mill capabilities, including Dynamic Motion technology.

Stock model compare: Guests learn how to use the stock model for the last operation as the model for the next. When you come back in, you know what you have left to machine, so you don't have to spend so much time cutting air, or you are able to get a better representation of what you are going to start cutting.

Take Better Advantage of
What You Already Have *(continued)*

More accurate simulation: Companies who are doing complex 5-axis movements frequently use Vericut G-code simulation to ensure the safety of their parts, equipment, and expensive tooling. However, the use of Vericut can significantly increase programming time and machine cycles. For many basic 5-axis and 3+2 machining operations, simulation with Mastercam's Verify feature is sufficient once the setting has been optimized for the application.

Tool manager: Mastercam's Tool Manager provides an efficient and comprehensive way to manage tools and tool holding components, and to create tool assemblies to use in Mastercam. Besides the tooling component support, Tool Manager also integrates work material and cut parameter data, allowing the user to create a proprietary database of experience based on information that can become a powerful competitive advantage for those who use it effectively.

Automated in-process gaging: Integrating in-process gaging into CNC programs using Mastercam's Productivity+ module can eliminate the downtime that occurs while equipment idles waiting for manual in-process gaging. One user determined that in-process gaging with Productivity+ reduced cycle times for its aerospace production runs by as much as 50%.

Multitasking: Advanced mill-turn and multitasking machines are becoming increasingly popular. They can deliver fewer setups and faster production on a variety of parts. Fundamental topics like stream syncing and optimization make these machines pay for themselves faster.

Are you using all of the tools listed above to the best advantage?

Action Plan for Igniting
Your Manufacturing Business

CAM vendors and manufacturing service providers are on a mission to help customers Ignite Their Manufacturing Business. It is not an impossible task.

Advanced CNC equipment, cutting tool technology, innovative software, and support services are readily available. To ignite these resources and propel your business toward the never-ending objective of manufacturing excellence, all you need is a good plan and the determination to execute it.

We've condensed this whitepaper into the following 2-page action plan.
Print it, keep it, and refer to it, and you'll have a solid foundation for growth.

① Opening Moves

Start from where you are and assess your strengths and weaknesses. Install CAM software that will be powerful and flexible enough to take full advantage of the equipment that you have invested so heavily in. Enlist the support of your CAM reseller and other trusted advisors to guide you on how to marshal your equipment and manpower resources for all they are worth.

② Commit to post and go manufacturing

Inculcate your workforce with the concept of Post and Go manufacturing, so that when anyone in the plant sees idle equipment, they also see a potential opportunity to obtain a competitive advantage by improving spindle uptime. The front line of this battle is fine tuning posts so that little is left to do at the machine except set it up and run the part program.

Action Plan

③ Ingrain technology

Embrace new technology and the engineers, programmers, and machinists who are so good at it. The world is moving at a faster pace than it did even five years ago. The new work force is used to this, and good people will be able to adapt quickly to change and take advantage of what new technology has to offer. It is at their fingertips; empower them to use it intelligently.

④ Embrace training

In the world of CAM, training does not sap profits, it enhances the value of all the technology your manufacturing business has accumulated. There are many ways to keep your workforce well trained. Some are initially expensive but provide a rapid payback. Others cost almost nothing and help deliver incremental improvements year after year. Investigate what your training options are, and implement some of them.

⑤ Take full advantage of what you already have

The hundreds of thousands of CAM license holders worldwide are funding massive R&D efforts that result in many powerful and incredibly useful product enhancements and new capabilities with every annual release. Companies that make the effort to discover and implement these capabilities are most likely to make discernible advances in manufacturing efficiency and cost reductions.

⑥ Repeat

By the time you have gone through the list above, it is likely that conditions impacting your manufacturing business will have changed. Don't view this is a problem. It is simply the way manufacturing is, and will be, for the foreseeable future. Evaluate your strengths, weaknesses, , and opportunities, and come up with a plan that will keep you moving forward confidently. After all, your manufacturing processes have been ignited.

About Us

CNC Software, Inc. is dedicated to providing state-of-the-art software tools for CAD/CAM manufacturing markets. Our single focus is to provide superior software products based on our users' needs to solve simple to complex design and machining problems.

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