


Segmented Cutterheads



Plane hundreds of feet of lumber with no tearout and no knife changes

BY ROLAND JOHNSON

Installing fresh knives in jointer or planer cutterheads is tedious and time-consuming, requiring dial indicators, magnetic knife holders, and a bit of voodoo to get all three knives set to exactly the same height. And right after you get a sharp set installed, it takes only a stray grain of sand or a small, hard knot to take a tiny nick out of those fresh edges and start leaving tracks on every board. But if you delay and don't change your knives when they need it, you'll be frustrated by tearout and bad results.

Segmented cutterheads are one of the few truly new developments in wood-working. The multi-sided, (usually) carbide teeth hold an edge many times longer than traditional steel knives, and pivot quickly and accurately when they finally do need a fresh edge. Users also report much less tearout than they get with straight knives.

Today's higher-end machines come equipped with a wide variety of these innovative cutterheads, and there are at least two that can be retrofit into your old jointer or planer. But there is a lot of debate about

Big benefits

One project's worth of rough lumber is enough to nick and dull the straight, steel knives on your jointer and planer. Not so for segmented cutterheads, spelling the end of tedious blade changes.



CLEANER CUTS

The perfectly indexed, long-lasting carbide teeth leave fewer ridges and less tearout in all types of woods.

Photos, except where noted: Anissa Kapsales

Change the Game

which types leave the cleanest surfaces, those with forward-facing teeth (a bit less expensive to manufacture) or those with angled, shear-cutting teeth.

To find out if all the claims about segmented cutterheads are true, and see if any of the types have an edge on the competition, we ran hundreds of feet of lumber through most of the models on the market. As we were going to press we realized that we missed two, available as an option on some machines from General and General International. We'll test those in the future.

An explanation of the new cutterhead

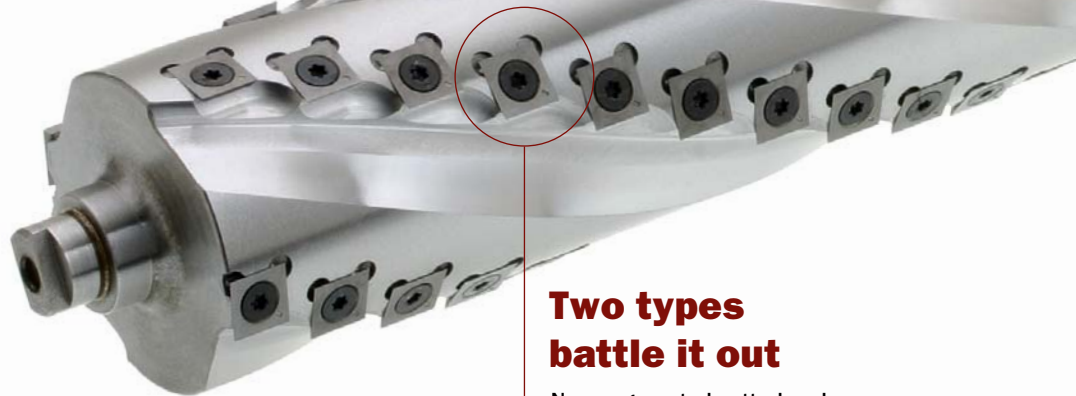
Microprocessors make super-accurate CNC machining possible, and this, in turn, makes insert-cutter technology not only possible but affordable for the average woodworker. The cutterheads have pockets machined in them that accept precisely ground cutters held in place by a screw. The typical cutter has four sharp edges (one type has two), and all can easily be rotated to a fresh cutting edge when one becomes dull or damaged. The CNC accuracy creates very accurate knife projection so all the knives

cut uniformly in all four positions, leaving a planed surface nearly free of knife marks. All of the heads left very shallow tracks or scallops in the wood, but none were deeper than normal milling marks, easily removed with one pass of a sander or handplane.

Aside from the milling marks, many users claim that the cutting action of a small insert cutter creates less tearout than a full-width, straight knife.

The mechanical differences

There are obvious differences between the various cutterheads, such as tooth count

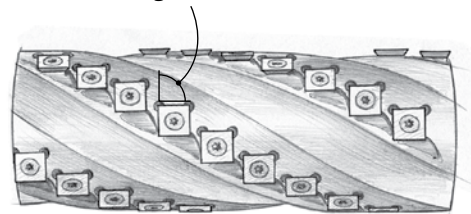


Two types battle it out

New segmented cutterheads are emerging all the time, but they shake out into two main approaches, each with its own passionate advocates.

