

**TRACK 1: STRUCTURES AND MECHANICAL SYSTEMS**
**“THE ROLE OF RESIDUAL STRESS CHARACTERISATION IN MANUFACTURING PROCESS DEVELOPMENT”**

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**ABSTRACT**

Residual stresses are stresses which are retained in a stationary body and at equilibrium with its surrounding. They are introduced into components or assemblies through thermal, chemical and mechanical processes. As such, most manufacturing processes (forging, machining, surface treatment, joining) introduce residual stresses that can be beneficial (improved fatigue life) or detrimental (distortion, cracks). This makes residual stress characterisation critical to the success of process developments. This paper looks into commonly utilised residual stress characterisation techniques and their application on surface enhanced materials, typically used in aero-engine, where distribution of residual stresses is a key desirable outcome. Almen measurements are currently relied upon heavily for estimation of intensity of surface enhancement processes designed to introduce compressive residual stresses. While the system provides convenience, its ability to correctly predict the amount of stresses in the surface is not consistent particularly when different materials are being considered. Residual stress characterisation removes such ambiguity by elucidating the actual distribution of residual stresses in the material that can be directly linked to fatigue life. This paper seeks to discuss relative advantages and disadvantages of these characterisation techniques that can be used in surface enhancement process development.

**BIOGRAPHY OF SPEAKER**


Dr. Dennise Ardi completed his undergraduate studies at Nanyang Technological University in 2011, majoring in aerospace engineering. He was awarded the Dorothy Hodgkin Postgraduate Award (DHPA) from EPSRC and Rolls-Royce to pursue his doctorate at the Rolls-Royce’s University Technology Centre (UTC) within Swansea University, UK. During this study, he looked into the intimate relationship between surface topography and its impact on mechanical performance of nickel based alloys. At the end of his postgraduate studies, he was recognised as the best PhD student in Materials Research Centre, Swansea, UK. Dr Ardi joined the ARTC as the development scientist for mechanical characterisation in 2014. Since then he has been developing residual stress measurement capabilities such as X-ray diffraction and hole-drilling.