MetalSawz Inc.

Factors That Affect Cutting On Your MZ Series Bandsaw

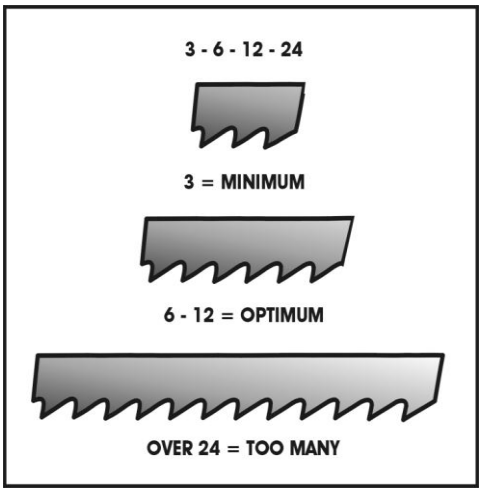
Increase Blade life the easy way .

FACTORS THAT AFFECT CUTTING ON YOUR BANDSAW

There are several factors that affect band sawing efficiency on your CobraSaw; blade tooth selection, blade "break-in" procedure, band speed, feed rates, vise loading, lubrication, the blade cleaning brush, the condition of the blade weld and the material you are cutting.

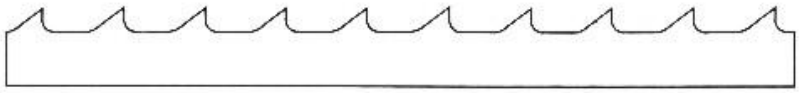
TOOTH SELECTION

The basic rule is to keep between 6 – 12 teeth in the material. Fewer than this risks tooth strippage and gullet clogging. This range can be achieved through the correct combination of tooth pitch and vise loading. Most blade manufacturers today produce a " variable pitch" tooth pattern in which the spacing between tips is not uniform. Varying tooth pitch tends to break up harmonic vibrations resulting in reduced noise and improved cutting performance. A variable pitch band is a particularly good choice when cutting structural steels. Remember when following the 3-6-12-24 rule to use the average tooth size when using a variable pitch tooth pattern. If there is a condition where there are too few teeth and too many teeth in the material (i.e. an I-beam), slightly increase speed and decrease the feed. ***It is conservatively estimated that between 75 to 90 percent of blade failures result from wrong tooth selection. For example, selecting the wrong tooth pitch or pattern may cause crooked cutting, tooth stripping, band breakage, slow cutting rate and in some cases damage to the machine***

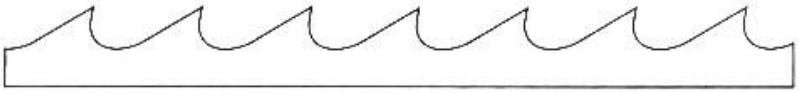


Regular tooth
Recommended for use on all ferrous metals and for general purpose cutting. It has a full round smooth gullet.

Skip tooth
Features a flat gullet which gives larger chip clearances when cutting ferrous and non-ferrous metals, woods and plastics. Used at high speeds.

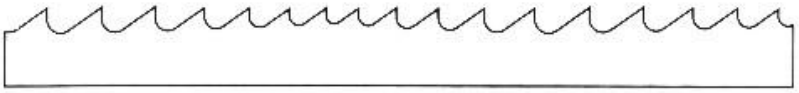


Hook tooth
This tooth form has a lengthened gullet and the tooth face has a postive rake of 10°. It is most suitable for non-ferrous metals.



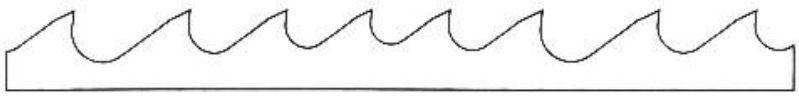
Variable Tooth Form
Varied tooth sizes, set at regular intervals, with each tooth achieving a slightly different cutting angle. Recommended for interrupted cutting eg Pipes, Tubes.

The variable tooth form, minimises chatter and reduces disruptive and costly vibration.



