The path of precision machining has taken a decidedly unexpected change in direction.

Yes, machining centers, in their various configurations of horizontal, vertical, and universal, continue to hold their preeminent positions in shops for their ability to create value-added benefits to individual workpieces or parts in serial production. The future appears bright for continuing advances in spindles that offer high-speed and high-torque performance in production situations, especially in the automotive industry and continuing expansion of multifunction capability for example in gear making, and merging of milling and turning capabilities onto one machine.

Complex geometries and workpieces from a wide variety of metals can be created with DMG Mori’s Lasertec 65 Additive Manufacturing machine using generative laser deposition welding and five-axis milling.

Additive Joins Subtractive on Advanced All-in-One Machines

New levels of hybrid multifunction machines are here, as five-axis milling mixes with laser deposition welding technologies.

Jim Lorincz
Senior Editor
But the distinctions between stand-alone machining centers continue to be driven by the addition of multifunction capabilities leading to multitasking magic—five-axis versatility, and altogether new iterations like additive/subtractive machine combinations. The newest advanced machines can bridge the gap between highly complex designs with laser-sintered metal welding deposition and removal of metal through subtractive milling processes.

“We see a tremendous emphasis on five-axis machining whether mill-turn or turn-mill machines,” said Randy Harland, executive vice president, DMG MORI USA (Hoffman Estates, IL). “Customers have known for a while that when machining on a lathe it’s generally best to be able to finish machining operations with milling on the same machine. “Now the ability to put the workpiece on a machining center and articulate the workpiece or the head in virtually any direction and do practically any secondary operation on the machine is equally important, particularly turning.”

“Automotive, Multifunction Loom Large in Plans

DMG MORI USA is creating a Center of Excellence for Automotive in Novi, MI, which will be a showcase for machine technology that has been so successful in automotive manufacturing in Japan. “We are bound and determined that the US producers of those same kinds of automotive workpieces understand how we have processed them so successfully in Japan for so long. We will be demonstrating those processes and will deploy some of the machines that we will exhibit at IMTS at the Center,” said Harland.

Multifunctionality continues to be the newest driver of machine design at DMG MORI. “At our 2014 Innovation Days in Chicago, many of the 40 machines that will be shown will have gear-making capability using our software called gearMILL, which can be used on many of our products,” said Harland.

Taking multifunctionality to another level, DMG MORI has merged tool-changeable additive manufacturing onto standard-offering subtractive five-axis milling platforms. The first concept study multifunction machine is called LASERTEC 65 AdditiveManufacturing. This hybrid machine incorporates generative laser deposition sintering on a five-axis milling machine, enabling complex metal geometries and workpieces.
to be produced with combined laser deposition sintering and five-axis milling.

“With the LASERTEC 65 Additive Manufacturing, we have added laser sintering capability to alternately build up and mill powder metal using a wide variety of metals. The method uses a deposition process by means of a powder nozzle which is up to 20 times faster than generation in a powder bed,” said Harland. Equipped with a 2-kW diode laser, the LASERTEC 65 Additive Manufacturing is expected to expand the market for additive processes from metal prototype and small part production to complete machining of complex components with undercuts as well as for repair work.

The LASERTEC 65 Additive Manufacturing is also well-suited for application of partial or complete coatings for mold making and general engineering or medical applications. Changeover between milling and laser sintering operations on the LASERTEC 65 Additive Manufacturing is automatic with the option to successively build up layers of different materials in wall thicknesses of 0.1–5 mm. Complex 3D contours can also be generated in layers without supports, or large workpieces can be rough and finish machined and coated with corrosion-resistant alloys for applications in the energy and oil industry.

EDM Cell with Precision Machining, Automation

Roku-Roku vertical machining centers are well known to be built to jig-bore standards. “Precision machining of graphite and hard milling applications results from careful thermal control and compensation for all machining axes,” said Len De Bruyne, application engineer-machining centers and cells, MC Machinery Systems (Wood Dale, IL). “The ability of the machine to produce an accurate part, especially for such high-dollar parts as medical and aerospace applications is essential,” said De Bruyne. “These machines are put into service to run non-stop with integrated robots in automated cells. For example, we have created special automated systems to increase the throughput for EDM operations. The cell...
integrates a Roku-Roku H658 VMC for machining graphite electrodes and a 3R pallet system for storing and loading them on a Mitsubishi EA12E sinker EDM.

Continuing to build upon its reputation as a single source to shops for laser, EDM, and waterjet technology, as well as consumable products, MC Machinery introduced the Mitsubishi Diamond Cut line of VMCs with models for every aspect of shop machining from general engineering to moldmaking. Its most recent product introduction is being made in partnership with Matsuura Machinery Corp. (Fukui City, Japan). MC Machinery Systems is introducing the Matsuura Machinery’s LUMEX machine to the North American market.

The LUMEX Avance-25 metal hybrid laser milling machine combines metal laser sintering (3D SLS) technology with high-speed milling on one machine to manufacture complex molds and parts from metal powders by digital engineering, using 3D data. MC Machinery Systems is introducing the Matsuura Machinery’s LUMEX machine to the North American market.

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bones and implants are required, as well automotive, and job shops.

The LUMEX Avance-25 metal laser sintering hybrid milling machine relies on one-machine, one-process manufacturing of complex molds and parts by fusing metal laser sintering (3D SLS) technology with high-speed milling technology. The machine enables production of complicated parts through total manufacturing by digital engineering, using 3D data. The machine achieves the highest accuracy in part fabrication since metal powders are melted and sintered via laser, while surfaces are precisely milled at high speeds.