STRAIGHT STYLE IS LESS EXPENSIVE

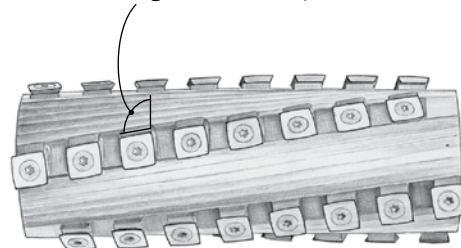
Teeth are set along a spiral, but each is straight and faces forward.



Teeth are straight on all four sides.

SHEAR CUT IS MORE COMPLEX

The teeth are not only arrayed in a spiral, but their edges follow the spiral too.

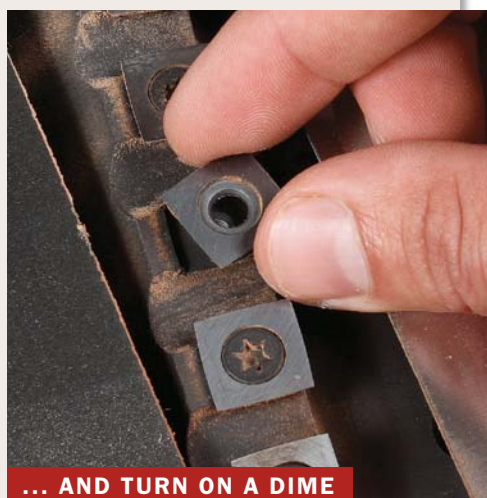


Teeth are set at an angle and slightly curved on the edges to create a shearing cut.



TEETH LAST 20 TIMES LONGER ...

The typical insert cutter has four sharp edges vs. one or two on high-speed-steel knives, and is made of carbide, making each edge much more durable.



... AND TURN ON A DIME

When you do finally need a fresh edge, the teeth are simple to loosen and turn, and they go right back into perfect position. Say goodbye to tedious knife changes.

Head to head

We tested five types of segmented cutterheads both as standard equipment in new machines and retrofit into DeWalt DW735 12-in. benchtop planers. Our control group was another DW735 and a Jet JJP-12 Jointer/Planer, each outfitted with the straight knives. We ran MDF through each machine to accelerate wear, and then closely examined cut quality on a wide variety of woods, from tiger maple and exotic woods to common domestic hardwoods and soft white pine. We think that straight knives will fare a bit worse in the real world than they did in our tests because people tend to avoid changing straight knives, keeping them in place long after they are dull and causing serious tearout. Also, our MDF wear cycle only simulated 200-or-so feet of lumber passing by the blades. We would have listed prices in the chart, but there are too many factors (machine type, bearings, cutterhead dia.) to lock down specific ranges. In general, Accu-Head is the least expensive and shear-cutting heads cost the most.

