Wind Energ. Sci. Discuss.,
https://doi.org/10.5194/wes-2020-58-RC2, 2020

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Interactive comment on "Constructing Fast and Representative Analytical Models of Wind Turbine Main-Bearings" *by* James Stirling et al.

Anonymous Referee #2

Received and published: 1 August 2020

General:

The manuscript presents a method to calculate the bearing reaction forces and moments of spherical roller bearings and tapered roller bearings used as a single main bearing of wind turbines. An simplified analytical models considering the translational and rotational stiffnesses of these bearing types is shown. The benefit of this simplified approach is comprehensible. The manuscript is well structured. Major revisions are needed

Specific comments:

To be repeatable, basic parameters such as bearing dimensions and stiffnesses should be given. This is not consistently done in the manuscript

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In general, more detailed illustrations of the Fe models would clearly contribute to understanding. In particular, the consideration of the contact conditions and their simplification within the FE-models should be considered in detail

The elastic behavior of the bed plate is set rigid. The author should indicate how this simplification affects the results

he physical modelling of the main bearings is not comprehensible. It seems that the spherical roller bearing has been replaced by a deformable spherical joint. It remains questionable whether this form of modelling is permissible, since the contact conditions between rolling elements and running surfaces, which varies under load, results in the characteristic non-linear stiffness of the bearing as such. In addition, no statement is made to whether the bearing clearance of the spherical roller bearing is taken into account. It is unclear how the mesh has been obtained. It is said that larger elements are used for the shaft and smaller elements are used around the bearing and bearing housing to increase accuracy at the contact regions. The mesh density is normally obtained by a convergence study. The author should indicate if this was carried out here

Also in the case of the tapered roller bearing, it is not apparent whether the contacts between the raceway surfaces and rolling elements were taken into account in the FE model. It seems as if the bearing was modelled as a piece of solid material. If this would be the case, it would have to be questioned to what extent the translational and torsional stiffness of the main bearing can be represented by the FE model. It is also indicated that the preload of the taper roller bearing is taken into account. The author should indicate how exactly the preload is considered

The analytical model is enhanced by an torsional stiffnesses of the tapered roller bearing. These stiffnesses are set constant and with that a linear stiffness behavior is indicated. In the case of roller bearings a non-linear stiffness behavior can be assumed (hertzian contact, clearance). The author should evaluate which error must be

accepted for this simplification.

The author should also add the assignment of stiffnesses K and KR in the figures

In general the results are well presented

Technical corrections:

The literature does not show the state of the art concerning modelling main bearings of wind turbines. Especially the modelling techniques used for FEM calculation should be updated.

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