

Wheel-rail optimization



Staying focused with an integrated view

One of the most important interfaces in a rail system is that between the wheel and the rail. Management of infrastructure and rolling stock seldom takes place within a single department and often not even at the same company. In order to achieve the best wheel-rail contact, knowledge and understanding of both sides is absolutely essential. There are many issues, such as vehicle, infrastructure and user characteristics, as well interface aspects, which affect the interaction between wheel and rail. This interplay can only be understood and optimized on the basis of an integrated approach.

Wheel-rail contact is an aspect of the vehicle-track system that is relatively vulnerable and is often the spot where the consequences of a non-optimal system occur.

Specialized in wheel-rail contact

DEKRA Rail specializes in wheel-rail interaction. We have extensive know-how of both rail and train. We understand the forces and movements at play between vehicle and rail better than anyone, and we know how the two influence each other. To support you in making choices, for example, with respect to a specific material or maintenance procedure to be used, we can determine what the effect will be on the life cycle, the environment, safety and maintenance costs. To do this, we do measurements, generate rail and vehicle models to carry out rail-vehicle dynamics simulations, perform analyses and evaluations.

Wear, passenger comfort, derailment risk, costs of maintenance

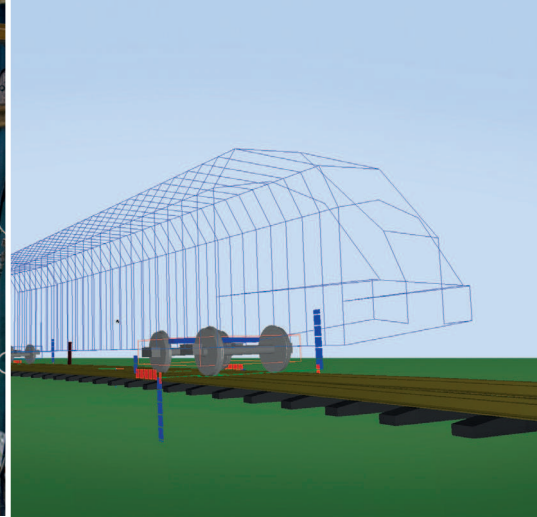
When a vehicle moves along the track, this results in considerable forces and tensions in the wheel-rail contact. Ultimately this leads to wear on both the wheels and the track, and possibly to fracturing as a result of fatigue or impact. DEKRA Rail is able to identify these forces and indicate the best way to deal with them and what the cost implications will be. If the forces are too excessive, this can have an undesirable effect on the handling of a vehicle, so reducing comfort levels for passengers. Wear can also occur and, in the worst instance, there may be an increased risk of

derailment. Using measurements and model calculations, DEKRA Rail is able to determine the stresses at play and the related remaining useful life. We also provide support in the decision-making processes with respect to possible management measures, replacement or maintenance.

If you change anything in one of the four quadrants in the figure, it will have an effect on the other processes. For example, if an infrastructure manager installs a lubrication system on a set of points, this will have a possible effect on brake and acceleration behavior and wear on the wheels of passing trains.

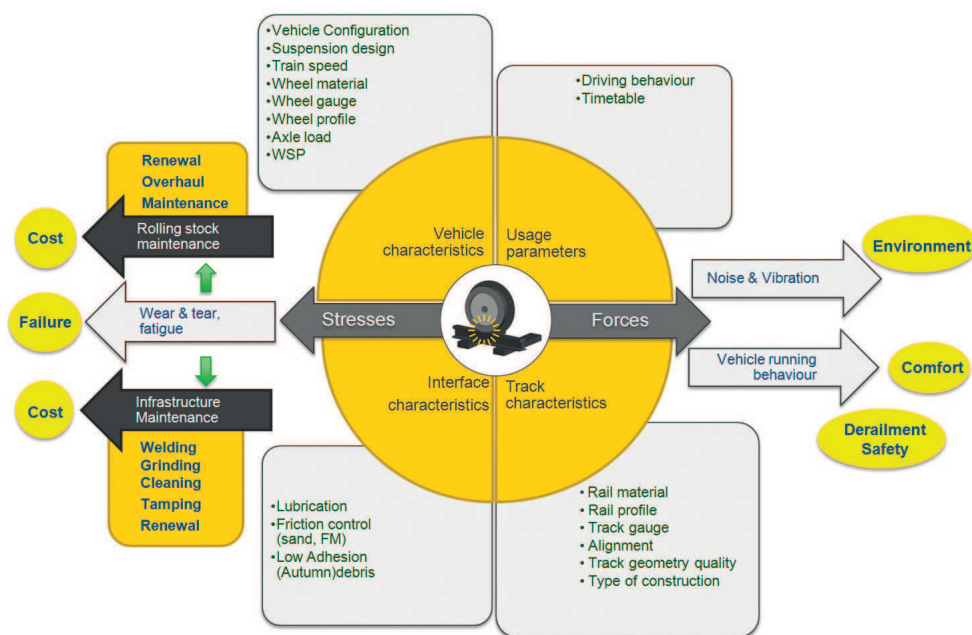
Many technical disciplines are required to achieve optimization

In investigating wheel-rail issues, DEKRA Rail can call on the expertise of specialists with different backgrounds. Materials science, mechanical engineering, tribology and electrical engineering, for instance. We take measurements on-site at clients and in our laboratories. We deploy formulas which allow us to understand and quantify the effects. To this end, DEKRA Rail uses 'Vampire' simulation software, which simulates vehicle dynamics and determines the resulting contact positions, displacements, forces and accelerations. We have test rigs for wheel-rail contact. The rigs simulate and test wheel-rail contact to scale. DEKRA also uses Final Element Modeling. Based on the forces and resulting tensions, this method provides insight into the degradation of individual components (such as wheels, axles, bearings and fasteners). For example, the initiation and growth of cracks in an axle can be predicted from the loads which occur, on the basis of which inspection intervals can be planned.



Example of such an approach

If wheels are subject to rapid wear, we try to establish the cause. We look for any irregularities in the interaction between wheel and rail, for example, in the pairing of materials and the match in the profiles of the wheel and the rail. Infrastructure will also be taken into account in this process: What is the rail construction, the welding process and the type of rail used? Have any changes been implemented in the system, where exactly does the problem occur (or not occur)?



DEKRA Rail internationally

DEKRA Rail has amassed extensive international experience when it comes to wheel-rail contact. We have worked with rolling stock operators and infrastructure managers in the Netherlands, the UK and Saudi Arabia, and also with metro operators in Paris, London and Mexico City.

Other services provided by DEKRA Rail

- > Railway Certification and Assessment Services
- > ERTMS services
- > Remaining useful life assessment
- > Product Testing
- > NDT services
- > Rotating equipment condition monitoring

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