



HARDENING OF SHEARING BLADES

Task

Textiles and carpets are commonly cut with shearing blades, rotating and arranged in a spiral-form, and a counter blade to an even fiber length. The company Heusch from Aachen is the world's leading manufacturer for such high-performance blades and shearing systems. To minimize the wear of the spiral-formed shearing blades, the intermeshing cutting edges have to be hardened. To date, the shearing blades are induction hardened across the entire material thickness. Distortion and embrittlement of the hardened area, which make alignment and fitting on the shaft difficult, are disadvantages of the process. When laser radiation is used for hardening, however, only the surface area required for the shearing function is hardened. The bulk material remains ductile, which eases alignment and fitting.

Method

Initially, using straight knife sections, Fraunhofer ILT developed the laser hardening process with a fiber-coupled diode laser and zoom optics with an adaptable laser spot size. In a second step, Heusch continued to develop the process under production conditions, and finally hardened spiral-formed shearing blades were tested by an end user.

Result

With an adapted laser spot dimension the hardness desired in the required area was precisely adjusted. When compared to that of induction hardening, the feed speed could be doubled. The laser-hardened blades have been successfully tested in production at an end user. The next step is to introduce the process at Heusch in its manufacturing line and replace induction hardening over the long term.

Applications

In addition to shearing blades, this process can also be generally used for hardening thin ribbon- or sheet-working materials, for example for self-sharpening cutting edges. With this process the functional integration of wear resistance near the surface and ductility in the bulk volume can be made possible in the smallest amount of space.

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1 Shearing cylinder with spiral-formed shearing blades (source: Heusch).

2 Detailed view: shearing blade (source: Heusch).