A Probabilistic Characterization Of Adhesive Wear In Metals

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Summary

Adhesive wear is one of the predominant mechanisms responsible for mechanical component failures that result in a huge economic loss. Adhesive wear has been studied; the deterministic model formulated by Archard is frequently used. However, its parameters, such as material-hardness and wear coefficient show a considerable variation around the nominal value; this variation necessitates a statistical framework for studying the wear law. This paper treats these parameters as probabilistic quantities. Investigation of the model involved an experiment consisting of a pin-on-bushing machine. Load and sliding speed are used as variables while the geometry and material of the friction couple are constant. The generated data are analyzed using simple statistical methods. The randomness of wear and hardness are best modeled by the Weibull distribution, whereas the wear coefficient is modeled by a log normal distribution. Scatter parameters and median life of wear are explored for various velocities as time progresses; the median life characteristics are mathematically modeled. The application of these models in accelerated wear testing is highlighted; accelerating by increasing the speed of operation provides a better extrapolation as compared to using heavier loads