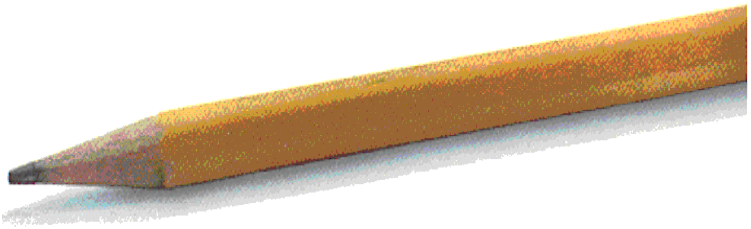
Positive Rake
Bimetal bandsaws are available with a positive rake for regular teeth. This enables faster and more efficient cutting on difficult to machine materials.

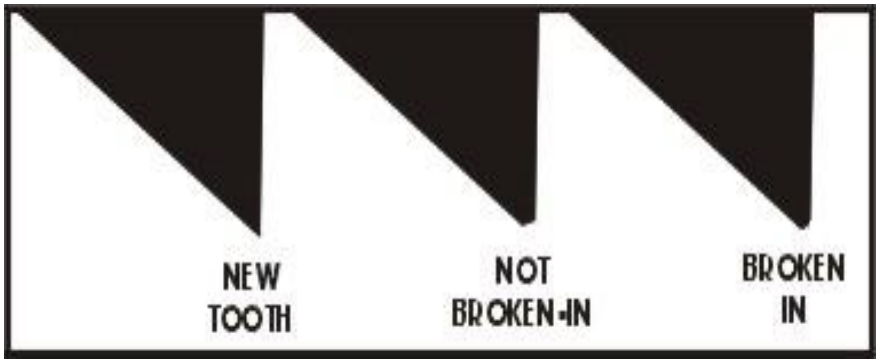
Positive Rake Variable Pitch
For faster and more efficient cutting of difficult materials (where there is a variety of sizes to cut or on interrupted cutting).



BLADE BREAK-IN

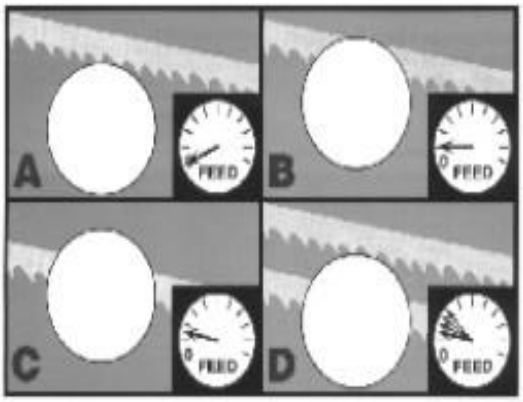
Have you tried writing with a newly sharpened pencil? The point breaks off as you start to write and you are left with a ragged tip. This is the same result you'll get if you try cutting with a new blade without break-in. It won't work efficiently and you might even chip off teeth and ruin the blade. A broken-in blade retains its sharpness longer, can penetrate better and has the strength to withstand the cutting force. Proper blade break-in is the single most important step in sawing. With break-in the blade will cut: 1) faster, 2) straighter, and 3) longer because tooth sharpness will be retained longer. We recommend break-in for all blades except when cutting severely work hardening materials. To break-in a blade maintain normal blade speed and start off a new blade with a very low feed pressure and gradually increase to achieve normal feed pressure. The number of cuts before reaching full normal feed pressure varies according to the type of material. If the material is difficult to cut, begin break-in with a heavier feed so the material does not work harden and damage the tooth.





The process of blade break-in removes the dead sharp point and feather edge and places a fine radius on the tooth tip. This radius allows the chip to shear away from the work piece readily and also gives the required support to the tooth tip, which undergoes extreme forces during the cutting process.

BREAK-IN PROCEDURE



STEP (1) Set recommended blade speed.

STEP (2) Set feed rate at half of normal, begin "Break-in".

