1.3.13. RAYLEIGH WAVE VELOCITY DISPERSION FOR CHARACTERIZATION OF SURFACE TREATED AERO ENGINE ALLOYS

Koehler B., Barth M., Fraunhofer IZFP, Dresden, Germany;
Bamberg J., Baron H.-U., MTU Aero Engines GmbH, Non-destructive Testing (TEFP), Munic, Germany

In aero engines mechanically high stressed components made of high-strength alloys like IN718 and Ti6Al4V are usually surface treated by shot-peening. Other methods, e.g. laser-peening, deep rolling and low plasticity burnishing are also available. All methods introduce compressive residual stress desired for minimize sensitivity to fatigue or stress corrosion failure mechanisms, resulting in improved performance and increased life of components. Beside that, also cold work is introduced in an amount varying from method to method. To determine the remaining life time of critical aero engine components, a quantitative non-destructive determination of compressive stresses is required.

It has been shown that high frequency eddy current techniques are able to characterize shot peened IN718 alloys but not as well Ti6Al4V alloys. Investigations to separate the influence of stress and cold work to the eddy current signals are presented in another contribution to this conference.

This paper deals with the potential of the Rayleigh wave velocity and its dispersion for getting the desired information. The Rayleigh waves are excited by conventional probes and detected by a laser vibrometer. This method determines not only the velocity at a single frequency but its dispersion over a wide frequency range. It could be shown that the surface treatment can be characterized by Rayleigh wave dispersion. The separation of the influence of compressive stress and cold work is subject to ongoing work. Besides a pure Rayleigh wave approach also a combination of ultrasonic Rayleigh wave and high frequency eddy current measurements is considered.