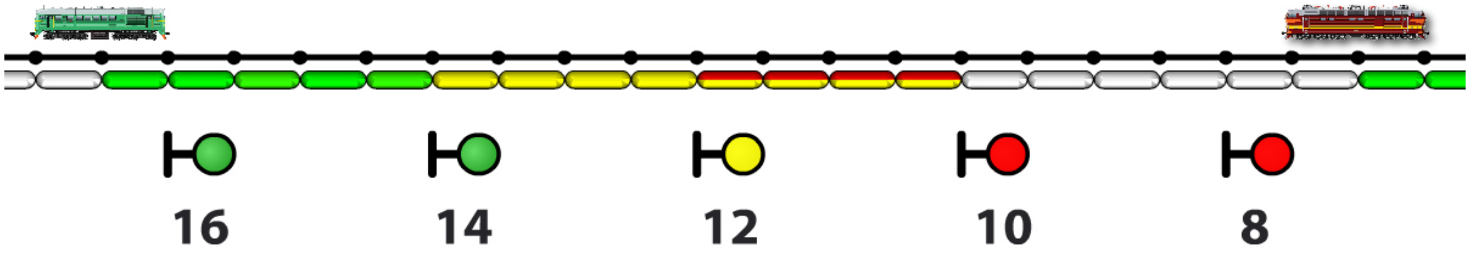
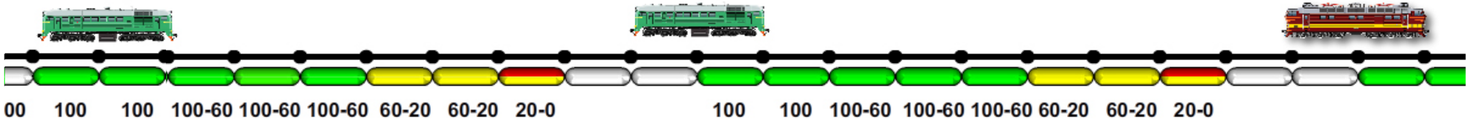
Comparison of succession intervals for different signaling systems



Typical ALSN system

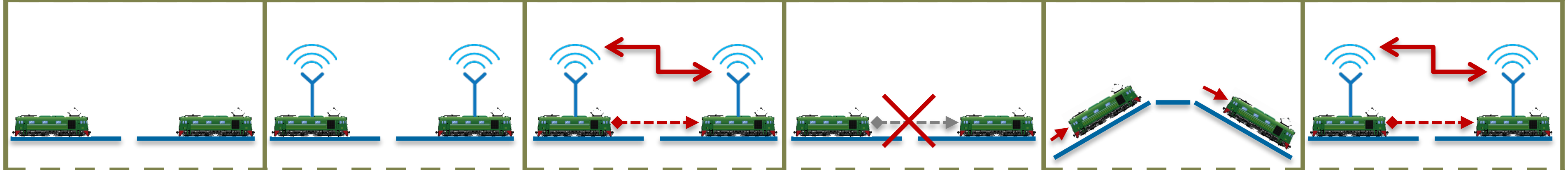
The efficiency of the multi-valued train signaling ALSEN use



