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Search for More Comfortable Bogies

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It is difficult to eliminate all irregularities of in the path of a railway, as well as it is to maintain its perfectly regular condition, in view of available technology and required costs. Accordingly, designs have been developed to achieve the specified passenger comfort even during operation on an irregular track (as specified by the track maintenance standard or other related standards) by installing springs or dampers inside a bogie, between a body and a bogie or between bodies. Since vibration may be caused by openings required for assembly, elastic support and other features have been introduced as countermeasures. The body is supported by the primary spring gear (to support the axle box) and the secondary spring gear (to support the body), both installed on the bogie. Also, springs and dampers are mounted to control vibration caused by rolling or other rotating movements. These devices are either active (i.e. those that change their characteristics according to applied force) or passive (i.e. those that do not).

To provide high-performance vehicles to users, our company mainly uses a combination of passive springs and dampers, which are highly reliable while requiring low maintenance costs. However, springs and dampers inevitably suffer time-related deterioration that lowers their performance to a level lower than the original design performance. Also, rail heads and wheel treads are deformed due to wear, and conditions on the contact between wheel and rail change constantly. Accordingly, it is necessary to adopt designs and elements that can maintain a satisfactory vehicle maneuverability even if conditions on vibration have worsened.

Our company uses a computer program to simulate movement, based on multi-body dynamics, to design the characteristics of springs and dampers so as to optimize their arrangement. Fig. 1 shows the dynamic model of a typical vehicle. Figs. 2, 3 and 4 respectively show passenger comfort performance on a curved track and running stability, as determined through calculation.