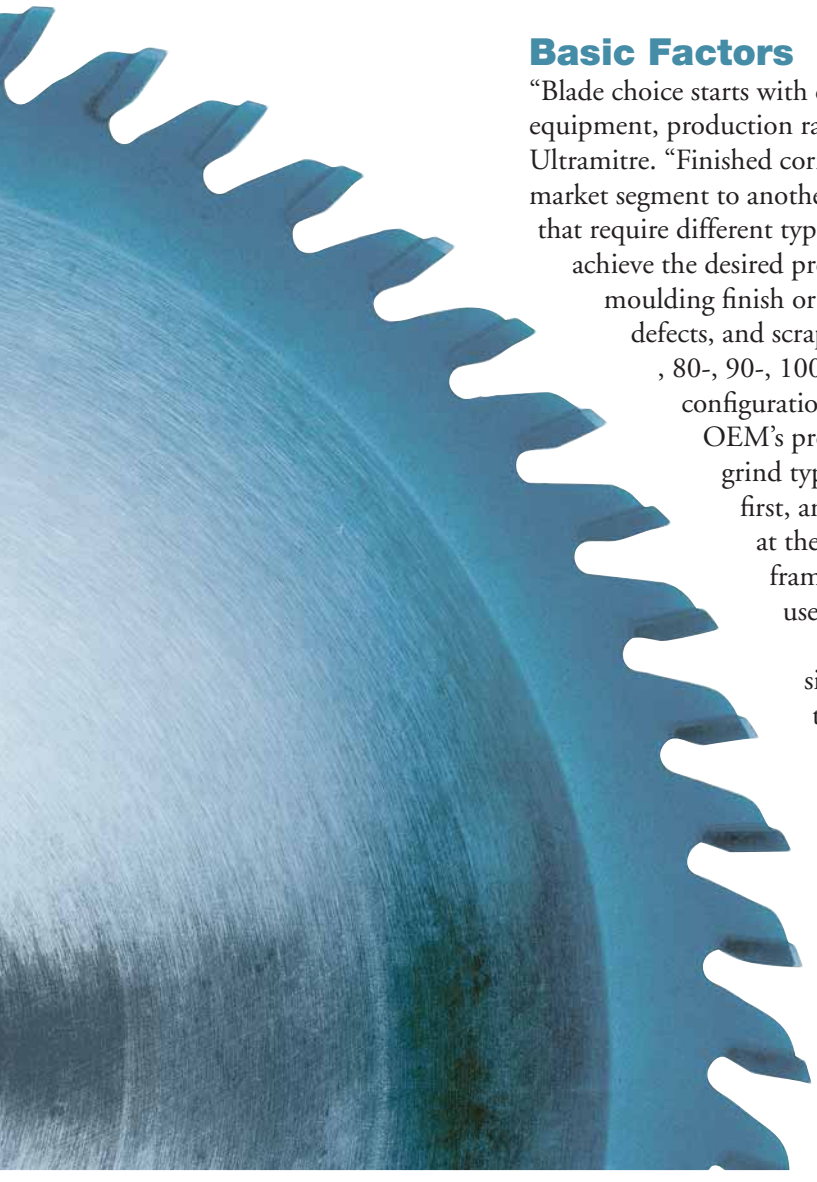
Choosing The Right Blade

Selecting double miter blades that match your materials can make your production more profitable.

By Patrick Sarver

Choosing a blade starts with the material that's being cut," says Justin Convey, sales manager at ITW AMP. "The most important thing is to match the blade with the material so that you can achieve the quality of cut you need."

That statement captures the essence of finding the right blade for your double miter saw. But as the old saying goes, the devil is in the details. And paying attention to details when selecting and managing double miter saw blades is critical if you want to achieve the quality of cuts you need while keeping your profits up and your downtime to a minimum.



