Response to reviewers' comments

First, the authors greatly appreciate reviewers' valuable comments. Reviewer's comments are colored as "blue," whereas the answers or comments by the authors are given as "black."

1. Review Comments:

Overall a very nicely written paper. The authors have discussed the importance of accelerated aging data for prognostics.

Some comments:

Page 1: Column 2: Para 1:

The authors referenced to accelerated aging work by Celaya et' al. Did they look at any other literature discussing accelerated test data for prognostics.

→ We're sorry, but not sure about that. However, the authors know their group has been active in the prognostics field.

Page 2:

Fig 2 and Fig 3 need to be more clear.

→ They have been modified to be more clear.

Page 4: Column 2: Para 1:

It should be "Table 2 shows the difference between"...

→ That has been corrected. Thank you.

Page 6: Col 2: Para 2 and Para 3

It should be slope and not slop.

→ All of them have been corrected. Thank you.

General Comments:

The authors have discussed synthetic data for this work. Do the authors plan to build accelerated aging systems and then implement their algorithms on these systems.

If so if the authors indicate about the current work in progress and discuss it that would be useful for the readers.

→ The authors are planning to implement our algorithms with real test data, and hope we can validate the results using run-to-failure data under field operating conditions. These data will be from lab test as of now, but we're also looking forward to getting real industry data.
We mentioned about that briefly as adding the last sentence in Conclusions.

2. Review Comments:

This paper discusses how accelerated test data can be utilized for the purpose of prognostics. This is a fairly well-written paper. I do have some comments and questions that I feel might help improve the paper further.

The authors mention that in Fig 5(b), the prior distribution of the damage parameters is narrowed using accelerated test data. Could the authors please add some explanation about how this is done?
→ We modified the first paragraph in page 2, right column to add explanation how the distribution becomes narrow.
Also, how do the authors guarantee that the actual damage parameter value will not fall outside the prior distribution of damage parameters derived using the accelerated test data?
→ The difference between field operation conditions and accelerated conditions is just usage conditions, especially, loading conditions in this case. Parameters estimation is based on physics, which means parameters can be identified not differently even if they are under different loading conditions. Also, identified parameters using accelerated test data are much more close to ones under field operation conditions than ones from lab test using specimen or the literatures.

The prognostic performance metrics, such as alpha-lambda metric, RA, CRA, PH, etc. are merely mentioned and the original paper is referred to. However, for the sake of completeness, please introduce each of the parameters listed in Table 2 and also provide brief explanations of each of these parameters.
→ According to the reviewer's comment, the authors added brief explanations of the parameters to the last paragraph in Section 4.1.

The authors mention on Page 5 that for case 2, "it is better not to utilize accelerated test data not matched with field condition, and wrong prior information does not have a good effect on the prediction results". Could the authors please elaborate on this further, and perhaps, provide an illustrative example?
→ The following paper will help the reviewer and the reader to understand it. Please refer the paper.

An, D., Choi, J. H., Schmitz, T. L., & Kim, N. H. (2011). In-situ monitoring and prediction of progressive joint wear using Bayesian statistics. *Wear*, vol. 270(11-12), pp. 828-838.

The discussion of using inverse power model is quite abrupt and short, and it is not clear to me why this approach is taken. The reviewer requests that the authors explain this some more in Section 4.4.

→ It is well known that inverse power model is widely used to define the relation between loading conditions and system's life in the problems such as an electric insulator, bearing, metal fatigue. The example in the paper is also metal fatigue problem, and accelerated conditions data and field operation data have different scale of loading conditions and life. Therefore, the authors have been employed the model for mapping that is to repeat the process defining the relation between loading conditions and system's life according to different damage thresholds.

Other minor comments:

I printed out the paper using a couple of different printers, and in all the versions, I could not see the 'grey dots' in Figure 1. I would recommend that the authors re-do the figures and replace the 'grey dots' with perhaps 'black stars' to make the distinction between given usage conditions and various usage conditions.

→ The grey dots have been changed with little bit darker color than before.

Page 1, second column, second paragraph, second line: perhaps "test data has been mature..." should be replaced with "test data is mature..."

→ That has been corrected. Thank you.

The table captions should come *above* each table, and not below it, as is the case in this paper.

The subfigure captions should be complete sentences, and also, these subfigure captions need to be centered in Figures 4 - 11. Also, please make sure that the first word of each subfigure caption is capitalized.

→ The authors agree with the reviewer's opinion for general format in the other conferences or journals. However, PHM society format is that the captions are below the table. The format of figures also does. The authors followed the format suggested by PHM society. The reviewer's understanding will be appreciated.

Page 3, second column: Something is not quite grammatically correct with the sentence "Figure 4 shows synthetic data, and three sets of accelerated test data in Figure 4(a) are utilized as training data and additional information for data-driven and physics-based approach, respectively, which are used to predict future damage growth of in-service system shown as star markers in Figure 4(b)". Please rephrase this sentence.

→ The sentence has been revised as the following:

Figure 4 shows synthetic data, and three sets of accelerated test data in Figure 4(a) are considered as training data for data-driven approach or additional information for physics-based approach. In other words, these data are used to predict future damage growth of in-service system shown as star markers in Figure 4(b).

Page 4, first paragraph of Section 4.2: replace “it’ll” with “It will”, replace “let’s” with “let us”. Using the short forms is informal and not recommended in technical papers.

Page 5, second paragraph of Section 4.2: replace “doesn't” with “does not”

→ They are corrected. Thank you.

Page 6, the authors use “slop” instead of “slope”

→ They are corrected. Thank you.

3. Review Comments:

The problem area worked on is important and practical. However, the authors are unable to treat justifiably.

1. Instead of discussing all four situations the authors should focus more and in details on two cases, namely physical modeling with and without loading conditions.

→ The authors cannot understand why the two cases should be focused rather than the other two. If the reviewer gives more opinions about that, it will be highly appreciated.

2. The reader would expect an concrete comparison of RUL and damage data at the end for the test case considered. However, this is not included and so the validity of methodology is unclear.

→ The results of RUL and damage prediction are being presented in the paper. Only for the case 4, the authors did not add the results in the paper because it is clear that the results are accurate, which can be presumed from Figure 9.

4. Review Comments:

The paper presents a method of utilizing accelerated test data for the purpose of prognostics.

The paper is well written and touches upon an important aspect of the condition monitoring paradigm.

Instead of showing graphically, it would be better if the authors presented some measures to evaluate the prediction accuracy of the results obtained using accelerated test data.

→ Thank you for your comments.