

Text and Photography by Robert Eckhardt

## A BETTER WAY TO ADJUST SPRING RATES

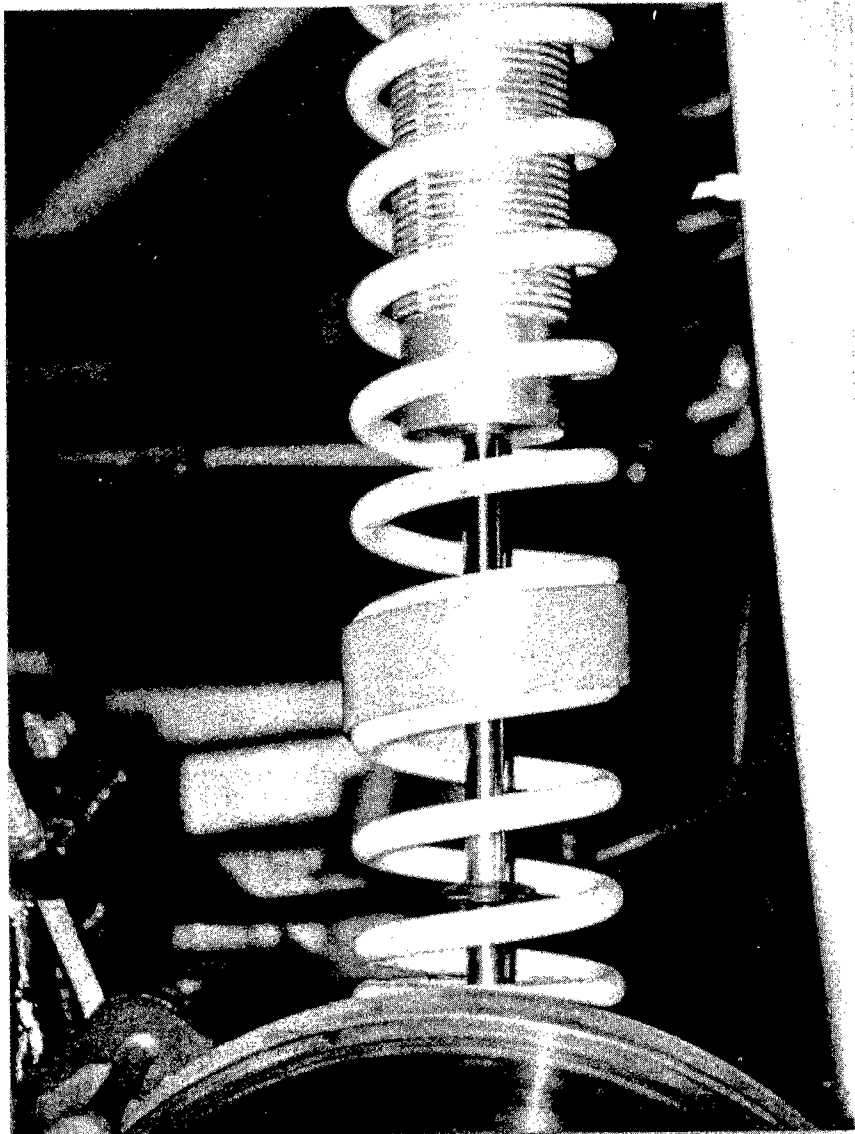
**New multidensity spring rubbers allow for tuning flexibility**

**W**IN-WIN SITUATIONS IN RACING are hard to find. After all, there can be only one winner. However, when a racer buys a product that makes it easier for him to tune his suspension and that purchase helps children learn math and science, everyone wins. That is exactly what happens with the new spring rubber called Speedthane—a urethane foam manufactured with different densities.

The Speedthane story begins with a crew chief looking for a better way to tune his suspension. Mickey Love has been racing for more than 30 years. He also happens to have a mechanical engineering degree. He has designed many parts for race cars, and while he was at the Dana Corporation—designing ball joints, idler arms, and tie rod ends—he designed the first adjustable idler arm used in Winston Cup.

In 1994, Love joined a NASCAR Busch North team as a chassis and shock specialist. He later became the crew chief. About the same time, Love began working at Freudenberg-Nok as a chassis product development manager. He realized the special micro-cellular polyurethane (MCU) foam material the company manufactured would be perfect for spring rubbers. So he began to design and test the new urethane spring rubbers.

The special urethane has dynamic



The new multidensity spring spacers called Speedthane allows adjustability for a quick suspension fix.

properties that are much better than those of rubber. It holds up better under high heat and performs normally at low temperatures. Most importantly, it is a soft material that has a progressive compression rate. The spring rubbers are available in three different densities. The variety of densities allows racers to adjust their car's spring rates. With the old black, hard-rubber spring spacer, racers had to cut it into sections to achieve some degree of adjustability. That is why we hear racers refer to using a half rubber or a third rubber.