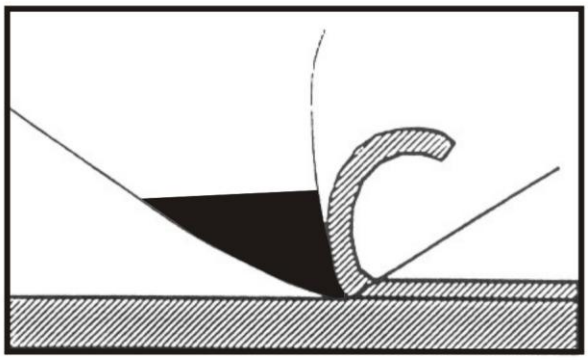
STEP (3) Increase feed slightly after cutting a distance equal to the width of the blade.

STEP (4) Increase feed again at the halfway point. Finish cut.

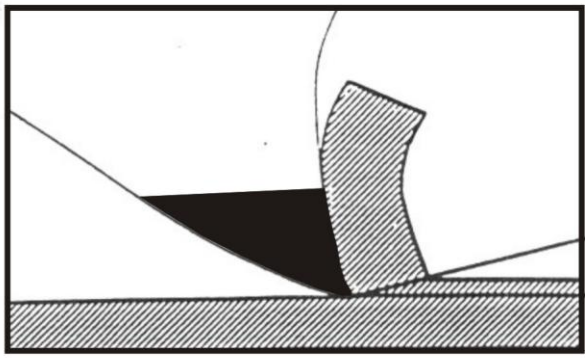
STEP (5) Start cut at same feed rate as last cut. Repeat step 5 until at least 100 sq. in. has been cut in soft material or 50 sq. in. in hard material.

BAND SPEED

Band speed refers to the rate at which the blade cuts across the face of the material being worked. A faster band speed achieves a higher more desirable shear plane angle and hence more efficient cutting. Band speed is restricted however, by the machinability of the material and how much heat is produced by the cutting action. Too high a band speed or very hard metals produce excessive heat resulting in reduced blade life.

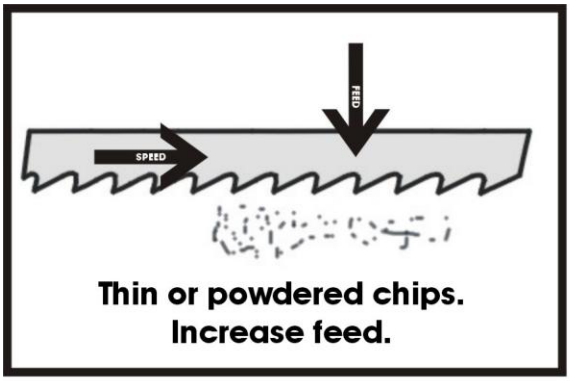


Higher band speed

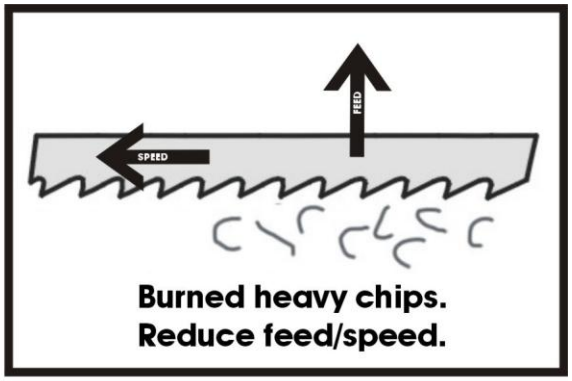


Lower band speed

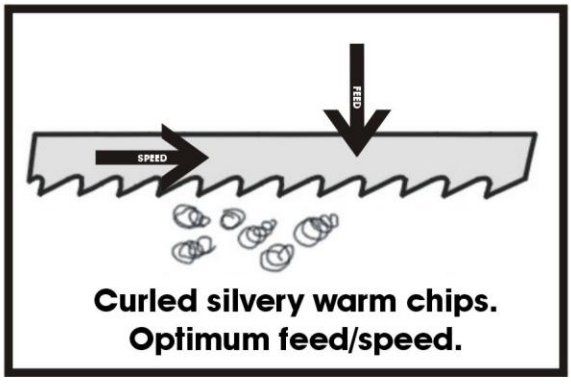
How do you know if you are using the right band speed? Look at the chips: check their shape and color. The goal is to achieve chips that are thin, tightly curled and warm to the touch. If the chips have changed from silver to golden brown, you are forcing the cut and generating too much heat. Blue chips indicate extreme heat, which will shorten blade life.