Protected by 8 patents

The scheme of through passage of twin trains on the basis of virtual coupling

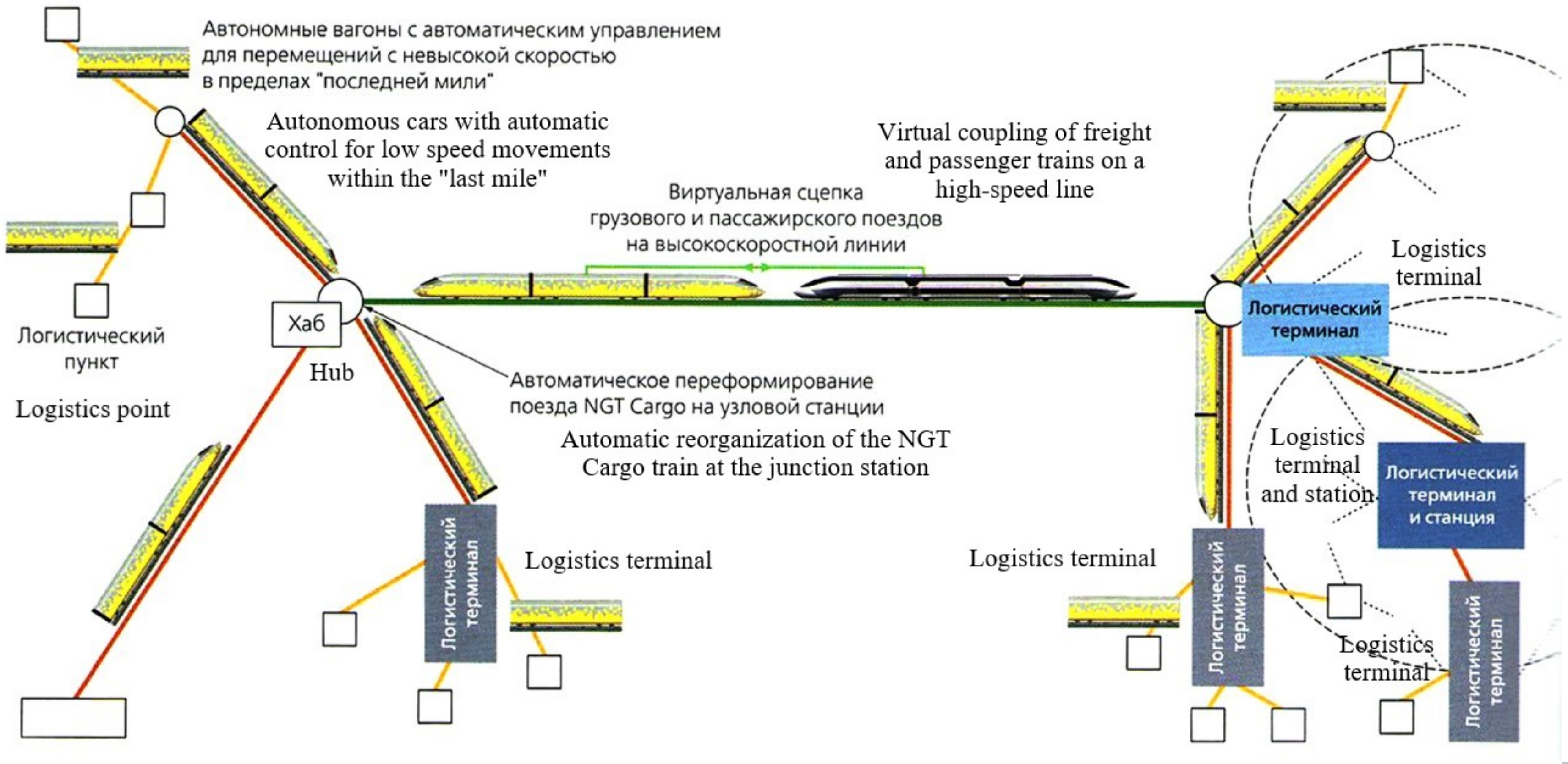
PROCESS	Taishet station		Bolshoy Lug station		Slyudyanka-1 station
Connection planning	Connection check	Virtual coupling at the station-to-station block	Virtual uncoupling	Autonomous movement when jogging	Virtual coupling at the station-to-station block



