The workhorse of a circular sawmill is the saw blade itself. It looks simple—a spinning disk with sharp points on the outer edge. But the blade is actually a sensitive and critical piece of spinning metal, and the teeth are equally important. Let's examine the circular blade more carefully. The discussion here applies to all circular blades used in a sawmill on green logs or cants. Let's begin with some terminology.

**Bite** The amount that each successive tooth moves into the wood being sawn is called the bite. Generally, for softwoods the preferred bite is 0.125 inch and for hardwoods 0.140 inch. This means that after 10 teeth have cut the wood the saw will have moved 1.25 inches or 1.10 inches forward into the wood.

**Body or Plate** The body or plate is the main piece of metal used to make the saw blade. The teeth are fastened to the outer rim. The center has a hole to accommodate the arbor.

**Collar** The washers on either side of the blade when the blade is attached to the arbor are called the collars. The collar not only holds the blade to the arbor, but also stops wobble and effectively increases the blade stiffness. The collar should be as large as practical for stiffness. (Some collars are too small, in my opinion.) The collar must touch at its outer perimeter, so often one of the collars is hollow ground, while the other is perfectly flat, or sometimes both are hollow ground. Overtightening the arbor nut can actually cause some collars to warp and lose contact and effectiveness.

**Eye** The exact center of the saw is the eye.

**Gauge** The measure of the plate thickness is the gauge. A typical saw, for example, could have 7 gauge, which is 0.180 inch or approximately 5/32 inch in thickness. (Table pg 14.)

**Gullet** The space between the teeth and the body of the saw. This space holds the sawdust while the teeth are in the cut. The gullet must be large enough to hold all the sawdust produced. A full gullet means that no further cutting can be done; slower than normal feed speeds will have to be used, plus the blade may vibrate excessively. Larger gullets are required when making deep cuts (that is, when sawing thick pieces). Slow feed speeds when gullets are too small mean fine sawdust, low production, heating, and short saw life (rapid dulling). Gullets should be rounded without sharp corners to avoid cracks and breaks.

**Kerf** The width of the slot in the wood made by the blade when sawing is the kerf. For practical purposes, the kerf is the same as the overall width of the saw teeth, called the set. Technically, after the teeth cut the wood, the wood actually closes the slot or spring back a very small amount giving a narrower kerf.

**Number of Teeth** Circular saws are specified based on their diameter and the total number of teeth they have. Teeth spaced too closely make more fine sawdust and potentially more heat, causing the blade to wander a bit at times.

**Set** In order to create enough room for the body of the saw to pass through the wood without rubbing, the saw teeth are made a bit wider than the body of the saw. The extra width on each side of the body of the saw is called the side clearance. The set is the total width of the teeth. Avoid large sets as they will greatly affect yield and profits. As a rough rule of thumb, each 1/64 inch of extra kerf is a 3/8 loss in yield.

**Side Clearance** See set.

**Side Dressing** Is it important that the sides of the teeth be perfectly aligned with one another (that is, protrude out the same distance), so that they produce a smooth surface. This process of aligning is called side dressing. Many saws have terrible tooth alignment and therefore cut very rough surfaces and waste wood (and money).

**Swage** (Rhymes with edge) This is the process of mechanically (with a hammer and special tool) spreading the metal at the tip of the tooth out so that the tip of the tooth becomes the wider spot. After swaging, the tooth is sharpened normally. Swaging is normally done to solid-tooth saws, but rarely done to inserted-tooth saws.

**Teeth** The teeth are the part of the blade that cuts the wood. The teeth cut a slot, called the kerf, in the wood that is a little bit wider than the thickness of the plate, so the plate can move through the wood without rubbing.

**TIP of the TOOTH** The part of the tooth that does the actual cutting or scraping of the wood is the tip or top of the tooth. Some manufacturers of inexpensive saw blades do not have extremely sharp teeth when the “new” blade is shipped—this is “bad news.” Even inserted teeth may not be well sharpened.

