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53rd Internationales Wissenschaftliches Kolloquium
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Influence of the rotating direction of helical springs on their tribological load

As to be seen in practice, high tribological loading occures between the end coils of helical springs and the spring discs under dynamic loadings [1][2][3]. Wear on the contact faces leads to an increase of the fitted length L_1 and for this reason to a shift of the working point on the load/deflection curve (Fig. 1).

The investigation of this effect is very important especially for valve springs in combustion engines, because valve springs can rotate around their spring axes in operation compared to the spring discs. To evaluate these influences tests on the original components (springs and spring discs) with the help of a pin on disk tribometer have been done with the following intentions:

- Generating of general results to the friction and wear behaviour of cylindrical helical compression springs and spring discs under different rotating directions of the spring around their spring axes under dynamic load
- Determination of the influences of different material matchings between spring and spring disc on the friction and wear behaviour

The tests have been done under different loadings and speeds. The rotating direction of the springs has been adjusted left or right by the geometry of the spring, espacially of the closed end coil and the change-over coils. The springs were made from valve spring wire VD 54SiCr6 with d=2.65mm and manufactured with closed end coils, grinded spring ends and shot peened. The spring discs were manufactured from Cq15 through cold forming and case-hardening or gas nitriding.

The friction coefficients of both tested material matchings under loads of 170N and 300N and a speed of 20 rpm with both rotating directions left and right are demonstrated in Fig. 2.

The friction coefficients between spring end coil and spring disc at the beginning of the tests are different for the different loadings (for 170N load higher as for 300N load). At the end of the tests (up to 10 hours) the friction coefficients for both loadings were similar, between 0.12 and 0.14. The friction coefficients for both rotating directions of the springs were similar. Also the amount of abrasion was similar for both rotating directions.

As a conclusion can be said that the rotationg direction of helical springs under dynamic loading conditions has no influence on the friction and wear behaviour for both tested material matchings and must not be taken into account in the spring design process. Of course the effect of spring rotating itself has to be taken into account, so further investigations are planned in this field.

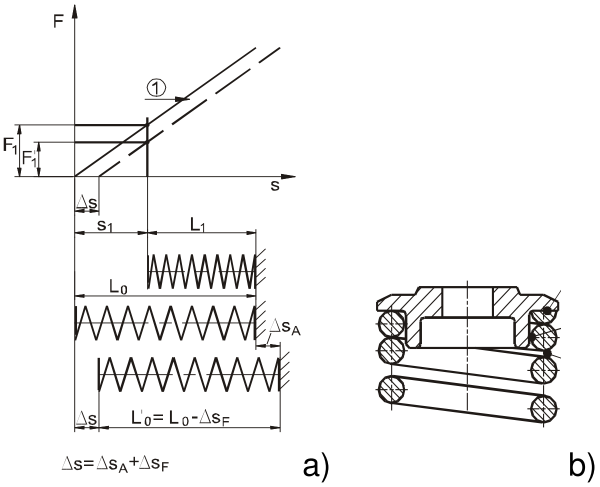

Fig. 1: Tribological contact between spring and spring disc:
a) shift of the load/deflection curve due to the abrasion at the spring end coils and the spring discs
b) friction contacts between spring / spring disc

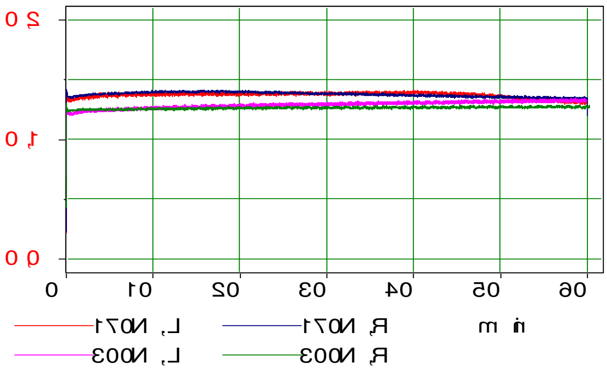

Fig. 2: Friction coefficients between springs and spring discs

References:

[1] Schorcht, H.-J.; Gevorgyan, G.; u.a.: Auswirkungen tribologischer Beanspruchungen auf Funktion und Lebensdauer von Schraubendruckfedern. Zwischenbericht DFG-Forschungsthema, TU Ilmenau 2004

[2] Krikau, O.: Federbrüche und ihre Beurteilung. Draht 23 (1972) 9, 10

[3] Barthold, G.: Spring Failures and Their Causes. Springs, Summer (1998), p. 21-37

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