

Innovative Advanced Manufacturing Processes for High Complexity Tooling

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Due to the rise of the additive manufacturing (AM) technology, whole new ways were opened in the manufacturing of die and mold parts due to its flexibility and ability to create geometries, which were unthinkable to create with subtractive methods. The AM is near-net-shape process, where finishing is required for the critical areas. The following areas were researched within the Flex – TOOL project:

- Experimental investigation of the processes of **Wire Arc Additive Manufacturing (WAAM)** and **Laser Additive Manufacturing (LAM)** and their utilization for the repair of highly complex forging tools.
- The experimental samples of additively manufactured surfaces (**SK STELKAY 6-G, Dievar and UTP AF Robotic** clad on **1.2343 (H11)** and **1.2714 (H13)** tool steels substrate in argon atmosphere were prepared using various combinations of process parameters of WAAM – current, voltage, wire speed feed; LAM – laser power, wire feed speed.
- The possibility of application of the **laser surface texturing** were investigated. For these experiments the nanosecond pulsed fiber laser was applied and the influence of the process parameters (laser power and laser beam scanning speed) on the geometrical parameters of generated textures were observed.
- The **different types of texture elements** and different **texture densities** were used and the process parameters database for laser surface texturing of different types of deposited materials has been performed. The machined surfaces were analysed by optical microscopy, scanning electron microscopy (SEM) and confocal laser scanning microscopy (CLSM).

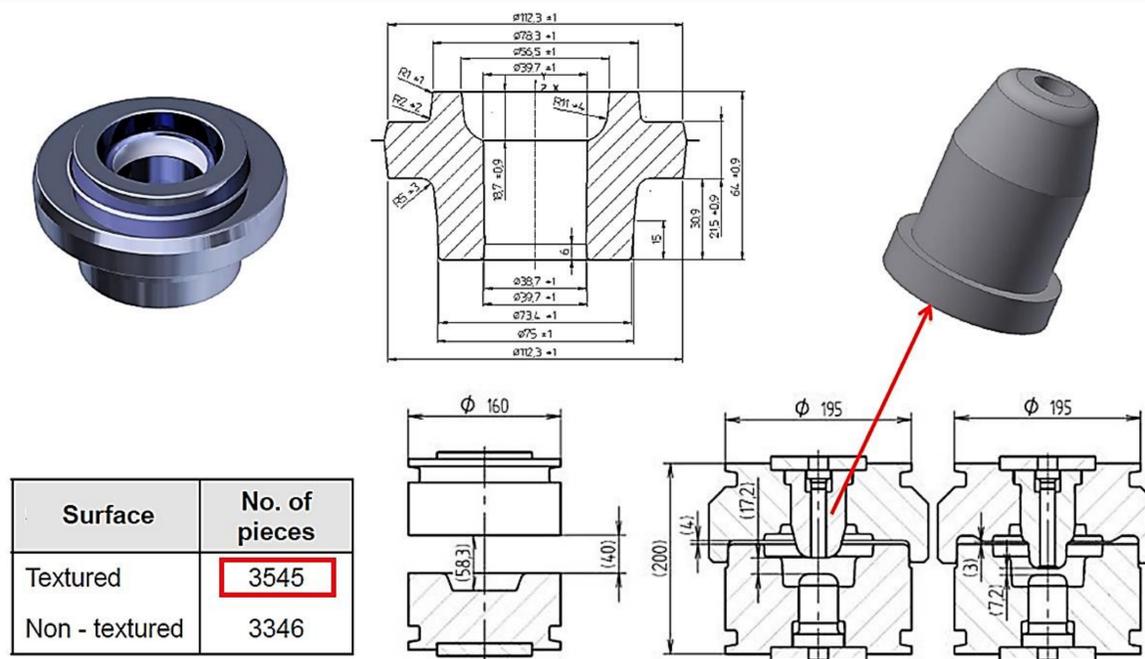


Fig. 1 Forging tool – test parts design for application of laser texturing

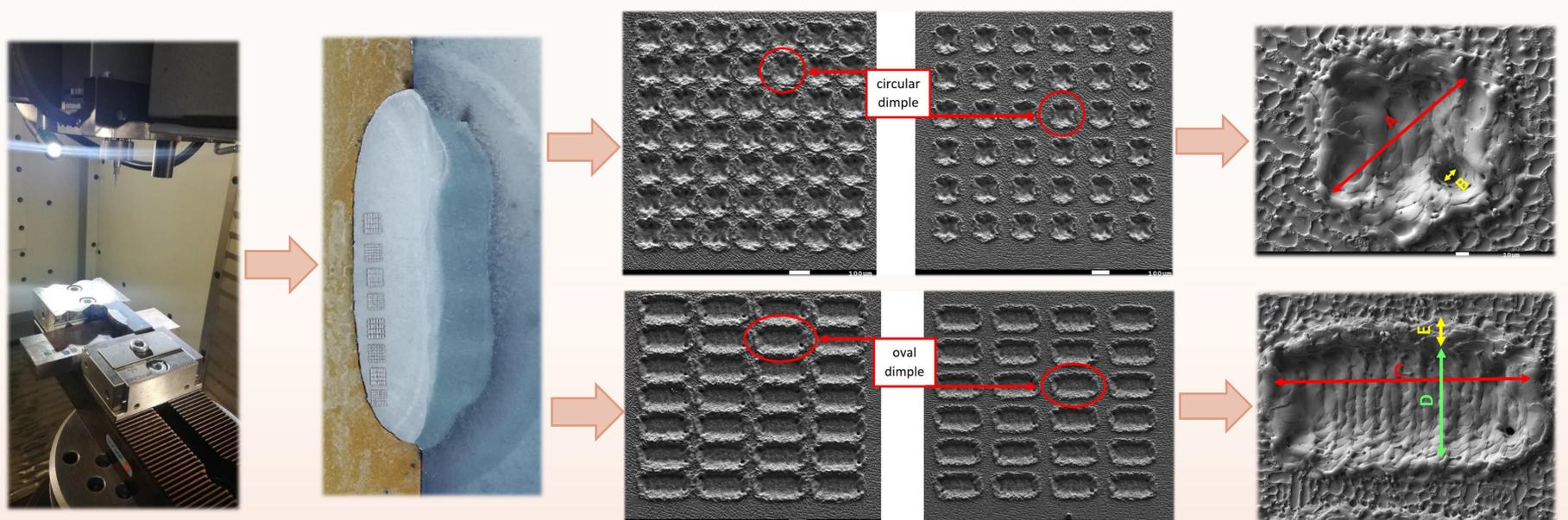


Fig. 2 SEM study of the laser textured WAAM surface – SK STELKAY 6-G
Dimensions: A = 137,5 μm, B = 10 μm, C = 280 μm, D = 120 μm, E = 15 μm

