ABSTRACT

The Ebre river runs along the Iberian Peninsula in the NW-SE direction flowing into the Mediterranean sea. It has a length of 914.8 Kilometers and drains the vastest Spanish hydrographic basin, which has a total surface of 85.362 square kilometers, representing a 17.3 % of the Spanish territory in the peninsula.

The Ebre river has always been a navigable river. Notwithstanding, in order to achieve an effective and continuous navigability the solution is to execute the defined projects in the river Ebre itself. The major problem arises when the river flows through those zones which are more pervious (gravel, sands…) where the river widens considerably and the draught is diminished, making the navigability difficult in periods of low flow.

The flows that this river has during the whole year make that the project of navigability go forward and in an expansion course of action. In certain sections of the river, the existing draughts cause the river is currently dredged in stages. In such event, the river floor diminishes and therefore the draught is increased up to the specific levels required to make it navigable.

Frequently the huge spates of the river have caused that the fluvial dynamic itself gives a new plan and sections to the river. Despite the strict regulation of the basin, the fluvial dynamic of the river Ebre subsists, above all, in such sections where it is not regulated.

When it comes to study the river in its entirety, or a given part of it, the knowledge of two essential factors is required: the fluvial hydrology and the hydrological regime of the river. Because of the hydraulic infrastructures which exist along its basin, river Ebre has seen both its fluvial hydrology and hydrological regime partly conditioned: accordingly, the natural regime of the river has been modified in an anthropogenic way, thus compelling it to abide by the decisions taken.

This dissertation analyzes, by means of an hydraulic model, the section of river Ebre between Móra d'Ebre and Tortosa, giving the characteristics of the fluvial hydrology it has, the

navigability of the section, the geomorphologic evolution within the last years and the computation of the Manning coefficient.

This hydraulic model is based in the integral in the river of the Saint-Venant equations which describe the non-permanent regime gradually variable in flow and free-plate.

With the geometry of the river and a circulating flow within this section, the hydraulic model calculates the are to be occupied by water, the wet perimeter, the width,... thus obtaining the hydraulic variables that will characterize each section of the river.

In order to analyze the navigability, the model has been measured considering the most up-to-date bathymetry as well as the fluvial hydrology of this section of the river. Both the draughts and speeds in each section confronted to the minimum requirement to make navigability effective are studied. Additionally, the effectiveness of the dredge procedure is verified.

The geomorphologic evolution has been analyzed with regard to different bathymetries of the same section within a seven-year lapse of time, by comparing the various hydraulic variables in each case and observing the possible evolution tendencies of the river.

Finally, the Manning coefficients for different sub-sections have been calculated, measuring the model with the limnigraphs recorded during the fieldwork carried out in 1999.

In the light of the simulations performed we can conclude that, by means of the dredge the necessary draught for navigation is attained within the section studied, and that the Manninng coefficients are in a well-defined rank. Notwithstanding, it has been corroborated that the hydraulic model, given the length of the section and the imposed hypothesis, undergoes a re-adjustment of the system when it comes to the attainment of the values during the first day of the study, which forces the extension of the time of analysis.