

Evaluation of Real-time Crack Monitoring Method for Railway Axle and Bogie Frame

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The concept of leak-before-break (LBB) is often used in safety cases for pressure systems. If the hollow axles or bogie frames of railway vehicles are designed as pressurized components and a through-wall crack occurs, compressed gas in the components could leak through the crack. The LBB argument is validated by demonstrating a detectable leak of gas through a through-wall crack in hollow axles or bogie frames before their failure. Then, assuming that the LBB argument is validated and the LBB concept is applicable, cracks should be detected by real-time monitoring of the pressure inside sealed hollow sections of axles or bogie frames. In this study, the application of the LBB concept for guaranteeing the safety of railway hollow axles or bogie frames and the safety margin of this method were evaluated. The experimental results indicated that this monitoring method can detect cracks of size much less than the size that causes fractures of hollow axles or bogie frames. Consequently, the proposed crack monitoring method based on the concept of LBB is applicable to railway hollow axles and bogie frames.