On the right track: Prevention of torsional vibration on wheelsets

How measurement systems from imc increase locomotive safety with real-time data analysis

Fig. 1: DB Cargo freight train

Prevention of torsional vibration on wheelsets: Safely to the platform

Torsional vibration of wheelsets presents a challenge in rail transport. The torsional vibration of a wheelset reduces traction and leads to increased wear, also termed “rolling contact fatigue”. Normal torsion stress from rolling contact is brought about by drive torque, brake torque or load torque. Along with torsion stress due to technical aspects relating to vehicle operation, wheelsets are also subject to natural vibration.

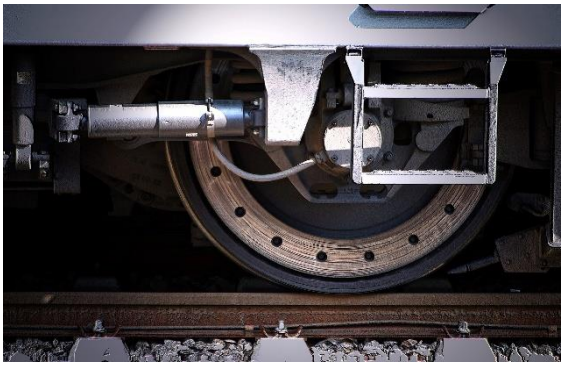

Fig. 2: Wheel of a train

Focus on longevity

In order to ensure that railroad vehicles operate with as little wear as possible on material, locomotive manufacturers seek solutions to recognize rolling early and prevent it. Rolling reduces the fatigue limit of the wheelset. Especially when it comes to new locomotives, systems must therefore be developed to recognize and reduce rolling. Railroad vehicle manufacturers are paying particular attention to safety and durability of both the locomotive as well as its components – for example, proof of the fatigue limit for wheelsets. The compact measurement system is installed on-board the locomotive.

Faster and more compact

Together with experts from DNV-GL Maritime Advisory, imc developed a Torsional Vibration Limiting System (TVLS). It excels through its flexibility, performance and availability.

Fig. 3: imc CC-X000-N-VL for the control cabinet

While the locomotive is in operation, the system from imc inspects the internal speed sensors on the wheels and determines whether torsional vibration is occurring in a wheelset. Whenever the measurement system acquires critical information that indicates torsional vibration, a TTL signal is sent to the locomotive’s traction control. This reduces drive power and thus ensures a safe drive. The assured and fast response time to recognizing torsional vibration of a wheelset is derived from the acquired sensor signals and performed by an algorithm that has been developed by DNV-GL Maritime Advisory. This is fine-tuned to the locomotive type and programmed into **imc Online FAMOS**, the real-time data analysis platform of the measurement device.

Advantages of the system

Test measurements have shown that damage is brought about not by high levels and individual events, but instead by many small events. Figure 4 illustrates that a system for preventing rolling contributes to a manifold reduction in torsional vibration.

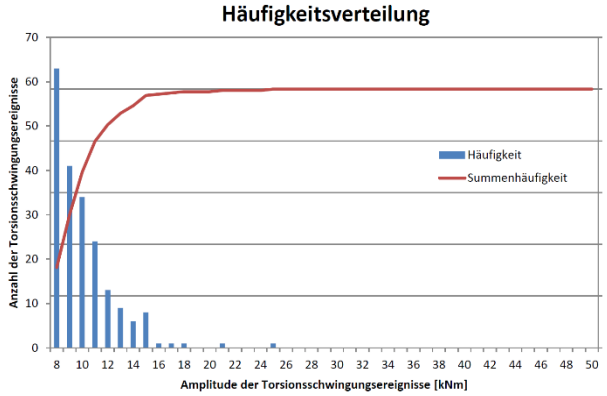

Fig. 4

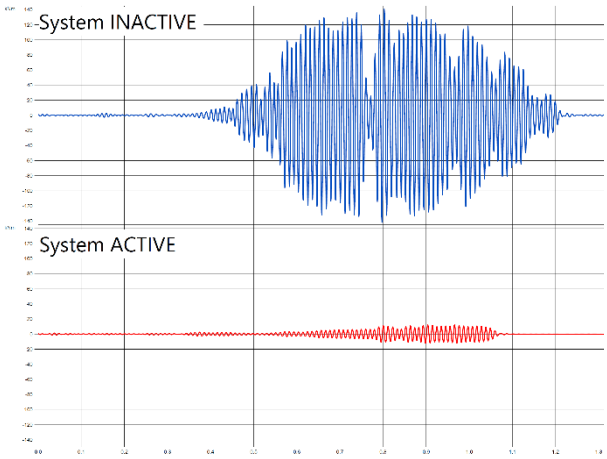

Abb. 5

The torsional vibration limiting system (TVLS) offers the following advantages:

- The new system has a high sampling rate and can therefore acquire signals particularly fast.
- The real-time platform **imc Online FAMOS**, which is integrated into the new system, analyzes and monitors states at ms intervals and directly interacts with traction control.
- The compact and light imc measurement system with isolated separation of the power supply and measurement inputs is space-saving and can be built directly into control cabinets.

Conclusion

Working together with its partner DNV-GL Maritime Advisory, imc offers a comprehensive solution for railroad vehicle manufacturers. This consists of the measurement system and the application for recognizing rolling, which integrates the algorithm developed by DNV-GL Maritime Advisory. This is fine-tuned to the type of locomotive.

Image sources: Pixabay (Fig. 1 & 2); imc T&M; DNV-GL Maritime Advisory (Fig. 4 & 5).

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