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The Flexible Web Gear Modeling and Analysis Method for Efficient Gear Web Shape Design

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Abstract
In recent years, the importance of high speed gear element is increasing in electric vehicle transmission system. The elements of the electric vehicle rotate at a high speed over 5000 rpm, so an element design for the high speed is strongly required. To reduce the weight, the design of the gear web shape is an effective method. The purpose of this study is to suggest the method to confirm the influence of the gear web shape. A Gear system is modeled by RecurDyn, a commercial multibody dynamics program.

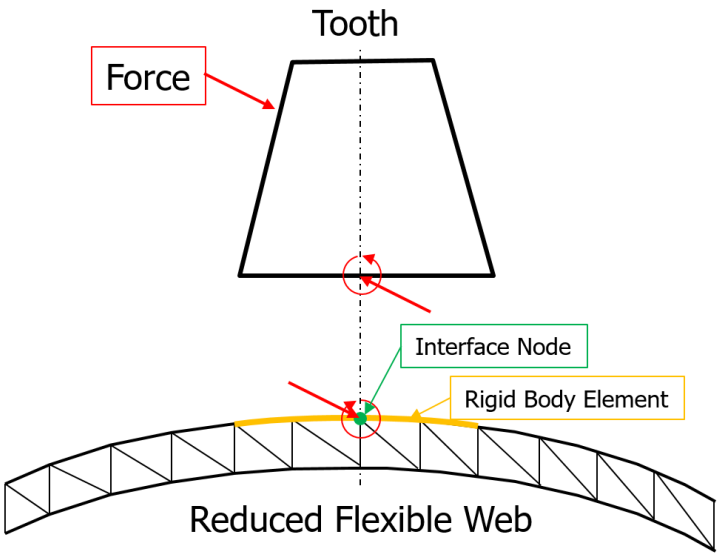

Figure 1: Flexible web gear model

Figure 1 shows the proposed flexible web gear model. A gear is divided into teeth and the web. The web is made of a reduced flexible body defined as an interface node where the teeth are connected in order to increase the calculation performance. A tooth connects to the interface node with a fixed condition. Additionally, an involute contact is used to represent the mesh between the pinion and the gear. The in volute contact is modeled based on the penalty force approach.

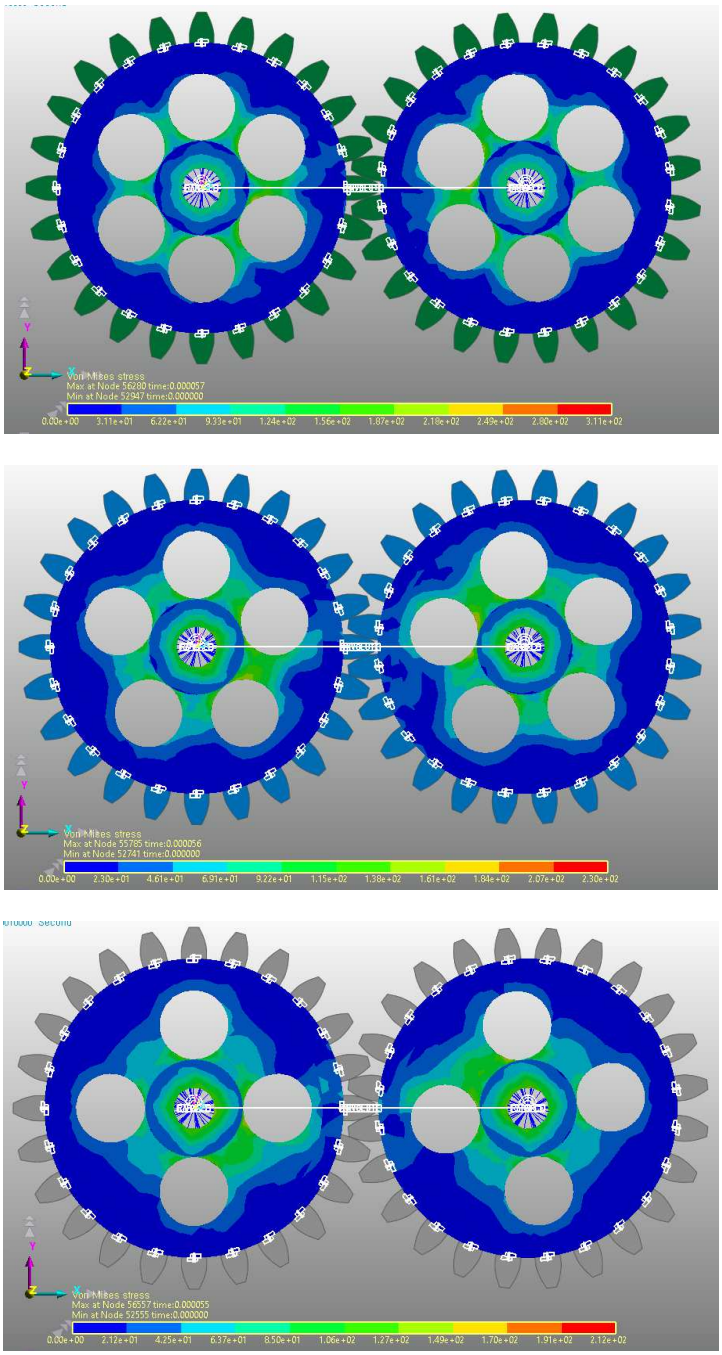

Figure 2: Stress contour results for the flexible web gear (RecurDyn)

Figure 2 shows an example of the flexible web gear model and shows contour results depending on the number of holes in the web. As shown in the Figure 2, the distribution of stress is different from the number of holes. The different stress distribution can cause different noise generation. Therefore, the proposed flexible web gear model can be useful for the effective gear system design and analysis.

References

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