Subject: Coil Spring Test Data
Posted by Steve Winter on Tue, 08 Sep 2009 22:23:04 GMT
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I have started this thread for a place for contributors to submit there test data on coil spring designs for SWF material. I am looking at doing a design that needs coil springs and looked for test data on the forums to help me determine the design parameters for springs, but did not find any. With some test data we can at least get a estimation on what to expect for force from a design we want built. I think this would be very beneficial to the community.

We can use Hooke’s Law to help extrapolate how a new spring design will function, based on existing test data. Hooke’s Law is:
F = ky

Where F is the elastic force exerted by the spring, y is the change in length of the spring, and k is the “force constant” of the spring.
For example we can say that a spring with half as many turns will require twice the force to stretch the same amount.

The test data needed is the following:
Length of the coil spring – along the main axis of the spring
Number of coils in the spring – number of loops around the axis of the spring
Diameter of the coil – the diameter of a loop
Diameter of the spring material – thickness of round coil material
Force test data:
Change in length – 5mm
Force applied – e.g. 8 ounces

For example I see that there is a spring in the whoosh machine in the following tutorial:
http://www.shapeways.com/tutorials/designing_mechanical_part s_3d_printing_the_whoosh

The following information would need to be filled in:
Length of spring – e.g. 15mm
Number of coils – e.g. 7
Diameter of the coil – e.g. 10mm
Diameter of spring material – e.g. 1mm

A simple test could be done to get the force data:
Add weights to the top of the button until the top of the button is pushed down so it is flush with the top of the surface it is sticking up through, e.g. 8 ounces of weight. Then measure the length of the button that sticks above this surface with the weigh removed. This is the change in length y.

Tests can also be done by stretching the spring. I think the constant k should be the same for stretching and compressing. Tie a weight to the end of the spring and measure how much it stretches by, e.g. if it starts out 15mm and stretches to 18mm, then y is 3mm here. The force is the weight used.

It would be good to have test data for different diameters of spring material, e.g. 1mm, 2mm, 2.5mm etc.
I think some extrapolation could be done for springs of the same spring material diameter, but different coil diameter, by using the overall length of the coil material, i.e. the length of the coil material if you uncoiled it into a straight line.

Please add your data to this thread for any designs that you have done. After some data is gather some tables can be put together to go in the thread.

Thanks
Steve W.

Subject: Re: Coil Spring Test Data
Posted by Steve Winter on Tue, 15 Sep 2009 00:23:21 GMT
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Another method to get spring data is to do the test on a cantilever beam. Clamp the beam to a table, and tie a string with a weight on it to the other end of the beam. Use enough weight to get a significant deflection. Record the length of the beam, the cross section of the beam, the amount of deflection of the beam, and the weight.

We can expect to get the same amount of deflection, for the same amount of force (weight) if we take this beam and wrap it into a spiral shape to make a coil (via the magic of CAD or Blender).

Steve

Subject: Re: Coil Spring Test Data
Posted by Ushanka on Tue, 15 Sep 2009 07:30:13 GMT
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From what I understand, WSF is not perfectly elastic. The springs will be less springy as time passes. Good luck, regardless!
