ABSTRACT

A method able to compute the residual stresses caused by two-dimensional rolling and sliding contact is proposed and applied to the analysis of elastic shakedown. Firstly, the two-dimensional shakedown map is obtained for both full slip and partial slip conditions. The results are then compared with previous works and show good agreement.

The method proposed here is not based on the application of Melan or Koiter theorems, but rather by reproducing the ‘real’ stress–strain history of the material subjected to rolling contact loads. As a result, the model allows different load conditions to be explored without any great difference with regard to computational implementation.

For this reason the analysis is extended to variable load conditions. In particular, two sets of conditions are considered. One of them is $p_0/k = 3.75$ and $\mu = 0$, while the second one is $p_0/k = 3.75$ and $\mu = 0.15$. These conditions are imposed alternatively on the material. Surprisingly, the material does not shake down to the elastic state, although both conditions fall, if taken independently one from another, below the shakedown limit. The reason for this behaviour and its important implications on rolling contact fatigue damage are then discussed.

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3 [http://dx.doi.org/10.1016/j.engfracmech.2006.03.008](http://dx.doi.org/10.1016/j.engfracmech.2006.03.008)