A Numerical Model for the Prediction of Crack Initiation on a Gear's Tooth

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Abstract

A numerical model for the prediction of crack initiation on a gear's tooth is presented.
This is achieved by solving separately the dry rough contact problem and the smooth elastohydrodinamic one in regard to the surface normal and tangential stress distributions for each instant in the load cycle. The solutions are then combined in order to obtain the rough elastohydrodinamic solution by means of a load sharing function (see *fig. 1*).
The bulk stresses are subsequently obtained for the entire load cycle, taking also into account any initial residual stresses due to material heat treatment or grinding operations; following which the Dang Van multi-axial fatigue criterion is applied to each point. The areas were the criterion is violated are thus identified as crack initiation areas (see *fig. 2*).

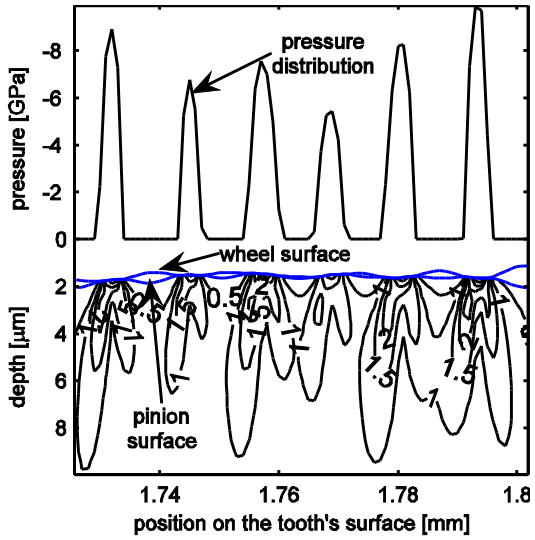

Figure 1: Pressure distribution and Von Mises shear stress [GPa]

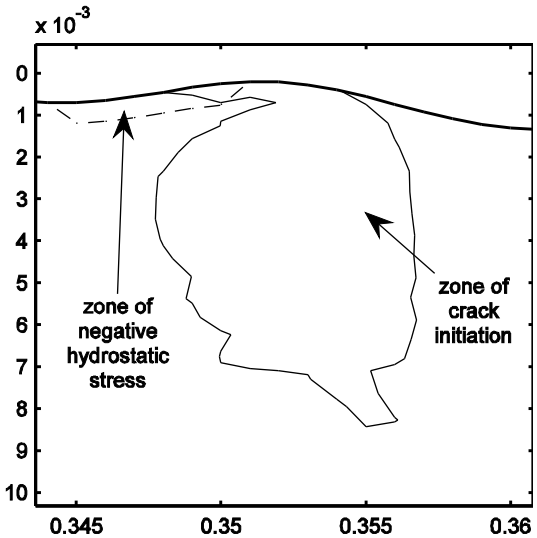

Figure 2: Example of a crack initiation area under a roughness peak—distances in [mm]

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