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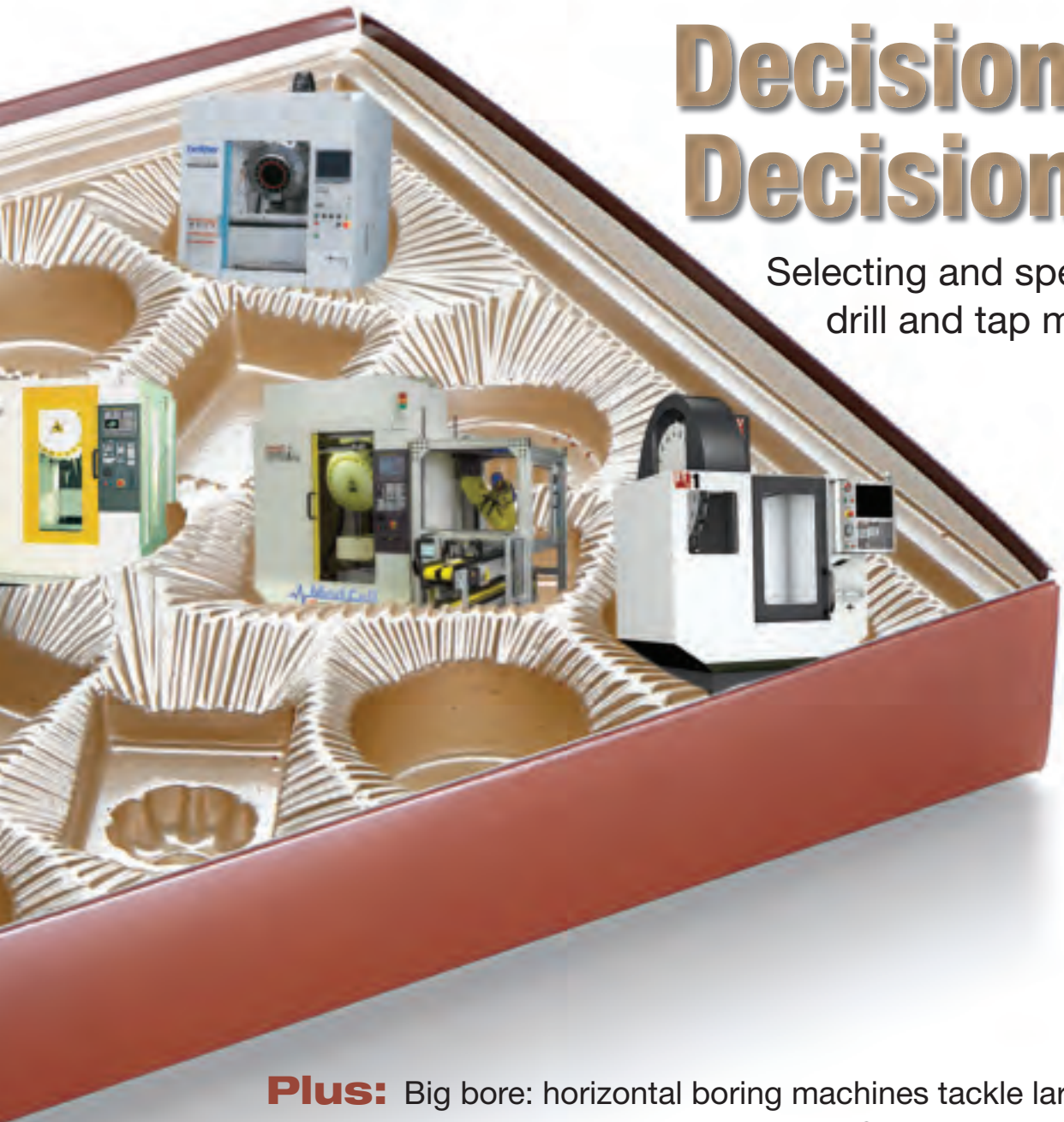

Decisions, Decisions

Selecting and specifying drill and tap machines

Plus: Big bore: horizontal boring machines tackle large parts ■ Applying part finishes: outsource or DIY? ■ Hard grooving with PCBN cutting tools ■ High-pressure coolant demands strict foam control ■ Viva Las Vegas: imX event preview

Speed thrills

"THE BIG THINGS TODAY are speed and cycle times," said LaDonna Hambrick, Haas Automation Inc. milling product technical specialist. "Seconds count; everyone wants to go as fast as they possibly can." As a result, Haas "sees a lot of interest in high-speed, small-footprint machine tools," she said, and has developed products like the DT-1 drill/tap and milling machine that "can change a tool in less than a second and can accelerate from 200 to 12,000 rpm in half a second."

