Linking stock, joining forces

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Up to now the European braking and signalling requirements have limited the freight trains' size. However, this can change sooner rather than later thanks to the development of new technologies.

Policy-makers' and R&D's focus is nowadays being shifted on such issues as energy savings and environmental protection. Moreover, economy-driven improvement of existing infrastructures' utilization is inevitable in order to both fight congestion on roads and reduce operating costs. Fortunately, successful 1,500 m long freight train trails carried out by the EU co-funded MARATHON project have shown that Europe is heading towards fulfilling 21st century competitive demands by introducing efficient as well as flexible & eco-friendly solution.

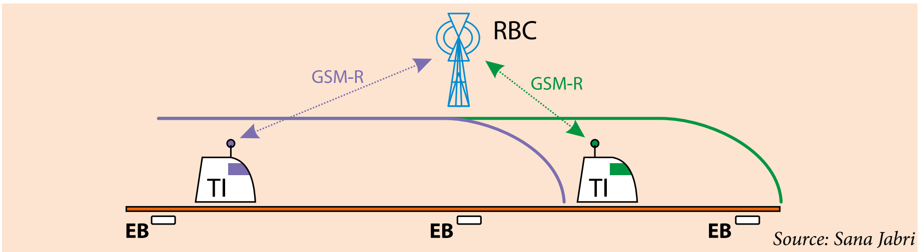
MARATHON project partners wish to make rail freight transport more competitive, by allowing operators to run longer trains in compliance with safety rules, adding therefore extra capacity without actually putting new tracks on the ground. Project mission also covers streamlining rail freight services through nodal points and encourages a more cooperative attitude among rail operators. In short, longer trains will very much relieve EU countries' budgets from capital-intense and long-drawn rail infrastructure investments, improve air quality and make roads safer.

Breaking the way

Looking at the way traffic is managed across rail networks, preserving enough breaking space in front of a mega-train is a must. This can be accomplished by two ways. One, by dividing the network into sections (blocks) protected by traffic lights between which a train can run at normal speeds (when the next block is empty) or stop if necessary (Fig. 1). The second option is a bit more sophisticated (Fig. 2) – by knowing the real time position of the preceding train the following set is able to stop on time. This solution is based on the mobile block principle which in the long-term is the target of the level 3 European Rail Traffic Management System (ERTMS).

A new mega-train braking system has therefore been developed, whereas a new computerised interface manages radio signals between the coupled trains with special new antennas used to ensure that messages can be sent uninterruptedly between trains through tunnels, forests and mountains, independent of weather conditions. The project team has packaged these innovations into a technology kit, which the partners hope to roll out for commercial use by 2016 (provided that relevant authorities will give their approval and that all procedures will be satisfied).

Fig. 2. ERTMS level 3 rail signalling system



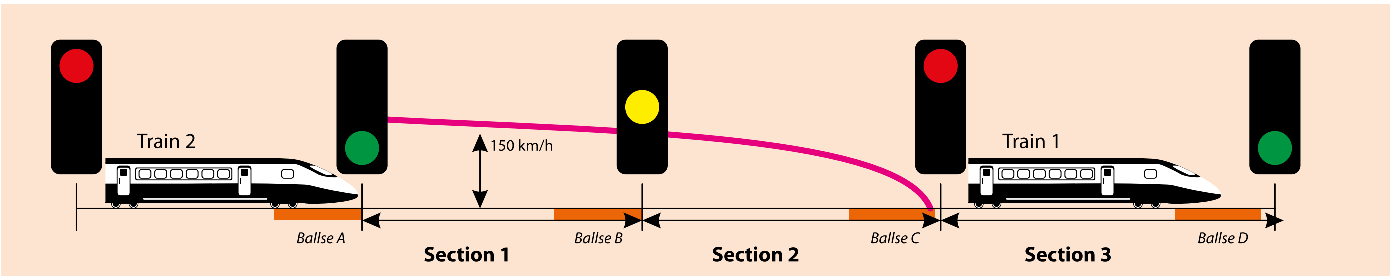
On the 18th of January, 2014, the MARATHON team tested the very first 1,500 m long freight train. It was pulled in France from Lyon to Nîmes by two Alstom/Akiem electric locomotives covering the full distance of 300 km and reaching a top speed of over 100 km/h. Three months later, on the 12th of April, the test was repeated on the same stretch, this time using two Vossloh diesel locos. The MARATHON train, with 1,524 m – the longest set in Europe to date, consisted of 72 wagons and a maximum load of 4,036 tonnes. Before launching the train received an approval from the French National Safety Authority EPSF as well as passed all possible extreme conditions stress tests in laboratory conditions. As was foreseen, the mega-train was able to pass successfully all braking procedures in the normal as well as in the degraded mode, proving its absolute safety just as an ordinary train would do.