Basic Factors

"Blade choice starts with careful consideration of the moulding substrate and finish, equipment, production rate, and desired finished corner quality," says Ken Frank of Ultramitre. "Finished corner quality varies with the value chain from one consumer market segment to another. There are numerous moulding finishes and substrates that require different types of blades, grind types, and tooth counts. The goal is to achieve the desired production rate and, at the same time, avoid damage to the moulding finish or 45 degree accuracy that cause expensive touch up labor, defects, and scrap. There are 12-inch blades, for example, that have 60-, 80-, 90-, 100-, and 120-teeth, with as many as three different grind configurations to best suit individual production requirements. An OEM's product mix and production rate drives the tooth count and grind type. Large OEMs historically have set the rate of production first, and then they strive to achieve quality with different blades at the pre-determined rate. Smaller OEM and commercial framers today are faced with higher quality demands and may use slower production rates to get the desired results."

"Among the factors you need to look at are the blade size, the arbor, number of teeth, and tooth configurations that are best for a material—and even if it's a carbide-tipped blade," says Clay Simpson, sales manager for Active Sales.

For example, take blade diameter or size. "Every double miter saw requires its blades to be an exact diameter," says Bob Pistorius, president of Pistorius Machines. "If they are oversized, they could hit together. You also have to match the arbor size of the machine. Is it 5/8" or 1"? Sometimes you can put a reducing bushing into the bore to match the blade to the arbor, but that always creates the possibility of a little play, producing a poorer cut."

Wood Blades

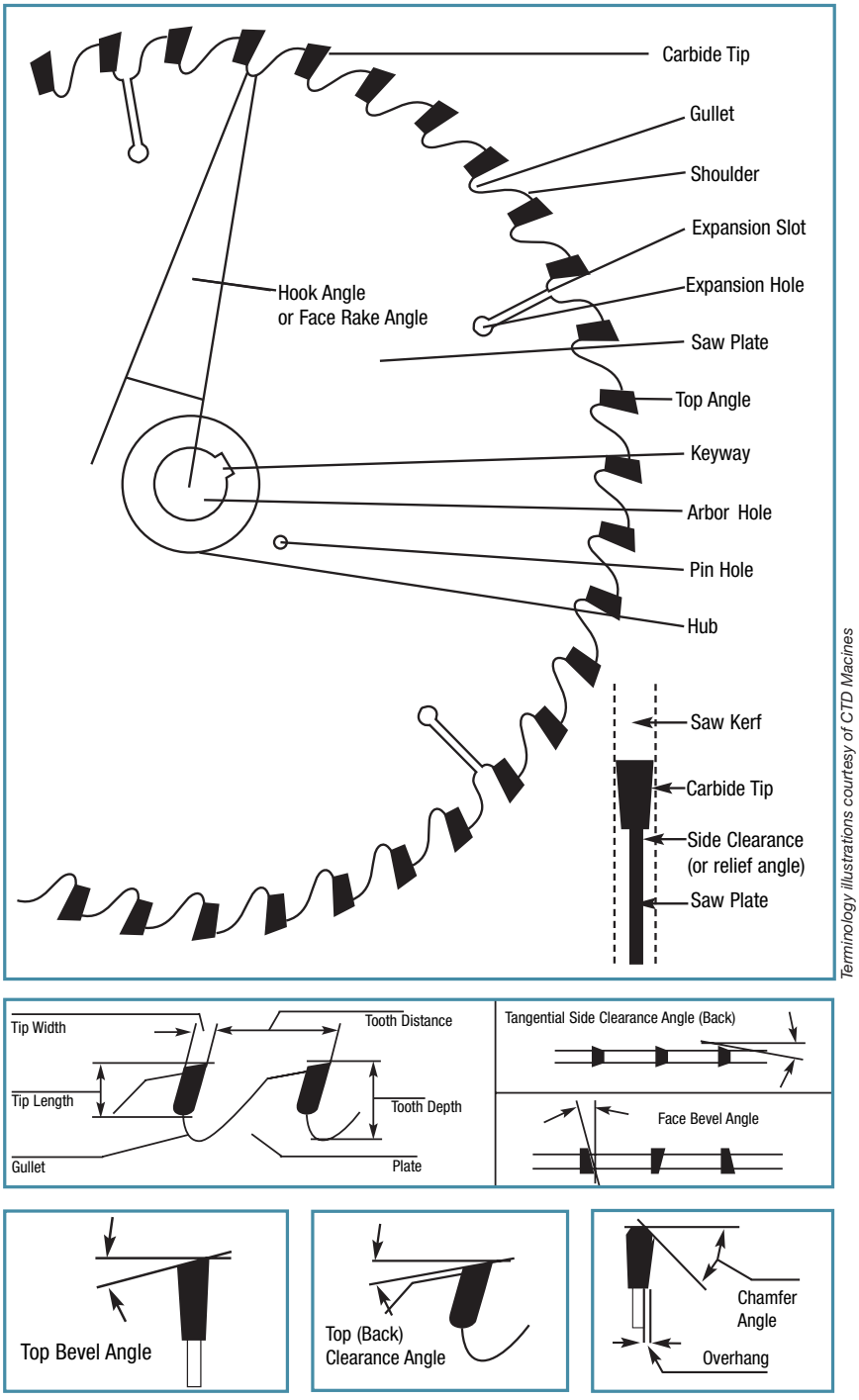
If you work mostly with wood, the choice is to buy a blade made to cut that material. A wood-only blade typically has what is called a 4+1 alternating top-level grind. There are four teeth with a 20- or 25-degree top bevels alternating right and left followed by one square tooth that is .012" lower than the other teeth and called a raker tooth. The 4+1 alternating grind has a very sharp angle point to start the cut, so that it cuts like a shear from the outside in. The raker tooth is designed to bring material through the cut so it isn't pushed out to the sides.

