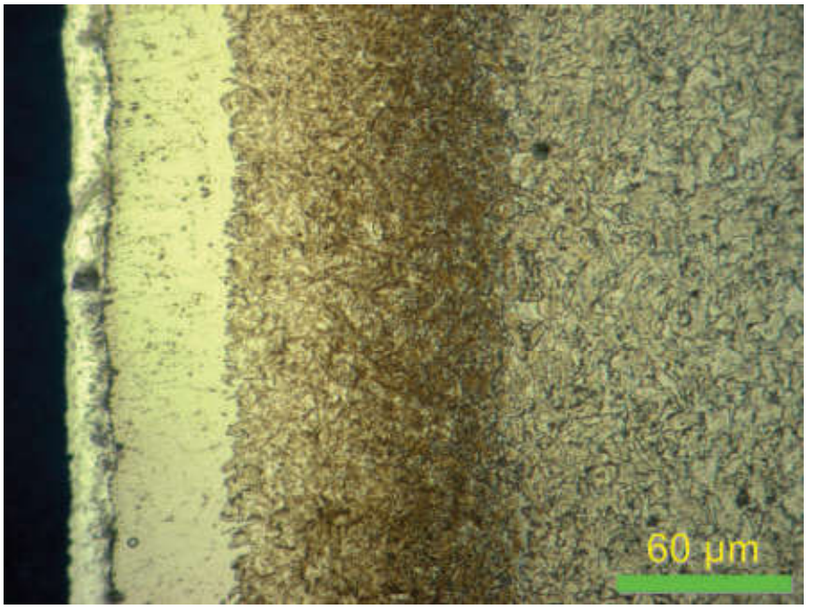
Heat-treating process adds dimensional stability, corrosion resistance to stamped parts

Situation

Stearns, a manufacturer of spring-set motor brakes located in Cudahy, Wis., was looking for a way to minimize heat-treating distortion on 0.12-in. low-carbon steel stamped parts. The parts were being carbonitrided, 0.005- to 0.011-in. case depth, to minimize wear of a slot edge, but the carbonitriding distorted the parts beyond the 0.020- to 0.025-in. flatness requirement. This created the need for restamping the parts after heat treating to flatten them.

The company tried ferritic nitrocarburizing (FNC) since its benefits include reduced distortion, added wear resistance, and increased strength. However, the process is not always robust enough for parts requiring maximum wear protection, and while FNC solved the distortion issue, the case depth was insufficient, and the slot edge was wearing.



WearAll™ process (400X, 3% Nital)

Resolution

An engineer from Stearns took the problem to Service Heat Treating, which was able to provide the required wear resistance and dimensional stability, as well as enough corrosion protection to eliminate the need for a zinc-phosphate coating, by processing the stamping using its WearAll™ process.

This process takes place below the ferrite-to-austenite phase transformation temperature. For the iron-carbon system, this is 1,333 degrees F. Because dimensional changes occur in steel as it transforms from one phase to another, processing at a temperature at which no phase transformation of the core material occurs minimizes distortion.

The WearAll process can be controlled to produce a white layer—a compound layer of iron, nitrogen, and carbon. Upon quenching, a beneficial subsurface layer of austenite is retained that can be subsequently transformed to martensite by freezing and/or tempering. This provides a good support structure for the hard surface. The resulting microstructure comprises a matrix of tempered martensite with a relatively thick white layer, which is particularly useful in providing wear resistance and antigalling in intermediate-stress applications.

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