Sawmill Forum

BY CASEY CREAMER

Let me start by saying I have enjoyed your column for my entire adult life. I am a mechanical contractor who does a lot of work on gas fired boilers. I really appreciate your take on measuring for quantifying issues and your approach to a puzzle.

I have always wanted a clearer understanding of what the tension is you refer to and what a hammer blow does to affect tension. I assume it has something to do with moving metal in a certain technique. Any chance you could illustrate this in one of your columns?

The tension part of saw hammering is possibly the least understood concept that we deal with. I readily admit that once I learned how to hammer saws, it still took me quite a while to get an adequate handle on that particular subject. Just the use of the word tension can be very confusing for people. When people are feeling tense, they tend to stiffen up and can become less flexible. That is not how it works with saws or metal in general.

I am a saw doctor, but I am not a saw psychologist. No matter how much we may personify a saw blade, it really has no feelings. So, when we refer to tension in a saw, it is nothing like the tension a person might feel when trying to figure out what tension in a saw really means.

We saw doctors often use terms like adding tension or taking tension out. That can also add to the confusion. We actually can't add or remove tension. All we can do is change the relationship of how much the metal has been stretched in one area to how much it has been stretched in another area. And it is that relationship that makes a properly hammered saw run true, assuming all of the other variables are taken care of, such as accurate sharpening and proper collar geometry, to mention a few.

Why do we need tension? First, we need a saw that is flat on the log side and has an acceptable amount of runout (i.e., wobble). Then we need the right amount of tension in the right location. Whether you have a circular saw or a wide band saw, the part of the rim of the saw that is in the cut at any moment will tend to stretch because of resistance and a normal amount of heat from the friction of cutting. I say normal amount of heat. If the body of your saw is heating a perceptible amount, you are having trouble, and you need to solve that problem or your saw will not work properly. But the portion of the rim that is in the cut at any given moment will be just a little bit warmer than the rest of the saw. Band saws also have what is called strain, which tightens the blade on the wheels and puts a certain amount of stretch into the whole blade. That is strain, not tension, because it strains the entire blade all at the same time.

But the issue for both band and circle saws is that the rim is being stretched where it is in the cut. That means that the circumference of the circular saw will grow a little without the diameter changing. In the case of a band saw, the length of the rim grows a little without the length of the rest of the saw growing.

When that rim stretch happens, the rim is no longer in the exact same plane as the rest of the saw, and no amount of centrifugal force is going to change that. And the saw will not cut a straight line because it is no longer in the plane of the rest of the saw. To solve that problem, I have to stretch a part of the body of the saw so that when the rim stretches, it will be stretched the same amount as the body and therefore be in the same plane and be able to withstand a proper feed rate. The same thing happens on a band saw.

Now, let's dispel an old myth one more time. Many people still hang onto the myth that a circular saw should be dished a little so that when it comes up to speed, centrifugal force will straighten it up and it will saw properly. People think that is tension. It is not tension. It is just a bent saw. If the saw is dished one way and you can pop it back and forth, that can be tension and a bent saw. On the other hand, if it pops back and forth and takes exactly the same amount of force to move it back and forth, that is a saw that is not bent but is either hot or has way too much tension.

When the body of a saw is hot, it stretches. While it is hot, you could say it has way too much tension, until it cools back to ambient temperature. Let's get back to that centrifugal force myth. No, centrifugal force does exist; it just won't do what people think it does to a saw. First, at the speeds we run, there is not nearly enough centrifugal force to straighten a bent saw. And if there was, why not just start out with a straight saw? Centrifugal force isn't going to make it less straight. In the case of a band saw, centrifugal force would be pulling in an entirely different direction and the saw would never be able to do anything but saw at ninety degrees to the travel of the carriage. That won't work.

If we had no tension, that part of the rim that is in the cut would stretch, and because that metal is stretched, it would sort of pucker a bit, which would make it snake in the cut like crazy. That is why saws that have tension, but just don't have enough, will tend to snake, dodge knots, and run in and out and anywhere but straight. Some saws that are just a little low on tension will run okay, but they won't stand up to a robust feed rate. Why? Because the harder you feed the saw, the more the rim stretches due to resistance, and the more tension the saw needs to compensate for the stretching of the rim.

How do we put tension into a saw? Remember that putting tension in or pulling it out is just a misnomer that we use because it sort of feels like we are adding or subtracting tension in our minds. Plus, it seems to be an easy way to refer to it.

And maybe it is one more example of how saw doctors have their own language so that the rest of the world won't catch on. Medical doctors have that situation too, except they use a language that we could learn if we wanted to. What we are actually doing is just changing how much one area is stretched in relation to another area. If we want to do what we would call adding tension, we would stretch the body of the saw a little more. If we want to do what we call pulling tension out, we would stretch the rim a little, thus changing the relationship between the rim and the body of the saw.

To get back to the original question, here is how the stretching process works:

Basically, I have three slightly different ways of tensioning either the rim or the body of the saw. I can use a machine called a stretcher roll that has two crowned rolls, one top, one bottom. I squeeze the saw between these two rolls to stretch the metal in whatever area I roll. This machine uses screw thread as an inclined plane and a lever to exert a tremendous amount of pressure on the saw that is between the two rolls. Another, more common method is to hit a series of hammer blows with the saw sitting on a slightly crowned anvil, which is harder than the saw. I will do a round of hammer blows on one side of the saw in a particular area and then turn the saw over and hit matching blows in the same area. When you hit a blow with the hammer on one side and the anvil on the other side, the metal will stretch, especially if you hit the blows on both sides of the saw. This is the same as using the stretcher roll except that the stretcher roll is doing both sides at the same time.

The other method that I use a lot, when appropriate, is to find a bend in an area where I also want to stretch the saw a bit (adding tension). As I hit the bend on the high side with my hammer to try to get the high spot to go down and not through to the other side, the metal will stretch. Now, it won't stretch quite as much as if I had hit both sides with the hammer, but if all goes as planned, the lump will go down and the metal will have stretched just enough for me to say it now has the right amount of tension in that area.

Hopefully this explanation relieves the tension of not knowing enough about saw tensioning.

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