

Systematic Optimization Of Beam Based Spring Structure

X. Zhou¹, P. Holst¹

¹Triple Ring Technologies, Newark, CA, USA

Abstract

Beam based spring, possibly one of the most ancient mechanical mechanism, is exhibiting its noticeable existence from few bucks' living goods to millions of dollar's instrument. Its size ranging from meters in heavy duty machinery to micron in MEMS device. With the significant presence of spring in the engineering world, it is natural for any practitioner or design to ask himself following question: does my spring serve my needs; Can it be optimized; Or even can I have the spring designed under the constraints. Those questions are even more prominent in the world of drug delivery where device needs to be miniaturized, preferably to be portable, on the premise of robust performance. In this paper, the author setup a unified treatment of studying the feasibility of spring under constraints (geometry, strength, robustness to tolerance) based on energy conservation and then perform optimization (if constraint is feasible) based on constitutive equation. The motivation of this treatment is to relieve the designer/engineer from reading catalog or running tons of FEM simulation based on statistical or search based optimization approach. This systematic treatment is verified by Comsol and also partial implemented in Comsol.