

Laser surface hardening of stainless steel shafts

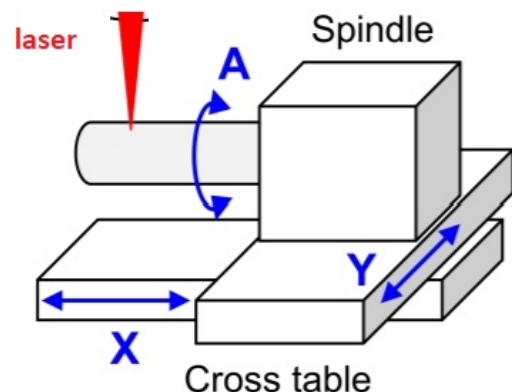
Ziel

To increase the performance of a rotational shafts under excessive working condition, we are going to harden the shaft surface by high-power continuous laser. This can be done by producing martensite on selected regions of hardened steel components. The laser parameters as well as the material properties have a strong influence on the process outputs which are here mainly microstructure type, hardening depth and width. At the same time, it should be taken into account that the material surface degradation and beam reflection must be kept as minimum as possible. Since laser hardening is a time-related thermal process, cooling condition (type, rate) plays a critical role on the process performance.

What is planned here is to select appropriate laser processing parameters in order to firstly achieve the optimal lasered hardening depth and then, to investigate the effect of any possible interrupting factor to the process. Then an optimization on all of the process outputs would carry out.

Methodik

The experimental setup consisted of five mechanical axes plus a laser beam as illustrated in the figure. Based on desirable hardening area, simultaneously the laser spot in x-y plane moves when the shaft as the workpiece rotates. All the movement speeds should be under control. Then the produced hardening area would be examined under microscope as well as by a hardness tester in order to make a conclusion between input parameters of laser and the configuration of the desirable hardening depth.



Aufgaben

- Screening the input parameters including those related to laser as well as the motion ones.
- Doing experiments according to the initial parameters
- Investigation of the configuration of the structure
- Metallurgical investigation of the samples' cross sections
- Modification and optimization of the process

