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Prediction Methodology for xEV Motor Durability against Random Vibration

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This paper proposes the predicting methodology of the motor parts damage in the fatigue test when the motor case is excited randomly. In the past, we usually repeated trial and error in the actual test and fixed within the required fatigue standards. However, this developing process took much time. In this way, predicting the damage methodology was required widely.

Under this condition, we established the CAE model to reproduce the strain and predicting methodology of the damage of the motor parts. Moreover, we measured the actual strain and the actual damage of the sample of motor parts. Finally, we demonstrated that the predicting strain and the damage showed in good agreement with the actual test of the sample of motor parts qualitatively. In general, the motor consists of many parts and each component transmits the vibration with each path. Especially, the power lines that connects the motor case and motor coils resonate and sometimes occurs breakage in the prototype tests. In this study, we focused to predict the damage methodology for the power line.

At first, we modeled the motor shown in figure 1 and predicted the resonance frequancy. After that, we conducted the hammering test and confirmed that both results met in good agreement. In the next, we predicted the dynamic strain and strain count of the power lines based on the same motor model when the motor case was oscillated with the sine wave sweep. Similally, we conducted the actual test of the sample of motor parts with the same condition of the model and confirmed that strain count fit well.
In this process, we applied Dirlik method which has been widely used in various engineering fields when we predicted the damage.

Based on the above, we concluded that we established the predicting methodology of the motor parts damage in the fatigue test when the motor case is excited randomly using CAE model.

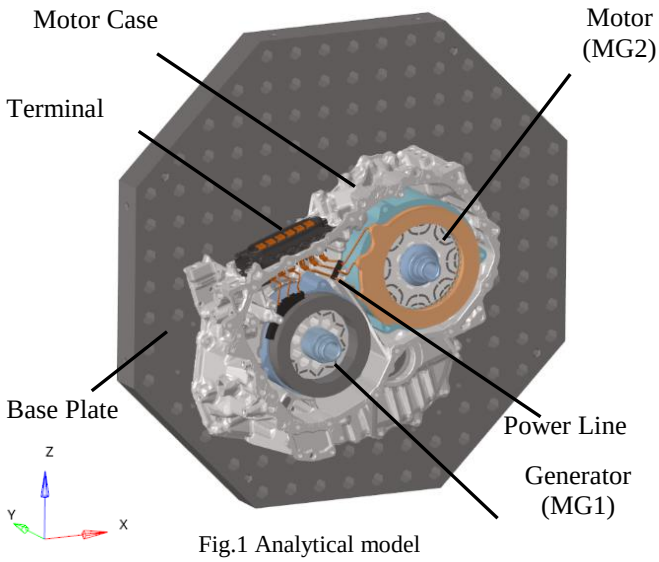

Fig.1 Analytical model

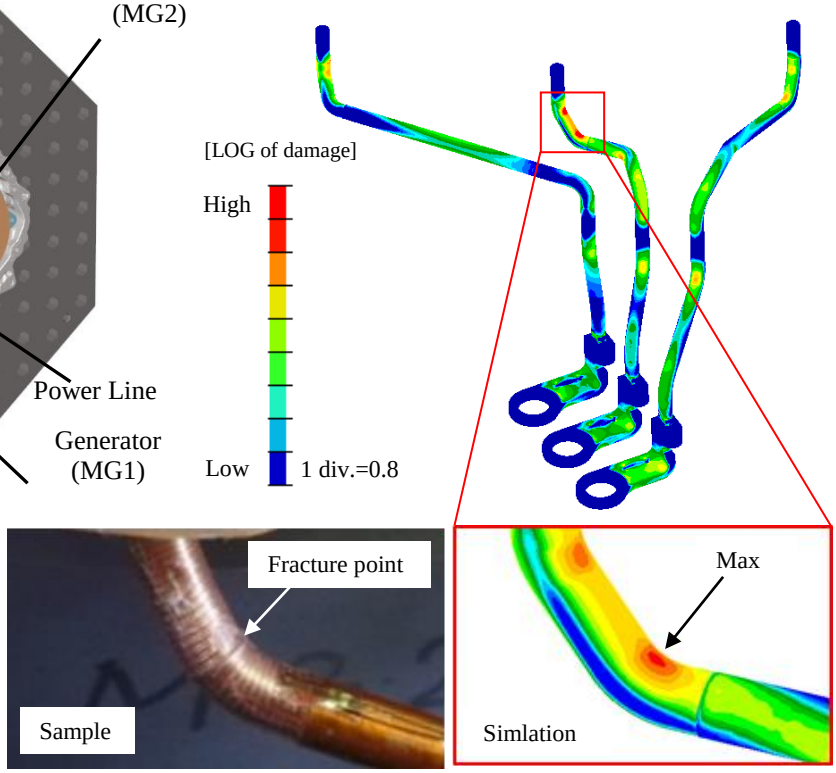

Fig.2 Fracture point of the sample vs max damage point of the simulation