Tech-Spring Report 16
Push-pull Springs

Introduction

Most compression springs are used in compression mode only, but a few are used either side of their zero deflection position. In other words some springs are extended as well as compressed. A typical spring of this type would be as shown in Figure 1.

Figure 1 Spring that may be compressed or extended

In order to effect a deflection that increases its free length a bolt is fitted at both ends. One application that uses such springs is in vibratory screens – these springs are large, made from 32mm bar and they fail in service whereas they don't on test. However, the only test possible is in push-push mode, and so the springs in use were filmed by Lake using a high speed camera. For electronic readers of this report, the springs in use are shown below:

Spring filmed in use - double-click to play.mpg

This filming showed that the push-pull deflection in use was greater than the screen designers had believed and greater than the test deflection. This lead to the conclusion that the springs were capable of achieving the design deflection but not the actual deflection in service.

It was decided to investigate this problem further, by making a scaled-down spring from EN 10270-1 type wire. These springs were tested in both modes, the push-pull mode with both ends moving being shown in the film clip below (electronic readers only).

[Still to Insert]

Using a test stroke of 35mm these springs were fatigue tested in three modes – push-push, push-pull with one end only moving, and push-pull with both ends moving, as in the film above. Some of the test springs failed in the bolted end coil – these results were discarded, the remaining results were:

Test Mode	**Life to Failure / Millions**	**Survivors @ 10^2**
Push-pull – one end only moving	6.2, 0.8, 3.0, 3.4, 2.0, 0.6	0
Push-push	1.4, 4.1, 3.2, 0.6, 2.1, 1.3	0
Push-pull both ends moving	4.8, 3.9	2

Conclusion

The test stroke or stress range dictates the number of cycles to failure, and the fact of testing either side of zero deflection is almost irrelevant. This result is surprising, but the service springs show this same performance.

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