



REFERENCE MATERIALS

American Mold Builders Association National Convention

March 3-7, 1999

"Rapid Milling – Business as Usual"

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Profit is the key concept in business, yet it seems ever more difficult in today's mold industry. Competition and technology have paired to make "rapid-" everything just ***"business as usual"*** here at the turn of the millenium. The supreme demand for your clientele today is turnaround time. Concept to part gestation time has shrunk to just weeks in so many cases. Quality is assumed. Innovation in design features is a key to competition. Moreover, our mandate today is to provide a better way for your customer, the molder to compete, quickly and efficiently. Right the first time, every time. The mold business can be a great and profitable place to be if you can balance the need for technology with a fair cost for that technology!

The ongoing development of CAD/CAM and CNC have been major enabling technologies to meet these demands. Faster computers and software have made design and programming near instantaneous. Faster machinery has automated the fabrication of prototypes and hard tooling alike. Higher speeds and feeds, impossible just a few short years ago, are not only possible, but even common today because of developments in tooling. All these technologies can combine to provide your staff with an ability to do more work with less equipment and people. As consumers, modern technology provides us all the benefit of more innovative and better end-products!

Fast Delivery – Job 1

When you bid on a job today, the overwhelming priority is always delivery. This priority slowly overtook the old favorite priority, low pricing. In the '80's, we gradually came to recognize the need for "just in time" deliveries, acknowledging the high cost of buying anything before it is needed, coupled with the high cost of any delays at all.

When we say quality is assumed, that is ***quality is assumed to be top-notch***, perfect the first time, not simply taken for granted! The widespread proliferation of TQM, total quality management programs like ISO 9000, etc., demonstrates the reverence we have all acquired for quality's high priority in our success and very survival.

Achieving the end goal of better tools in less time takes a total change in mindset, says Pro Mold & Die's David Long. He asserts that "assuming that this requires a major adjustment in attitude, away from the idea that this is fast, to the idea that what used to be fast is now just ***"business as usual!"***"

To prove that paradigm shift, Long cites the growing trend to build prototype tools in just weeks! Not lots of

weeks, but few weeks, like ONE! Often, these aren't your old-fashioned down and dirty aluminum prototype molds, but high-quality, **hard** prototypes, using P-20 mold steel, capable of millions of parts! In growing proportion, the difference between prototype and hard tool is simply the number of cavities and the amount of automation. Less and less is there a difference in the quality of the part produced.

One recent job at Pro Mold was turned around in just one week, 168 hours! The job actually required 140 hours of labor! It was a simple tool of P-20, yet included both slides and lifters for automation! Completing a job like this in less time than the shop is open requires a special shop culture.

"CAN DO!" is the attitude that makes all the pieces come together successfully to make better tools faster. The following disciplines all play a key role according to Pro Mold's Dave Long:

- Team concept and communications
- Job planning/tracking software
- Faster CAD/CAM and CNC
- "Business as usual" attitude
- Constant Innovation

The Team Concept

Many shops today are using the team concept to ensure success for everything. The old days of an individual toolmaker taking on a complete mold and seeing that tool through to completion seems near-laughable today. A new strategy of setting a course for success from day one is becoming the norm. Though still new to many companies, this growing trend has recently been identified as a key trend for future business development in the SME's MTA (Manufacturing Technology Association). A group consisting of specialists, a team leader, designer, cutterpathing, machinists and fitting/polishing personnel, all start any new job by first planning for its successful, timely completion, "starting with the end in mind" as some would say it. That same team meets often through the project, concurrently attacking the various aspects of the job to compress

the time needed to the absolute minimum. The team approach thus makes the individual input more important, yet makes it practical to coordinate through an organization of smaller teams of the essential skills.

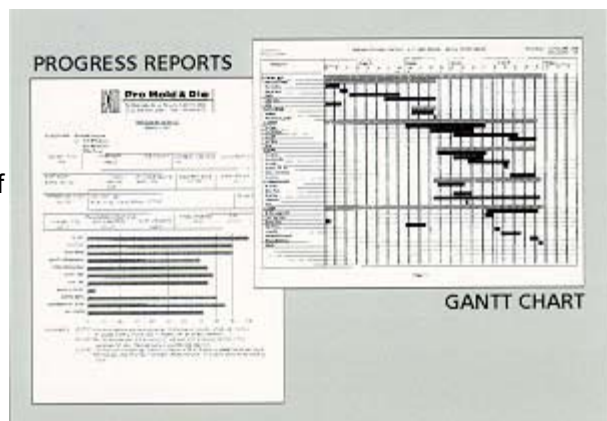


EPW's team concept begins with sales and project leaders, maintaining continuity between all customer and manufacturing associates