CUTTERHEAD

Straight knives

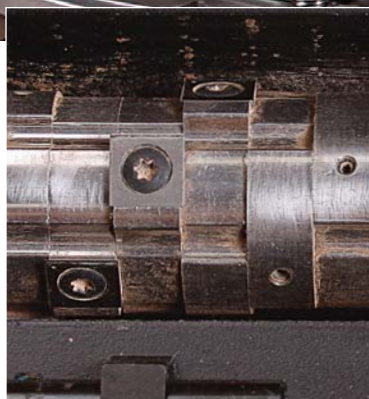
Accu-Head

Byrd Shelix

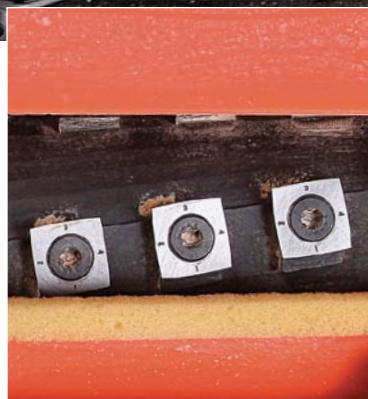
Grizzly
spiral cutterhead

Laguna
ShearTec II

Powermatic/Jet
helical cutterhead



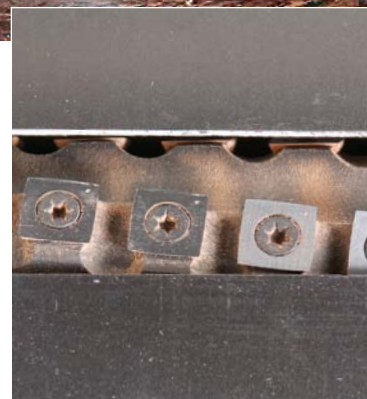
Accu-Head



Byrd Shelix



Grizzly spiral cutterhead



Laguna ShearTec II

AVAILABLE ON	TOOTH ORIENTATION	TEETH PER INCH	PERFORMANCE		
			HARDWOODS	SOFTWOODS	DIFFICULT HARDWOODS
All machines	Straight	n/a	Good	Very good	Good
General International's 13-in planer*, many of Steel City's jointers and planers, and as retrofits for dozens of other machines (check Accu-Head.com)	Straight	2¼*	Good	Good	Good
Available on some new machines (check with the manufacturers), and as retrofits for many more (check byrdtool.com)	Shear	5	Excellent	Good	Excellent
Grizzly planers, jointers, and planer/jointers	Straight	5	Very good	Good	Very good
Laguna planers, jointers, and planer/jointers	Shear	6¾	Excellent	Very good	Very good
Jet planers, jointers, and planer/jointers, and a few Powermatic jointers	Shear	4¾	Excellent	Very good	Excellent

*Accu-Head teeth are high-speed steel and have two sharp edges. All others are carbide, with four sharp edges.



and tooth positioning on the cutterhead. For example, the teeth on the Accu-Head face forward, and are arranged in a steep spiral with the teeth staggered for overlapped cutting. The teeth are high-speed steel (HSS) with two sharp edges. Grizzly's cutters also face forward, but they are arranged in spiral rows. Also, each tooth is carbide and has four sharp edges. The other main types we tested have carbide, shear-cutting teeth, positioned and ground so the edges align in a spiral.

Apples to apples

A head-to-head comparison of the technologies is a bit difficult because the machines they are installed in play a role in

cut quality. So we tried them in a wide array of machine types and sizes.

But we did manage a limited head-to-head test, using the two cutterheads that can be retrofitted, the Accu-Head and the Byrd Shelix, putting each into a DeWalt DW735 benchtop planer, with a third DW735 tested with its original straight knives.

That allowed us to measure amperage draw and decibel levels on a level playing field, to get some ideas about power demands and noise levels. Surprisingly, the straight knives consumed the lowest power, the 26-cutter Accu-Head was next in line, and the Shelix required considerably more power. My assumption had been that



Powermatic/Jet helical cutterhead

How we crunched the numbers

We rated the surface quality on dozens of sample boards on a 1-to-10 scale. No single board was worse than a 5, and no overall average was lower than 6. We called an average rating between 8.5 and 10 "excellent," 7.5 to 8.5 "very good," 6.5 to 7.5 "good," and 5 to 6.5 "fair." When all the samples were averaged, no cutterheads got a rating below "good."



Upgrade the machine you have

BY BILL PECK

For both retrofittable cutterheads, the Accu-Head and Byrd Shelix, installation in the DeWalt DW 735 planer is straightforward, if you follow the detailed instructions provided with both. This is not a job for the mechanically challenged, but some patience and attention to detail will make the installation go smoothly. You'll need a good set of internal and external snap-ring pliers, some other standard tools, and about two hours to do it.

When reassembling the Shelix unit, I found the key slot in the cutterhead shaft was slightly undersize and would not accept the DeWalt key. Byrd quickly provided a new key, which solved the problem.

At right are a few highlights of the job, with tips for success.

START BY REMOVING THE OLD CUTTERHEAD

Tip for removing the belt. Neither set of instructions tells you to remove the idler pulley from the feed roll chain, but doing so eases the removal of the drive belt, and it's easy to do.

Knock out the original head. Heavy taps with a dead-blow hammer and a block of hardwood unseats the bearing, and then it slides out easily. Fasten the planer securely when removing the old cutterhead and reinstalling the new one.



with insert cutters the power needed to make a cut would be lower simply because the cutters are narrow, compared to a full-width blade, and take a smaller bite.

I believe that the reason for the higher power demand is that the cutters are constantly in contact with the wood. With three or four straight knives, the motor has a chance to regain a bit of lost inertia between bites. Don't worry, the constant power demand won't wear out your motor any faster, but the additional amp draw could trip the breaker on an undersize circuit.

