Tech Article; October 2012

This month I want to discuss a problem we have seen several times recently at the shop; worn suspension bushing on the front end. This is not as bad as a lot of you may think. There is actually a benefit to this, and not only to repair shops. With worn bushings on most old British cars, the negative camber increases and this can make a car seem like it handles better. Of course, there are a lot more negative effects from worn bushings.

First, let me explain in simple terms what the front suspension geometry consists of, remember, this is a simple description. First, we have toe. This is the angle that the two front tires create when they are either pointing toward each other or away from each other as the car moves forward. If the front of the tires point toward each other, then you have toe-in. If they point away from each other, then you have toe-out. In the old days, since probably the 50s, cars came with more toe-in than new cars. This allowed for several things. First, as suspension bushings were soft, the force of going down the road would push the front of the tires away from each other and create toe-out.

So what; back then toe-out would wear the inside tread of the tires very quickly. Toe-in also helped in keeping the car straight on the crowned roads. Bushings are stiffer and newer roads do not have the same amount of crown so toe-in can be reduced. Most of our cars are very happy with 1/16” toe-in per side. If you are going to drive the car hard, especially in autocrossing, 1/16” toe-out will be better, but set it back when done. Why does toe-out help on hard cornering? When you turn your steering wheel to make the tight turns, the inside wheel is already pointing a little that way and grips a little quicker, making the car steer quicker into the turn.

Next is camber. Negative camber is when the tops of the tires lean into the center of the car. Positive camber is when the top of the tires lean away from the center line of the car. As a car turns into a corner, the outside tire leans away from the centerline of the car. It tries to go to positive camber which would only allow the outside edge of the tire to make contact with the road. If the tire starts off with negative camber, as it leans out, it sits square with the road and increases handling traction.

You may have noticed, if you watch it, NASCAR cars go down the straights with the right front tire having negative camber and the inside tire having positive camber. This way, as the car leans into the turns, and there seems to be one at each end of the tracks, the outside tires go from negative toward positive camber and the inside tires go from positive to negative camber. This makes both front tires square to the track surface. This will be adjusted based on the banking of each track. They know how far their car leans and they know how far they need to lean the tires to keep the best contact.

Too much negative camber will wear the inside edge of your tires also. As your bushings wear, the tire will lean in at the top more creating negative camber. To a degree, this helps with handling. However, due to the design of most of our front ends, as the top of the tires lean in due to worn upper bushings, the toe-out will increase, making the car turn into turns better. So you think your car handles great but your tires are wearing on the inside edge and it can wear out a tire in just a few thousand miles. If your lower bushings wear out, then the bottom of the tires move away from each other and this can increase toe-in. This does not help the handling any.

Last, but not least is caster. This is the angle a line makes with the ground that goes thru the center of the lower king pin pivot or trunnion and the center of the upper ball joint or trunnion. If it leans back toward the car, it is positive and if it leans forward, it is negative. Caster effects the how the car goes straight down a road with hands off the wheel, do not try this. If it wiggles all over, you need more positive camber, if it is hard to steer, you need less positive caster.

Back to the NASCAR boys, they will run a lot of positive caster in the outside tire and less on the inside tire. This makes their cars almost turn the corners by themselves. They have computer programs that can simulate every track they go to and they can make changes on the key board then go test that at the track. On modern day tires, you can run as much as 7 degrees positive caster, any more and the car gets too hard to turn without power steering.

Ok, back to our cars. When the lower inner suspension bushings wear the weight of the car will force the tires into negative camber. If the upper bushings wear at the same time, negative camber increases a little more. If you have a car with hard bushing, such as any of the poly whatever style, then you will not have this problem occur. If you can picture the bottom of your tires being pushed further from the centerline of the car and the steering rack not having any play to allow the steering arms to compensate for that motion, the toe has to change some.

It changes the toe slightly as the pivot points for the tie rod ends are pulled together or pushed apart a little bit. On a lot of our cars, toe is the only change you can make to the front suspension geometry. If you adjust this, you can live for a short time with some wear in the bushings. But do not let it go too long, do not forget it is wearing the tires out quicker than normal. When we get cars in that have not run in years and we are asked to make them operational again, we do not put front end rebuilds near the top of the list of needed repairs. They are listed as a number 5 or 6 item in priority of things to get done.

First, get the car running and stopping and some lights and electrical items working. Then we have the customer drive the car and see if they still enjoy it before spending

any more money on it. If a car has sat for 8 to 10 years, your attachment to it may have decreased. We will set the toe and list the suspension wear and give the estimate but suggest they wait until they decide if they are going to keep the car. Driving with some worn bushings will not wear out the new tires we suggest they get in a few hundred miles.

Now, do not get the impression that you can live with worn bushings forever. It is not safe to keep driving with them. The draw backs are; possible vibrations in the steering wheel, difficult steering, severe wear on the tires, and possible breakage in the suspension causing loss of control. The only cars we have seen this on are MGBs when the lower pivot bolt wears thru the lower stamped steel a-arms. This has occurred several times in my 38 years of working on LBCs.

A very simple way to tell if you have a problem is to find a flat, level floor, like your garage and spread some baby powder on it in line with your front tires. Slowly drive the car straight into the garage and thru the powder. Now look at your tires and see where the powder sticks and look at the floor and see where the tire leaves powder tracks. If the tracks left are uniform in width with the tire, then your camber is probably ok and your bushings are not bad. If the inner edge of the tire leaves a track, then you have too much negative camber. Simple, except for cleaning up the powder left behind. I guess you can roll a moist baby around the floor to pick it up.

Just remember, this is a very short simplified version of what goes on with your front suspension. There are hundreds of books written on this matter and you should not waste your time reading them. Just use Google and you will learn more than you ever wanted to know about suspension geometry. If you want to take a look at your front end, give us a call and we can get you in the shop and get your car up on the lift so you can see what problems lurk under it.

Now for a simple receipt of my favorite soup, chicken soup. While this will cure the common cold, it will not cure worn bushings. I start with a whole chicken cleaned and the bag of parts removed. I boil the chicken in a large pot of water, enough to cover the chicken or at least two quarts, with 3 or 4 celery stalks chopped into ½" pieces, two large carrots cut into ½" pieces, one large yellow onion cut into ½" pieces, about 1 teaspoon of garlic powder, salt and pepper to taste. When the chicken is fall off the bone tender, I remove it and the gizzards (these I give to Tucker, our dog) and de-bone the chicken. Cut up the chicken or shred it into small bite size pieces and return it to the pot. I like to add one or two cubes of chicken bouillon to my soup and since it usually has a lot of salt, I add very little salt by itself. Sometimes, I will add a few tablespoons of smaltz to the soup instead of the bouillon. If we are going to eat the soup that day, I now add ½ bag of large egg noodles (not the healthy kind) to the soup and boil it until the noodles are tender. Serve a big bowl of this with some Jiffy corn bread and you have a

meal. If you want to know what smaltz is, I will explain next month, but it is good and you cannot buy it in the stores.

Well, I need to get back to work now so I hope to see yall somewhere soon. Barry