

# MACHINE MATTERS

DEVELOPMENT IN THE SPINDLE DESIGN FOR HIGH SPEEDS IS THE MAINSTAY OF THE HIGH-SPEED MACHINES. MANUFACTURING TODAY FINDS OUT HOW VENDORS LOOK AT DESIGNS OF SUCH MACHINES

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1. CNC increases production choices as CNC machines are software driven and updateable and as a result of which new choices.

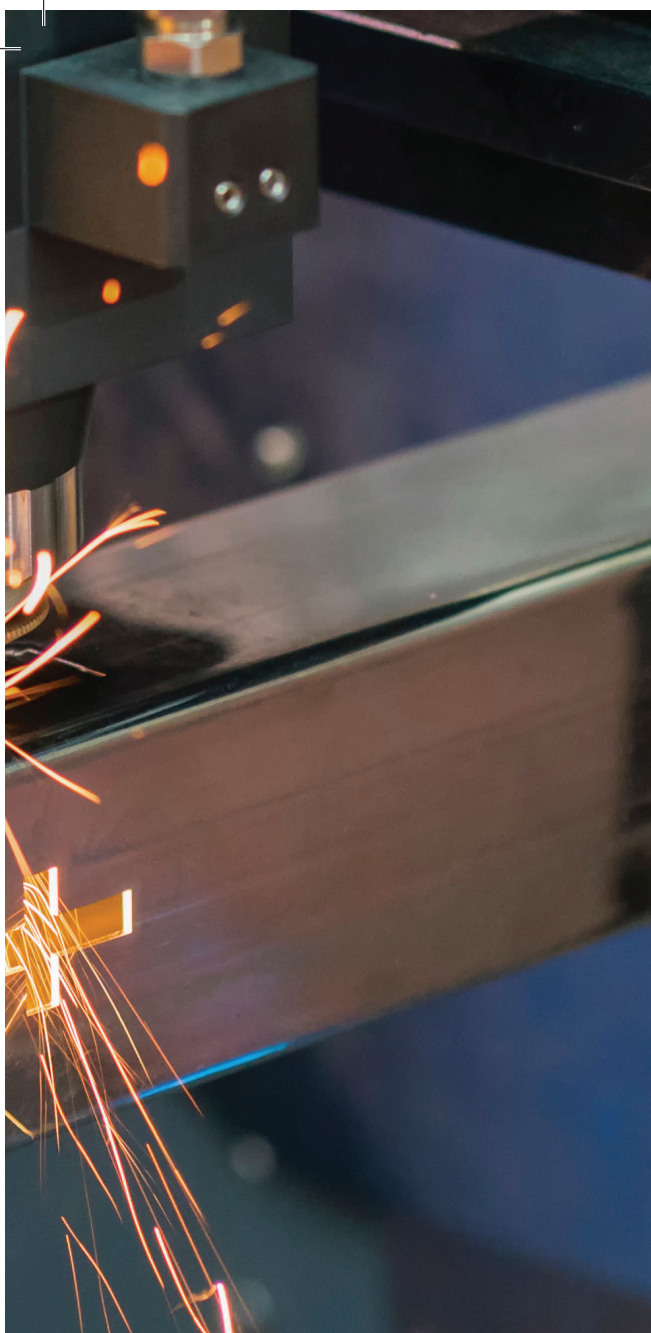
**FASTER MACHINING OF PARTS COUPLED WITH** higher throughput without compromising the accuracy, surface finish and repeatability is always the focus of the manufacturing industries. High Speed Machining (HSM) involves faster removal of material compared to conventional machining for which feed, spindle speed and torque characteristics, depth of cut, cutting tool, NC program preparation and program transfer and execution play an important role and HSM ensures quality, surface finish extended tool life, accuracy and overall increase in productivity. High speed machining is use of higher spindle speed of more than 20000rpm and higher feed rates compared to conventional machining and material removal is carried out using small size cutting tools by giving faster and lighter cuts.

## ADVANTAGE CNC

CNC increases production choices as CNC machines are software driven and updateable and as a

result of which new choices, new designs and new ideas can be easily implemented. "Although, CNC machines represent huge initial investment, but in long term there is a dramatic decrease in labor cost. CNC machines work on programming and maintenance, so we need to employ few technical technicians rather than hiring complete labour. While you will need to have a skilled employee that know how to use the CNC machine, that one person may well negate the need for individual workers trained in how to use each individual machine, as the CNC machine will be driving all the other machinery, automatically. If you are looking to manufacture small runs of a component, or indeed a bespoke piece, then you're probably better sticking to conventional machining techniques. However, if you have high volume production rates of the same part, CNC may well be for you," says **Ashish Gupta, Founder & Director, Intrading**. These machines are designed keeping IIOT (Industrial Internet of Things) in mind with a fo-





cus on productivity and capturing data for quality assessment. It helps to maximise inventory output and reduce system or production loss in the process. These machines also help in keeping track of metric measurements at each stage of production.

