What’s Next in Grinding?

Many precision grinding machines on the market already offer their users near-perfect tolerances, leaving one to wonder: What’s next in grinding? But tool builders still have plenty of room to add valuable new improvements, machine shop owners say. Aside from adding complementary manufacturing functions, such as milling or turning, there is still an appetite for new and improved automation, as well as software solutions that make grinders easier to use and allow them to use less space, labor and energy. And, of course, there’s always room to come down on price.

One of the big names in grinding, Rollomatic Group (Le Landeron, Switzerland), decided that bringing value to the marketplace was a good strategic direction. It purchased Strausak AG (Lohn-Ammannsegg, Switzerland) four years ago in an effort to bring more value offerings to its portfolio.

Sarah A. Webster
Editor in Chief
The Strausak U-Grind five-axis Universal CNC tool and cutter grinder, shown at IMTS 2014, is about 35% less expensive than a comparable Rollomatic five-axis CNC tool grinder, said Henry Ecker, president, Strausak Inc. (Mundelein, IL) and a former regional sales manager at Rollomatic.

“With the return of Strausak to the US market, the Rollomatic Group now has a machine to offer where the Rollomatic product line did not historically sell well, such as resharpener applications, manufacturing of small-batch specials and price-conscious consumer installations,” Ecker said.

Although it has an easier entry point, the Strausak brand has plenty of credibility in tool grinding, being one of the first to market with a five-axis grinding machine in 1991, called the Fleximat 91, which was popular in Europe.

The U-Grind, in particular, is versatile, intuitive and easy to use, Ecker said. It is aimed primarily at small-batch specialty tools and regrinding, but can accommodate larger batches and manufacturing from solid carbide up to 1.0” (25.4 mm) in diameter. All axes are direct-drive, so the five-axes system works free of backlash, offering greater precision. High structural rigidity and damping ensure smooth operation for the highest surface finish quality and tightest dimensional tolerances. The powerful spindle motor allows for high feed rates even when fluting, while the torque motor on the B-axis provides rigid holding accuracy. In addition to other features, such as a workhead with a one-button quick-change collet system, the U-Grind also includes a six-position wheel changer as standard, with robot-loading automation as an option. The machine also includes flexible programming with NUMROTO Plus software and 3D tool simulation and machine animation, which can detect and help avoid any axes crashes. Strausak and NUMROTO have been partners for more than 20 years.

Space-Saving Quality Grinders

Another heavyweight in tool grinding, ANCA (Wixom, MI) unveiled an all-new series of three ANCA FX Linear machines at IMTS 2014. The series replaces the RX/GX models.

The new series consists of three levels—FX3 Linear, FX5 Linear and FX7 Linear—which offer different standard configurations, and cover the spectrum, from light manufacturing and regrinding to full production. The series’ best performance and productivity range is for tools with a diameter up to 12 mm. It offers grinding capabilities for tools up 200 mm in diameter. Maximum wheel diameter is 8” (203 mm).

The highlight of the series is the new ANCA-designed tubular shaft linear motors. In addition to the space savings, the motors offer lower operating costs and higher tool quality.

The new design does not have ballscrews in the X and Y axes. Instead it has a magnetic shaft clamped at each end.
At Melin Tool (Cleveland) the company has nearly 10,000 SKUs—from the end mills that the family business started manufacturing in 1940 to a full portfolio of cutting tools, including countersinks, drills, threadmills and more. The tools come in a range of materials, too: premium high-performance and conventional carbide as well as cobalt high-speed steel.

With a large, diverse catalog and 400 active distributors around the world, production rarely slows down, even during economic downturns. That’s partly because Melin likes to keep inventory sufficient to ship same-day as much as possible.

“I never see it slowing down. It’s a runaway train—I just hold on. We’ve been waiting for a slow week for five years,” said Mike Wochna, company president. “We run 24 hours a day, every day.”

Production schedules at Melin, which has 82 employees in its 35,000-ft² (3256-m²) facility, are also fairly complex, even with the help of sophisticated computer software. Wochna said Melin sometimes feels like it is two shops: On weekdays, during fully staffed hours, Melin runs specialized, custom and smaller jobs. Overnight and during the weekends, the shop runs large jobs lights-out. Most of this production work consists of grinding because all Melin tools are CNC finish ground.

“We buy more grinders than anything else,” he said. The production floor is made up of 40 CNC grinders, with a variety of brands—Rollomatic, ANCA, Walter and more. The average machine is about five years old, but there are some old-timers over 12. Even these have been updated, though. Virtually all machines have loaders and robots and are connected to Melin’s software system. “There is so much data involved now,” Wochna said.