Courtesy EPW, Elkhart, IN

Scheduling/Tracking Software

A key component to the success of the team approach is job scheduling and tracking software. The growing importance this computer software arena plays within all industry was recently featured in "Inc. Technology" magazine. They cited numerous examples of industries including our own mold-making, where either off the shelf applications like Microsoft Project or custom applications can impact the ability to compete. Using these powerful tools, all tasks associated with the build of a mold are planned ahead and then depicted in one overview called a Gantt chart. The key to the planning is evaluating the individual tasks to establish an optimal sequence of events. By overlapping all tasks possible, the job can be completed in the least time. As an example, simply pre-



Pro Mold & Die uses Gantt charts for planning and progress

planning and timely ordering components like ejectors and heaters, the job need not wait for arrival of key parts for assembly. By building the mold base while the electrodes are cut and cores and cavities are burned, both

the base and cavities are ready for assembly at once. Moreover, planning for completion and tracking progress at regular intervals makes success consistently attainable.

reports to weekly convey status to the customer.

Courtesy Pro Mold, Roselle, IL

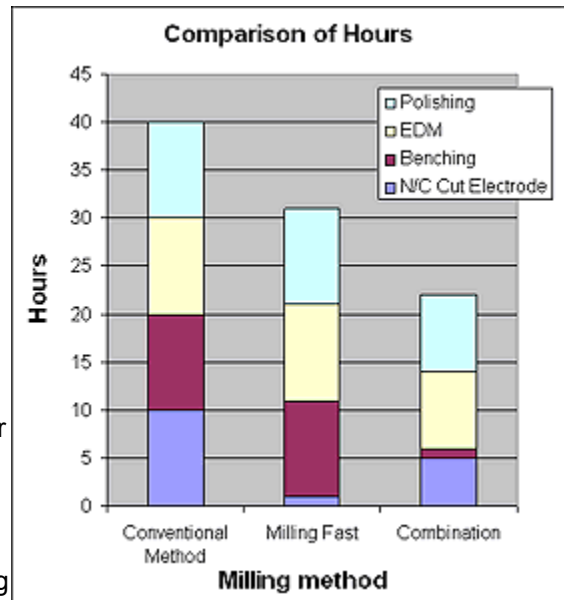
Planning also has another benefit. "Historically, when we took on a hot job, we often prayed we'd meet the delivery schedule. Today, we know our delivery capability the day we take on a job, by evaluating the current workload and plans of each team. This has helped us grow from about a 50% to over 90% on-time delivery rate!" says Pro Mold's Dave Long. That enviable on-time record gives them a big advantage when the competition is close. Not only is quoted delivery important, but also your proven track record to actually live up to the promises made.

The Technology Connection

Once the job is planned, it is time for the technology to take over. Mold design is sped along by on-line component databases, continually improving data quality from customers, and faster design software and computers. The cutterpathing now occurs virtually on demand, increasingly even on the shop floor. The CNC pushes new cutter technologies like TiCN and diamond coatings at increasing feedrates, not just to finish cutting faster, but to improve the finish and the fit, reducing handwork and improving the quality.

It took creative mold makers and innovative management to learn how best to harness the developing resources. Just going faster isn't enough. You have to use that speed to your best advantage in concert with the big picture. Witness the fact that Pro Mold retrofitted numerous CNC mills with new controls, resulting in a 10 times improvement in milling speeds! Dave Long was convinced that getting the milling done faster and letting the machines sit idle was squandering a great resource. The 22% reduction in cavity time just wasn't enough. "*High Speed Electrode Milling and its Strategic Application*" in the September issue of "EDM Today" magazine details how Pro Mold's cavity process evolved,

using the speed to make more electrodes with finer finishes, further reducing cavity time to a total 45% savings! This incredible reduction is life changing for a business! To your staff, this means faster turnaround because of less electrode finishing, faster burning, and less polishing of the hard steel. To you this means a competitive advantage and better profits. To your customer, this means faster delivery, lower pricing, and a better part. When considering new products in the market, the end consumer gains through the availability of a new concept in the marketplace sooner, perhaps at a lower price than would be possible otherwise. In virtually all cases, this represents a better product for the consumer. There appear to be no losers in this utopian world of modern high-tech mold making!