#### MACHINING MODUS

Features of HSM involves a machine built with appropriate structural considerations, controlled by a suitable controller and drives controlling rotary and linear movements and ability to handle large data, medium sized tool holders and small size cutting tools capable of high speed material removal, accessories like ATC, computer aided manufacturing programming aspects which are different than the traditional machine. "In order to achieve performance at high speeds by HSM, host of parameters play a role. Physical structure and characteristics of the High Speed Machine requires machines designed to ensure higher rigidity, higher precision, enhanced motion dynamics, resistance to vibration and



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thermal build-up as the primary criterion. "Considering the moving elements, Spindle speeds of the HSM will be above 20000rpm and direct drive spindle and medium sized tool holders are used. The other moving element being axis movement involving servo controlled feed motors, it is important to ensure smaller controlled movements at high acceleration without thermal build-up. Low inertia, higher acceleration capable Linear motors are also preferred to rotary drive motors for HSM which offers improved performance. Design around Linear motor eliminates ball screw resulting in improved machine dynamics and simplifying structural design aspects as well," says an IMTMA spokesperson. In HSM, small size cutting tools are used at high speeds and feeds with smaller and lighter cuts which ensures uniform chip loading, less chatter and vibration and the design should ensure improved chip handling and removal. Medium sized tool holders having balanced and high rigidity are used in HSMs which offer better control and machine dynamics. Machine construction has to offer high rigidity for ensuring chatter free, vibration free, uniform chip loading achieving required surface finish and accuracy.

#### NEW VISTAS

Changes are being seen in the drives of CNC machines. The machines are now more and more mul-



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tipurpose with simplified circuits and better architecture. The rate of breakdown and maintenance is considerably reduced. The machines are now more energy efficient along with the ability to cope with torsional forces and heavy duty cutting. Further to it, CNC machines are enabling more precise positioning of slides and backlash is almost completely eliminated. **Sudeep Sen, head of industrial, manufacturing & engineering vertical, TeamLease Services** says, "With digitalisation and automation on shop floors, these machines are now being used in electronic and internet connectivity environments rather than just in mechanised environments. Vendors look at it as an immediate opportunity and also future opportunity to keep pace to the changing scenario and syndromes. These machines are part of the new age machine evolution. The demand of these instruments will increase in the future as the adaption witnessed so far is high. The previous models were very mechanical. The IIOT revamp was required as the data flow of upstream and downstream was not very efficient."

#### VENDOR FACTOR

Usage of such machines offers reliability and better quality of products and also help in improving product design and help in cutting down the unnecessary costs. High speed machining is a methodology which end users need to establish by applying skill

and knowledge. HSM is not just using high speed spindle and generating faster axis movement, it involves intelligent software for generating optimised tool path, selection of CNC system with huge data handling capability, type of material being machined, selection of cutting tool, using appropriate speed, feed & depth of cut for manufacturing parts and a host of other parameters. Vendors expect enhanced throughput and efficiency by buying HSM machine, which is a myth, it involves through understanding and applying of HSM specific manufacturing methodology.

#### CHALLENGES & MORE

In a country like India, where labour is unorganised and cost of capital is higher, people do not want to shift to fully automated option. "Further to it, CNC machines include lot of handling, and things like improper programming and maintenance, can negatively affects the output of these machines. To avoid programming errors, make sure that employees fully understand the proper set of G and M codes for the particular controller on the machine and best practices for implementing," says Gupta. The new age CNC machines are comparatively compact in size and are equipped with automatic tool changers. "These come along with multi-axis machining technology which is a new age technology. The new CNC Milling process is about 10 times faster and safer than traditional mill-



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ing machines. These are more versatile as well. Be it metals, industrial plastics or alloys, almost every material can be used with a CNC milling machine without compromising on the quality. If we look from the new technology enhancement perspective, these need to be replaced as and when new advancements and up-gradations are available. They may not be required to be changed but upgraded," says Sen.

The new advanced CNC machines will create more opportunities for the operators and technicians who are skilled with the concepts of system integration, data flow, upstream and downstream during the process of cutting, moulding and also reverse engineering. "This will also attract new skilled talent and hence, we can see an incremental demand of 8% to 10% of skilled operators and engineers. Another point to keep in mind is that, if the course curriculums are enhanced, then the demand supply balance will hold good and would be the perfect for the "Make in India" vision," avers Sen.

#### SOME TRENDS

New design trends include lot of fusion. This is better than 3D print technology as it allows complex shapes and designs to be developed. When it comes to last-ing power, CNC machines are durable. Usually, these machines lasts upto 8 years. Technology improves every two years and as a result of this improvement, efficiency of these machines are also increased. The CNC machines help in lowering down the labour costs and increasing production runs which is a big advantage. Appropriate software tools to be used for

## THE INDIAN GOVERNMENT'S MAKE IN INDIA PROGRAMME HAS BEEN A GREAT SUPPORT FOR HSM.

HSM programming and for generating optimised tool path suitable for high acceleration, feed and lighter material removal. Customised tool path generation is essential for HSM to maximise throughput and productivity. "CNC system should be chosen with enough memory and buffer to avoid data starvation during NC programme execution. CNC systems with look ahead buffer are preferred for handling huge data points and a constant surface feed rate for contour machining. HSM requires stable, low friction bearings and hybrid ceramic bearings having higher stiffness are used to achieve precision. Design aspect should also ensure special mechanisms for lubrication, eliminating grease starvation for bearings and moving elements. Automatic Tool Changer (ATC) to be designed for handling tooling and ensure faster tool change over. With HSM, both accuracy and speed can be achieved maximising throughput and productivity," adds the IMTMA spokesperson. 

4. Dynamic Technologies getting ready with Chinook structures.