Hambrick said a typical user of DT-1 machines is International and Domestic Production (IDP), an Oxnard, Calif., precision job shop serving primarily aerospace, medical, government and solar power customers.

Part production volumes range from as few as five to 10 pieces to as many as 5,000 to 10,000, with typical runs of about 1,000 pieces. Workpiece materials range from aluminum and steel to aerospace-grade alloys and advanced plastics.

Brandon Buschold, engineering manager, said the shop has two DT-1s. Competitive pressures prompted acquisition of the machines. "The machining industry isn't what it used to be," he said. "We used to be able to make a good profit running standard high-speed machines."

Haas

An operator at the control panel of one of IDP's two Haas DT-1 drill/tap milling machines.

Now, the global drive to reduce cycle times and manufacturing costs compels shops like IDP to seek new technologies like the DT-1. "Because the rapids are so fast, we are able to cut down our cycle times by 30 to 45 percent, in some cases even more," Buschold said. He cited a steel milling application where 1"-dia. endmills are running at 220 to 250 ipm and 0.033" DOC.

To further boost the shop's productivity, IDP also uses the Haas HRT160SS rotary table, designed for the DT-1. The machine's 160mm-dia. table can rotate at a maximum speed of 570° per second, more than four times the speed of the company's standard HRT160, according to Haas.

Buschold is using the table to run a 1,000-piece order of 416 stainless steel gun barrels and slides for the U.S. Army. "I chuck up on the barrel, concentric with a 0.002" TIR to the hole for the rifling. We rotate the barrel and machine four or five different surfaces on it, going really fast with a high-feed endmill. The combination saves us time and money."

The shop's goal is to acquire another four or five DT-1 machines, Buschold said, "but I won't replace my Haas VF VMCs because I have large parts that I need to do as well. A lot of our parts are from 3½"x3½"x½" to as small as 0.200"x0.100" square. For those smaller parts, I can pop three double Kurt vises on the DT-1 table and get six operations done at once, no problem."

On a fixture mounted on the rotary table, the shop "nests as many parts as we can and lets the machines run for 20, 30 or 40 minutes, so my operators can run three to four machines at a time," Buschold said.

The speed and versatility of the drill/tap machines help IDP find and keep customers. "More and more customers are looking for shops like ours that are not just using conventional milling, putting the part on a standard machine and running a regular endmill at the same old, slow 20 to 30 ipm," Buschold said. "That costs customers money, and they have to be competitive too. We are always looking for ways to go faster, to save time and money. We pass the savings on to our customers, and they are happy and keep coming back."

—B. Kennedy

design used in Haas' 40- and 50-taper VMCs. The DT-1 machines do not have quite the milling capacity of those larger machines. "But they are full 3-axis machines that can be upgraded to 4th- and 5th-axis capability," Rathburn said.

Saving Time

In the quest to reduce cycle times, reduction of noncutting time is as important as speeding up cutting operations. Said Yamazen's Hansen, "Assuming we can push a tool to its maximum cutting capability, the only machining variable becomes noncutting time, including toolchange and workchange times."

To reduce the time picking up and exchanging pallets, Brother developed a servodriven Quick Table that rotates 180°, like a Lazy Susan. (See photo on page 29.) The system can execute a workpiece change in 2.3 to 3.4 seconds, according to Brother. Because the system is servodriven, it can change the work simultaneously with toolchanger or axis movement.

Exchanging workpieces raises issues of repeatability, especially in high-precision applications such as 5-axis medical parts machining. According to Methods' Bond, successful 5-axis machining depends largely on accurate and repeatable location of the parts being machined.

To maximize repeatability, the Robo-Drill Med Cell incorporates a zero-point pallet system employing 70mm-square pallets like those used in an EDM. (See photo on page 28.) The workholding pallets have a centrally located drawbar or stud drawn into a machine-mounted chuck. The system provides consistent positioning and repeatability within a few microns. Workpieces are mounted to the pallet and the robot fits the pallet into a chuck on the machine. After the part is machined, the robot removes the pallet and replaces it with another. The zero-point pallet locking system assures consistent location of each succeeding part. (See sidebar on page 32.)

New drill/tap machines can produce major time savings compared to earlier models. "Machines today are engineered to be extremely efficient and provide little or no waste," Hansen said. "That means building them with castings and spindles appropriate to the type of work being done, and using motors sized to the work to eliminate excess electricity usage." Minimum machine footprint conserves floor space, and smaller machines simply cost less than larger ones. With much of industry focusing on lean manufacturing, Hansen said, "the very design of the tools is on a lean platform." CTE

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