Thin or powdered chips.
Increase feed.



Burned heavy chips.
Reduce feed/speed.



Curled silvery warm chips.
Optimum feed/speed.

Chips are the best indicator of correct feed force. Monitor chip formation and adjust accordingly.

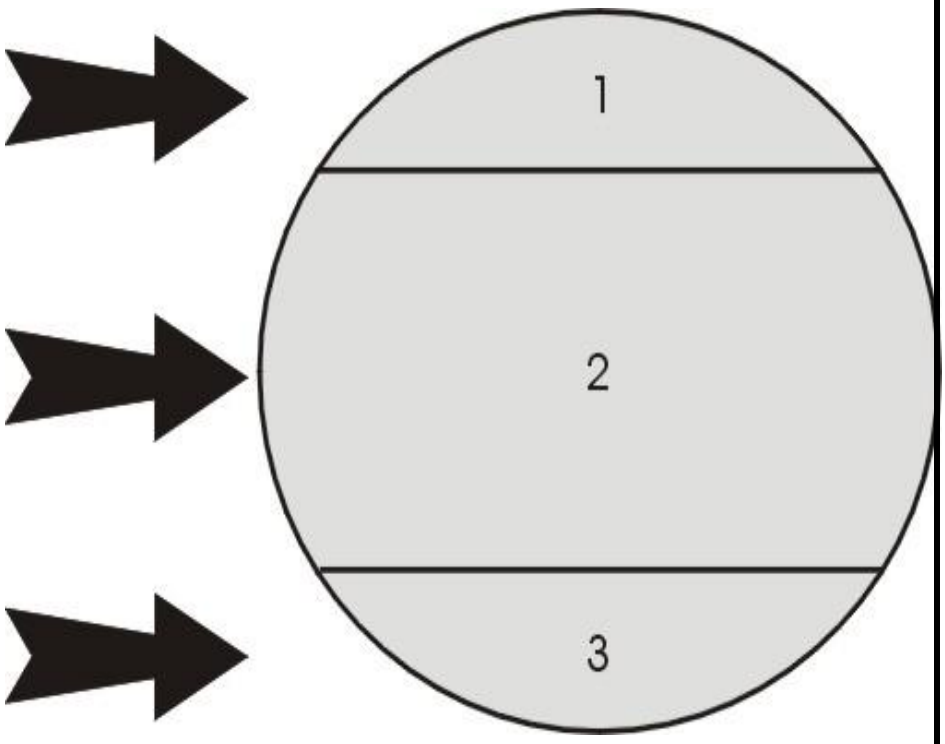
FEED PRESSURE

Once you understand how feed and gullet capacity limit cutting action, you will be able to choose the most effective feed rate for the material being cut. Here is an example. Assume you are cutting a piece of 4" round. There are actually three cutting areas to consider.

1. Entering the material, the blade encounters a small width and therefore meets minimum resistance. Feed rate is the limiting factor here, so you can use a feed setting that maximizes cutting without losing blade life.

2. As the blade moves through the material the width increases, more material fills the gullet area and imposes limitations on feed and depth of penetration. For maximum sawing efficiency in this difficult midsection the blade must have ample gullet capacity, otherwise the feed rate must be reduced accordingly.

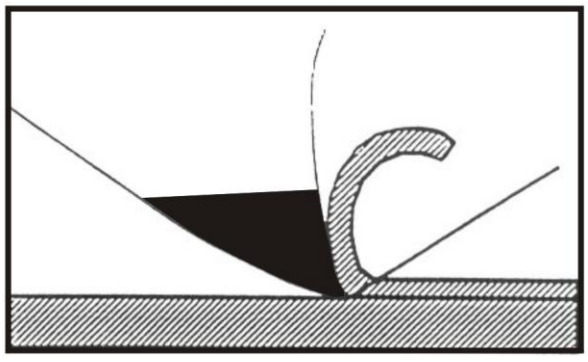
3. As the blade moves out of the difficult cutting area and into an area of decreasing width, the important limiting factor again becomes feed rate and the feed setting can again be increased.



