



Increase productivity with advanced milling

The innovations in tools can open up some machining alternatives which can boost the productivity. Rohan Ambike writes on how productivity can be increased through advanced milling.

In today's fast paced environment, the sophisticated tooling and machining software give a chance to incorporate more products. In this process, most of the software has to integrate optimum tool feeds and speeds into those complex milling routines. Trial-and-error programming puts moulds, tools, machines and schedules at risk. Integrated tooling and software can get die and mould processes up and running quickly, without scrap. High Productive Milling (HPM) is a process of optimisation of the combination of high cutting speeds and feeds, up to a point of diminishing returns. The rationale is that higher output is only beneficial if the end result is good parts, minimum rework and near-zero scrap.

Milling pre-hardened dies and moulds to tighter tolerances generally slows down throughput of cutting tool feeds and speeds and lengthens machine cycle times. Demands for tighter tolerances and higher quality levels can lengthen machining times and slow production. Advanced milling tools are essential for mould makers to conquer hard materials, become more productive and stay in business. However, knowing what technology yields the greatest payoff and how to make the best of it takes the assistance of a knowledgeable tool supplier.

Speaking about the role of advancements in increasing the productivity for milling technology, Gautam Ahuja, Managing Director, Dormer Tools India Pvt Ltd says, "You also want to be sure you don't get the output at the expense of early retirement of your expensive CNC centre due to excessive wear and tear. A lot depends on your application, work piece, component material, depth of cut, workload, and so on."

"The latest milling cutters from Dormer Pramet are designed in such a way so as to use minimum spindle load. A positive geometry allows for a reduction in cutting forces, offering good productivity, lower machine power consumption and longer tool life. There are dedicated geometries of inserts to machine different types of materials. This helps in improved parameters, leading to increased productivity. The coatings on the inserts are available in both CVD and PVD, for maximum tool life. All cutters offer improved stability in a wide range of applications, even under unfavourable cutting conditions," Ahuja adds.

Gautam claims that the company has Dormer Pramet cutters are robust in design with a positive geometry and dedicated insert geometries for each type of material, which are capable of taking high depths of cut, while at the same time work at high cutting speeds and feeds.

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Gautam Ahuja, Managing Director, Dormer Tools India Pvt Ltd

TaeguTec provides full solution for machining such complex profiles right from roughing to finishing. These cutters are three times faster than traditional HSS cutters.



**L Krishnan, Managing Director,
TaeguTec India**

Highlighting the most recent developments of Dormer in the area of milling technology, Ahuja said, "S450E is a completely new range of cutters and inserts for economical face milling of stainless steel form part of a launch of products by Pramet. The versatile range includes OEHT octagonal inserts for cutting depths 4 – 10 mm, alongside REHT (round) and XEHT (wiper) inserts." He further says, "By utilising eight cutting edges, the highest number available for positive inserts – the new range provides an economical offer for customers, while the wiper insert option boosts feed rate capabilities and surface finish quality."

Ahuja claims that Pramet's Force AD range provides an 'all-round' milling option. The universal 90-degree cutter features Pramet's 'AD' program of indexable inserts, including the ADMX07, ADMX11 and ADMX16. All offer improved stability in a wide range of applications, even under unfavourable cutting conditions.

CNC replaced conventional machines

CNC machines have replaced old conventional machines, because of their versatility and use. CNC machines are available for various applications for e.g. Milling, Grinding, Automation, hobbing, Die moulding etc. Its features are used for correction in process, accuracy of component produced etc.

CNC machines work at high speed, due to use of antifriction Linear Motion Guideways for linear traverses of machine axes as well as a switch in the lubrication trend to either grease pack or localised oil tanks.

D S Totre, Vice President, Premier Ltd feels that integration of CNC machines with robotics will increase the productivity because there is no manual loading and unloading of work pieces, which reduces the time required to load and unload the workpiece. The accuracy of the produced part is also guaranteed. "Many machines with automation are available and these machines are grouped in cells as per the sequence of their operations. This will help to reduce the movement of components and will also automate the loading and unloading of components," he says.

