If spring design is the heart of spring making then it can be said that system-analysis is its soul. That's because system-analysis is an intensive scrutiny of our springs in actual running configuration.

Put plainly, system-analysis is the investigation of the valve train components as a complete mechanism or system. It includes the study of spring performance as it relates dynamically to the interaction of the camshaft, lifter, pushrod, rocker and valve in an engine while in operation.

To create a spring any other way is an invitation for failure. That's because understanding how a spring interacts with the entire valve train system is absolutely critical to designing an application-specific spring.

It cannot be understated how vital the testing process is, and to that end COMP Cams® has made an enormous investment in state-of-the-art equipment to precisely test and analyze springs.

Our sophisticated analysis equipment is used both in the scrutiny of prototype springs and in the quality assurance of springs as they move from prototype to full production. The mainstay of our spring analysis equipment is our Spintron® machines. These machines represent a sizeable investment into our design program and, as such they play pivotal roles in design analysis.

Functionally, a Spintron® is an electrically driven test machine. In the case of springs, it is used for the in-depth investigation and analysis of spring dynamics at rpm.

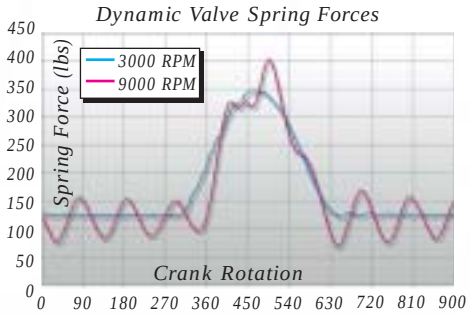
One of two COMP Cams® Spintron® testing fixtures

These machines are capable of turning the valve train up to as much as 20,000 rpm, and provide our engineers with a means of defining spring performance. It also provides computer data to verify correctness of each application-specific spring design.

In tandem with the Spintron®, our engineers analyze springs through the use lasers, strain gauges, load cells and high-speed video.

Lasers show the cumulative effect of the valve train components at work. This allows our engineers to know that designed springs are in harmony with valve train set up.

Strain gauges and load cells are used to measure the forces on a spring. This permits the understanding of actual stress levels of a spring in operation.



By looking at the high-speed video valve train movement in super-slow motion, our engineers are able to observe, analyze, and assess spring dynamics. The use of the high speed video is important because, as anyone knows, a picture is worth a thousand words.

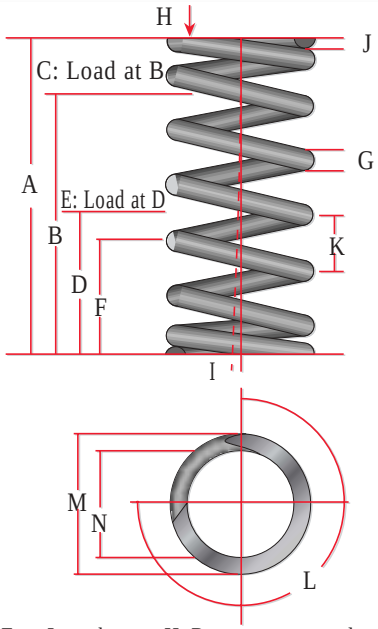
The use of both our Spintron® and video provide information and data that's critical to the creation of a new spring design. This process is one of many reasons why our design method is superior. We take steps in spring design unlike anyone else to make sure our springs meet the high demand of high-performance applications.

Each prototype is also analyzed on our Computer Driven Spring Analysis System (CDSA). This sophisticated equipment accurately measures springs loads at different heights. By doing this they are checked against the design specifications.

Data from the CDSA is stored, and used to verify that a prototype spring design is correct for the specific application. This data not only confirms the correctness of design, it also provides a database that's use in the subsequent full manufacture of springs.

Along the way, every part of a prototype is measured and verified against the design requirements. This is a vital operation in the validation process and we go to extraordinary lengths in checking and re-checking every prototype dimension.

As an illustration of how precise we are in our checking method, take a look at our manufacturing dimension worksheet.



A: Free Length	H. Runout on ground end
B: Installed Height	I. Squareness
C. Installed Load	J. Tip Thickness
D. Open Height	K. Pitch
E. Open Load	L. Angle of grind bearing
F. Solid Height	M. Outside diameter
G. Wire Diameter	N. Inside diameter

You can see the depth of analysis done to make sure prototypes are made to our exact design specifications.

Not only is this examination critical to checking prototypes, it's just as important when springs go to manufacturing. That's why we use the same methods in each and every run of springs that we make.

Reaching the goal

When a prototype has successfully passed our rigorous testing and examination, our engineers are ready to move to full production.

Throughout our design process one goal is uppermost, that of creating the ultimate application-specific spring.

Reaching this goal is reflected in our commitment of minds, materials, and machines. So when a spring moves into full production, the best spring possible has been designed for you.