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 examined under microscope as well as by a harness 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 motional ones.
- Doing experiments according the initial parameters
- Investigation the configuration of the structure
- Metalurgical investigation of the samples’ cross sections
- Modification and optimization of the process