"Future High Speed machines will be with Nano control. In Nano control, the position command calculation fraction of the interpolation calculation is small, so fluctuations in speed command due to the fractions is reduced. This reduces acceleration fluctuations, resulting in finer lines at the time of repeated acceleration/ deceleration," says Totre.

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Latest face milling cutters are equipped with wiper inserts, wherein feed rates can be substantially increased for reducing cycle times and getting better surface finish.



M. Krishnamoorthy, Senior Director, Indian Machine Tools Manufacturers Association

Premier Ltd is one of the leading manufacturers of large and heavy duty CNC machines such as CNC Gear Hobbing, Shaping and Shaving Machines, CNC Gear Tooth Chamfering and Rounding Machines, Vertical Turnmill Centres, and Turnmill lathes, Vertical and Horizontal Machining Centres and Special Purpose Machines. The company's Engineering Division provides components for wind energy, power generation and infrastructure sectors. Giving a brief outline of the product range of Premier, Totre said, "Our machines are generally used for cutting automotive gears, power train gears, turning railway wheels, turning large diameter gear blanks, housing, die mould applications and special purpose machines such as multi spindle, deep hole and drilling machine."

Speaking about the advantages of using the products manufactured by Premier, Totre said, "We are a one-stop-shop, as we provide complete machining solutions ranging from designing to manufacturing, including servicing. Since all our machines are CNC operated, they yield high productivity in shorter time periods and very low maintenance costs. Some of our gear hobbing and shaping machines feature direct drive which is a unique feature in such machines.

In the case of TaeguTec India, L Krishnan, Managing Director says, "Form Milling and Profile Milling have been a challenge in the industry, owing to the

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D S Totre, Vice President, Premier Ltd

limitations of the commonly-used HSS and brazed tools. Their usable cutting parameters mostly resulted in low productivity and low tool life, and did little for the problems of form retention," about the innovations in this area.

Sharing the most recent developments of TaeguTec in the area of milling technology, Krishnan says, "For power generation and aerospace industry, we have Fir tree profile milling." Fir tree profile is a dovetail form on the root of the turbine blade and in the turbine rotor for fixing the blade on to the rotor. This joint demands high accuracy both on geometrical and dimensional aspect. "TaeguTec provides full solution for machining such complex profiles right from roughing to finishing. These cutters are three times faster than traditional HSS cutters."

The railway industry has numerous challenges for machining profiles on the new rails, crossing rails and re-profiling of worn rails. Typical applications are form machining for wheel face of rails, foot machining of tongue rails and fish plate area machining for joining two rails. In this area, TaeguTec has come up with rail profile milling.

The ever increasing need of urban development has given rise to high demand of pipe lines for transportation of fuel and water from the source to consumption point. The SAW pipes are manufactured from steel plates after preparing the edges for continuous welding. Depending on the application a variety of seams have to be milled on the longitudinal edges of the plate. Taegu Tec has also contributed in this area. "TaeguTec has hands on experience of manufacturing seam milling cutters up to 800 mm diameter with modern tangential indexable inserts. Tangential inserts provide enough carbide along the cutting cross section resulting in very high feed per insert. High mill speeds up to 20 metres/min can be achieved with these type of cutters," concludes Krishnan.

M. Krishnamoorthy, Senior Director – Training, Indian Machine Tools Manufacturers Association (IMTMA) feels that the Automatic Tool Changer (ATC) and Automatic Pallet Changer are means to increase productivity. According to him, today's machine tools are equipped with higher power as well as higher spindle speeds, enabling milling of aero space parts and dies or moulds.

"Latest face milling cutters are equipped with wiper inserts, wherein feed rates can be substantially increased for reducing cycle times and getting better surface finish. High speed machining is possible with high feed milling tools which are having less lead angle or approach angle," he says. Krishnamoorthy, further says that, "Interchangeable clamping systems (Zero point clamping) enable quick set up of parts 5-axis machines, mill turn centres and multi tasking machines enable machining in a single set up, reducing cycle time drastically." 