Production Goals

While Melin manages a large number of diverse jobs around the clock, Wochna said it would be wrong to assume speed was the company’s primary production goal. He isn’t interested in machines and wheels that impress with output alone. Two of his largest customer segments are aerospace and medical, and quality is paramount.

“We need to make sure we have a certain number of good parts at the end of the day,” Wochna said. The biggest production enemy is setup time and rework, and most production and purchasing decisions are made to limit both.

“We may make a year’s supply of one item to reduce setup,” Wochna said.

And rework is particularly troublesome, he said, when the margin per tool is considered. For the money, it’s usually not worth it.

“Final part and finish is more important than speed to us,” he said. “We consider the limiting factor to be finish.”

The Paradigm Advantage

That makes purchasing decisions particularly important at Melin, where investments in new machines right down to the consumable wheels is considered carefully. While the company has a diverse mix of grinders on its floor—Wochna said it’s good to have flexibility there—it doesn’t have as much variety in some other areas.

Melin, for example, prefers Schaublin collets and it has fewer brands of grinding wheels than it used to.

About 60% of its wheels today are now Norton Paradigm Diamond Wheels, a product that Wochna said has substantially improved its operations and quality output. “They hit a home run with Paradigm,” Wochna said. “We want to have the best wheels.”

Paradigm is positioned in the top tier of grinding wheels from the Norton brand of Saint-Gobain Abrasives, the world’s largest abrasives manufacturer.

Norton Paradigm Diamond Wheels have a patented design that allows an ionic bond that allows for improved exposure of the working particles and higher grain retention.
The wheels feature a low diamond-to-bond ratio, possible because the special metal matrix forms an ionic bond with the diamond particles. The lower mix of bond allows for higher exposure of the working particles, and the ionic bond also delivers higher grain retention, which aids in a more uniform wear.

Compared to other superabrasive wheels, Norton says Paradigm offers a high ratio of material removal rate versus wheel wear, up to 2.5× longer wheel life and a 30% higher material removal rate. While that ultimately means faster cycle times, Wochna said other aspects of the wheel are more important to him.

Every wheel, he said, has a sweet spot on the machine on which it’s running, in the way that it runs, wears, how much horsepower is used for good results and how long the wheel can run effectively between dressing, which requires labor. “When it is run properly,” he said, “the Paradigm wheel needs little dressing. With the other wheels, it’s once an hour.”

What’s more, Wochna said Paradigm is simply a sharper, freer cutting product on its face, which requires less horsepower, or force, to cut into hard metals. That saves energy.

But perhaps even more important, because Paradigm was engineered to erode in a predictable manner, he said, “It helps us run lights-out.” That way, there aren’t surprises in the morning.

Paradigm, Wochna said, is one of the things helping Melin grow profitably. The company plans to add 10,000 ft² (930 m²) to its facility soon, and it invests substantially in research and development.

“We’re changing and tweaking our geometries all the time,” he said, in addition to adding new coatings.

As he looks ahead, Wochna still doesn’t see a slow week on the calendar, but he’s trying to keep it manageable. “We try not to grow too fast,” he said, “about 10% a year.”

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of the axis. The lack of ballscrews reduces wear, and the design promises smoother axis motion, reduced reversal errors and no backlash or lubrication issues. The linear motors are fully sealed and so are impervious to contamination. The vertical Z axis uses a preloaded ballscrew to move the grinding head.

The FX Series also comes with a new generation of software that promises improved ease of use and is supported by the latest generation AMD5x control system, along with a full touch-screen CNC operator panel.

The FX3 is an entry-level machine. The FX5 offers an automated two-wheel changer and, when properly equipped, can provide untended operation. The FX7 is ideal for manufacturing and resharpening. It has a standard automatic headstock and a range of options for high productivity, including a robot loader with capacity to load up to 840 tools, a six-station wheel changer for auto loading of wheel packs and coolant manifolds, a compact loader, and laser probe for in-process tool measurement.

Grant Anderson, ANCA CEO/director, said the company is excited about the new FX Linear line, especially its new software and automation technology designed and developed by subsidiary ANCA Motion. “These new developments,” he said, “include the LinX linear motors as well the new touch pad user interface, high-performance CNC, remote pendant, AMD5x servodrives and IO box, all of which use the latest EtherCAT communication technology.”

Production Tool Grinding

At the higher production end of the spectrum, United Grinding’s Walter brand (Fredericksburg, VA) showed off a new Helitronic Vision 400 at IMTS 2014 that is designed for high-volume production and precision, especially in the aerospace, automotive, medical and woodworking industries.

The high-performance Vision 400 model is positioned above Walter’s Helitronic Power CNC tool grinding machine and specializes in tool grinding of rotationally symmetrical tools ranging in diameter from 3 to 315...
Engineered for high-production volumes, the machine has a robot loader that can handle up to 1500 tools. An optional extension for a robot loader can hold four additional pallets for up to 2000 tools, providing a total production capacity of 3500 tools.

