

TOWARDS ROBUST CALCULATIONS AXIAL BLADE/DISK ATTACHMENTS

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ABSTRACT

The aim of the work presented is to extend the calculations used for power transmissions to the technology and design of high-pressure turbine blade-disk attachments.

The use of semi-analytical methods has resulted in a significant reduction in calculation times compared with conventional finite element (FE) method. Nevertheless, the current modelling is based on simplifying assumptions made to test the feasibility of the method and estimate the reduction in calculation times.

Given the geometry of the parts under study, several surfaces of the blade will be simultaneous in contact with other surfaces of a sector of the disk. So, one of the first challenges of this work will be to be able to solve several contacts at the same time by starting from a code that solves one contact at a time between two surfaces.

To answer this question, we have chosen an approach that decouples the effect of the global structural deformation of the part from the effect of the local deformation on the pressure distribution due to local contact. This type of approach is often used to calculate load sharing on gears and splines [1].

Concerning the effect of local deformation due to contact, we have chosen an approach that allows us to solve the static equilibrium of the structure and used the local displacement obtained in a semi-analytical (SA) code that quickly solves the local contact and are able to take into account several phenomena such as stick-slip, plasticity, wear on the contact zone. This SA code has already been used in several previous studies such as the prediction of fretting and wear on blade-disk contact [2].

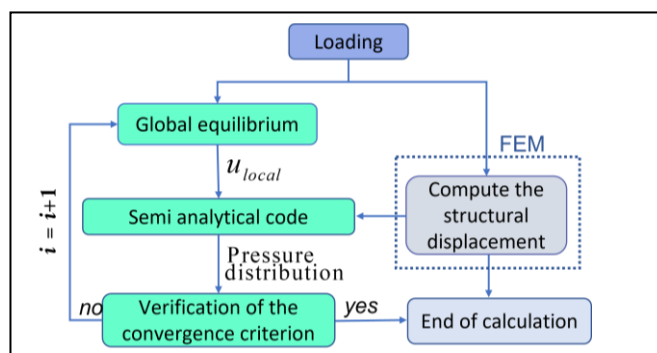


Figure 1: Schematic diagram of the mixed method

To take into account the phenomenon of structural deformation, the SA code will be coupled with an FE model that isolates only the effects of bending of the structure as in [3].

Finally, the results obtained from the coupled finite element/semi-analytical model are compared with those obtained from a complete finite element modelling to assess the time saved and the accuracy of the simulations.

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