Towards Smart Railway Infrastructure Assets

RAILWAY SYSTEMS
by voestalpine

Digital twins are enablers for a better system understanding and condition-based maintenance.

The global trend towards digitalization and digital twins of railway infrastructure assets has an impact on railway operators, but also on infrastructure suppliers. While today periodic interventions in the system are based on tonnage, mileage or in some cases even time – the future perspective goes in the direction of unmanned inspection, condition based decision-making and automated maintenance of railway assets. This will make the railway infrastructure in the future more reliable, optimizes availability and we will have a higher safety level by the reduction of humans in track.

Data driven models versus physical models

The main challenge of the next years is to combine now different types of data to generate reliable digital twins. While R&D engineers usually want to work with physical models, trying to explain a certain behaviour on a deep physical basis, new possibilities arise with the use of measurement data from railway track. In railway infrastructure, several non-linear, state dependent mechanisms are challenging to fully describe on a physical basis. Here the generation of data-driven models and the use of artificial intelligence algorithms can help to generate knowledge of the damage mechanisms behind.

The hybrid approach

Therefore, the strategy of voestalpine Railway Systems, a subsidiary company of the leading global steel and technology group voestalpine goes in the direction of a hybrid approach – using physical models wherever possible and challenge / extend these models with data-driven models based on the experiences from real railway operations. Physical models also have one big advantage: Tuning physical properties by design changes lead to different results. This opens opportunities for optimization of our products. At the end, only validated digital twins will have a benefit for operators and suppliers of railway infrastructure and generate value. ■

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