**Swing to the TOOTH** Same as “tip of the tooth.”

**Saw Plate Thickness** The plate transfers the power from the arbor to the teeth. The plate also keeps the teeth from breaking the kerf. A wide kerf comes the widest spot. (See set.)

**Saw Blade Style**
- Those with inserted teeth (that is, the teeth are replaced after being sharpened a few times). The saw will stay the same diameter after repeated sharpening.
- Those with teeth that are an integral part of the saw, called solid-tooth saws. Each time the teeth are sharpened and the gullet is ground slightly, the saw will decrease slightly in diameter.

**Saw Diameter** The diameter is chosen based on the horse-power, expected wood density, log or cant size, tooth size, and so on. The larger the saw, the slower it must be run, the more teeth it will have, and the more horsepower required. Further, the larger the saw, the harder it is to maintain. Of course, the larger the saw, the larger the piece of wood that can be sawn. However, most mills will bypass a few large pieces of wood and use a smaller saw, rather than be able to cut everything and use a larger saw.

Detailed calculations of the best saw size can be done. For example, see www.fpl.fs.fed.us/prettydocs/mine/circsaw.pdf.

**The Circular Blade**

By Gene Wengert
Sawmills have 15.

The Circular Blade

hot cakes and improve wood manu-
thin-kerf, stiff plate, it will sell like
thicker, and therefore stiffer, plate.

As a result of

which in turn means non-straight

sensitive to heating and wobbling,
called thin-kerf blades, are very sen-

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thinner plate means that there is

er at the eye of the saw and then ta-
thick. Sometimes the plate is thick-
is typically 1/8 inch to 1/4 inch

saw will wander in the cut.

The plate of a circular saw blade

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called thin-kerf blades, are very sen-
tivity to heating and wobbling,

which in turn means non-straight

(wavy or snaky) cuts. As a result of

these factors, the Birmingham gauge has

been used.

Saw Blade Tension

When a saw blade is spinning, the

outer rim wants to fly off due to

centripetal force. The metal below

the rim keeps the outer metal from

expanding, however. In order to off-

set this centrifugal force, the rim of

the blade can get wavy. Of course, a

wavy rim means wavy cuts. To cor-

rect this tendency, a saw blade is

dished slightly when at rest. The

amount of dish depends on the final

speed of rotation. As the dished saw

blades increases its speed, the rim

gets longer by becoming un-dished

or by “standing up straight.” The

process of dishing a saw is called
tensioning the saw. It was done

mainly by hammering the saw, but is

now often done with automatic

rollers and tensioning devices. In

now often done with automatic
tensioning the saw. It was done

to give the saw the proper tension for it to run

correctly–straight and true. The clearance angle is the angle

between the back of the tooth and a line drawn connecting adjacent
teeth. This angle is required so that the back of the tooth does not rub

on the wood as the saw is fed into the wood.

Generally, the hook is 43 degrees to 45 degrees. The rake angle is 35 degrees to 37 degrees and the clearance angle is 9 degrees to 12 degrees. These three angles must to-
tal 90 degrees. Generally, being careful not to change the angles from the factory settings.

Sharpening

Sharpening can be done with a handheld file, but almost everyone uses an electronically driven tool (that looks like a hand drill with a grinding wheel) called a Jockey Grinder. It is critical to keep the an-
gles the same as originally supplied and to also keep the taper straight

and not angled. Avoid too much heat being used (turning blue is too much). Although sharp-
ening is easy, it must be done care-
fully and skillfully to achieve the best results and good lumber sur-
face quality. Ask an expert if you need to consult with a local expert.

Hook, Sharpness, and

Clearance Angles

The angle of the tooth face, com-
pared to a radius from the center of

the plate, is called the hook angle.

(Rake is the same angle, but usually
take is applied to knives and hook to

saw.) The larger the hook, the more

the blade wants to climb into the wood; a saw with large hook is called

an aggressive saw. It can feed so ag-

gressively that the saw will stall. The large hook also means rougher cuts

(that is, more tear-out). Blades with

smaller than normal hook angles are

hard to feed.

When specifying an inserted bit

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