

Rail Business

[FOCUS-INDIA]



MISSION RAFTAAR

CLOSE KNIT INDIA

CATCHING UP ON TRAINS SPEEDS



1 **Mission Raftaar:**
Speeding up IR trains

8 **Coaches in aluminium**

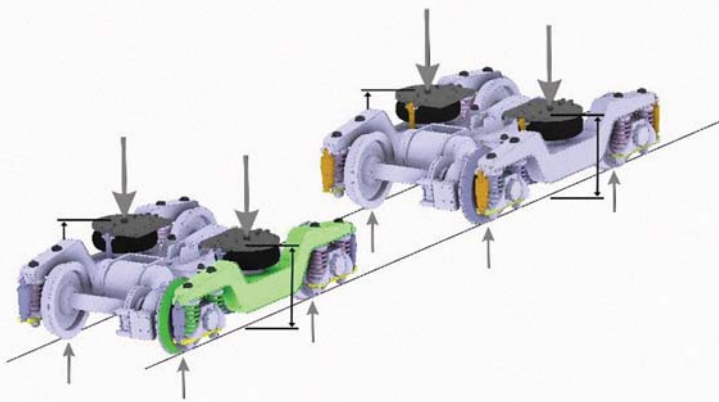
12 **IRCE 2018:**
A successful initiative

20 **New bogie design for IR**

32 **International news**

40 **A rail vision that set up
the network**

Wheelset cost push by improved shopping



Overview of influences on the bogie



A topic of ever present implication is the reduction of wheel wear to minimize the life cycle costs and improve on run train safety. Adjustment, targeting and control the correct wheel load can lead to benefits and modern methods help in making the optimal choices.

There are still many workshops or maintenance concepts which do not take enough care regarding the importance of the wheel load and the described practice should be applied, and necessary test equipment made available. The necessary investments should be budgeted – with the benefit of re-using springs, less wheel wearing and re-profiling, less unscheduled maintenance, etc. Consultants should implement those technologies into the design of workshops. In some countries authorities applied regulations regarding wheel loads etc. (IR workshops are not equipped for such measurements; perhaps internal specifications are also missing... editor.)

Key influencers

Safety against derailing depends on two important forces: the lateral force (Y) on a wheel, caused by lateral forces in curves, the sinus movement, side wind etc. The adjoint vertical load (Q) is in contrast that must be strong enough to withstand the lateral load. The typical maximum ratio Q/Y should be < 0.8.

Main factors influencing differences between a vehicle's wheel load are the diameter differences amongst the wheels, the primary suspension, a possible twisted bogie frame, the height differences from top of rail to the top of the secondary suspension between the bogie's left and right side or the front and rear bogies. It is finally also the load distribution within a vehicle body as well as the flatness of the supporting surfaces that contact the bogies.

Wheel load is also influenced by the evenness of the track, the train weight and load distribution and the aerodynamics in case of trains under higher speeds etc.

Different wheel diameters

If the diameters between the left and right-side wheel or amongst all 4 wheels are out of tolerance (EN 15313 < 0.3 mm), the wheels must be re-profiled or exchanged. The difference is often several millimetres. This reason may be explained in a simpler way, e.g. imagine sitting on a four-legged chair, with one leg shorter than the others. While less weight is on the shorter leg, more is on the other three legs. And the weight is not distributed equally to the other chair legs.

The primary suspension

Springs with different characteristics have a negative influence on the wheel load. During heavy maintenance, the primary suspension springs should be checked by a spring test press. It is important to have springs with similar stiffness characteristics and heights within a bogie and the heights under load can be corrected with primary shim plates. Standards such as UIC 822, EN 13298 or EN 13913 provide guidelines on how and what is to be tested. Experience has shown that springs are often still in a good condition and can be re-used.

The lateral movement

It is also known that helical springs move sideways under increased vertical load, often called "chaise effect" or bowing of springs. If some primary springs under load are moving in the same lateral direction, the side force Y will increase, and the ratio of Q/Y becomes worse and the derailing safety is reduced. Under such circumstances, more wear on the wheels is the consequence.

