Moving towards higher efficiency of multifunctional measurement vehicles

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Challenging Development

The progress in rail transport development creates the consequences, which affect the processes of railway asset management:

- Growth of passenger and freight traffic
- Increase in operating speeds
- Higher axle loads

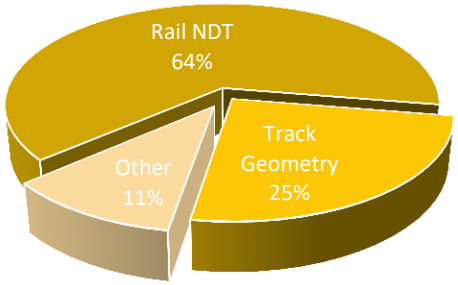
These factors **restrict** the ability of railway operators to provide adequate diagnostics and maintenance of the infrastructure.

The solution is to focus on the efficiency of measurement procedures.

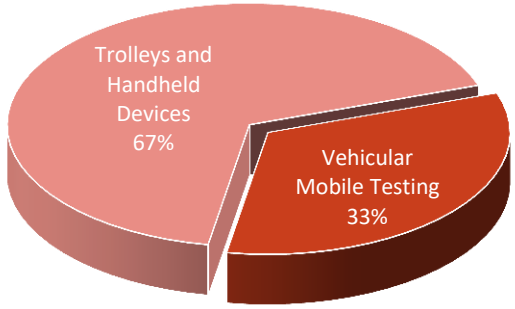
RZD Diagnostics – Current Status

- Total of **124,254 kilometers** of tracks
- 835,800 employees, **more than 23,000 in diagnostics**
- About **€200M of diagnostic costs** in 2014, 64% of that for NDT of rails and 25% for track geometry measurement

Costs by objects of testing



Costs by type of testing



RZD Diagnostics – Strategies

Following the general direction to decrease the operating costs, three main strategies were selected for implementation:

- Continue the replacement of manual units with **vehicular testing**
- Focus on the vehicles with the **combination of systems**
- **Increase** of testing and measurement **speeds**

The advantages of the first strategy were proven by practice in many years, and two others were just started to be used in Russian Railways.

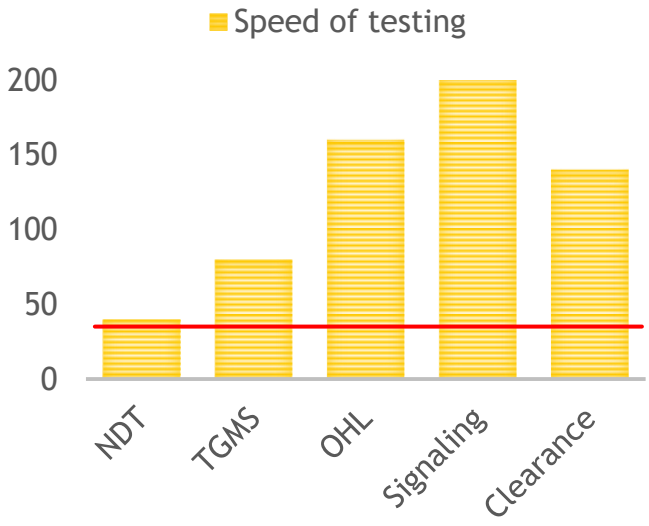
Combination of Systems on one Train (1/3)

Starting from 2008 RZD purchased **4 infrastructure diagnostic trains** each having up to 15 various systems and measuring at once over hundred parameters.

It helped to **save the costs** on the initial **procurement and operation**, comparing to the similar functionality distributed over several trains.

Combination of Systems on one Train (2/3)

However, this approach had several drawbacks, which were experienced during the years of operation:



- **Frequency of testing** is different for various objects, leading to “overtesting” of some elements
- **Measurement speed** varies for different systems, and the slowest system limits the whole train speed
- Staff of the train **reports to various departments**, and that causes discoordination of activities

Combination of Systems on one Train (3/3)

Why should RZD after all support the strategy of combining the systems?