"A raker tooth is used for a faster, smoother cut, based on the way the material is removed," says Pistorius. "The alternating left and right teeth have sharp points that sever the fibers as cleanly as possible but leave a piece in-between. The raker tooth cleans that out."

With all the tooth counts available, what's the optimum? "Typically, I recommend 80 to 90 teeth on a wood blade," says Tom Orlando, president of CTD Machines. "For a 14-inch blade, you could go up to 100 teeth. That's plenty to do the job. If you're cutting heavy, solid materials, you might want to drop down to 60 to 70 teeth. The same thing holds for cutting compo or gesso. They take the same blade as wood; the blade just dulls a lot faster."

Compo and gesso tend to be very abrasive, especially in larger mouldings where there can be large amounts of those materials, adds Pistorius. Hard woods can also be abrasive. "If you're cutting black gessoed moulding with a black lacquer finish, that's so delicate you have to have a very sharp blade to cut it without chipping. It also needs more teeth because each tooth is taking out less material and less cutting force is being applied to the moulding. So you have a better chance of cutting cleanly—keeping in mind that a blade with more teeth can't cut as fast."

MDF can also be hard on a blade, says industry consultant Jim Parrie. "It can gum it up and create smoke after a while, so you need to keep your blades clean for the best cut." The wear on the blade from MDF can also reduce the number of sharpenings you get with a blade, which is why some manufacturers recommend using a higher grade of carbide for cutting fiberboard.



Terminology illustrations courtesy of CTD Macines

This illustration of basic blade terms shows some of the details involved in creating tooth configurations and grinds that work best on specific materials.

Metal Blades

"Metal-cutting blades come in two basic configurations: a triple-chip grind and a high-low grind—which some people also call a California triple-chip grind," says Orlando. "A triple-chip is a three-tooth combination. It starts with a double-chamfered tooth, a chamfer in

one direction on the second tooth, and a chamfer in the opposite direction on the third tooth. The high-low grind has a double-chamfer tooth and then a lower square tooth. The first tooth takes out the majority of the material and the square tooth takes out the rest and squares out the corners. It is similar to a raker tooth on a wood blade."

