machines in the industry to ensure that each and every spring is wound to the exact specifications dictated by the design.

Following coiling, springs are stress relieved. Since the coiling operation permanently bends the wire, this operation removes harmful residual stresses from the wire. This step puts the spring in an oven for a prescribed amount of time and temperature. In this operation, the temperature is held to a two-degree tolerance for stress relief.

Next, the ends of the spring are ground. This operation is critical because it ensures each spring is square and that the forces will be evenly distributed to the stem of the valve. The necessity for a spring to be square is obvious, and each spring is held to an incredible tolerance of 2° to the retainer and the spring seat. Then the springs go through a finishing step that removes any uneven areas on the surfaces of the ground ends, paving the way for the next critical process of shot-peening.

Shot-peening is the process that bombards the spring surface with application-specific media to impart compressive stresses on the surface. This crucial step provides a dramatic increase on fatigue life of the spring. Following on the heels of shot-peening, each spring is heat-set. This is a step in which the spring is compressed for a specific time and temperature that takes the initial load out of a spring. Simply put, each COMP Cams® spring comes already pre-set for initial load loss.

At the end of the manufacturing process, springs receive a coating of an anti-corrosive material. This is done to provide a moisture barrier that prevents surface corrosion, which is virtual death to a spring.

Testing, Testing, Testing
Our engineers perform destructive and non-destructive tests on every spring batch to be sure that every spring made is as well as the last. These tests are performed on sophisticated equipment such as the IST Cycle Tester, Scanning Electron Microscope and X-Ray Diffraction Machine. The IST Cycle Tester tests for spring cycle life by causing springs to fail by taking them through as many as 10,000,000 cycles at stresses much greater than they will see in an engine. When this is completed, we have documented proof that the cycle life of a given spring design meets and exceeds the design criteria. This also ensures batch-to-batch consistency of each run of springs.

A Scanning Electron Microscope (SEM) is used as another check for material integrity. This high-powered equipment permits our metallurgists to view material cross sections to check and double check that the material microstructure is correct. Another tool that’s used to verify spring integrity is the X-Ray Diffraction Machine (XRD). The XRD is used to measure compressive residual stress. This inspection verifies that shot-peening operation is correct because it is critical to the fatigue life of valve springs.

Bottom Line
In the end, each complex and intensive step we take in our spring making process comes down to one simple truth: we want you to have the best spring possible. This is our mission. We are dedicated to this, and you can have the confidence in knowing that it is the same intensity we put into every product we make.