

FlowTrain: a new concept for sustainable and more efficient high-speed railways

The system described here is meant to improve the performance of high-speed train lines, granting both a reduction of the required power and a higher convoy speed.

FlowTrain aims to decrease the relative speed between air and wagons, which has a major impact on the power loss due to viscous friction. To do so, FlowTrain harnesses an airflow running in the same direction as the convoy; this makes FlowTrain unlike any existing concept based on the depressurisation of the duct, with the advantage of an easier implementation even in already existing tunnels. The FlowTrain plant relies on fans to channel the airflow through the ducts; it can employ the latest generation bladeless fans for a less cumbersome design. Since air has to

be driven only in sections where the convoy is running, the FlowTrain system allows for only a limited number of fans to be operational at the same time - resulting in power saving.

Considering the efficiency of the fans, the distributed pressure drop and the flow turbulence, it is possible to save 31% of power consumption of a traditional train running at the same speed of 250 km/h. On the other hand, the convoy speed can be raised from 250 km/h (traditional railways) to 283 km/h (FlowTrain) with the same power expense. The physics involved amounts to a fluid dynamics analysis and a power balance of the system. This calculation has been optimised through a MATLAB dedicated code •