The tooth design used on a wood blade won't work for cutting aluminum, says Pistorius. "If you tried to use the sharp, pointed teeth of a wood blade, the points would chip right off. That's why the triple-chip has blunter teeth. On the other hand, an aluminum blade doesn't do a very good job of cutting wood because of the blunt face on the teeth."

Blades used to cut aluminum frames typically have slightly more teeth than for wood—90 and 100 teeth on a 12-inch blade. "The 100 is used for lighter, 1/16" wall aluminum extrusions, while the 90 is designed for 1/8" to 3/8" aluminum," says Orlando.

Another option for cutting aluminum moulding is a high-speed steel blade designed specifically for cutting thin-walled aluminum. These have 150 to 180 teeth, says Skip Luberto of Quality Saw & Knife Company. "They are non-aggressive blades that cut very cleanly and won't try to pull moulding out of a clamp like a carbide blade tends to do. The downside is that it only lasts about a fifth as long as a carbide blade. These blades use an alternating bevel grind, where the tooth and face are ground on a 10 degree angle."

Polystyrene Blades

"When cutting polystyrene, you use fewer teeth, a faster cycle rate, and a lot more clearance on the blade," says Pistorius. "You need to keep heat to a minimum or you'll melt the debris from the blade, and it will stick on the bottom of the cut. It's not only unsightly but may cause a bad joint. The right tooth configuration usually eliminates that problem."

"Polystyrene blades use an hollow-face inverted-V grind, where the face of the tooth is ground in a hollow—it looks like a half moon," says Luberto. "One tooth is a complete V that comes to a point, and the tooth behind that is a raker. The first tooth starts the cut with the V, and the raker tooth finishes the cut. But because the cutting tooth is ground on a hollow, it does a lot of side cutting as well. The hollow-face design pushes material off to the side rather than through the middle, which eliminates a lot of the melting and burning on plastic moulding. Plastic-cutting blades also have only 48 to 60 teeth, which eliminates heat build-up."

Combination Blades

A combination blade for wood and aluminum uses a triple-chip metal blade tooth design that is very similar to a metal blade. It offers versatility and doesn't require changing blades for different materials. But it

Care and Use of Blades

Don't Lay Blades on Metal

When changing and handling blades, never lay them down on a steel table or allow them to come in contact with the saw or any other metal object. As soon as you lay a blade down on metal the carbide tips are going to get microchips, and blade deterioration will start before the blades are even used. Also package blades properly when sending them out for sharpening, making sure the teeth don't touch one another. If one blade sits directly on top of another and they slide back and forth, the teeth will break.

Use a Chip Breaker

There's a little box on some saws called a chip breaker. Because of the weight of the fallout of that little V or triangle the blade cuts out, the chip breaker supports that material until the blade goes all the way through before falling off. That also gives you a really nice corner.

Keep MDF Dust Off Linen

When you're cutting MDF and then go to a linen liner, change the blade immediately. MDF particles get inside the teeth and will leave brown residue stain on the linen liner if you don't change blades.

Clean Blade Residue

With wood moulding, pitch and sap will build up on the sides of the blade. When the blade tries to cut through the moulding it will push the sap against the wood making the cut more difficult and sealing the wood so the glue won't adhere as easily. Remove the blades and spray on any kind of biodegradable cleaning solvent, such as Simple Green, and wipe it with a clean rag. Or you can use a little oven cleaner if you don't mind the fumes.

Watch Out for Nails

Watch out for staples and nails in moulding, which will chip and break carbide tips pretty quickly. It doesn't take much of that to ruin a blade.

Dedicate Saws to Materials

If you have more than one saw, set up one to cut wood and the other to cut metal to get the best yield out of the blades. If you rely on a combination blade to cut everything, you'll sacrifice the cleanliness of the cuts in the wood moulding and prematurely dull the blade because wood is more abrasive to carbide in a combination blade tooth design.

