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A Study of Suspension Hysteresis Reduction Method for Mass Production Vehicle

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Hysteresis is one of the non-linear characteristics of suspension which has been focused to enhance the ride comfort performance of vehicle on road surface, where the issue could not be modified only by adjusting the suspension damping force. The characteristics of Hysteresis are considered to be complex because the characteristics change due to interaction between kinematics and components. Therefore, it is difficult to derive an efficient reduction method. For that purpose, it is necessary to accurately measure the hysteresis curve and separate the contributing factors of the hysteresis components. Hence, a highly accurate measurement system was constructed (Figure 1), and the hysteresis curve was measured. Suspension Hysteresis was measured when the characteristics of the components were modified, and the contributing components to the hysteresis were separated (Figure 2). The effect of reducing the hysteresis on the vibration characteristics was calculated and examined, and a method for reducing the hysteresis was formulated

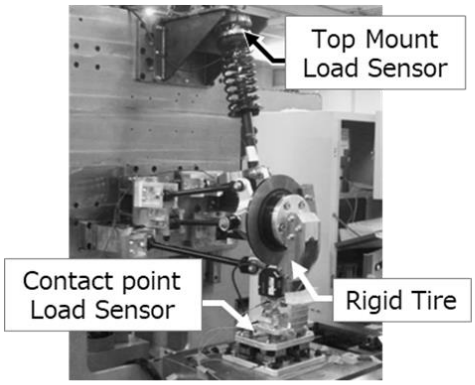

Figure 1: High Accuracy Measurement system

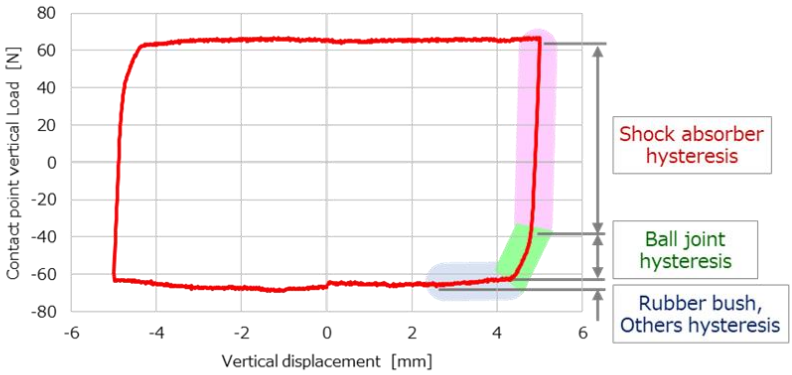

Figure 2: Separation of Components Contribution in hysteresis

The knowledge of reducing hysteresis was reflected in the developed vehicle (Figure 3), where the damping is reduced due to the reduction of hysteresis, and stability issues are expected, so the characteristics of the shock absorber were also modified. Components for reducing hysteresis and shock absorbers with modified characteristics were reflected in the vehicle, and the characteristics of ride quality and stability were confirmed by measurement. As a result, it was confirmed that the vibration of the vehicle was reduced at almost all frequencies, with improved ride comfort performance (Figure 4). In terms of stability, it was confirmed that the damping of yaw rate was improved, and that there was no decrease in stability due to the reduction of hysteresis.

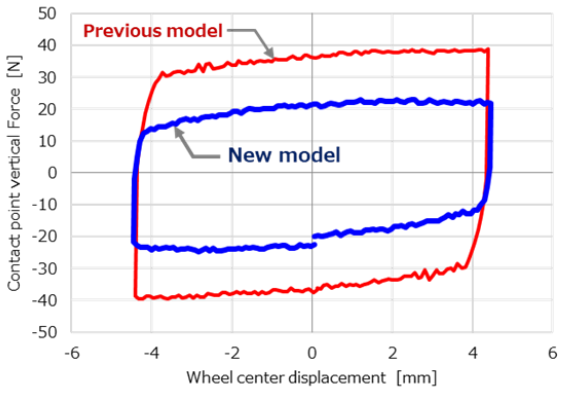

Figure 3: Refined Hysteresis of Front Suspension

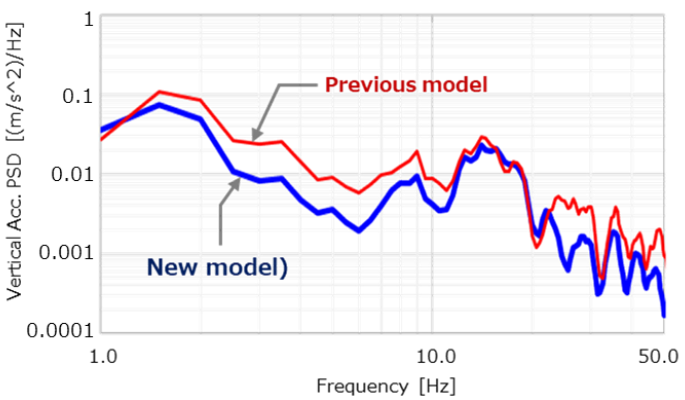

Figure 4: Vibration reduction effect of new model