Dear Reviewer,

We would like to thank the Reviewer for valuable comments, which in our opinion contributed to increasing the quality of the paper. All suggestions and comments have been carefully thought out, and the corresponding revisions have been made to the paper. In addition, we have supplemented the incorporated changes with specific answers given below.

Yours sincerely,

Comments and Suggestions for Authors

Dear Author(s), the manuscript 'The Influence of the Geometry of Movement During the Friction Process on the Change in the Tribological Properties of 30CrNiMo8 Steel in Contact with a G40 Steel Ball', Manuscript ID: materials-2762701, have some weakness that must be revised appropiately.

Please find below some, of the most crucial comments:

1. In the Abstract section, Authors shuld introduce firstly to the area of research and presenting the significance of the study. Currently, there is no goal put in the paper as the main line.

Answer:

Thank you very much for your valuable comment. Experiments with changes in motion geometry are extremely valuable for engineering and development purposes because they provide important data on the effect of tribological factors on the performance and service life of joints. This knowledge makes it possible to more accurately design tribological systems, optimize materials and develop innovative solutions with the aim of achieving longer life and more efficient operation of mechanical components in various industries. From the point of view of applications and specific areas of research, it is not possible to clearly define in which industries these results will be used. Their significance lies in their universal contribution to tribological research and engineering applications. This knowledge can be relevant and applicable in a wide range of industries where wear control, friction optimization and defect prevention are critical to the performance and reliability of mechanical systems. For this reason, these results can be applied in several contexts, from the automotive industry to engineering to energy.

2. Secondly, still to the Abstract section, the significance of the analysis must be highlighted. Authors did not present the industry or practical applications to the advantegous of the results obtained.

Answer:

Thank you for your valuable comment, which follows on from the previous question. In the Abstract, we focused on the general emphasis of the importance of the analysis in the

context of the influence of the motion geometry on the tribological properties of the 30CrNiMo8 steel. Our effort was to present the main parameters of the measurement as well as the main findings from this study, specifically in the area of the geometry of the friction movement, with an emphasis on the resulting wear as well as the distribution of chemical elements. We incorporated the possible industrial use at the end of the article chapter in the Introduction section.

3. For the Introduction section, each of the reffered items must be cited separately, like [2-4] or [5-7]. Authors should present advantages and disadvantages of the previos study, which can indicate the meaning of the proposal.

Answer:

Thank you for your valuable comments. In the Introduction section, we have detailed each of the listed items and cited them separately. We also focused on determining the advantages and disadvantages of the cited studies. Overall, we did not want to extend the introductory part too much so as not to artificially stretch the article, we tried to focus more on the experimental part of the publication.

4. The motivation described in lines 97-108 does not derive from the critical review of the previously published papers. Usually, in the scientific paper, the novelty is suggested according to the lack in the current state of knowledge. From that meaning, the proposal is required. Authots did not clearly define the disparencies from the previous references.

Answer:

Thank you for your valuable comment, most of the publications that investigated the geometry of the tribological process in some way focused more on the investigation of the asperity of the surface, in relation to the geometry of the pressure indenter. As for the geometry of movement, there is a research gap in this area. Therefore, we focused on using the same measurement parameters and investigating rather only the change in the geometry of the movement of the tribological process. The aim of the study was to find out what difference in wear occurs when the geometry of the friction pair's movement is changed.

5. Some values of sets of experiment, described in lines 138-166, are not fully justified and looks like selected arbitrarily. Please add some irrelevant information with judgements completed.

Answer:

Thank you for your valuable comment. An explanation of the choice of methods, the setting of measurement parameters as well as the choice of other measuring devices with which we evaluated the results was added to the text of the publication. This tribological device offers the possibility of modular exchange of different parts of the device, which allows to use different kinds of tribological process methods. Due to the prescribed dimensions of the sample, tribological measurements were performed on the same sample that is used on the given device, and therefore a larger measurement angle could not be used in the Ball

on Disc method. Also, the load was chosen in such a way as to obtain a sufficient amount of wear and to be able to compare the results of wear in both types of measurement.