The big test

For the ultimate test—surface quality in real-world situations—we started all of our machines and cutterheads with several passes on cherry and oak boards, taking 1/16 in. per pass. Then we put 120 linear feet of 12-in.-wide MDF (very unkind to cutting edges) through each one to put some additional wear on the edges. And then we ran three types of woods through all of them. We ran cherry, oak, and maple as examples of domestic hardwoods; and then cumaru, jatoba, hickory, and tiger maple to test the cutter-

heads on the toughest interlocked and alternating grain. Last we ran some white pine, since softwoods present their own challenges.

Most of the planers we tested have two feed speeds. We used the lower speed, which is generally considered the finish-cut speed. On the jointers, we pushed the wood through at a slow, steady rate.

Overall, we were pleasantly surprised at how well all these cutterheads performed. The straight knives survived the MDF better than we had anticipated. If we had unlimited time and manpower, we would have run a lot more of it through. The HSS segmented cutterheads followed suit with very little discernible difference between brand new and slightly abused, and the carbide cutters all breezed through the test regimen with little difference in cut quality before and after the MDF. It is logical, however, that the gap will widen as the cutters become more worn.

Overall, our testing proved that insert cutters do a better job of dealing with difficult wood than straight cutters, and that there are subtle differences be-

Do the math: You'll save in the long run

Comparing the costs of this technology isn't a straightforward matter. You should consider the number of sides the segmented cutters have because it adds longevity to the cutterhead. You have to think about the cost of replacement blades and sharpening costs for straight knives. Go to FineWoodworking.com/extras to read Roland Johnson's detailed breakdown and formula for figuring out total costs and values involved with the different cutterhead scenarios you may come across.





INSTALL THE NEW ONE



Cutters off, cutterhead in. Accu-Head tells you to remove the teeth (left) before sliding the cutterhead through the bearing housing (above). Byrd provides a plastic wrapper to protect its carbide cutters, but we recommend removing its cutters, too. It takes a little longer but you are assured not to damage the brittle carbide edges or score the bearing housing. After the head is in place, Peck says it's easy to re-install the teeth (right).



tween the technologies with regard to quality of cut.

Using a raking light, we analyzed both grain tearout and surface quality (lines, ridges, or troughs). The milling marks were all about the same, all shallow enough that normal surface prep (a light pass with either a smoothing plane or a random-orbit sander with 150-grit sandpaper) will remove them. Tearout was also a non-issue on most boards, whether the cutterheads were straight or segmented, but certain species and individual boards caused problems, just like they do in the real world.

The shear-cutting heads were the top performers in the group, planing domestic or exotic wood with virtually no tearout and minimal ridges. The front-facing teeth on the Grizzly head came in just behind, showing slightly more tearout on the worst boards, and the Accu-Head didn't fare any better than the straight knives on the toughest boards.

By the way, unlike the straight knives, all of the segmented cutterheads worked almost as well no matter which direction we sent a board through.

Bottom line: These cutterheads are worth the added cost

I can unequivocally say that insert-cutter technology for jointers and planers is worth every penny. The fact that each carbide edge will last 10 times longer than a steel one, conservatively, and that most teeth have four sharp edges, not one or two, is enough to repay your investment. Add to that the time you will save on knife changes. Now consider the lack of tearout and the resulting savings in lumber and time, and you can see how quickly one of these cutterheads will pay for itself, whether in a brand-new machine or as a retrofit for a good machine you already own.

But most valuable of all will be the reduction in stress. There are few things more frustrating than having the perfect board become firewood from massive and unexpected tearout. With a segmented cutterhead, on the other hand, you'll have sharp teeth on your jointer or planer and tearout-free cuts almost all the time.

When the teeth do become dull, rotating them is simple compared to the dreaded knife change. The accuracy of CNC machining means the teeth will always be

positioned accurately. That alone will result in better cuts and longer tooth life (all of them share the load). And if just a few teeth are damaged by a nail or grit, only those teeth need to be rotated. By the way, replacement teeth cost \$40-\$60 for a 10-pack.

So here's my bottom line. If you are on a budget and work with mostly straight-grained domestic hardwoods and softwoods, any of the carbide-tooth cutterheads will revolutionize your ability to create straight, flat surfaces with minimal or no tearout. If you have slightly deeper pockets or work a lot of difficult wood, then the shear-cut technology is the ticket. □

Roland Johnson is a contributing editor.