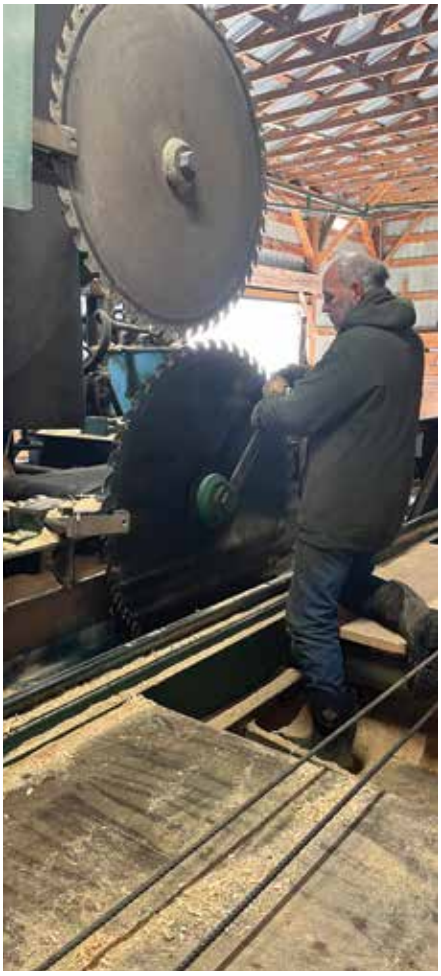
Sawmill Forum

BY CASEY CREAMER

I just checked my collars using your method of tightening the nut from hand tight to wrench tight and measuring the movement on the rim of the saw. The rim of the saw moved .045" towards the board side. I assume that is a problem but I haven't sheared the pins so I was wondering how my collars got this way?

You are correct that if the rim of your saw is moving .045" in either direction when you tighten the nut, it's time to pull the mandrel out and have those collars re-machined. You might even want to order a new mandrel and then make the switch and send this one out to your machine shop and then keep it around for a spare. When you get the collars machined, have your machinist also true the outside diameters so that the collars mate to each other and then mark their orientation when they were mated so you can always put the loose collar on the same way relative to the fast collar.



We all know that anytime you shear the lug pins, you will have to re-machine the collars. When you shear the pins, the saw stands still while the mandrel and the fast collar are still turning. As a result, the outer edge of the fast collar deposits some of its metal onto the board side of your saw at the collar line. By the way, this extraneous metal has to be removed from the saw, but it should be done by a professional so as not to permanently ruin the integrity of the surface of the saw at the collar line.

How do collars go bad without shearing the pins? That is a question that I have been pondering and that customers have been asking me for years. There are a few possibilities, although some are more likely than others. The most common answer that I run into is that some of these collars just were not right to start with. It could be a brand-new mill, a brand-new mandrel on an existing mill, or a mandrel that had been re-machined, but just wasn't done exactly right. I always recommend that when you install a re-machined mandrel or put in a new one, the first thing to do is check the collars by tightening the nut from hand tight to wrench tight and measure how far the rim of the saw moves in either direction. Just because the collars are new or just re-machined, is no reason to assume they were done correctly. That covers about 90 percent of the collars that need work without having sheared the pins.

As for the other ten percent, I have a few unproven theories. When I first started hammering saws, it was not uncommon for mills to be running four or four-and-a-half-inch collars. As the more modern so-called automatic mills started to replace the old hand-set mills, six-inch collars became the minimum size which was quickly followed by eight-inch collars. The relationship between the size of the collars and the diameter of the saw is called the clamping ratio and it didn't take long for sawyers to see the benefits of a better clamping ratio due to larger collars. My assumption is that if you overtighten the nut, there is more chance of causing deflection in a bigger collar than there would have been with the old smaller collars.

I'm also often asked, how tight should I make that nut on the mandrel? Engineers tell me that you must ensure that your application has the appropriate amount of torque and tension to avoid bolt shearing (sliding apart) and tensile (pulling apart) forces. After the nut has been turned onto the bolt, additional torque causes the nut to turn and stretch the bolt. When the bolt stretches, it becomes a solid spring that clamps the components together. The components won't be pulled apart if the clamp load is not exceeded by the tensile load. Under shear loads, the increased friction prevents relative motion of the components, preventing material failure. How is that for engineering language?

Torque requirements are based on the grade or hardness of the bolt and the diameter of the bolt. Of course, those vary from different manufacturers of saw mandrels. For example, if we have a bolt size of 1 ½" using the softer SAE Grade 2 bolt I found a chart that claims the desired torque using a torque wrench should be 850 foot-pounds. While on the other end of the spectrum if we were using an SAE Grade 8 bolt of the same size, the chart suggests 3,161 foot-pounds of torque be applied. That is a huge difference but then there is a huge difference in properties between bolts of those two different grades. I had one customer years ago in North Carolina who used a torque wrench to tighten the nut on his mandrel. I watched him do it and my opinion was that he was overtightening that nut, but at least he did it in a consistent manner. I know of no other mills that use a torque wrench for that purpose, but I can see where it would make a lot more sense than kicking a wrench with your foot. I don't think that is what they mean when they use the term foot-pounds of torque.

Most sawyers are aware that when mounting a saw on the arbor you should

always turn the saw back against the pins before you tighten the nut, but there are a few that just haven't been told that yet. If you don't do that, you make it easier for the saw to shear the pins because it has the ability to sort of get a running start that it wouldn't have if it was already snug up against the pins. So it does occur to me that maybe if you neglect to turn it back against the pins, and you manage not to shear the pins, the saw probably moves that small amount to eventually rest up against the pins in which case every time you change a saw there is a little movement there that is wearing off the taper that was supposed to be in that collar to the point that it will eventually need work.

Otherwise there are very few mills that actually change saws to sharpen them in a filing room instead of sharpening them in place. So that may mean one or two saw changes per day and I suspect each time you tighten that nut you may actually wear those collars just a tiny amount. That shouldn't be a problem for most mills but the ones that change daily could possibly see an issue sooner instead of later. It is not that big a surprise to have a mill that hasn't sheared the pins in eight years and then all of a sudden they start having trouble sawing, at which point the collars are found to be bad. How did they get bad if you didn't shear the pins? Maybe just age or maybe they only had the bare minimum of taper eight years ago, so it wouldn't take more than just a tiny amount of wear to get them to the point where they no longer have enough taper and are now dishing the saw when you go from hand tight to wrench tight.

The most important thing to take away from this is that whenever you are having trouble, always check the collars by going from hand tight to wrench tight no matter what you see using a straight edge. Even if you think the collars shouldn't be a problem because you haven't sheared the pins, do the check anyway. Let's also remember that every time your saw runs off line in either direction, that saw is moving inside the collars to some extent. The center of the saw is free to move in reaction to the rim moving. And as a result, there may be just enough movement at the collar line to create just a tiny bit of wear each time. Over time that tiny amount can be enough to wear out whatever taper you had in those collars to start with.

The Sawmill Forum is a bimonthly column. Read "From the Editor" this month for more details. Search "The Northern Logger" on YouTube to watch Casey explain how to hammer a cirular saw.

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