

THE OPTIMUM SPEED OF WHEEL – RAIL'S SYSTEM

Author: Òscar Mourabit Fossas

Tutor: Andrés López Pita

ABSTRACT

The concept of “*optimum speed*” is a basic parameter to get to define the most suitable exploitation's program of a railway service. Based in the cost – revenue's analysis it answers the question of which may be the most convenient speed to consider in agreement with a specific concurrent and economical environment.

The cost and revenue's valuation is then presented as the basic work's proceeding to define the optimum service, valuation that can be realized by an individualized study of every one of the implicated variables or appealing a formulation with a character more mathematical.

This concept was introduced for first time by the french high speed's services by the end of seventies emphasizing the idea that the objective must not be to circulate as fast as it was possible but as it was necessary commercially. The application of this new methodology in the Paris – Lyon's passage supposed to adopt a speed of 260 – 270 km/h. The technical and economical studies realized showed that this speed allowed getting the best rentability in a track admitting a potential speed of 300 km/h in large part of it.

The information brought by one's own experience in a railway service plays an important roll in this process of optimization (including continuo services and experimental ones) especially when is required to define the evolution of the main variable's behaviour with the speed. However sometimes is necessary to realize foresights with a more mathematical character especially from a certain speed's threshold.

In the analysis of revenues the most important aspect is the demand's evaluation. In this case the “*price – time*” formulation is one of the most used as an explicative model of distribution between train and plane, the main rival in half and large distances. These studies show that a progressive improvement of the speed doesn't receive a same answer from the demand due to the reduction in their sensibility's level. This explains the fact that rolling faster doesn't have to be the best commercial option.

There are some aspects conforming the cost in the railway exploitation. Between them the ones that are in a close relation with speed are: energy's cost, maintenance's cost, track's cost and the cost of the employees. A progressive increase of the speed supposes a grow non – linear of aspects as the move resistance, dynamic loads and track radius. At the same time and in the context of high speed, it must not get forgotten the importance of acoustic emissions, aspect that must be considered in the global cost's evaluation.

Nowadays the opening of the high speed service between Madrid and Barcelona makes evident the commercial need to overcome the barrier of 300 km/h in a relation where exists an important competence from flying transport. This is not the case of the Paris – Lyon's passage where the train, with a share of the 90 % of the traffic “train + plane”, has few options to increase their incomings.

Recommendations about travel's duration attending the competence show the need to offer a time similar as the plane one (center to center and including the registration of luggage). This supposes to get a maximum speed of 330 – 350 km/h in the relation Madrid – Barcelona, speed defined as the optimum of exploitation in agreement with the demand's foresight.

All these aspects shows at last the idea that “*optimum speed*” doesn't have to be a universal parameter and static in the time, so the necessaries cautions must be taken when models of other countries are analyzed.