### Spring Rubber Basics

A spring rubber works by putting two coils into a coil-bind condition and

changing the spring rate of that spring. Part of the formula for determining the spring rate of a spring is its number of free coils. When that number is reduced by coil-binding two coils, the spring becomes stiffer.

Cutting the old hard-rubber spring spacers into thirds or halves did not support a complete coil. This could induce some bending into the coil and change the way the spring acted. Therefore, the spring's action could be very abrupt.

Speedthane's variable densities allow the installation of a full rubber that supports a complete coil. That way there is no bending of the coil. With Speedthane, the transitions into a corner are smoother, because the car is not

upset by an abrupt spring-rate change.

### Quick Results

The use of spring rubbers is a great tuning tool if you make pit stops. It can also be beneficial in testing or practice when time is at a premium. Spring rubbers are not a substitute for having the correct spring rates in the car. If racers are not close in their setup, spring rubbers will not work effectively.

The best thing about a spring rubber is it can be changed quickly. At most tracks, you are lucky to get 15 to 20 minutes of practice time. If you go out and your car is horrible, it will take at least 10 minutes to make a spring change. There goes the practice session. But with different-density spring rubbers, racers can come in and instantly put in a rubber and go back out and practice. By putting in or taking out different spacers, racers will know which spring to change and by how much. If you have to use a 50-pound spring rubber, you do need to change the spring.

There is a difference between using a rubber in the front and rear. A 10-pound change in the back is a nice little tuning tool. A 10-pound change in the front is probably not going to affect the handling of a heavy stock car.

### Nine Different Rubbers

There are actually nine different Speedthane spring rubbers: Three for front conventional springs, three for rear conventional springs, and three for coilover springs. The reason a coilover has only three spacers is that the space between the coils is virtually the same on front and rear coilover suspensions.

The foam density of each rubber is constant. Therefore, the amount it changes a spring's rate depends on the starting rate for that spring. For instance, an 800-pound front conventional spring will gain about 25 pounds with the soft rubber. It will increase about 50 pounds with the middle spacer, and the hard one will add about 75 pounds. A typical conventional rear spring would be 250 pounds. With the soft rubber, you add about 10 pounds to the spring rate. The middle spacer adds about 20 pounds, and the hard one increases the original spring's rate by about 30 pounds.

With coilover springs, you see 5-, 10-, and 15-pound increases with each increase in the density of the rubber. With that kind of exactness in spring-rate increase, racers can fine-tune their suspension. Coilover springs come in

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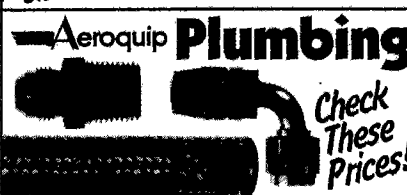


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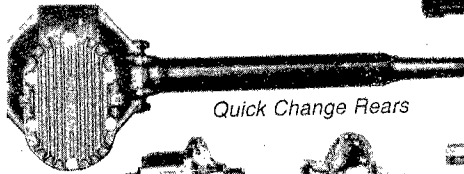
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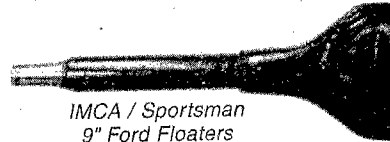
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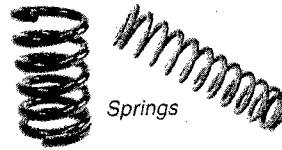
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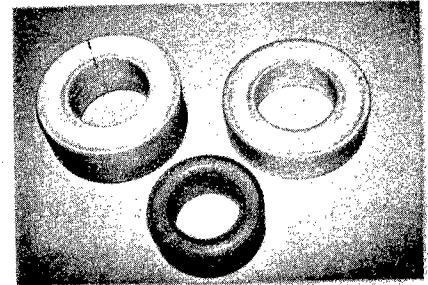


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# FeatureTech



Speedthane has spring rubbers in three densities for conventional front spring, conventional rear, and coilover applications.

25-pound increments. You will see 200-, 225-, 250-, and 275-pound springs. What do you do if you need a 265 pounder to balance your car? The answer is simple. Add hard rubber (15-pound-density spring rubber) to a 250-pound spring to reach 265 pounds.

## TUNING WITH SPRING RUBBERS

Tuning a race car can be an exercise in frustration. You make a change to cure one problem, but that change causes something else to go wrong. If you get lost, always go back to your base setup. When all else fails, remember this rule of thumb: If the problem with the car is getting into the corner, work on the front of the car. If the problem is getting off the corner, work on the back of the car. If the problem is in the middle of the turn, play with both ends.

