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Investigation into Variable Contact Load Effects on Fretting Fatigue Behaviour of Ti-6Al-4V

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Fretting fatigue behavior in titanium alloy Ti-6Al-4V, a common material used in commercial & military aero-engines, under realistic loading conditions was investigated which involve bulk load on substrate, tangential and contact loads on fretting pads, all cyclic. Therefore, a test set-up was developed which provided capability to apply these three loads as cyclic. Several tests were conducted using cylinder-on-flat configuration. These tests showed that fretting fatigue lives are reduced under variable contact load relative to their counterparts under constant contact load. Finite element analysis was used to compute a critical plane based fatigue parameter which was then evaluated based on their ability to predict crack initiation location/orientation angle, and number of cycles to fretting fatigue crack initiation. These predictions were compared with their experimental counterparts. These comparisons showed that fretting fatigue crack initiation mechanism in the titanium alloy is governed by both shear stress and normal stress on critical plane.

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