FZU
Institute of Physics of the Czech Academy of Sciences

SEMINAR

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Seminar hall

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Surface Integrity of Meso-sized Components in Laser Shock Peening

The development of additive manufacturing (AM) has helped the industries and mankind significantly, especially when it comes to design and manufacture an intricate shaped geometry. AM allows flexibility to the industries to print the part for specific need and application. But, the poor surface properties in terms of surface quality (SQ) and surface integrity (SI) of the AM components are still the biggest challenge for industries. The surface quality fundamentally displays at the exterior surface of the manufactured part such as; surface texture, roughness, lays, laps, tears, pits and other geometrical deviations. Whereas, surface integrity reflects the interior of the surface typically 0.1-0.5 mm below the surface of the manufactured part, this includes microstructural alterations, intergranular changes, heat affected zone, microcracks, hardness alteration, residual stresses and material inhomogeneity etc. The limitation of AM to manufacture near net shape components with required SQ and SI enables the need of further post processing operations such as hardening, polishing and imparting deep compressive residual stresses to enhance the service life of the manufactured part. Most of the mechanical post processing methods are available for macro sized parts.

The post processing's of the micro-manufactured products by mechanical means (such as heat treatment and shot peening) also considered as a challenging task due to their small size, lower material availability, risk of thermal damages and mechanical distortions. Laser shock peening (LSP), or laser peening, is an efficient technique to enhance the resistance of micro-manufactured parts to damage by foreign objects and improve the fatigue life. LSP has potential to improve the mechanical and metallurgical properties of micro and miniature parts due to its *capabilities of deep penetration, better surface quality aspects, and unaltered geometry of the treated components*. In the present work, SLM manufactured meso sized gears of spur and helical geometry were used as samples for their post processing with LSP. The results have shown considerable improvements in terms of residual stresses, microstructure modification and considered roughness parameters. The presentation will highlight some of these results, achievements and discuss the near term goals for the project.

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In the present work LSP has been planned for meso-sized spur and helical gears. The details of gear, its essential characteristics and planning for improving its surface integrity and quality has been presented.

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