Applying high-speed milling creatively, Pro Mold & Die nearly doubled its benefits for productivity, besides making more accurate, better looking parts.

Keeping Technology Costs Down

What about your cost to compete, though? That is a detail so often overlooked. Your profitability is directly coupled not only to your cost of hard materials, but also your machine and technology overhead costs. Historically, high-speed technology has cost high dollars. If you have to mortgage your entire company's future to obtain the technology to compete, high speed and high technology can be a treacherous place to be.

Fortunately, there are increasing choices that offer top-notch performance with out top-shelf pricing. A few new machines are setting new standards of value, offering dramatically higher performance at competitive low prices. Hybrid machines are another choice now, featuring custom combinations of features to meet individual special needs. Retrofitting of existing machinery can be another tremendous way to leverage existing assets with high technology to gain competitive capability without high costs.

New machines frequently offer the best performance, generally designed as a "system" with the latest in spindle, axis drive and control technology. Unfortunately, limited choices in controls and options can often compromise new machine specifications, resulting in less than stellar results. Prices for new, high-tech machines can often be prohibitively high, based on the promise of amazing performance and sure reliability. The single most important rule for evaluation of new machinery is benchmarking against your current capability and alternative machines under consideration. While this comparison testing may seem both obvious and tedious, the promise of superior performance is not always realized! The writer is often reminded of the disappointing, slower performance one expensive new dedicated electrode mill provided when compared against a 15-year-old retrofit! That awareness came too late, once the machine was bought and paid for. Ongoing promises of improvement went unfulfilled. The sting of low performance only adds to the insult of the high cost, every day. Be sure the machine of your dreams can really fulfill its promise!

Hybrids are a new and growing alternative to new machines. These new machines are customized to meet special requirements. Choices may include special spindle speed and power ranges, multiple spindles, special coolant and/or dust collection equipment, pallet changers and work holding, and special CNC control. Moreover, hybrids allow you to choose the options that fit your special needs or goals.

Retrofits are another alternative to build on your existing capability. The CNC control has proven to be the single biggest limitation to CNC performance. Performance gains of 10 times or more can be achieved by simply changing controls! If you have a unique or costly machine, or are simply driven to get high performance for a low cost, retrofitting may be your best choice.

Within the world of retrofits, three options exist. In the simplest case, the machine may simply be fitted a new control. Here, the control features and performance must fit with the ability of the control to adequately support the machine's capability and features. Operator features, to be covered later in this discussion, are another key priority for us in mold work, where the user often interacts quite differently from production-oriented applications. More extensive retrofitting may often go beyond control replacement to include rebuilding of the machine. Ballscrew regrinding or replacement, scraping or replacement of way surfaces, replacement of encoders or scales, and even spindle upgrades are common considerations. At the extreme, complete overhaul of the machine with ballscrew and way refits, complete motor and amplifier replacement, etc. can make an old machine as good or better than new with special capabilities to meet your own specific



Defiance Innovations' new DMC compact high speed mills set new performance standards for small, reasonable cost mills.

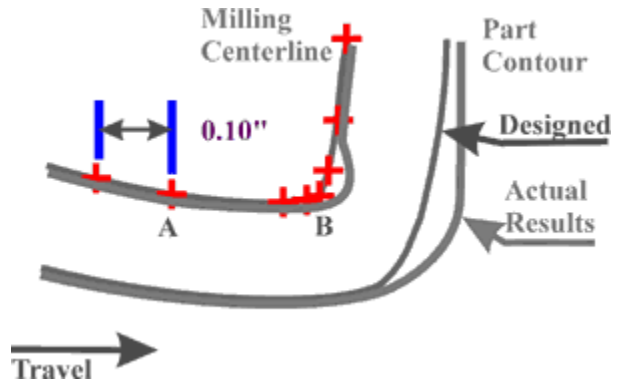
Courtesy Defiance Innovations

needs. Although this can be an expensive undertaking, the cost is often easy to justify relative to complete machine replacement, especially in view of the potential benefits of customization.

In the rapidly changing world of high speed machining, retrofits offer many choices to keep your company competitive. Performance gains of 10 times or more can provide all the benefits of new machinery without all the risks.