We asked Love to make handling recommendations based on using spring spacers either to increase or decrease spring rates. These recommendations are based on his experience in the Busch North and from working with friends running Speedthane rubbers in the Winston Cup and Busch Grand National series.

"If the car was tight going in to the turn, you can put a rubber in the left front. That increases the split. On our car, sometimes we run a higher spring on the left front than the right front, to keep the left tied down. This will help the car to cut, turning the car," Love says.

"If it is loose in, you would put one in the right front. That will increase the spring rate on the right front and cause it not to want to turn as much. It will tighten up the car.

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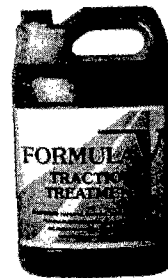
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The amount of spring-rate increase depends on the density of the rubber and the spring's beginning spring rate. Racers must use a spring rater to determine by how much each rubber changes the spring's rates. Since the rubber acts in the dynamic state, racers need to duplicate the rubber's effect on the spring as it goes through its travel.

### Testing

Normally when a spring is tested, it is put in a rater and compressed 1 inch. It is then compressed another inch. The amount of force needed to collapse the spring the second inch is its rate. When you use a spring rubber, you are not interested in the spring's rate but the overall rate with the rubber in the spring. Therefore, the test must be different.

Love explains how to determine the overall spring rate with each rubber. "You need to know the length of the spring at ride height in the car," he says. "Measure the spring on the car to find its installed length at ride height. Then put the spring in the rater and compress it down to the normal ride height length. At this point, put in the spring rubber and compress it an inch to get

the spring rate with the rubber in it. That way you know exactly how it is going to work on the car.

"You will be fooled if you compress it only 1 inch and put the rubber in it. It may only show it being a 6-pound rubber, but on the car, it may be 25 pounds. If you know you have 2 inches of travel, measure it at 1 inch and at 2 inches. It will be a little different, because these

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"If you are tight in the middle, you can put it in the right rear or the left front. Remember, the car works on diagonals. Putting a rubber on the right rear will increase the rate in the right rear. This will loosen the car up, allowing it to rotate. If you put it on the left front, it helps you getting in, and the increased spring rate transfers to the right rear.

"In a tight-off situation, we can put it in the right rear. You can reduce the rate in the left rear by 100 pounds and put the rubber in the left rear. Since the rubbers are progressive, in the beginning it will help you getting in. It will do OK in the middle, but getting off, it is not going to have that big of an effect. So it will help the car sit down. Putting it on the left rear helps it bite and loosens the car up a little bit.

"If the car is loose off the turn, put it in the left rear with normal spring rates. It will put more load on the left rear and tighten up the car.

"Because of Speedthane's progressive nature, it gives you something you can't get with the natural black rubbers. The traditional rubbers work all the time. The soft nature of our urethane rubber allows you to tune the car by getting the rubber to work when you want it to work. It is almost like turning them on and off."

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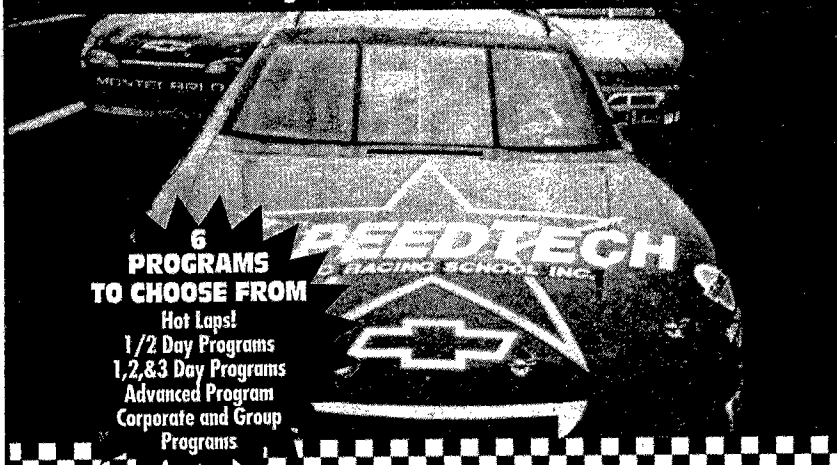
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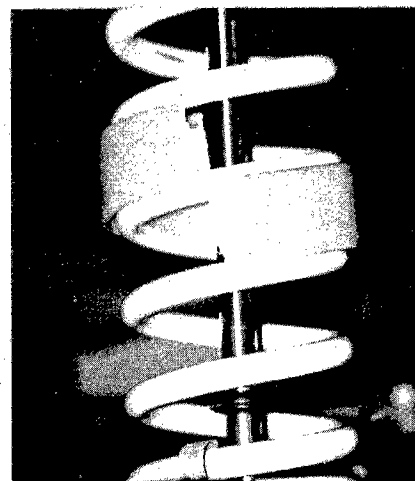
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# FeatureTech



Since Speedthane is available in three densities for adjustability, the whole rubber is used. This supports a complete coil, allowing the spring to work normally.

rubbers are progressive. They get harder as they are compressed.

