Laser beam hardening - Manufacturing integration enables streamlined processes

Task

Laser beam hardening is a very efficient process to preferentially treat those localized surface areas on parts that are actually experiencing mechanical loading conditions, wear and other influences. The over the past years increasing availability of high power diode lasers and related system technology developments helped to establish laser beam hardening as a complementary technology to the classic hardening methods. The process is like many other heat treatment processes primarily applied in a separate step outside of the main production flow. However, in order to reduce time and costs, manufacturers prefer a continuous part flow without the need for additional logistics and storage. The laser beam hardening process is very suitable to be integrated into process chain. The task for the Fraunhofer IWS is to design an optimized process flow with integrated laser technology based on the analysis of the entire production process of a manufacturer.

Examples

Gantry systems are, for example, recommended for the manufacturing of large tools. In such a setup the gantry system is integrated and connects via palette changers to several milling machines. Fig. 1 shows a photomontage of such an arrangement. The implementation of such a system is currently being planned for an auto manufacturer.

The integration into a manufacturing cell has been accomplished for Borg Warner Turbosystems GmbH in Kirchheimbolanden. In this application example the laser is used to partially harden the bearing areas of turbocharger shafts for utility vehicles (Fig. 2).

Generally it is possible to integrate a high power diode laser directly into a tool changer in a turning / milling center. The precision is very high as a result, because the different processes can be performed sequentially within one and the same setup of the parts.

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