

Interactive comment on “Friction torque of wind-turbine pitch bearings – comparison of experimental results with available models” by Matthias Stammler et al.

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Thank you very much for your comments! In the following lines, we would like to comment on the single aspects, using the original critics as a starting point. A revision of the paper has been created and some of the following remarks refer to this revision:

- "The friction torque measurement system is described very briefly (line 5, page 3), despite its central importance for the presented work. There should be at least a figure showing conceptually the configuration of the pitch drive and the instrumentation. Corresponding text describing such a figure should also be added."

C1

Measurement of shaft torques is a standard procedure in many industries, as such we did not deem it worthwhile to get into detail here. Nevertheless, we added some additional information about the telemetry system on page 5.

- "Too little information regarding the application of the different friction models is given, in order to support the conclusion that all considered models are insufficient. The information given from line 10 on page 11 to the end of page 13 should be more thorough and be presented more systematically."

We have reordered the information in the following way: At first, the adaptations of empirical values are described. Second, the results of the single models are explained. We think this is more systematically than before, thanks for the remark. We also added some further explanations on single aspects of the results.

- "It is also unclear how the roller element loads extracted from the FE model are used here. An example of a corresponding FE result would help here."

The FE consists in the load sharing of the individual rolling elements. Such calculations have been described in the literature and respective references have been added on page 4. The rolling elements load are used to calculate the overall load used for some of the models or for some of the calculations necessary for the Wang model.

- "Normalizing with respect to the average torque measured at the maximum load, limits the scientific value of the presented data significantly. Since the measurements appear to be the main contribution of the model, either the absolute values should be provided, or data normalized with respect to a well defined quantity."

We did not normalize against average values, but against the highest measured value. A clarification has been added on page 11.

- "The term movement is in general too broad for a scientific text. In many places of the text the term can be replaced with more specific ones such as rotation and shearing."

Indeed, rotation is a more suitable expression in many of the cases. This has been

C2

changed.

- "In several places the subscript "ges" is used instead of the English equivalent "tot"."

The initial idea was to maintain the original subscripts in order to make it easier to compare the equations mentioned in the paper against the ones in the references. But we understand the subscript "tot" is self-explanatory in an English paper and exchanged "ges" against "tot" in the remaining instances.

- "the argument in line 19 on page 10 is unclear" The argument was completed by an explanation: However, owing to the oscillating movements used for the torque measurements, there is a relatively high standard deviation in the single measurements (shown for 2 and 5 MNm in Figure 6), due to torque vibrations caused by the repeated accelerations of the blade and pitch bearing masses.

- ""had to be chosen" (line 13, page 11)"

Rectified.

A new version of the manuscript is prepared and added to this comment. It will be uploaded as a new manuscript version according to the editor's decision.

Please also note the supplement to this comment:

<http://www.wind-energ-sci-discuss.net/wes-2017-20/wes-2017-20-AC1-supplement.pdf>

Interactive comment on Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2017-20>, 2017.