HIGHSPEED LASER ABLATION CUTTING OF METAL

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In the investigation 2 single mode continuous wave fibre laser sources were used YLR 3000SM/ YLR 5000SM (IPG Photonics) in combination with the galvanometer scanner Superscan SC 30 (Raylase AG). For the material stainless steel X5CrNi 18-10 (AISI 304) the maximum ratings of the applied processing parameters were studied. This paper discusses the impact of the mainly ablation process influencing parameters on highspeed laser ablation cutting, such as laser power, scan speed, focus spot size, intensity of laser radiation, and energy input per unit length. In this case the cumulative cutting speed is defined as the scan speed divided by the applied number of scans. The ablation depth per scan can be increased by raising laser power, reducing spot size, or dropping scan speed. For a given sheet thickness of 0.5 mm and an applied laser power of 4.3 kW a cumulative cutting speed of up to 97 m/min was achieved. The quality of the cutting edges as well as the cutting kerfs was evaluated by means of SEM and digital optical microscope photographs. Finally highspeed laser cutting was investigated by using a highspeed camera providing useful insights into the cutting process.

Figure 1: Cross section photographs of cutting kerfs obtained with various number of scans on maerial AISI304, parameters: $P_L = 0.86 \text{ kW}$, $d_{86} = 21 \text{ μm}$, $v_{sc} = 1200 \text{ m/min}$; left: 1 scan, middle: 10 scans, right: 20 scans