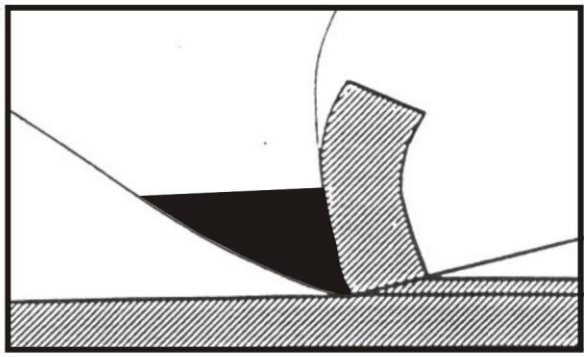
By knowing those portions of the cut which affect only feed rate, you can vary the rate accordingly in order to improve overall cutting efficiency.

HOW CHIPS ARE MADE

If you were to look at a blade cutting metal under a microscope, you would see the tooth tip penetrating the work and actually pushing or shearing a continuous chip of metal. The angle at which the material shears off is referred to as the "shear plane angle". This is perhaps the single most important factor in obtaining maximum cutting efficiency.



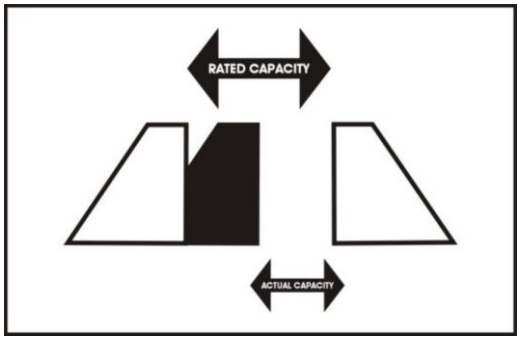
Low shear plane = low efficiency



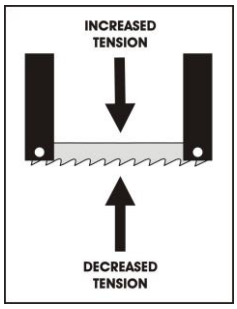
High shear plane = high efficiency

Generally, with a given depth of penetration, the lower the shear plane angle, the thicker the chip becomes and the lower the cutting efficiency. The higher the shear plane angle, the higher the efficiency with thinner chips being formed. Shear plane angle is affected by band speed, feed, lubrication, and blade design.

VISE LOADING AND BEAM STRENGTH



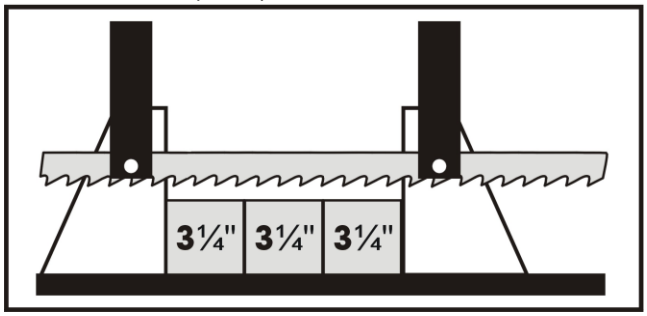
Each CobraSaw model has a stated capacity – but the optimum level is usually lower. Cutting rates are usually best at less than full capacity. When you load smaller bundles, the machine is more likely to run at its optimum because of increased "BEAM STRENGTH". This means more efficient cutting. Beam strength depends on the width of the blade and the distance between guides, the machine type (vertical or horizontal), blade tension and the width of the material being cut. From a practical standpoint, use no more than 1/2 of the saw machine's stated capacity. For harder materials, It is safer to work closer to the 1/3 capacity. An exception is when making only a few cuts on long bar stock. Here the more pieces you stack, the more time you'll save.