Look Ahead for High Speed with Accuracy

Certainly one of the most key developments for CNC speed is "look ahead." This powerful feature, also known as geometric intelligence, allows the machine to be programmed for the highest feedrate useful in any given conditions. The CNC controller then assumes responsibility for reducing feedrates as needed to navigate complex geometries, maintaining perfect accuracy in spite of dramatic, sharp details. A surprise benefit can be the smooth operation of the machine and better machine life, in spite of faster cycle times! Look ahead is pivotal to maximizing CNC productivity in the dynamic world of molds, dies and complex 3-axis shapes.



Without look ahead, parts can be violated when point density exceeds a machine's ability to accelerate or decelerate in a single point move

Open Architecture for Your Future

The PC revolution is having a growing impact in the area of CNC, making more powerful features and update-ability available at ever-lower costs. The shift towards PC-based CNC adds another choice to the industry. Ultimately, some of us foresee an evolution for CNC parallel to that of PC's and word processing, to where the CNC is really just software in a common PC or PC-type computer environment. Even now, with some PC-based systems, the CNC need no longer be obsolete when you buy it, but can keep up with today's rapid developments toward higher speeds, feeds and productivity. A CNC need no longer be only what you bought; it can stay competitive through the miracle of software revisions as with most PC software packages.

People Productivity

While the productivity of your machinery is pivotal to your success, an often forgotten factor is the productivity of your people. Today's technology can influence your staff's productivity in both the CAD/CAM and the CNC arenas. Implementing specific CNC with shop floor programming, the two can be combined for a synergistic gain of even more than each individual technology's gain!

All CNC controls act as the user interface to the machine. The user interacts with the CNC control to give the machine instructions. While CNC mills generally have the same functions, i.e. spindle, axis, tool change, coolants, etc., the way the operators **need** to interact with the CNC differ depending upon the

application. The **security** needed in many production applications to prevent operator program changes is too confining for our mold making needs. Here, not only must an operator be able to make program changes,



Shop floor programming makes the CNC operator more efficient, empowering him for immediate changes "on the fly."

but he must also have the freedom to do it freely, quickly and reliably.

Where production applications generally run hundreds of thousands of parts, our needs to run one part quickly, right the first time, beckons fast, on-board graphics for program verification and visualization. In production applications, with short programs and process optimization, program interruptions make scrap. In mold making, unable to ever optimize a single program, the operator must have the latitude to interrupt operations, change cutters or entire programs, and even re-start in mid-stream, all without hesitation. Thus, a CNC control streamlined for 3-D and mold making applications can have a profound impact on the efficiency of your existing staff through features like the entire editor's strategy, fast on-board graphics, and efficient mid-file starts.

The CAM system itself, and even its location can make a huge difference too! Nearly 10 years ago in our tooling arenas, a new concept called "automatic cutterpath generation" appeared on the scene. This concept is not as flexible as full-fledged heavy-duty CAD/CAM, yet makes the everyday generation of 3-D cutterpaths from IGES data quite simple. A minimum of user input is required. By making various assumptions about the cutterpath based on the software's built-in logic for 3-D, the learning curve can be very short and user productivity can soar. Automatic cutterpath generation can often make the cutterpath process routine for 90% or more of a shop's requirements, slashing programming efforts to as little as 10 or 20% of the historic cutterpathing times!

This automation can then be leveraged by relocation from the CAD/CAM area out to the shop floor! We can reassign the task of making the cutterpaths to the CNC operator! At first consideration, this may sound overwhelming, adding to the already hectic pace on the floor. The surprising benefit is that this arrangement often eliminates the CNC programmer's job, **and** the CNC operator making the cutterpath also becomes more efficient! He becomes more effective because he makes the cutterpath **his** way, eliminating common challenges between the CAD/CAM and CNC departments. Shop floor programming is definitely one area where more can be less! Empowering the machine operator to make his own toolpaths can result in less time spent on the job, time for the operator, time for the machining, and overall time for the job!

Daily Implementation

The embodiment of these strategies is a full paradigm shift, a change in thinking to where again, this is just **"business as usual."** Implementing the available technology speed up the process is important. Implementing the available technology to empower all people in the work stream is another key factor. The true **empowerment**, though, allowing the people to creatively **use** those tools to find the best way to make each job faster and better, that is the innovation that keeps you, your staff, and your entire company in a role of industry leadership.

Providing a profitable environment for industry leadership? That's your job as a manager. Technology is increasingly available for reasonable prices, combining the possibility of leading-edge technology with profits! Careful selection of technology with value can make competition in today's complex world of mold making a great place to be.



Hybrid machines can combine the ideal features with a modest price tag to make modern, high-tech mold building profitable.

For more information, visit <http://www.creat.com>

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