Both the Vision 400 and Mini Automation feature Walter’s grinding software, Helitronic Tool Studio.

Plug-and-Play Internal Grinding

Aside from tool grinding, another of United Grinding’s brands, Studer, is offering a new S141, which has been redesigned from the ground up, for both short, medium and long workpieces. That model is also serving as the basis for a new ID grinding series from Studer, which launched a new S131 and S151 at its annual Motion event. (See NewsDesk on p. 24)

Internal grinding is regarded as one of the more challenging areas of grinding, because the farther the grinding wheel gets from the bearings and spindle, the more challenging it...
is to manage precision. Wheels on long arbors can cause deflection and other challenges. What’s more, an internal grinding wheel has a greater contact area with the workpiece, which can cause challenging wear issues.

The S141 series is available in different design lengths, for workpieces with maximum lengths of 300, 700 and 1300 mm. The S141 is well suited to grinding chuck components, spindle shafts, spindle housings, rotor shafts or axes. Many workpieces are in the areas of machine tools, drive elements, aerospace and toolmaking.

Andrew Osborn, product engineer at United Grinding (Miamisburg, OH), said the company took the highly accurate S41 grinding machine and converted it into an internal grinding machine with the S141. The company’s internal grinding center in Biel, Switzerland, played a large role in redesigning the machine. “It can hold a 52” [1320-mm] part on the machine,” he said, noting that the machine maintains accuracy even at very long internal grinding lengths. Internal grinding quills up to 265 mm long can be used. A direct drive and high-resolution direct measuring system ensure quick, controlled rotational movements and precise positioning with a repeatability precision of less than one angular second. Workpieces can be completely machined both internally and externally in a single clamping with minimal auxiliary times. In addition, the grinding spindle turret has a universal measuring probe, which can be used for length positioning of a workpiece or diameter control measurement.

“In your programming options, you can say how often you want to dress the wheel, and it will go dress itself and automatically compensate for the new wheel diameter,” Osborn said. There are even special features for the most precise applications. “When you’re dressing a diamond wheel, one micron... you can compensate 60% of a micron. There’s little features like that. ... The machine is very plug-and-play.” Osborn agreed that grinding technologies are getting to a place...
where accuracy “can’t go much further,” so United Grinding is focusing on making the whole process as automated as possible, as well as energy savings. The vision is for an operator to easily enter a part program into a machine, and the machine will grind it, measure it, provide automatic feedback to the machine and make necessary adjustments itself and produce a finished part with little operator involvement beyond the initial program.

What’s New in Surface Grinding?

Ease of operation is a highlight of two Chevalier surface grinding machines, which were to be shown at Houstex. The new FSG-ADIII series, highlighted by the FSG-1632ADIII, is an advanced, automatic-precision, surface-grinding machine that offers improved accuracy, quality and ease of operation. This series includes a new touch-screen control station that can be adjusted for operator comfort. “Switches, buttons, LEDs and indicating lamps are all combined in a touch display that is ergonomically positioned to provide the best user-friendly operation,” said Chevalier Vice President Johnson Lan.

The series also includes a new PLC controller that provides a grind cycle with rough grinding, fine grinding, spark-out passes and an automatic over-wheel dresser with compensation, which can be added to fully automate the grind process. After the cycle is finished, the table will “park” either left or right of the saddle and at the front to facilitate unloading and loading. The spindle can be set to “stop running” or “continue running.” The wheelhead can also be set to return to the start position or to park at a reference point. Once the cycle is started, the wheel head will move rapidly to the start point and repeat the grind cycle.

If material is required to be removed from both sides, “flip over” can be selected, so that the wheelhead position is at the finish grind height, which will start grinding immediately without touching off.

Chevalier’s SMART-B818III surface and high-profile CNC grinder also boast ease of operation. The SMART-B818III is capable of producing mirror-surface finishes on highly accurately ground workpieces that produce microfinishes of 5 rms. The positioning accuracy is (±) 0.0025 μm and the grinding accuracy is 1 μm. The SMART’s movements are programmable in increments of 0.001 mm and include a table size of 8 × 8” (203 × 203 mm). The maximum distance from table to spindle centerline is 16” (406 mm) and wheel spindle is rated at 1000–7000 rpm and 4 hp (3 kw). The SMART’s standard grinding wheel size is 8 × ½ × 1¼” (203 × 12.7 × 31.8 mm).

“The SMART’s PC-based control,” Lan said, “combined with a user-friendly conversational TaskLink function, makes it easy to learn and operate.”

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Rollomatic
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