



# THE SPRING'S THE THING



## Valve Spring Maintenance

BY JOHN DIBARTOLOMEO

**D**ollar for dollar, possibly one of the most expensive components per cycle in your engine is your valve springs. When we speak about cycles in the case of valve springs, we're talking about one valve event: that being from closed valve through wide open and return to closed.

Thought of in that regard, valve springs go through tens of thousands of cycles on each run down the drag strip. Add in warm-up time, driving to and from the staging lanes, shutdown, etc., and you've got a component that takes a fair amount of abuse.

Brad Brown of Comp Cams said, "When we design a spring, we build every part of that spring around the application that we intend for it to be used in. So the life expectancy that we want to achieve is very much a part of this equation.

"If you think about the life of a spring like we do," he added, "you will see it in number of cycles. So that being stated, an NHRA Pro Stock spring doesn't need to



Valve springs are available in a wide combination to suit your individual needs. Matching the springs to your camshaft will afford you the best chance of a long spring life.

## TECH ▶ VALVE SPRING MAINTENANCE



Dollar for dollar, valve springs are probably the most expensive part per cycle in your engine. They tend to take quite a bit of abuse when you think in terms of them going up and down several hundreds of thousands of time during a run.

have used the material we have available."

One of the things that goes into the life expectancy of a valve spring is the installed height. The stress range is a function of the installed height and the open height; although dynamically it gets a little more complicated than this due to the coils oscillating up and down. Brown said, "That's why we specify what installed height to use and how much lift the spring can handle. Some people think these

numbers are purely from a stability standpoint but the life is a major factor in coming up with them."

The fact of installing as large a spring with as much pressure as you can, really makes no sense at all. It really comes down to matching the valve spring to the cam lift and acceleration. It used to be that certain cams had a tendency to eat valve springs due to their ability to accelerate the lifter extremely fast to get the valve open sooner, keep it open longer and close it fast.

Today's cam manufacturers have done a considerable amount of testing with cam lobes and now know just what valve spring matches up to that lobe and allows the spring to live to a certain life expectancy.

What this all comes down to, though, is the need to check valve springs at certain periods in their life cycle. Brown said, "It really should all start when a person is building a high performance engine. It's at that time when the springs should be installed as a function of coil bind."

Michael Tokarchik of Manley Performance added, "It stands to reason that the less mass you have with the valve spring and retainer,

the easier it will be to accelerate the valve events and the less strain will be put on the entire valve train. To this extent we have developed a new generation of compact, lightweight dual spring packages that can handle the loads formerly assigned

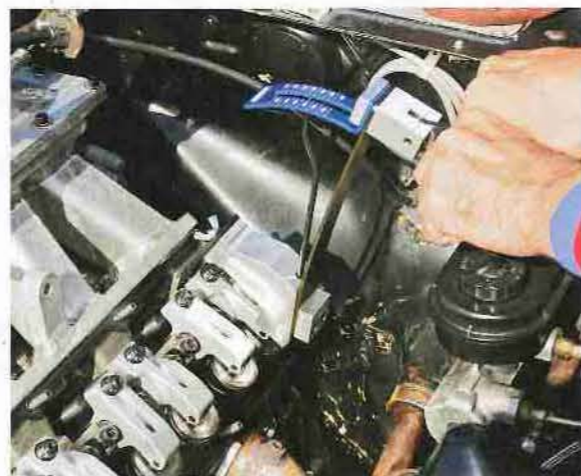
to triple springs. There are a number of other benefits to running the lightweight dual springs, including a reduction in friction and improved cooling—which adds to the service life of the spring."

The smaller diameter springs also allow use of a lighter retainer, which can improve RPM potential. To that extent, Manley has also developed a new series of TensileMax™ steel retainers that are designed to be as light as standard titanium retainers, but are hard enough to prevent wear. It's like having the best of both worlds.

At no time during an engine cycle should the spring get to coil bind. Coil bind occurs whenever a spring is compressed and one or more of the spring's active coils contact another coil. Each of the springs in a multi-spring assembly must be checked for coil bind. There should be a minimum of 0.060" clearance between the coils of the each spring.

Once the engine is assembled with a new set of springs, you can use an on-the-car valve seat pressure tester to take a quick reading of your new springs. Moroso's newest Valve Spring Tester utilizes an interchangeable claw to hook to the pushrod side of the rocker arm. Due to the many different varieties of rocker arms such as straight, right or left offsets, etc., the Moroso tool can be easily changed to hook properly to the rocker and give you a reading as to valve spring seat pressure.

You can calibrate your tester by bending the pointer on the tool to reflect the correct pressure and matching it to the number on the tool that corresponds to the pressure tested on a spring bench tester. However, as long as you record the reading on the tool of a new spring, it becomes simply a barometer to gauge any spring pressure loss. Powerhouse Products sells a similar tool.



