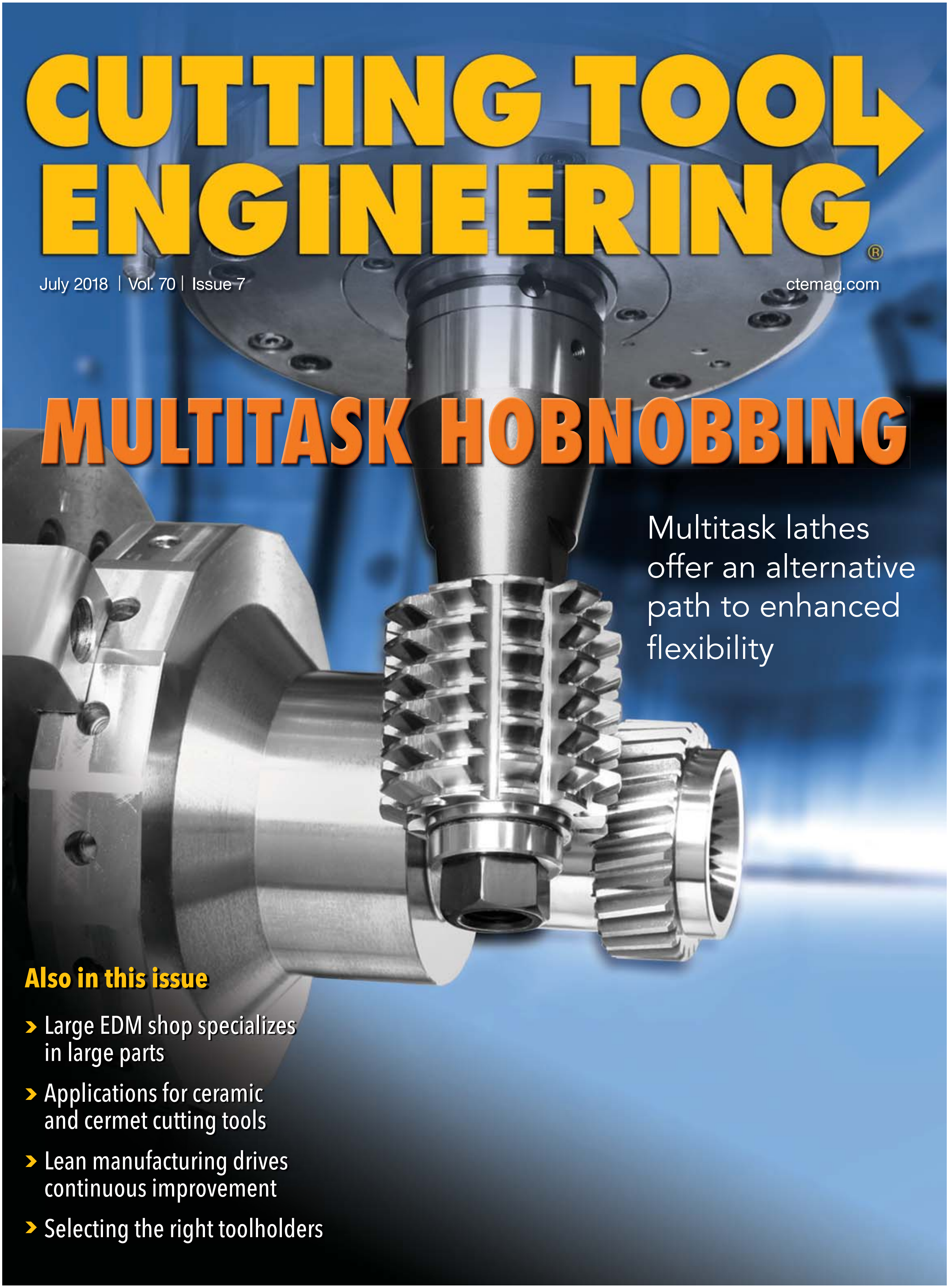

CUTTING TOOL ENGINEERING®

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MULTITASK HOBNOBBING

Multitask lathes offer an alternative path to enhanced flexibility

Also in this issue

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- Lean manufacturing drives continuous improvement
- Selecting the right toolholders

diameters, depending on the application. The abrasives used in the brush can also vary greatly, depending on the application. They include silicon carbide, aluminum oxide, ceramic and diamond.