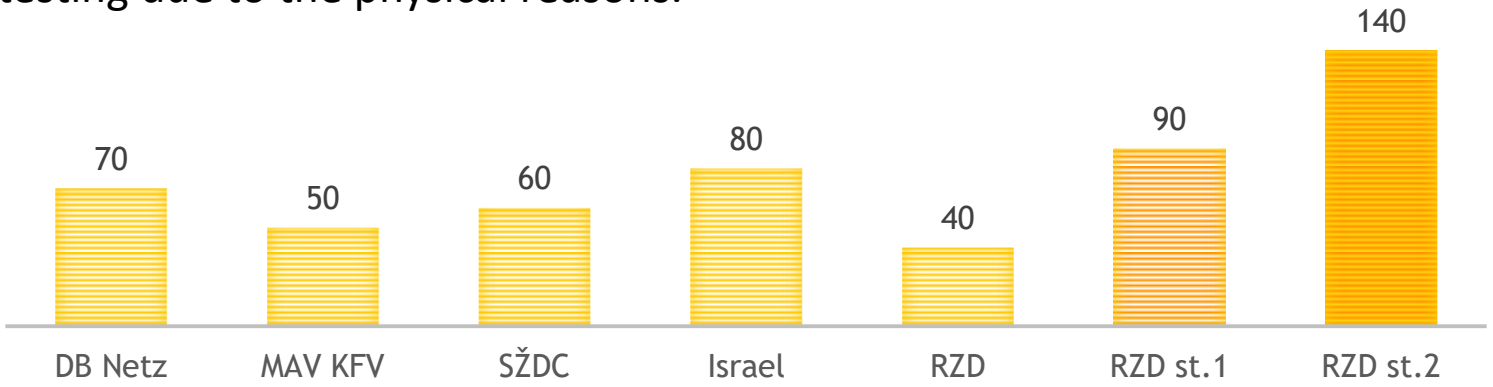
What if to configure the systems on the trains as per the principle below:

- **Rail testing** (ultrasonic, eddy current, corrugation, rail surface inspection) – 80km/h
- **Track and catenary measurement** (inertial TGMS, rail profile, video inspection, overhead wire position and wear, catenary parameters and dynamics) – 200km/h
- **Permanent way elements testing** (ballast profile, inspection of sleepers, clearance gage, ground penetrating radars) – 140km/h
- **Signaling and radio testing** (rail circuits, ETCS, GSM-R, radio networks) – 200km/h

Such combinations will provide the **optimal performance** of the vehicle by balancing the specifics of the measurements and the benefits of integration!

Increase of Measurement Speeds (1/2)

Some measurement and testing methods are still limited in maximum speed. Many railway operators all over the world limit the speed of ultrasonic testing due to the physical reasons.



The improvement of the technology allows to significantly increase the speed of rail testing and to remove this bottleneck of the diagnostic process!

Increase of Measurement Speeds (2/2)

RZD received its first high-speed NDT coaches in 2016. The plan is to operate at **90km/h** testing speed at stage 1 (2016-2017), and to start including them in the **commercial trains** with speeds up to **140km/h** at stage 2 (late 2017).

Failure of Measurements, Performed by Commercial Trains

The fancy unattended measurement systems showed very poor performance in RZD after being used on high-speed and suburban trains and long-haul locomotives

Disadvantages of unattended systems as per 4 years of experience:

- **Low reliability of measurements**
- **Localization of data not good enough**
- **Problems in organization of data transfer**
- **Difficult to arrange maintenance**
- **Distorted internal responsibility (rolling stock – measurement systems)**

Unattended measurement hardly conforms to the requirements of rapid developing large railways, though can be successfully used on certain tracks, e.g. metro!

Conclusion

No “one fits all” solution exists.

A proper way of organizing the diagnostic activities of the railway operator can only be found through debates and discussions of experienced managers and highly qualified suppliers!

Thank you for your attention!

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