TRACK 1: STRUCTURES AND ADDITIVE MANUFACTURING

"IMPROVING SURFACE INTEGRITY OF AEROSPACE COMPONENTS USING LASER SHOCK PEENING"

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ABSTRACT

Aircraft components such as gas turbine engine compressors and fan blades are prone to fatigue failure and foreign object damage during operation. The surface integrity of these components can be improved by inducing compressive residual stresses near the surface. Laser shock peening (LSP) is a promising surface enhancement technique capable of increasing the resistance to cracking caused by fretting, corrosion, foreign object damage, and fatigue. It employs a high energy laser beam to generate high pressure shock waves in the material which induces deep compressive residual stresses. However, LSP also faces lots of challenges for its application such as high investment cost, lack of process automation and requirement of sophisticated knowledge and skill for its operation. This presentation presents a brief overview on current status of laser peening technology in aerospace industry, the challenges in its application and future trends in this field. It seeks to discuss the relative benefits and limitations of LSP compared to conventional methods for fatigue life increment such as metal shot peening. Some case studies such as use of LSP for aerospace alloys, coated vs uncoated LSP and LSP as post-processing method in additive manufacturing are also presented.

BIOGRAPHY OF SPEAKER

Dr Niroj Maharjan completed his B.Eng. in Mechanical Engineering (with 1st Class Honours) from Kathmandu University (KU), Nepal in 2013. After a brief stint working as a research assistant in KU, he was awarded Singapore International Graduate Award (SINGA) from Agency for Science and Technology (A*STAR) to pursue his doctorate at School of Mechanical and Aerospace Engineering, Nanyang Technological University (NTU), Singapore in 2014. During this study, he investigated the interaction of laser beam with metals, with special focus on surface hardening of steels using laser. After completing his postgraduate studies in 2018, he joined Surface Enhancement team in Advanced Remanufacturing and Technology Centre (ARTC) as a Development Scientist. Since then, he has been developing surface treatment capabilities such as laser hardening and laser shock peening.

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