EN 13298 (2003) 5.2.3.3 specifies this effect. Spring test presses enable determining the bowing direction of springs that can then be marked and installed accordingly so that side forces are neutralized.

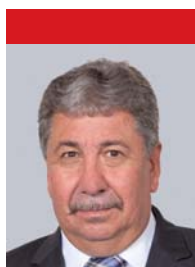
Bogie frame check

The geometry of a bogie frame should be checked after several years of operation or after a crash. Possible criteria are the flatness and the positions of the primary spring guide shafts. Deutsche Bahn DB has issued special guidelines, considering also the DIN 27201-9 standards.

Most bogie manufacturers and many maintenance workshops are equipped with bogie test benches. After assembling the bogie with all its components, the load of the specific vehicle body is simulated by PLC control onto the bogie.

The distribution of the load between the wheels and each single wheel can be determined. Possible corrections on the primary suspension with automatic calculated shim plates can be carried out. Additionally, the heights of the secondary suspension can be adjusted or corrected under simulated tare load. This is very important, as in case of one bogie side with a big height difference, it can even influence the wheel load of the bogie at the other end of the vehicle in a negative manner.

Under load simulation, it is also possible to adjust the correct heights of antenna, emergency brakes, coupling



Walter Kellenberger,
Vice President
Railway Technology,
Nencki Ltd.

heights, etc. The DIN standard 25043-7 is a useful guideline, already considered in bogie workshops outside Europe. Regarding the wheel load, the height of top of secondary suspension (bogie loading point) is important. Some rolling stock suppliers specify <2 mm, similar for between front and rear bogies.

Sophisticated bogie test benches enable the measuring of axle distances, mainly the axle parallelism. This is a very important criteria which should be checked on bogies. It is doubtless, that a bogie with non-parallel axles, tends to always move in a curve, having increased lateral forces and less safety against derailing consequently. There will be more wheel wear, noise and vibration. The only method to recognize such a situation and making corrections is on the bogie test bench before the bogie leaves the workshop and causes damages.

4- corner weighing of the vehicle body

A workshop knows the correct load which shall be applied onto the bogie for testing from the rolling stock manufacturer. In case of re-furbished vehicle bodies or repairs after accidents, it is recommended to apply the method of 4-corner weighing (DIN 25043-4). The result is the specific load forces which will be applied onto the bogie contact points. Another useful result of this test is to achieve the calculation of secondary shim plates to equalize the flatness of the contacting points to the bogie.

The final check

Before a vehicle leaves the workshop



Checking the load distribution and other adjustments on the bogie test stand



after overhaul or a preventive control, the balance of wheel loads of the complete vehicle should be checked. This is the final check against derailing safety. There are several testing methods available such as mobile wheel weighing cells, stationary installed wheel weighing bridges. DIN 27201-5 offers the required calculation methods for the maximum differences of wheel loads within a vehicle; maximum differences of <5% between wheels on a bogie are common.

A challenging situation for the wheel load occurs in case of uneven tracks or at the end of curves. The left front wheel on the left (in driving direction) according to the below photo,

receives the smallest wheel load, leading to unloading. EN standard 14363, chapter A.9.1. describes a method which allows to test the wheel load with twisting track, or in other words the simulation of an uneven track or end of a curve in a workshop. The unloading simulation and determination of the smallest wheel load can be tested on each single wheel either manually or better by an existing fully automatic test bench. If the difference between all bogie wheels, $\Delta Q/Q$ is out of tolerance, that indicates that the vehicle is no longer safe against derailing on uneven tracks or at the end of curves. This is a very good tool for condition-based maintenance.



Determination of the load which the vehicle body applies onto the bogie **RB**

F Davenne to lead UIC



François Davenne has been appointed Director General of UIC from mid-2019 for 4 years. Renato Mazzonici, Director General of Ferroviedello Stato Italiane (FS) will be UIC Chairman for a further two years.

Davenne , who will replace Jean-Pierre Lubinoux, oversaw railway safety and regulations at the French Ministry of Transport. Davenne had the opportunity to address UIC Members to underline his vision for UIC and the railway sector. ‘We have to shift our paradigm. I am truly convinced that UIC is the right place to propose a new vision for the railways... We definitively need standards to implement new services’.