**Wire diameter of helical compression springs initial estimation**

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***Abstract***

*The article is focused on helical compression spring wire diameter estimation when the diameter is not specified or required. Formulae for the initial estimation of minimal and maximal wire diameter based on the amount and type of load and material properties were determined. Thus, the diameter can be chosen from the appropriate range.*

***Key words:*** *helical spring; wire diameter; ultimate stress; spring index.*

**INTRODUCTION**

In calculation process of helical compression springs the wire diameter is often fixedly given or estimated by guesswork or by experience (*Schmid, Hamrock & Jacobson, 2014*; *Budynas & Nisbett, 2011*). …………………………….Aim of this article was to provide method for appropriate estimation of …………………………………

**MATERIALS AND METHODS**

Maximal operational tangential stress in helical compression spring can be calculated by equation (1)

 (1)

where *F* is maximal operational loading force (N), *D* is mean coil diameter (mm), *d* is wire diameter (mm)…………………………….

**RESULTS AND DISCUSSION**

Based on equations (9) and (10) the final formulae for wire diameter estimation are derived by eq. (11), (12) and (13). Measured data are presented in Fig. 1. For illustration of described process selected values are shown in Tab. 1.



**Fig. 1** Measured data…….

**Tab. 1** Wire diameter range values for selected spring wire materials

|  |  |  |
| --- | --- | --- |
| Material | d | Bs |
| mm | mm . N-1/(2-ms) |
| Music wire | 0.1-6.5 | 0.089-0.179 |
| Oil-tempered wire | 0.5-12.7 | 0.103-0.190 |
| Hard-drawn wire | 0.7-12.7 | 0.099-0.193 |
| Chrome-Vanadium wire | 0.8-11.1 | 0.081-0.151 |

**CONCLUSIONS**

Universal method for appropriate estimation of wire diameter of helical compression spring was determined. The estimation can be based only on amount and type of load and selected wire material. This procedure can be useful when only force and deflection of spring are specified.

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