On the Integrated Degradation Coefficient for Adhesive Wear: A Thermodynamic Approach

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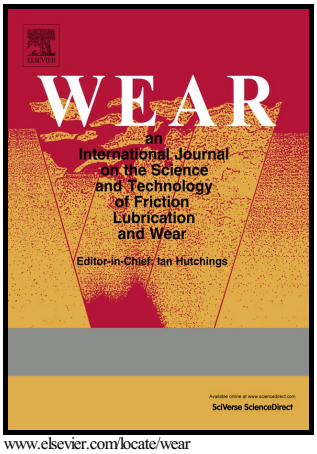

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On the Integrated Degradation Coefficient for Adhesive Wear: A Thermodynamic Approach

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Abstract:

Normal adhesive wear process in tribological components is characterized by a non-linear behavior during the transient running-in stage followed by a constant rate of steady-state wear. Even though the running-in stage of wear has an imperative significance in defining the component's long-term performance, its characteristics have been largely overlooked in the literature. In general, many of the available predictive models do not consider the contact temperature and the variation in the friction coefficient with time. The present work is an endeavor to propose a complete integrated wear model using the principles of thermodynamics. In this regards, an integrated degradation coefficient is proposed which correlates the time-dependent wear rates (at both running-in and steady-state stage), friction coefficient, and the contact temperature. The efficacy of the proposed degradation coefficient compared to established wear coefficient is demonstrated by considering test results using a vertical pin-on-disk apparatus. Results reveal that the degradation coefficient provides a realistic measure of wear during running period.

Keywords: Running-in wear; Transient wear; Archard law; Degradation law