Checking your valve springs on the engine should be a part of your maintenance program. The use of a simple tool such as Moroso's Valve Spring Tester makes the job an easy one.



As in any other components in your engine, valve springs, retainers and keepers need to be a matched set.



It all starts with checking the valve springs on a bench tester for seat pressure and coil bind. The coils of a spring should never contact one another, which is a sure recipe for damage to any number of components.

the same number of cycles as a NASCAR, street or circle track spring. We look at the specific application to determine the number of cycles needed. Because of this we can knowingly reduce the life expectancy due to the fact that spring life is directly correlated to the dynamic stress that is applied to the part. The more we stress the part the more efficiently we



The Moroso tool is available optionally with a number of different claws to fit the various rocker arm combinations used today.

Heat is probably the number one cause of spring failure. Brown said, "We advise people to use spring oilers and keep the springs as cool as possible. If you look again at the life of the spring, another part of the equation is the heat. If you can get a spring to run cooler, you can get it to run longer. If you do oil the springs, make sure it is a replenished oil supply or the spring will actually heat the oil and your top end will turn into a fry daddy."

Comp Cams has a Valve Train Assembly Spray and its main function is to make sure that after the engine has been built, but before the engine is run, the springs do not begin to rust and have some type of oil covering them.

As far as spring set after a new set of springs are installed, you can expect them to lose a small amount of pressure. Brown said, "We have done a lot of work to reduce spring set so that the end user does not have to reset the installed height on the springs multiple times after putting on a new set of springs. This involves us performing specific heat sets to knock out much of the residual load that is in the spring. This is like running for a couple passes but without the beating that the engine can put on the spring.

"With drag [racing] springs," Brown added, "the amount of pressure that may be lost is a function of how much rpm the engine is run and how good or bad the dynamics are on the system in question. A really poorly built system may lose 15 lbs of pressure on the first run and a few more on runs after, where some systems may actually increase in load. We have some new drag race duals that will actually increase in load like this due to all the new processes we use on them."

As to how often to check the valve springs, it really is based on your cam profile and intended use of your engine.



Each claw can be interchanged easily on the Moroso tool with the use of a wing nut that unscrews and two dowel pins to line each claw up on the aluminum foot.

It used to be fairly common years ago for Pro Stock teams to replace springs after every run. Fortunately spring and camshaft technology has advanced to a point where that's no longer a concern. But those running high-end engines still realize today the need to pull the covers after each run and check the springs. While for the most part they won't move, catching one before it does break or lose pressure can alleviate future damage to the engine.

For a typical bracket or sportsman engine, it's a wise idea to check the springs, especially when the engine is new. After doing that a couple of times, you'll soon gather some info as to just how often you should be checking them.

The end result of all this is that valve springs are one of those items that take quite a bit of abuse. A little care in that department will go a long way. **DRA**

### SOURCES

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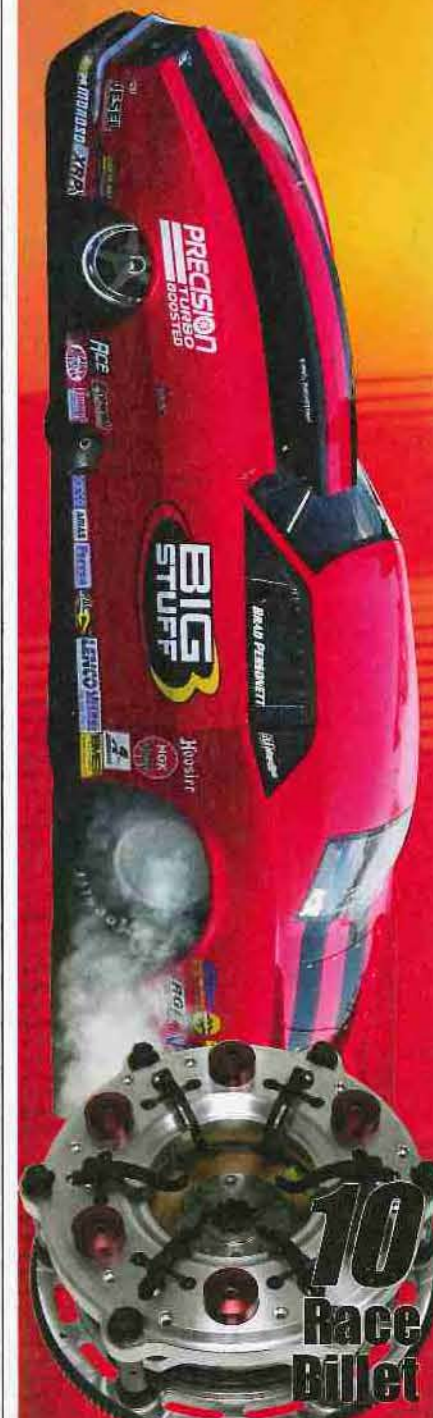
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