PREDICTIVE MODEL OF WEAR INDUCED BY LOW-LOADED SLIDING IMPACTS

T. Souilliart [a,b*], E. Rigaud [a], A. Le Bot [a], C. Phalippou [b]
*thibaut.souilliart@doctorant.ec-lyon.fr
[a] Laboratoire de Tribologie et Dynamique des Systèmes, UMR CNRS 5513, Ecole Centrale de Lyon, Université de Lyon, 36 avenue Guy de Collongue, 69134, Ecully, France
[b] Den-Service d'études mécaniques et thermiques (SEMT), CEA, Université Paris-Saclay, F-91191, Gif-sur-Yvette, France

KEYWORDS
Impact wear; Impact friction; Wear model

ABSTRACT
Repetitive impacts between steam generator tubes and anti-vibration bars in pressurized water reactors are studied with an analytical impact wear test machine. Repetitive impacts between an Inconel tube sample and a stainless steel flat bar target are performed in water environment at ambient temperature. Incident energy and angle of impacts are controlled, normal and tangential loads during impact are measured as well as rebound energy and angle of impacts.

Impact wear volume is observed to be directly related to energy loss during impacts. The proportionality coefficient between wear volume and energy loss is found to be dependent to the impacts incidence angle (Figure 1).

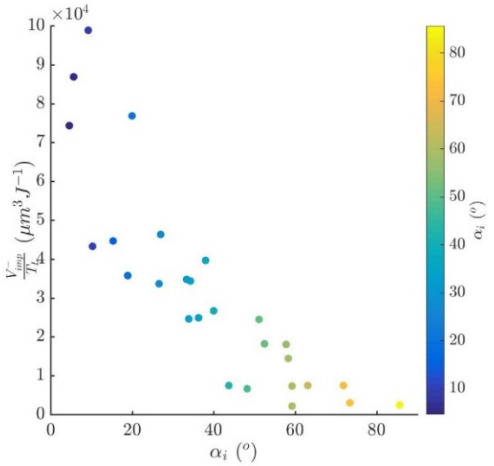

Fig.1 Wear volume per impact and per unit energy loss versus incidence angle.

Numerous abrasive scratches are observed on the worn surfaces. Their lengths correspond to the sliding distance measured during impacts (Figure 2).

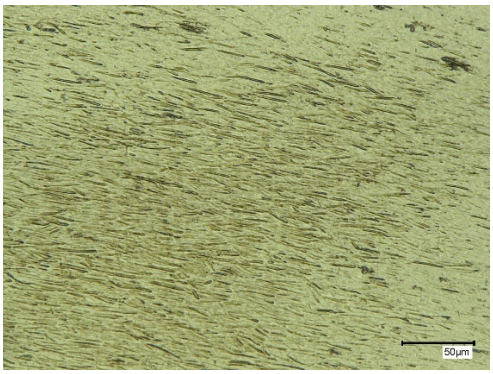

Fig.2 Tube wear scar microscope image.

A predictive model of impact wear is introduced based on these observations and previous studies [1–4]. Global wear volume is expressed as a function of the impacts number and the local wear volume of one single abrasive scratch. The volume of one abrasive scratch is determined from the incident characteristics of the impact and the materials properties. A good correlation is observed between the predicted volume and the experimental one.

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