Reviewer Blind Comments to Author

The submitted paper discuss the lubricating conditions of main-bearings of wind turbines using a double-row spherical roller bearing in a 1.5 MW wind turbine as case study. In the reviewer's opinion the submitted paper is well written and structured. However, the scientific significance of the applied approach is limited. Understandably the authors apply known methods and a significant number of assumptions, however, this leads to the question of how the proposed approach differs from the typical industrial approach.

The authors focus on reaching a wider readership by using simplified descriptions and methods. While this approach seems reasonable for part 1, it leads to the major short-coming of part 2: apparent missing novelty. In the reviewer's opinion the submitted paper could be shortened significantly and complemented with further aspects such as: consideration of sliding (due to the formation of a load zone, due to low loads and along the contact line - Heathcote slip), in-depth analysis of temperature distribution, lubrication type, geometry (such as modern tapered main-bearings), starvation….

In the reviewer's opinion the submitted paper is a case study rather than a research paper.

Please consider following points:

Abstract

- The temperature should be introduced as an influencing factor.

Introduction and Background

- The authors state that
    - *"higher than expected failure rates"* and *"premature failures in main-bearings"* occur. Please quantify and give the necessary references.
    - *"it cannot currently be known a priori whether main-bearing failure rates are likely to be improved or worse"*. In the reviewer's opinion the authors could discuss whether the contact conditions would most likely positively or negatively impact the lubricating conditions (speed, load, time between contacts and temperature could be compared).
    - *"fatigue life assessment……explicitly assumes EHL"*. Modern lifetime calculations do not assume EHL. For example, the a_{iso} or the a_{skf} consider the lubricating conditions through the viscosity ratio Kappa.
    - *"the described load structures were found to drive large, rapid variations*..". Please quantify.
- Based on the investigations in Guo et al. (2021) the authors state that axial motions are slow and highly unlikely to impact the lubricating film. However, they state that *"the lubrication was not modelled directly".* In this case, how was the aforementioned conclusion drawn?
- Sentences 29 through 38 are a good example of strongly simplified explanations which could be strongly shortened
- Please give the coordinates of the two radial components of the load vector

Methodology

- Please use references where is appropriate (e.g. IEC design standards)
- Could the authors please state if *"10 min."* refer to simulation or operation time?
- The authors explain that the applied force was considered (instead of the reaction force). Furthermore, they explain that it is necessary to ensure the correct one is calculated with the respect to the reference frame. How do the results will deviate if the reaction force is used instead? They have equal magnitude
- Please comment why the upwind row is *"only occasionally loaded during normal operations"*. One would expect that the radial load is carried by both rows
- In the reviewer's opinion the authors should expand their consideration of roller sliding. It is well known that sliding have a great impact on the contact temperature and the film formation
- The authors comment that *"other details are proprietary"*. In the reviewer's opinion profile and roughness measurements can be carried out and consider in half-space calculations
- Table 1
    - The combine surface-roughness seems high. Please give the individual values and the method used for determining the roughness
    - Please comment on the profile in width-direction
    - *"Inlet temperature"* is commonly used for "lubrication nozzles". Please consider writing "contact inlet"
- In the reviewer's opinion the selected temperatures could be too low. If the outer bearing casing is at 20-40 °C degrees the contact temperature (most likely) won't be in the range between 30 - 40°C. How did the authors make this assumption?
- Sentences 177 through 185 are a further example of strongly simplified explanations which could be strongly shortened. In which cases would the authors consider a spherical-roller bearing as a point contact (aside from insignificant loads)?
- One could argue that the consideration of starvation is not scientifically accurate. In the reviewer's opinion the authors should either select a concrete approach or take the sub-chapter out. If the authors decide to expand this chapter please consider modern literature regarding starvation and the influence of base oil and thickener on the film formation.

Results

- Sentences 231 through 240 are a further example of strongly simplified explanations which could be strongly shortened.
- Please consider using the shaft speed instead of the wind speed for Figure 10.
- In the discussion of Figure 10 the authors state that around the bearing circumference an unloaded region is generally included. While this is true for radial loads the authors stated before, that the down-wind bearing was used as case study. This bearing is supposed to be axially loaded, which could result in a load zone over 360°.
- The authors explain that *"outlying points at very low loads correspond to high values of film thickness"*. Please mark this points int Figure 10

- Please revise sentence 254-255. It gives the impression that the load is the determining influencing factor
- It is commonly known that the pressure increases in the area of the PETRUSEVICH-peak. How do the authors assume that the maximum EHL pressure values are equivalent to those seen in dry contacts?
- Did the authors consider the axial load in the pressure calculations?
- Please comment whether the minimal loading of the bearing is guaranteed and how this affect its sliding behavior
- Please give the used formula for lambda
- Please comment if the selected variations step in table 2 are plausible. Furthermore, the magnitude of pressure influence is dependent on the load magnitude (as shown in Fig 3.), therefore, the simplified statement that by reducing the load by 50 % the lambda value increases by 6 % is misleading.
- Why did the authors consider the bearing as a point contact for chapter 4.3?
- Why was a threshold of 25 % selected? Please add references

Discussion and conclusions

- The authors should discuss the influence of running-in
- No further comments. Please consider the points above