6. Along with the section 2. Materials and Methods, an accuracy of the Olympus LEXT OLS5100 confocal microscope measurement was not recognized. What about the uncertainty or noise or other type of errors? Please try to refer to the measurement process more comprehensively, e.g.:

Answer:

Thank you for the interesting reminder. The purpose of the study was not to investigate the accuracy of the used Olympus LEXT OLS5100 confocal microscope. We rely on the quality and accuracy of the production of these devices, and since they undergo regular calibration, we do not expect any significant measurement error. The roughness of the samples as well as the pressure steel ball was solved as an informative input parameter of the measurement, which serves for the reader to repeat the experiment or reflect on our results. In the description of Figure 4, the roughness values have been corrected. Since the measurements were carried out for better statistical accuracy at five different locations of the samples as well as the pressure steel balls, we think that this is a sufficient form of measurement accuracy. Error values were added to the article, which represented approximately ± 5% difference in the measured values.

7. Considering the subsection 3.1 Roughness and Hardness of materials, why only a Sa roughness parameter was studied? Justification of the only selected ISO 25178 roughness indicators against others must be risen.

Answer:

Thanks again for your valuable question. The Olympus LEXT OLS5100 confocal microscope was used for the measurement, which of course offers a wide range of measured values related to roughness except for the Sa parameter. From a professional point of view, Sa is needed as the main parameter in our case. The roughness parameter is used in a variety of industries and applications, including industry, engineering, and materials research. It is important for the evaluation of the surface quality of materials, for the control of manufacturing processes and for the design of components where surface treatment and roughness have a significant impact on functionality and reliability. Surface roughness Quantitative data on the quality of the surface of the material is provided. In view of the fact that a load of up to 50N was used during the measurements, other roughness parameters did not have such a significant influence that they could affect the overall measurement. For this reason, we presented only the basic parameter Sa, which, as I repeat, is mainly informative for an idea of what input parameters were used in the tribological measurement.

8. The critical discussion in subsection 3.2 Coefficient of friction and wear, is not provided. In that meaning, the advantaegs and any potential disadvantages of the study is unknown. Author have more 3rd section on the results presentation than any discussion.

Answer:

Thank you for your opinion. Yes, in chapter 3 we tried to describe the obtained results in a simple way, but we always supplemented them with conclusions, respectively we referred to the already achieved results of other authors, which are closely related to our study. We have also added text to some passages in chapter 3 in the form of a short discussion.

9. Each of the advantages and disadvantages must be justified and discussed more clearly, especially in subsections 3.2, 3.3 and 3.4 – it does not exist. The advantages must be highlighted in the meaning of both mentioned issues.

Answer:

This note is linked back to the previous note.

Increase in Wear with the Ball on Disc Method:

Advantage: Finding a 147% increase in wear in the Ball on Disc method over the Linear test can represent a critical wear value. This information allows inappropriate motion geometries that could lead to excessive wear to be identified and avoided in component design.

Rationale: This increase in wear may be the result of inappropriate direction of motion or frequency, which is important to consider when designing tribological systems.

Effect of Oxidative Wear on the Coefficient of Friction:

Advantage: The lower coefficient of friction in the Ball on Disc method due to a more even distribution of O and C is significant. This factor can lead to more efficient lubrication and reduced wear.

Rationale: The uniform distribution of these elements can act as a solid microlubricant, which improves tribological properties and can be used in the design of friction processes or possible surface treatments.

Formation of Microcracks in the Ball on Disc Method:

Advantage: Detecting defects in the form of microcracks with the Ball on Disc method offers important information about the safety and integrity of the material. These data make it possible to avoid unwanted degradation of the material.

Rationale: Microcracks can lead to a reduction in the depth of the affected area of microhardness, which is a critical parameter for the mechanical resistance of the material.

Overall, experiments with a change in motion geometry provide valuable data that are essential for the design of more efficient and reliable tribological systems and materials.

10. The 5. Conclusions section is long. All of the informations provided can be presented, however Authors must emphasize the novelty and main purpose against previous studies. In this section both general and detailed information must be eparated that the reader would not lose what the Authors are trying to convey. This section requires strong improvement.

Answer:

We appreciate your time spent in reviewing our article. We have incorporated your last comment into the article. We tried to shorten all the established conclusions to such an extent as to preserve the clarity and focus of the information. We considered the need for brevity and at the same time tried to highlight the key points of each sentence so that the reader gets a comprehensible overview of the resulting content.

From the above, the reviewed manuscript must be improved significantly before any further processing, if allowed by the Editor.

Thank you once again for your valuable questions, advice and comments, which will certainly raise our publication to a higher level, and with your help we will be able to present our contribution to a wide professional public.