Don't Force Blades

A lot of production companies cut moulding all day long to get product out. But at the end of the day, cuts may get ragged. That can often be eliminated just by slowing the feed speed (cycle rate) down to minimize extra abrasion caused by forcing blades through a material instead of letting them cut naturally.

Keep the Inner Flange Clean

The inner flange (or slinger) on a double miter saw is a critical surface. Every time you change a blade, clean that surface and the surface of the blade that rests against it. Any dust or chips that get between the blade and the inner flange will work against its squareness and precision. Once that happens, no blade will run perfectly true.

is a compromise. "When the moulding allows, we recommend using a combo blade for cutting materials like compo because it will stay sharper longer and the overall economy is better," says Frank. "If finishes are delicate, a wood blade will be needed."

"If you are going to cut wood most of the time, then use a wood blade," says Orlando. "If it's aluminum, use a metal blade. Most production shops don't cut both at the same time, so you usually change blades. Keep in mind that if you do use the same blade for both materials—a combination blade, which is basically an aluminum blade—you'll lose 25 to 35 percent of blade life."

Material	Blade Type	Blade Diameter	Tooth Count	Grind
Wood, MDF, Compo	Wood	10"	80-90	4+1 Alternating Bevel
Wood, MDF, Compo	Wood	12"	80-90	4+1 Alternating Bevel
Wood, MDF, Compo	Wood	14"	100	4+1 Alternating Bevel
Aluminum	Combo/Metal	10"	80-90	Triple Chip or High-Low
Aluminum	Combo/Metal	12"	90-100	Triple Chip or High-Low
Aluminum	Combo/Metal	14"	100-120	Triple Chip or High-Low
Polystyrene	Styrene	10"	48	Inverted Hollow-V
Polystyrene	Styrene	12"	60	Inverted Hollow-V
Polystyrene	Styrene	14"	72-80	Inverted Hollow-V

Notes: MDF may need the next hardest carbide tip.
Metal blades require lubrication when cutting.

This chart shows blade configurations for various moulding materials, based on a consensus of recommendations of the experts quoted in this article. Please note that these are only general recommendations, and the best blade for cutting a specific material may be different, based on such factors as the brittleness of moulding finishes, the desired quality of cuts, and overall production needs.

"The reason a combination blade will dull faster when cutting wood than a wood-only blade will is because the grade of carbide used is softer," says Luberto. "You also sacrifice some of the cleanliness of the cut on wood. The triple-chip grind on combination and metal blades cuts from the inside out, not from the outside in like a wood blade does, which is why a wood blade cuts cleaner and easier than a combination blade.

Price vs. Quality

"For a 12-inch saw, carbide blades run $60 to $230," says Frank. "The quality from a top blade is better from the first cut, and it will provide quality cuts longer—twice as long or longer than a cheaper blade—before it needs sharpening. In the end, the bottom line is far better when you use a precision blade because it reduces touch-up labor, defects, and scrap. All of the leading companies in the industry, at every level, are not wrong about this."

"You definitely get a more precise cut and more durability with that $230 blade," adds Simpson. "The quality far and away makes up for the difference in price."

"If I'm going to buy a blade, the first thing I'll ask the manufacturer is who some of their clients are," says Parrie. "I want someone who's serving the big companies and has a lot of blades in the field. They know how long their blades will last. That's important, because I want to know how many sharpenings I can get out of their blades."

Blades made for the framing industry cost twice as much as those made for cabinetry, points out Luberto, and there's a reason they do. For example, he says, "there's a different grade of carbide, and there's an acid-resistant binder in the carbide that helps it stay together longer and not break down, prematurely dulling the blade."