"Say you are going through the corner at maximum roll. You are getting 3 inches of travel on the right rear. The car is just tight. You would like to free it up a little so it can get off the corner. I would put the spring in the rater and compress it 3 inches. See what rate you are getting at maximum roll and make your determination based on how much rubber you need then. Test it like the car uses it."

By rating all your springs with this method, you know how much rate is added to each spring with each different rubber. If you need a 10- or 20-pound increase, you know which rubber to add at the track.

## High-Level Situations

Speedthane rubbers are on some Winston Cup and Busch cars. Love tells us that some teams will use two or three rubbers in a spring, because they don't know where the track is going to go or what to do. They will put a bunch of rubbers in during the race and start swapping them in and out. This may seem like a mistake. One might think these teams should get the spring rates correct first then use a spring rubber to change a car late in the race. If the team had a 500-pound spring in the car and put in three hard rubbers, it would bounce the rate up to around 700 pounds. If they wanted a 700-pound spring, they should have started with it.

Love helps clear up some of the confusion. "Usually when they put a bunch of rubbers in, it is on the rear. It happens at a place where they race at night," he explains. "They do it at Charlotte during the 600. They start in the afternoon and



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finish under the lights. I've seen cars there with two rubbers in each spring, because the track changes so drastically. On the other end of the scale, at Martinsville, they put one rubber in the right rear, and that will fix the car."

Love offers another explanation. He says, "At Daytona in the summer, it is a really greasy track. If the sun goes behind a cloud, the place will tighten up. If the sun comes back out, it will loosen up. If you start out in the sunshine, and it becomes overcast, you need to loosen the car up a little bit, so you put another one in it. If the sun comes back out, you have to tighten it up, so you take one out of the right rear."

Since most Saturday-night racers don't need to worry about the sun peeking in and out during a 600-mile race, they should copy the Martinsville example of using one spring rubber in the right rear. That should cure most handling problems once they are dialed in with the spring rubbers.

### Kids First USA

The other part of this story is the education of school kids. Only two companies in the world make this special foam. Freudenberg-NOK is one. It manufactures the spring rubbers exclusively for Lavigne Distributors. Lavigne sells the rubbers through four exclusive racing distributors and donates all its profits to Kids First USA, a nonprofit foundation that uses motorsports as a hands-on vehicle to teach math and science to school children.

The Kids First USA team pulls up to schools in a big transporter loaded with race cars. That is when the fun begins. Looking at the curriculum, one can see how different aspects of the race car are used to explain math (gear ratios, speed,

and acceleration) and science (computers, electricity, aerodynamics, gravity, and centrifugal force). The team also tries to teach the values of a healthy, drug-free lifestyle.

It is good to see racing used to educate as well as entertain. It is also good to have an inexpensive product that helps tune the chassis and get more people turned on to racing. The next Winston Cup champion may be getting his training right now from Kids First USA. **CT**

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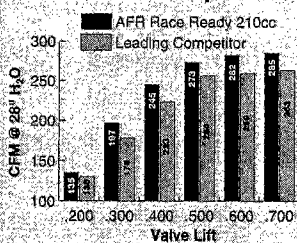
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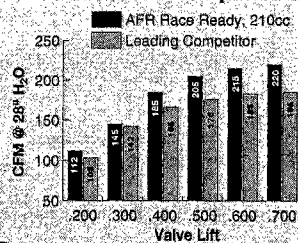
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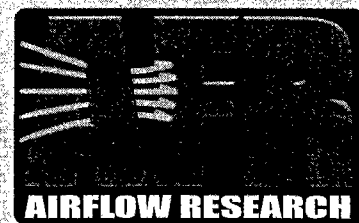
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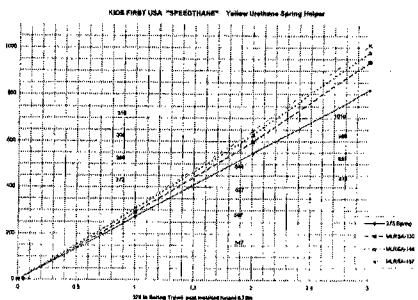


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This chart shows the effect of the three different densities of Speedthane on a spring. This is a 275-pound spring installed at its ride height of 8.75 inches then compressed. The overall spring rate will vary depending on the spring's starting spring rate. Therefore, racers must test each spring with the three different spring rubbers.