“Customers have known for a while that when machining on a lathe it’s nice to be able to finish machining operations with milling.”

Dies and molds with very complex geometries can be fabricated in one piece with high accuracy, shortening lead time and reducing manufacturing costs to a half or even a third of conventional methods. Also, 3D cooling channels can be incorporated into molds in the single setup, thereby increasing cooling efficiency and enabling high-cycle injection molding with better than ever quality and precision, reducing costs and improving efficiency. MC Machinery will demonstrate and support the LUMEX Avance-25 hybrid machine at technical centers located in Chicago, Los Angeles, Toronto, and New Jersey.

**Metals No Match for Versatile Spindles**

More machines than ever underscore the aim to respond to the user’s operation, not only with options and automation, but increased energy efficiency without compromising spindle power. The new compact Heller H 4500 four-axis machining center from Heller Machine Tools (Troy, MI) features a Heller-produced HSKA 100 spindle.
(also available in sk/bt 50 taper), a 500 x 630-mm pallet, and 800-mm strokes in X, Y, Z axes.

Introduced at EMO 2013, the H 4500 is designed for robust processes while providing an affordable, economical cutting solution for limited floor space and energy efficiency. Machines are capable of energy savings of up to 30% compared to conventional machine designs.

Metal-cutting performance has been enhanced with the introduction of the new powerful spindle. “With our new 500-Nm, 52-kW, 12,500-rpm spindle option, the H4500 can provide the low-speed torque it takes for cutting tough materials like iron and steel as well as higher speeds for machining lighter alloys,” said Vincent Trampus, Heller vice president sales. This capability sets Heller apart from others in its size range.

“The more universal and varied the machining assignment, the more important becomes adaptive power consumption of peripheral equipment and main units in order to optimize power use at various operating points,” said Trampus. Air, coolant, hydraulics, and other energy consumers are flexibly controlled based on demand rather than always being on.

“Precision machining of graphite and hard-milling applications result from careful thermal control and compensation for all machining axes.”

The H 4500 offers a wide range of basic equipment, so each machine can be customized for each user’s
application. This includes 50/100/150 pocket chain-type magazines for tool lengths of up to 600 mm, tool break monitoring with reference measurement and cleaning of the tool cartridges and holders. Workpiece management is equally flexible. The rotary pallet table has a maximum loading capacity of 1400 kg.

For efficient chip disposal, the H 4500 is designed for free chip fall below the spindle and between the rotary table and pallet changer, with steep chip chutes in the work area and at the loading station and with a 600-mm-wide scraping or flat belt design chip conveyor over the complete Z stroke.

Heller’s H4500 can provide the low-speed torque it takes for cutting tough materials like iron and steel as well as higher speeds for machining lighter alloys with its new 500-Nm, 52-kW, 12,500-rpm spindle option.

Machines are available with either Siemens Sinumerik 840D or Fanuc 31i-B CNC. Heller’s NC controlled out-facing head option is available on the H4500 for performing turning operations on the machine. A measuring probe for on-machine part checking, and instant tool breakage monitoring are also available. The machines, consistent with efficient cell operation, may be loaded with a robot or other automated loading systems.

Jig Borer Quality Machining Joins Lineup

Methods Machine Tools Inc. (Sudbury, MA) is now offering machining centers and jig borers from YASDA Precision KOMET JEL and BASS thread milling and tapping tools
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Tools which are known for their accuracy, precision and quality. “The need for more efficient, reliable ways to machine exceptional, high-quality parts is increasing as manufacturers in segments such as aerospace, die/mold and automotive, are demanding tighter tolerances combined with shortened cycle times. We expect this trend to continue and YASDA precision machine tools are well positioned to meet this challenge for OEMs and job shops,” said Steve Previti, Methods’ YASDA product manager.

In order to ensure the utmost in quality and precision, YASDA Precision uses only YASDA machines to build their own machine tools. The machine tools are ideal in applications where ultra-high performance, accuracy and rigidity are paramount for machining demanding nickel-based alloys, stainless steel, and titanium materials.
Methods is offering the complete line of YASDA machines and has recently introduced the H40i five-axis high-precision machining centers. The new YASDA H40i five-axis machining center is well-suited for manufacturing low-volume and high mix of complex parts. “The H40i user has the ability to adjust the work envelope to accommodate varying work sizes,” said Previti. “This capability offers owners flexibility to maximize machine utilization while taking on jobs with a wide variety of part sizes, materials and geometries.” The H40i is equipped with direct drive (DD) motors in the rotary axis for simultaneous high-speed five-axis machining with A and B-axis rotational speeds of 100 and 75 rpm, respectively. A high-performance spindle provides optimal power and torque for machining a wide range of metal alloys.

The new YASDA H40i has a large work envelope (XYZ travels are 34 × 29 × 27” (864 × 737 × 686 mm). For its large work capacity, the YASDA H40i has a compact footprint of less than 27’ (8.2 m) in length and under 11’ (3.3-m) wide fully configured with 24 pallets for efficient use of floor space. Available in multiple configurations, Methods offers from inventory the H40i-24PLS which is a 24-pallet version with a part preload station, A&B axis DD motors, and 240 tool capacity. A FANUC 31i-A5 controller and complete work scheduling and tool management via the APC and ATC are standard. ME

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