IMPLEMENTATION EFFICIENCY

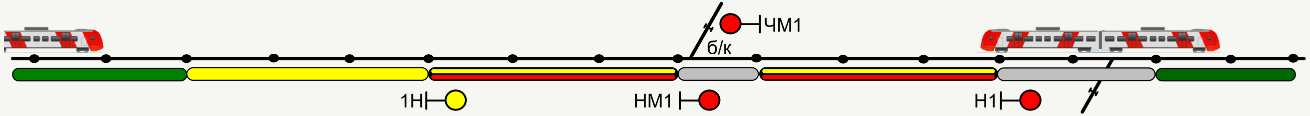
1. The possibility of end-to-end organization of twin trains work within a locomotive run and as a result, an increase in the direction productivity of t/km per day by 10-12%.
2. Increase in the traffic capacity of the direction by 10-12% (depending on the energy supply and the saturation of the traffic schedule).
3. Exclusion of station track occupancy associated with physical coupling operations from 2-4 hours per one twin train.
4. The possibility of rapid virtual formation of twin trains in large numbers on sections and station-to-station blocks where work is carried out during breaks in train running, increasing the passage of trains per unit of time.
5. Acting quickly and with mobility in case of passenger trains overtaking and technical faults.

The experience of Korean railways in the application of railway traffic interval control



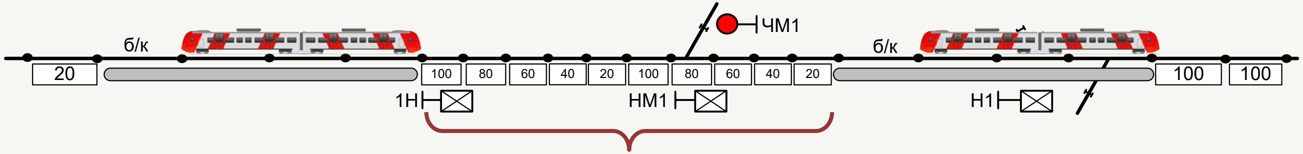
Train traffic management modes

TRAFFIC LIGHT MODE



- Typical interval regulation devices (AB and EC)
- There is no possibility of increasing the section capacity

AUTOMATIC TRAFFIC LIGHTLESS OPERATION MODE WHEN ENCODING WITH MULTI-VALUED ALS SIGNALS



indication of up to 10 free block sections in front of the train

Turning off the AB and EC traffic lights and switching the system to automatic mode with the use of encoding with multi-valued ALS (ALS-EN) signals allow to increase the section capacity by 20-25%

Proposals to change the reporting on the weight of freight trains

In the current Russian Railways statistical reports, the average gross weight of a freight train is determined by the formula:

$$Q = \frac{\text{gross ton} - \text{kilometers}}{\text{locomotive} - \text{km at the head of trains}}, (\text{tons})$$

Proposals to change the reporting on the weight of freight trains

The average daily productivity of a freight locomotive is determined by the formula:

$$F = \frac{\text{gross ton} - \text{kilometers}}{\text{Working locomotive fleet}}, (\text{gross ton} - \text{km})$$

Proposals to change the reporting on the weight of freight trains

As we can see, these indicators are related to each other:

$$F = \frac{Q \times \text{train} - \text{kilometers}}{\text{Working locomotive fleet}}, (\text{gross ton} - \text{km})$$

Proposals to change the reporting on the weight of freight trains

Therefore, it is proposed to cancel the accounting of the train average gross weight as a separate indicator and introduce two new accounting indicators.

1. Performance of freight trains unified weight ($Q_Н$) of the tight run profile

$$\frac{Q_Н}{Q_Г} \times 100 = \%$$

$$Q_Г = \frac{\text{gross ton} - \text{km of trains with a weight of } \leq Q_{кр}}{\text{train} - \text{km}}, \text{(tons)}$$

where $Q_{кр}$is the standard weight of a freight train by locomotive power.

Proposals to change the reporting on the weight of freight trains

2. Performance of the heavy trains weight task, including twin trains on virtual coupling

$$Q\text{тв} = \frac{\text{gross ton} - \text{km of trains with a weight of } \leq \text{Qн} \times 1{,}5}{\text{train} - \text{km}}, \text{(tons)}$$

The introduction of this indicator will help to increase the passing and carrying capacity.

Thank you for your attention