Combining benefits

The MARATHON train is a combination of two standard 750 m or three 500 m long trains with a master locomotive in the front and a slave loco in the middle, radio commanded by a driver sitting at the head of the set with the use of a remote control. During the pilot test, it took less than 15 minutes to couple the trains – a major step towards efficiency – with transportation cost savings of up to 30%. These stem from transporting more than twice the payload of a classical train, by using only one driver to control the two or three coupled trains as applicable, by making fewer train passes on the existing infrastructure and last but not least – by consuming less energy.

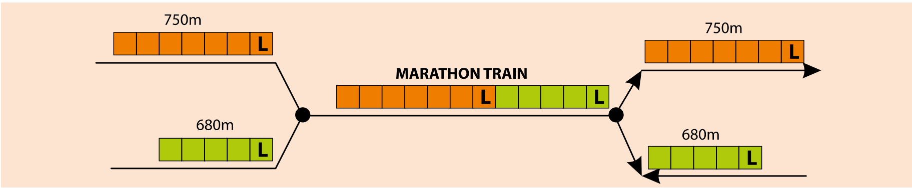
Luckily, there's no need for constructing new and expensive rail infrastructure for these longer trains, because MARATHON aims at making the most out of the infrastructure already in place in a traditional way. In this case the best way for optimizing the use of

Fig. 1. Traditional rail signalling system



railroads is to totally fill in the 1,500 m block. Different types of trains simply converge at a given hub into a MARATHON-type train, travelling then to other destinations for dismemberment/unloading when and where required. Such a train composition creates a 40% capacity gain per utilized path because this new type of train uses 1.2 times the capacity of one standard train instead of two, while carrying twice the load (Fig. 3).

Fig. 3. Combining separate trains into a mega-set



Moreover, the MARATHON concept opens up the possibility for new collaborative approaches. Two or three single trains could be loaded by different freight operators in order to reduce their transport expenses substantially. The economic necessity has been the main driver that has led to the co-loading of container vessels, cargo aircraft and even passenger planes. The same approach should be applied when operating and managing a mega-train.

What's more, commercial surveys have demonstrated that the market requires traffic industrialization, performance consistency as well as reliable timetables and service frequencies. In seaports rail tracks hardly exceed 750 m so it seems quite smart to prepare a few 500/750 m trains and to then combine them directly on the route within a few minutes. This solution also allows to serve medium-sized harbours by coupling two-three trains somewhere outside the port for trunk traffic; the set can then be decoupled when required if heading towards another destination. This system, by improving trunk lines through cost reduction, will increase the competitiveness of group wagon loads, suffering for some time now all over Europe.

On the future's tracks

It seems that world trade is heading towards importing more finished goods from the Far East, while Europe will be exporting more specialized technologically advanced products as well as agricultural products, foodstuffs and services. European seaports will have to face a major growth in containerized imports carried by bigger container vessels, distributed afterwards throughout more or less distant hinterlands.

With the increased volumes it will no longer be possible to keep boxes standing inside terminals where land will tend to be a limited resource (after a few years of recovery, the North Sea's container facilities are again struggling with congestion). It will therefore be necessary to swiftly move containers to dry ports and inland terminals preferably by rail and inland waterways. Mega-trains promise to ease these difficulties without turning Europe into one huge construction yard with more rail tracks than trees in a forest, backed up by more cargo traffic shifted from roads and reduced levels of noise, pollution and accidents. ■

MARATHON ('MAke RAil The HOpe for protecting Nature') has been a collaborative project (17 partners) co-founded by the European Commission in the scope of the 7th Framework Programme for Research and Development. The initiative officially started on the 1st of April, 2011, delivering in 2014 its final outcomes. The handbook on introducing in Europe 1,500 m long mega-trains can be downloaded from the project's website: www.marathon-project.eu