There are also all kinds of steel used for blades, and some won't hold their straightness or won't form as good a bond between the steel and the carbide tip as a good blade will, says Pistorius. "Quality is also an issue with the carbide. You can find cheap saw blades out there, but they're mass-produced, not very straight, have a lot of wobble and run-out, have poor quality carbide, and don't have the proper clearances."

"The difference between a $100 to $150 blade and a $200 to $250 blade lies in the plate thickness, the type of carbide used, and the equipment used to make grind the carbide tips," says Orlando. "The more sophisticated the grinding equipment is, the closer the clearance angles on the blade will be, and the better your cuts will be."

Blade Design

"Blades made for cutting moulding have a minimal amount of side clearance, the measure of how much the carbide tip hangs off the body of the saw plate, which is usually about .007 to .009 inch," says Luberto. "This allows a blade to come back up through the cut in the moulding without dragging and chipping it on the way up."

The amount of carbide on a tooth in a quality blade is optimized for cutting moulding. Putting thicker carbide on a tip, for example, would not noticeably increase blade life, says Orlando, and it would add weight, making it more difficult for a blade to run true. Nor can carbide tips be much longer or they would twist or bend under the cutting stress, causing the bond between the tip and the steel plate to fail.

All quality framing blades are made from steel plates that are hammer-tensioned, says Luberto. Some have copper plugs in the expansion slots to eliminate noise or vibration.

"The most important thing about a blade is the

plate thickness because that determines how straight it will cut," says Orlando. "A thinner blade has a tendency to wander and distort. If you are cutting extremely hard woods, you need a heavy plate blade. We use .110" thickness on a 12-inch blade. If you're cutting hard oak, maple, or ramin all the time, you'll probably want to increase the thickness to .125". This helps keep the blade rigid through the cut, especially when you're mitering, because you're going across the grain."

When to Change Blades

"The number of frames cut before a blade needs sharpening depends on profile size, type of finish, number of teeth, and quality requirements," says Frank. "One manufacturer who needs a perfect corner will take a blade off after 20 to 30 hours. Someone who doesn't need a perfect corner may get twice that much life. Determining that a blade needs sharpening commonly takes place when an operator sees a reduced quality cut. We offer metered services to allow a more objective decision-making process for when the blades get changed. If they aren't changed on time the result will be moulding damage and an increase in labor, defects, and scrap. It is important for OEMs to know their markets so they can establish sharpening schedules geared to the quality level they need."

Because there are so many different types of material, there's no one number on the amount of frames you can cut before you need to sharpen a blade, says Pistorius. "Moulding with heavy compo deteriorates blades quickly because it's like cutting a stone. On the other hand, really narrow soft pine moulding can probably be cut for a year without sharpening. Aluminum is more abrasive. Styrene is tough stuff, too. The cycle speed has an effect. If you try to cut too fast, you might damage the blade tips by forcing the blade instead of letting it cut. With aluminum, it depends on the lubrication of the blade. When the quality of the cut begins to degrade, you usually see it in simple things like burning or glazing on the faces of wood moulding, excess chipping or tear-out, or hollows in the centers of the miters."

Pistorius says he would also advise a higher volume shop to have a minimum of three sets of saw blades for each machine—one set on the machine, one set on the shelf, and one set out for sharpening. "At any moment, you could hit a staple or a carbide tip will get knocked out of alignment or something could get jammed that twists the blade and the carbide will pop off," he says. "The best insurance is to have extra sets of blades available quickly."

"Carbide is hard, brittle, and very porous," adds Orlando. "Resins from wood typically work their way into those pores, and that begins to dull the carbide. The blade will tell you when it's starting to get dull because it sounds different than when it's sharp. You can actually hear it working harder. On aluminum, a blade will start rolling over a burr as it gets dull."