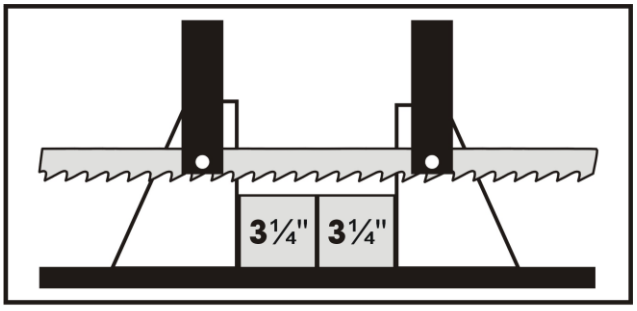
When resistance grows due to increased feed rate or the varying cross section of the material being cut, tension increases on the back edge of the blade and decreases on the tooth edge. This results in compression, forcing the blade into an arc, producing cuts which are no longer square. Beam strength is a blade's ability to counter this resistance during the cutting process. A blade with greater beam strength can withstand a higher feed rate, resulting in a smoother, more accurate cut. Beam strength depends on the width of the blade and the distance between guides, the machine type, blade tension and the width of the material being cut.

INCREASE BEAM STRENGTH – REDUCE COST PER CUT

Here's an example of how increasing beam strength can improve cutting economy. A customer needed to cut 3¼" squares of 4150 steel on a CobraSaw HM1420 machine with a 1" blade. The operator, trying to cut efficiently, placed three pieces side by side. The three squares together measured 9¾" wide - well within the 20" machine capacity.



DECREASED BEAM STRENGTH



INCREASED BEAM STRENGTH

CobraFab Technical Services suggested cutting two pieces at a time. which would decrease the guide distance to 8½" (2 x 3¼" plus 1" on either side). Moving the guides closer together permitted higher feed rates. Following these recommendations, the customer achieved 2,200 pieces, extending blade life approximately 10 times!

BLADE BRUSH:

We all know the importance of an oil filter in a car - it clears residue from the motor oil keeping the oil clean and your motor running efficiently. You wouldn't run a car without an oil filter; you shouldn't run your CobraSaw without a good chip brush. A chip brush reduces inefficient cutting. It cleans the blade and keeps the chips from re-entering the cut. Without a chip brush to clear them away, chips re-enter the cut. This causes less efficient cutting with crooked cuts and a poor surface finish: Don't run a saw without a chip brush, or with a worn chip brush. Your saw will cut more efficiently and you'll save money.

CUTTING OIL

Using the wrong weight oil can damage a car and its performance. Did you know that using the improper cutting fluid ratio could have a similar effect on sawing? Watered down cutting fluids increase blade wear, reduce cutting rate and wear out important machine parts. In sawing, lubrication is more important than cooling. When sawing, use the proper cutting fluid ratio - it can cut your costs. In band sawing, cutting fluids function in three ways. First, they cool the blade and the work piece. Second, they lubricate the side of the band, enabling it to pass through the guides without creating excessive frictional heat. Finally, they flush away chips, helping to prevent blade scoring and tooth stripping. When band sawing coolant is a primary concern because heat can soften the teeth, precipitating blade failure. The importance of cutting fluid increases as the cutting rate goes up and the hardness of the material increases. REMEMBER: Always add the oil to the water when mixing cutting fluid. "Oil" means "OIL IN LAST".

MATERIAL/BLADE LIFE

Some manufacturers of bandsaw blades forecast blade life by the number of square inches of material cut per foot of blade length. Unfortunately it is very difficult to predict blade life with any degree of accuracy. There are so many factors involved that have a definite bearing on life – to mention a few:

- Length of the blade.
- Material hardness.
- Scale and surface conditions.
- Consistency of material.
- Coolant type.
- Operator ability.
- Blade speed.
- Blade feed pressure.
- Blade feed rate.
- Blade width.
- Tooth pitch selection.
- Type of tooth.
- Room temperature.

Plus any other factors which change from operation to operation! We suggest that you buy a good quality blade from a knowledgeable blade distributor. His knowledge and expertise is usually supplied free to blade purchasers. Take advantage of it!