When an edge is sharpened, the post-ground material creates a ragged edge as the grinding wheel exits the cutting edge. This happens because there is no force pushing back on the edge to shear the burr away. If this edge is not addressed, the tool will have a dead-sharp cutting edge that will quickly wear and fracture.

Once a process is defined, it can be controlled to within 0.0001" from part to part.

The edge can be measured a few different ways. Common methods include visual measurements under a microscope and contour tracing. Also, image analysis software is available for inspection, allowing the user to measure in 2D and 3D.

The range of available hones is as broad as the range of cutting tools. As a rule, the harder the workpiece material, the larger the hone required. The best way to perfect the honed edge of a tool is to test the results and make adjustments accordingly, as each application is different.

—*Mutschler Edge Technologies LLC, Cleveland, www.mutschleredgetech.com*

FINE-TUNING A GRINDING PROCESS: Usually, a grinding process can be improved by simply picking the low-hanging fruit.

Grinding wheel manufacturer Meister Abrasives USA Inc., North Kingstown, R.I., recommends trying that approach first by selecting a single variable and significantly changing it. Determine if making a change in one direction helps or hurts; then make the change in the opposite direction and document the result. If changes in that variable have little impact on the desired result, target the next one. Common process problems include taper, out-of-roundness, incorrect shape, wheel loading, poor surface finish, chatter and premature wheel wear.

However, after the low-hanging

Industry Briefs

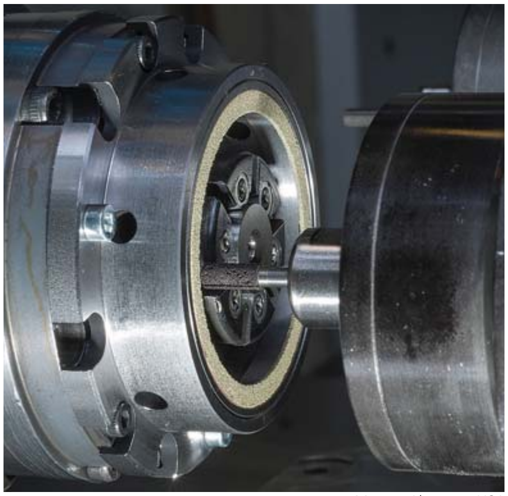
fruit is picked, a granular approach to troubleshooting is required to fix a specific problem. To find the proverbial needle in a haystack, Tom Cappadona, Midwest sales/applications engineer for Meister Abrasives, developed a spreadsheet with more than 80 variables that can be altered in numerous ways to fine-tune a grinding process.

"The monster was born," Cappadona said, after he visited large factories in which multiple grinders were running the same processes but the grinding parameters varied significantly. That realization led to

1	Data collection by Meister Abrasives USA		
2	**Part**	**ID widget**	**OD widget**
3	Material	52100	52100
4	Hardness	55-60 HRC	55-60 HRC
5	Part diameter	10mm	30mm
15	Starting wheel size diameter	8mm	400mm
17	Stub size diameter	5mm	390mm
19	Usable wheel diameter	3mm	10mm
27	Operating wheel speed	90,000 rpm	2,000 rpm
28	Operating wheel surface spd.	37.7 m/sec.	41.9 m/sec.
30	Coolant type	Oil	Oil
52	Dresser type	Radius	Straight
53	Dressing tool dia.	125mm	125mm
54	Dressing tool radius	1	0
59	Operating dressing spindle	4,500 rpm	5,000 rpm
60	Dressing tool surface speed	29.5 m/sec.	32.7 m/sec.
61	Wheel speed for dressing	90,000 rpm	2,000 rpm
62	Direction	Uni	Counter
63	Wheel surface speed for dressing	37.7 m/sec.	41.9 m/sec.
64	Speed ratio	78.1%	-78.1%
65	Dressing traverse speed	400 mm/min.	200 mm/min.
67	Achieved overlap	24.638	25.000
68	Dress depth diameter (AB)	0.003mm	0.003mm
69	Number of passes	2	1
70	Dress frequency (AI)	50	200
71	Dress cycle time	20 sec.	25 sec.
73	Theoretical dresses/wheel	500	3,333
74	Achieved cycle time	30 sec.	15 sec.
79	Theoretical parts/wheel	25,000	666,667
80	Wheel cost	$165.00	$4,600.00
81	Abrasive cost/workpiece	$0.0066	$0.0069

Meister Abrasives USA

An abbreviated snapshot of the process documentation/improvement spreadsheet developed by Tom Cappadona, Midwest sales/applications engineer for Meister Abrasives.