Types of Sharpening

"A lot of companies do face-only grinding when sharpening blades, which is a very economical for the sharpening business but doesn't create the maximum, proper performance of a saw blade," says Frank. "We grind the steel behind the carbide tip first so that the diamond wheels only grind carbide. This increases the accuracy of our grind. We then face- and outside-diameter-grind every blade to the manufacturers' original specs by using database driven computerized machines. While the largest companies, including Pistorius and CTD, provide comparable grinding, most sharpening services are geared to cabinet and construction trades and provide this level of service."

"Make sure whoever's doing your sharpening is using a computerized cutting device," says Parrie. "A good blade sharpener can have more than $1 million tied up in equipment. If you're spending $25,000 to $50,000 a year on blades, you want to know who you're doing business with, how many blades they sharpen, and what kind of equipment they're using."

"All double miter saw blades also need to be ground in matched sets so the blades won't vibrate from one side to the other," adds Luberto.

"Most people do what's called a 'top and face' grind," says Orlando, "which means you grind the angle on the very top of the tooth and the face of the tip. I recommend doing an "allover" grind about every four sharpenings. When you grind just the top and face, you're changing the angles as you take carbide off those two surfaces. The price is higher for an allover grind, but it's worth it to maintain the angles on the tips."

A good sharpener will also give each blade a precision inspection. "Every blade that comes in here is checked by dial-indication to make sure that it's true," says Pistorius. "If it isn't, we hammer it to make sure it's straight. Any carbide that is chipped or broken is replaced. If anything is bent, we straighten it."

Sharpening Schedule

"The number of sharpenings you can get out of a blade typically ranges from 12 to 18, depending on the size of the tip," says Frank. "Blades with more teeth have smaller carbide tips, so there's not as much to grind when sharpening. Blades with a flatter cutting pattern—a combo or metal-cutting blade—tend to stay sharp longer because the cutting edges are blunter and hold up better under stress and abrasion. Conversely, pure wood blades with sharp points may cut better on very sensitive finishes but won't stay sharp as long."

A scheduled sharpening program can allow you to decide at what point blades should be changed. "This point is determined by trial and error," says Frank. "Inspect the quality of material coming off the saw hourly until you see that it's no longer acceptable. Back up 20 to 30 percent from that, and that's when you should change blades. Yes, you could say you're giving up 20 percent of the sharpening life. But this is like insurance, because when you start getting poor cuts, you end up adding labor costs to repair bad corners. If you compare an hour of labor versus the cost of a blade sharpening, it doesn't take long to pay for the difference. When you sharpen earlier, you also get more sharpenings out of the blade. The blades wear better, and tip breakage is reduced or eliminated."

Parrie is also an advocate of a scheduled maintenance plan. "When you sharpen your blades early, you get more sharpenings per blade—maybe 14," he says. "If they're not sharpened enough, that may drop to 10. At $400 a set, it gets really expensive when you start throwing blades away too soon. I like a plan in which each blade is numbered. If I know I change blades every 350 frames, and given a production of 350 frames a day, then an operator knows to put on a fresh set of blades every evening before going home. Those blades are numbered 1 through 6, and for saws A through D. 1A is put on saw A. The next day, 2A is put on, and 1A is sent to the sharpener. Monday gets a 1 blade, Tuesday gets a 2 blade, Wednesday gets a 3, and so on. By the time the next week rolls around, blade 1 is already back from the sharpener and ready to go Monday morning. If blades are changed twice a week, it's the same format. When the blades and saws are numbered, you can track down any problems immediately."

"Ultimately, when you're looking at saws and blades, you need to keep down-line labor and defect costs in mind," Frank says. "A successful OEM today is one producing frames with zero labor needed after the frames are finished. An OEM manufacturer in North America has to achieve with his tools what a manufacturer in China or Indonesia can do with inexpensive labor. I still see factories with multiple labor inputs patching corners because the company doesn't want this year's blade-sharpening budget to be more than it was last month or last year. Ultimately, the important thing is to keep manufacturing in the U.S. The real bottom line is how choosing and managing your saw blades truly effects the cost of your product." ■