TECHNIGRAM 120

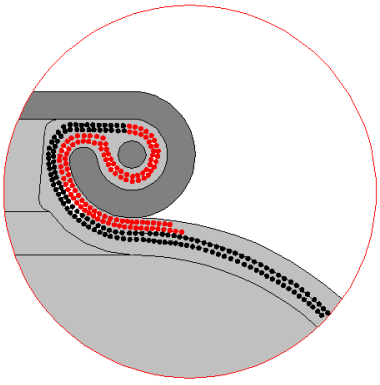
Firestone
World's Number 1 Air Spring.
FIRESTONE INDUSTRIAL PRODUCTS COMPANY

Explanation of "cracking" seen on air springs in actuation

Firestone air springs are built by layering rubber and fabric on a cylindrical mandrel. At each end of the cylinder the rubber and fabric material is folded over a bead wire. Once the bellows is cured into its final shape, this wire is what holds the shape of the bead area and allows the end plate, or bead plate, to be crimped onto the rubber part.

The process of folding the fabric over the wire creates an area called the "turn up", and the end of the turn up area is where the ends of the fabric terminate. (*See the illustration*)

When using air springs as actuators, especially when using the full stroke of the spring, the rubber part will flex substantially. The fabric in the bellows is in tension during that flexing while the fabric in the turn-up just lays on the surface (*the black dots in the illustration below represent the cords that are under tension and the red dots represent cords that are not under tension*). This creates a shear force between the fabric in tension and the fabric on the surface. Because of this, it is common for the turn-up area to break loose from the bellows. This will appear as a "crack" in the bellows, but it is actually the loose section of the turn-up separating from the bellows.



This is a common occurrence with all convoluted air springs and is not considered a failure or a manufacturing defect. We have seen parts last many years with this appearance. The performance of the part should not be affected. The rubber and fabric that is under tension are still held in place by the crimp of the bead plate.

If, however, you see the crack separating and there is visible fabric at the bottom of the crack you should look carefully at the application and perhaps replace the air spring. This condition is normally caused by overextension of the bellows and can lead to early failure.