Meister Abrasives USA

An HPB vitrified-bond CBN grinding wheel and vDD diamond dresser from Meister Abrasives.

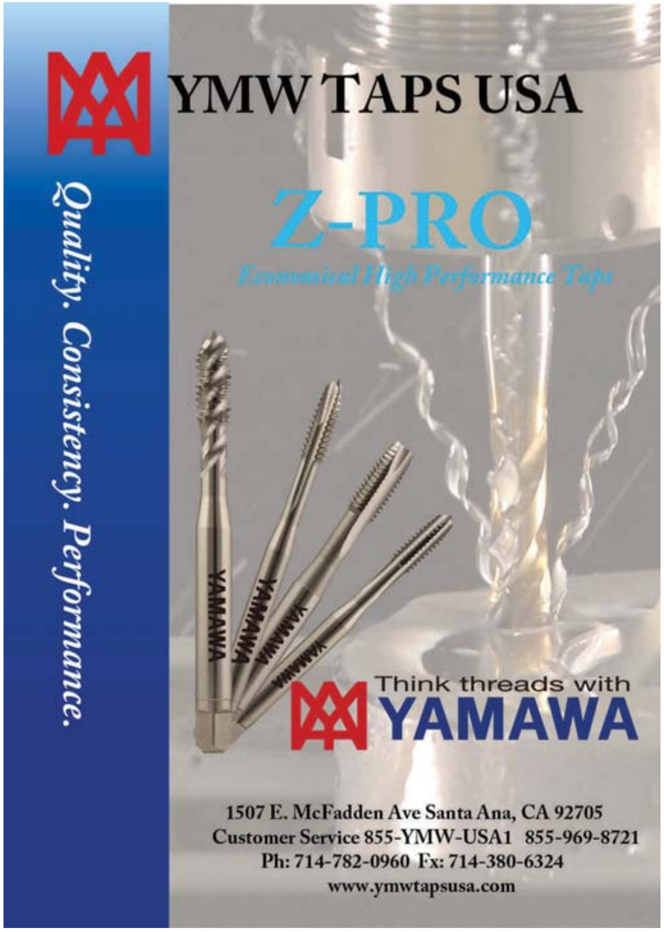
making calculations for multiple parameters, such as the surface speed of the grinding wheel, surface speed of the dresser and traverse speed when dressing, as well as the speed ratio of the dresser and the grinding wheel.

"Then there is the overlap ratio," he said. As the grinding wheel rotates and the dresser moves across the grinding wheel, that ratio is the number of wheel revolutions from the time the leading edge of the dresser enters a point on the wheel to the time the trailing edge of the dresser exits the same point on the wheel.

It's critical to be able to effectively grind a part after dressing without any operator intervention to correct a wheel's condition, Cappadona said. Possible interventions include slowing the infeed or reducing the feed override on the first couple of workpieces after dressing.

"By manipulating these conditions, we're looking to take away some of that 'sawtooth' effect from the last piece before dressing to the first piece after dressing," he added. "We want to be automated. Anytime you have human influence in the process, it is just a recipe for all kinds of variables."

The challenges increase when grinding with superabrasive wheels compared with conventional abrasive ones, Cappadona said. "Superabrasive wheels tend to cut and like to be used aggressively, but they don't like to be dressed." As a



result, a just-dressed superabrasive wheel often performs like a dull one. It pushes the workpiece material while imparting a fine surface finish until the bond opens again and the wheel starts cutting.

To cut rather than push material, he recommends more aggressive dressing parameters that crush some of the bond from the grit edges. An effective starting point is unidirectional dressing at a speed ratio of 80 percent. Another option is to increase the dress traverse speed.

Dressing also can impact taper formation. Dressing a bore wheel with a counterdirectional dresser, for instance, often shears the grains and creates a dull wheel, he said. A unidirectional dresser, however, breaks the bond from sharp edges of the microfracturing grits and "allows cutting to happen right off the bat. That gives a much freer-cutting wheel and will usually get rid of any taper. There are all kinds of little tricks that you can use to modify the results and get what you're looking for."

—Alan Richter